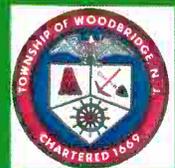


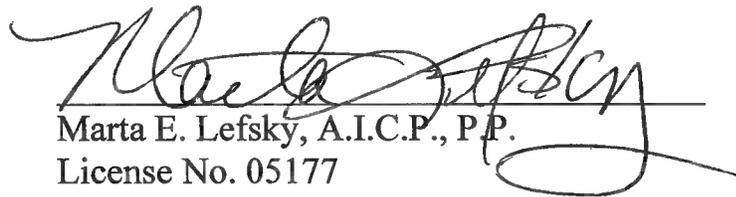
Green Buildings and Environmental Sustainability Plan Element

Township of Woodbridge, Middlesex County, NJ
Department of Planning and Development
Amended July 2012



The Township of Woodbridge, Middlesex County, has prepared this "Green Building and Environmentally Sustainable Plan Element" as an amendment to the Township Master Plan in accordance with the N.J. M.L.U.L.

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Adopted 7/25/2012 by the Township of Woodbridge Planning Board

Table of Contents

INTRODUCTION 1
COMMUNITY DEVELOPMENT: Our Progress to Date 13
LAND USE, LANDSCAPES AND ECOLOGY 22
ENERGY EFFICIENCY 32
WATER EFFICIENCY & CONSERVATION 47
MATERIALS & RESOURCES 51
CONCLUSION 59
SOURCES 60



INTRODUCTION

Sustainability is described by the American Planning Association as: “the capability to equitably meet the vital human needs of the present without compromising the ability of future generations to meet their own needs by preserving and protecting the area’s ecosystems and natural resources. The concept of sustainability describes a condition in which human use of natural resources, required for the continuation of life, is in balance with Nature’s ability to replenish them.”

Sustainability to the Township of Woodbridge is defined as the Township being committed to developing strategies that will reduce our impact on the environment both collectively and individually, so that we might preserve our natural resources for the citizens of this Township now and in the future. The Township is also committed to the growth of an economic and socially sustainable community.

Climate change is the single greatest challenge facing our planet. In February 2006, the Intergovernmental Panel on Climate Change released a report that people have accelerated the effects of climate change and as a result the argument has shifted: “We are no longer debating the existence of global warming, but what to do about it.”

Satisfying the world’s appetite for energy contributes to the growing crisis of global climate change, and New Jersey’s energy environment is contributing to this crisis.

Although New Jersey’s contribution is small when measured against the rest of the world, we can help lead the way in reducing the threat of climate change, and position ourselves to be as economically competitive as possible as the world mobilizes to address that threat.

Most power plants generate electricity by burning fossil fuels, such as coal, oil, or natural gas. The combustion process releases air pollutants including nitrogen oxides, sulfur

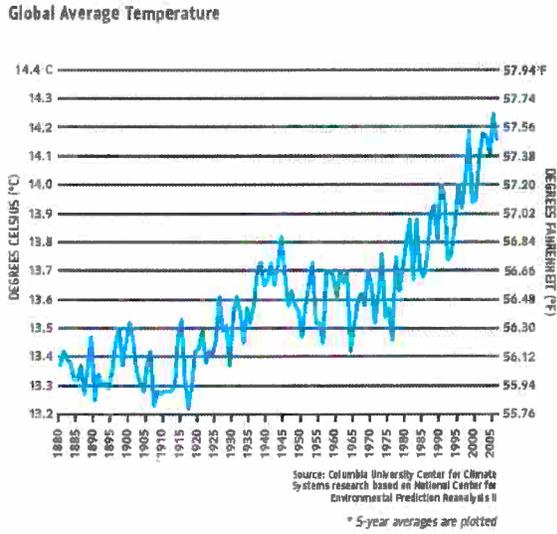
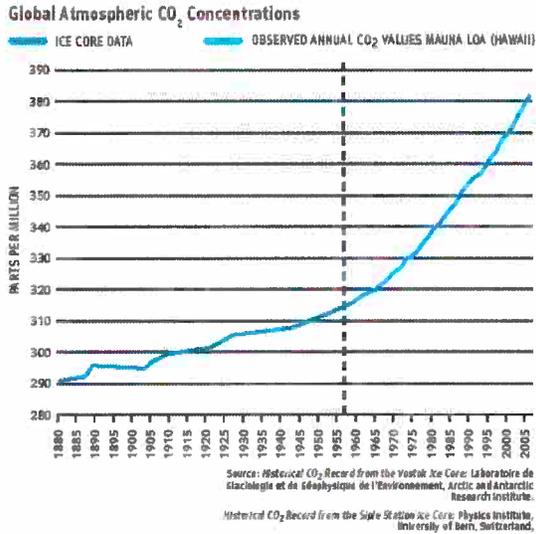


dioxide, mercury, and fine particles – pollutants that cause acid rain, respiratory diseases, neurological damage, and premature death. To attain health standards for ozone and fine particles, the New Jersey Department of Environmental Protection (DEP) has developed plans which affect electric generating units, as well as most other major air pollution source categories. The DEP's Ozone State Implementation Plan, which was submitted to the EPA in 2008, commits to a multi-pollutant control program for New Jersey's existing seven coal fired power plants. That will require all units to install up to date air pollution control systems for nitrogen oxides, sulfur dioxide, and other particulates.

Burning fossil fuels also releases carbon dioxide, a greenhouse gas that is contributing to the accelerating warming of our planet and changing our climate. Fossil-fueled electric generation, and the extraction and transport of the fossil fuels it depends on, also causes the emission of other greenhouse gases such as methane and nitrous oxide. Although these gases are emitted in far smaller quantities than carbon dioxide, each ton of those gases contributes more to global warming than a ton of carbon dioxide.

Carbon dioxide is the most common greenhouse gas. Today there is approximately 30 percent more carbon dioxide in the atmosphere than there was at the beginning of the Industrial Revolution, and as a result, temperatures have risen by almost two degrees Fahrenheit. By 2030 local temperatures may increase by another two degrees. The world also faces the threat of sea level change and intensifying storms.





The future impacts of climate change will affect our environment, economy, and the way we live. Moreover, natural resources are being consumed faster than they are being replenished. Without a plan for sustainability, we run the risk of depleting our natural resources to such levels that will dramatically change the way we live. Furthermore, as we realize our impact on the environment, it is paramount to change our daily habits toward a more energy efficient lifestyle.



The DEP has prepared the table below (Table 1), as a result of its response to Executive Order 54 and the Global Warming Response Act, that shows the greenhouse gas emissions by each sector, including the emissions from electricity generation. The emissions from electricity generation, from both in-state generation and emissions estimates of imported electricity, was approximately 33.4 million metric tons in 2005, which is approximately 25 percent of New Jersey's total greenhouse gas emissions. If no actions are taken, New Jersey's electricity contributions to greenhouse gas emissions may grow more than 27.5 percent from 2005 to 2020.



New Jersey Historical and Reference Case GHG Emissions, by Sector^a

(Million Metric Tons CO ₂ e)	1990	2000	2005	2010	2020	Explanatory Notes for Projections
Energy	111.9	118.4	130.4	131.2	145.1	
Electricity, Production-Based	12.4	20.2	20.3	17.9	31.7	All electricity values based on NJBPU projections, see assumptions in Appendix A.
Coal	6.9	10.7	9.6	12.4	15.6	
Natural Gas	3.6	7.4	8.3	4.1	13.4	
Oil	1.7	0.9	1.1	0	0	
Wood (CH ₄ and N ₂ O)	0.01	0.03	0	0	0	
Refuse and biomass	0.2	1.3	1.3	1.4	2.7	Under review; subject to revision
Net Imported Electricity	14.1	7.3	13.1	18.8	10.9	
Electricity Consumption Based	26.5	27.5	33.4	36.7	42.6	
Residential/Commercial/Industrial (RCI)	46.3	43.4	45.1	39.4	41.4	
Coal	0.70	0.033	0.029	0.029	0.030	Based on USDOE data
Natural Gas	20.5	25.6	26.2	22.9	26	Based on NJBPU projections
Oil	25	17.7	18.8	16.4	15.3	Based on NJBPU projections and USDOE data
Wood (CH ₄ and N ₂ O)	0.14	0.09	0.08	0.08	0.08	Based on USDOE data
Transportation	36.6	45.2	49.5	52.7	58.6	
On-road Gasoline	29.8	35.6	38.9	41.1	44.3	Based on USDOE regional projections
On-road Diesel	4.22	6.76	7.63	8.54	11.0	Based on USDOE regional projections
Marine Vessels	1.01	1.35	1.48	1.56	1.79	
Rail, Natural Gas, LPG, other	0.63	0.48	0.48	0.51	0.55	Based on USDOE regional projections
Jet Fuel and Aviation Gasoline	1.00	1.00	1.00	1.00	1.00	Estimated in-state portion of emissions only
Fossil Fuel Industry	2.5	2.2	2.4	2.5	2.6	
Natural Gas Industry	2.45	2.23	2.40	2.45	2.55	
Industrial Processes	1.3	2.9	4.0	5.5	8.6	
Nitric Acid Production (N ₂ O)	0.203	0.001	0.001	0.001	0.001	Based on State's modeling forecast of manufacturing employment for 2006-2020
Limestone and Dolomite Use (CO ₂)	0.000	0.003	0.005	0.005	0.004	Based on State's modeling forecast of manufacturing employment for 2006-2020
Soda Ash (CO ₂)	0.08	0.08	0.08	0.08	0.08	Based on 2004 and 2009 projections for U.S. production
ODS Substitutes (HFC, PFC)	0.010	2.41	3.59	5.16	8.37	EPA 2004 ODS cost study report
Electric Power T & D (SF ₆)	0.63	0.4	0.4	0.21	0.12	Based on national projections (USEPA)
Semiconductor Manufacturing (HFC, PFC, SF ₆)	0.01	0.03	0.03	0.02	0.01	Based on national projections (USEPA)
Laboratory Use of SF ₆	0.33	0.02	0.02	0.02	0.02	Assumed no change from 2005 levels.
Waste Management	15.9	7.8	5.9	5.1	4.6	
Waste Combustion	0	0	0	0	0	Captured under electricity production sector
Landfills	15.4	7.3	5.4	4.5	4.0	Includes waste landfilled out of state
Wastewater Management	0.45	0.52	0.54	0.57	0.64	Projections based on historical 1990 to 2005 average annual growth rate.
Agriculture	0.6	0.6	0.5	0.5	0.4	
Enteric Fermentation	0.13	0.09	0.08	0.07	0.06	
Manure Management	0.04	0.03	0.03	0.03	0.02	
Agricultural Soils	0.45	0.43	0.39	0.39	0.35	
Forestry and Land Use (Land Clearing Releases)	1.1	1.1	1.1	1.1	1.1	Based on NJDEP methodology; See Appendix H
Total Gross Emissions	130.8	130.8	142.1	143.4	159.9	
Forestry and Land Use (Sequestration)	-7.5	-7.0	-6.7	-6.5	-5.9	Based on NJDEP methodology; See Appendix H
Net Emissions (incl. forestry*)	123.2	123.8	135.3	136.9	154.0	
Increase in net emissions relative to 1990		<1%	10%	11%	25%	

^aAll values are estimates; 1990 and 2000 values are believed accurate to within 5%; projections are much less certain.



Scientists believe that only massive reductions in worldwide greenhouse gas emissions, on the order of 60 percent to 80 percent, in the middle of the 21st century, will stop the process of global warming.

Our carbon comes from many sources, but is mainly affected by three factors: (1) the efficiency of the buildings we live in, which determines how much heating fuel, natural gas, and electricity we consume; (2) the way we generate electricity, because inefficient power plants produce far more carbon dioxide than state-of-the-art ones; (3) transportation, including the amount of driving we do and the truck trips required to haul the freight we need. Slowing the pace of climate change will require concerted action across the world. But we also cannot afford to wait until others take the lead. It is incumbent on us to rise to the definitive challenge of the 21st century.

The Municipal Land Use Law (N.J.S.A. 40:55D-28) gives municipal planning boards the authority to prepare and adopt master plans or components thereof to guide the use of lands in a manner which protects public health and safety and promotes the general welfare. One component of the municipal master plan is the Green Buildings and Sustainability Element, which shall

“provide for, encourage, and promote the efficient use of natural resources and the installation and usage of renewable energy systems; consider the impact of buildings on the local, regional and global environment; allow ecosystems to function naturally; conserve and reuse water; treat storm water on-site; and optimize climatic conditions through site orientation and design.”

The Master Plan of the Township of Woodbridge was adopted in 2009. Although the Master Plan included a Recycling and Sustainability Plan Element, the Township desired to expand that plan element with the more comprehensive Green Buildings and Sustainability Plan Element. In August 2009, the Township prepared this Green Buildings and Sustainability Plan Element to provide a vision of a sustainable community in the future and strategies to achieve that vision. This plan element is being updated to reflect the Township’s current sustainability efforts and to provide better guidance for making decisions which will affect the environment.



The chief strategy of our initial sustainability element is the reduction of greenhouse gas emissions and conservation of natural resources through the recommendation of a series of strategies and policies to implement that reduction. The Township recognizes how decisions made regarding land use, community development, and redevelopment have a significant impact on the increase or reduction of greenhouse gas emissions. In light of the impact of these decisions, this Master Plan Element is intended to be used as a guide by Township officials when making decisions involving land use, transportation, land conservation, building and construction, waste management, and water conservation, which will affect the environment. This Plan will act as a vision to update municipal ordinances including, but not limited to, the Demolition and Construction Debris Recycling Ordinance, the Green Checklist Development Application Ordinance, and the Tree Protection Ordinance. The Master Plan Element will help implement these existing ordinances as well as any new and updated applicable ordinances. It will enable the Township to improve its current practices in order for the Township to become more sustainable.

The Plan includes a vision, goals and objectives for the Township to create a more sustainable community.

Vision

Woodbridge Township is committed to working today to create a more sustainable future. The Township remains dedicated to creating and implementing strategies that will reduce our negative impacts on the environment so that we will preserve our natural resources for the citizens of this Township now and beyond.



Goals and Objectives

The overall Goals of this Sustainability Element are the following:

1. Reduce Greenhouse Gas Emissions: Reduction of GHG's created or contributed by the Township Administration and the Community at large;

Objectives:

- (a) Reduce municipal and communitywide overall energy use and increase overall use of renewable energy sources in buildings by maximizing energy conservation and efficiency first, then maximizing renewable energy use in meeting remaining energy needs
- (b) Create incentive to promote investment in green building and sustainable design by offsetting initial building costs and streamlining permit process
- (c) Track Municipal Energy Expenditure and Building Maintenance
- (d) Obtain Energy Star Certification for All Buildings When Major Renovations Take Place
- (e) Enforce Anti-Idling Policy for Medium and Heavy Duty Non-Emergency Municipal Vehicles
- (f) Continue to Implement An Alternative Fuel Vehicle Fleet
- (g) Create a Carpool Board for Municipal Employees and Promote Carpooling/Alternative Fuel Vehicles
- (h) Reduce Urban Heat Island Effect and Preserve/Enhance Strategic Open Space Areas
- (i) Update Municipal Climate Goals to Match State Initiatives
- (j) Create Climate Change Mitigation Priority List for Special Environmental Permit Projects
- (k) Promote NJDEP Environmental Stewardship Checklist Program
- (l) Establish a Public-Private Industrial Advisory Group to Promote Climate Change Mitigation
- (m) Reduce Carbon Intensity of New Industries



- (n) Support Local Industries That Create Beneficial Uses for Recycled Materials
- (o) Small Business Energy Efficiency and Incentives Outreach
- (p) Encourage Home Performance with Energy Star
- (q) Create and Implement “Anything But Cars” (ABC) Program
- (r) Build upon Buy Local Program to Increase Services Offered in Downtowns
- (s) Establish a Pilot Site for Electric Vehicle Car-Sharing
- (t) Become a Leader in Regional Transportation Solutions
- (u) Implement a Tree Canopy Program
- (v) Greening Downtown and Other Large Multi-Use Redevelopment Projects
- (w) Plan and Implement Community Energy Aggregator Concept.

2. Conserve our Natural Resources;

Objectives:

- (a) Minimize embodied energy due to fossil fuel and other resource use in municipal government buildings, facilities and maintenance operations
- (b) Reduce use of potable water for landscape maintenance
- (c) Reduce use of potable water by building occupants
- (d) Preserve and enhance water quality by implementing non-structural storm water management practices that reuse and restore the quality of on-site run-off, e.g. constructed marsh or wetlands systems
- (e) Maintain natural terrain, drainage, and vegetation, and habitat by minimizing disruption of natural systems; remediate or restore degraded natural systems and discourage development that disturbs these natural systems
- (f) Promote innovative measures to reduce water use and increase wastewater reuse
- (g) Increase infiltration to recharge groundwater aquifers



- (h) Reduce water use during development process and ensure that current zoning and land use plans can sustain current and projected populations and development based on current and future water, wastewater, and stormwater treatment facilities
- (i) Promote sustainable stewardship of preserved lands
- (j) Ensure a well-defined “edge” around each community that is permanently protected from development through land acquisition and conservation easements
- (k) Implement a system of green spaces, and associated connections, within and among communities that may include links along established utility corridors, waterways, and abandoned railroads
- (l) Reduce or eliminate dependence on raw materials and non-local sources for construction, operation and maintenance of municipal buildings, facilities and operations
- (m) Collect and store non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics and metals
- (n) Purchase and utilize environmentally preferable products
- (o) Discourage the use of products that emit waste or other pollutants or products that utilize excess non-renewable and/or non-degradable resources.

**3. Promote Energy Efficiency through Public Outreach and Education:
Effectively alter the habits of the community to promote conservation;**

Objectives:

- (a) Provide guidance and education regarding energy conservation, green building and sustainable design measures for residential, business, and industry
- (b) To tap individuals’ energy and commitment to sustainability in achieving all of the goals and objectives stated above in the other sections of this plan through individual citizens’ participation or involvement in their families, homes, schools, workplaces and community institutions



- (c) To encourage businesses to accept as many of the following Sustainable Business Principles as possible (adapted from the Alliance for Sustainable Colorado):
- Leadership - Our business complies with and strives to exceed compliance with all applicable regulations. We share our practices with others and support stakeholders, suppliers and customers who are committed to sustainability
 - Education - Our business educates those in our “supply chain”, our stakeholders and youth about our sustainability practices and involves them in minimizing the life-cycle, social and environmental impacts of our products and services
 - Save energy - Our business conserves energy, obtains some of its electricity from a renewable resource and/or uses energy efficiently in lighting, heating, cooling travel and equipment use
 - Save water - Our business avoids wasting water by using it efficiently, utilizing low-flow devices and preserves water quality by significantly reducing discharges to water sources
 - Avoid waste and pollution - Our business develops and implements comprehensive practices that prevent pollution and waste of materials and natural resources
 - Community Involvement - Our business is locally and/or is substantially involved in our local community, providing financial support and utilizing local materials and services
 - Working conditions - Our business exceeds requirements for livable wages and benefits, promotes wellness and offers flex hours and/or telecommuting
- (d) To create green business and job opportunities by educating businesses and residents on sustainable best practices, energy and water saving efficiencies and grant and incentive programs that will facilitate their implementation
- (e) To support local businesses:
- To increase the purchase of locally produced products, supplies and services by business and local residents



- To educate local residents of the benefits of purchasing local products and services
 - To create educational materials, forums and other means to increase, promote and improve local businesses
 - To support economic development through key initiatives
- (f) To tap individuals' energy and commitment to sustainability in achieving all of the goals and objectives stated above in the other sections of this plan through individual citizens' participation or involvement in their families, homes, schools, workplaces and community institutions.

This sustainability element was prepared in accordance with the provision of the New Jersey Municipal Land use Law (N.J.S.A. 40:55D-28). The plan is broken down into five critical areas:

Community Development;
Land Use, Landscapes, and Ecology;
Energy;
Water;
Materials and Resources.

Each Section contains background information and recommendations under each subject.



COMMUNITY DEVELOPMENT: Our Progress to Date

In order to foster a sense of community the Township has pooled its resources and created and participated in the following pilots, projects, and programs to develop a “green” community and “greening” Woodbridge:

Green Building

- Suspended permit fees (for a pilot program for six months) for green improvements and publicized BPU and utility grant and incentive programs;
- Installed solar panels on six municipal buildings;
- The offering of green building workshops for local remodelers and contractors;
- Built a pilot rain garden at the Township Health Center.



Sustainable Planning

- Township Council adopted a Sustainable Land Use Pledge;
- Included pedestrian friendly streets in new, mixed use Redevelopment Plans;
- Creating a visually pleasing pedestrian experience in our downtowns;



- Completed an Environmental Resource Inventory;

- Completed a Community Forestry Management Plan;
- Selected a Tree City USA honoree for 19 straight years;
- Completed a joint project between the Army Corp of Engineers, the NY/NJ Port Authority, NOAA, the NJDEP and the Township remediated 23 acres of wetlands along the Woodbridge River;

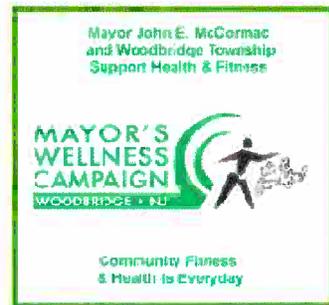


- The purchase of the nation's first green emergency management command vehicle.



Public Events and Educational Outreach

- The holding of regular programs which promote walking and cycling through the Mayor's Wellness Committee;



- Started a Farmers Market that is held weekly throughout the summer and fall;

- Held an annual Earth Day, Green Fair;



- Provide year round entertainment and recreation activities so that residents do not have to travel far to enjoy leisure activities;



- Created a “Buy Local” Program;

- Compiled special editions of the Green Woodbridge news;



- Supported local businesses through WEDCO, the Chamber of Commerce and the downtown Special Improvement Districts;

- Enrolled the Township in the NJMHFA “Live Where You Work” Program;



- Designated by the League of Municipalities as a Healthy Community;

- Distributed the ‘Green Challenge’ through the schools and at community events.



Green Web Technology

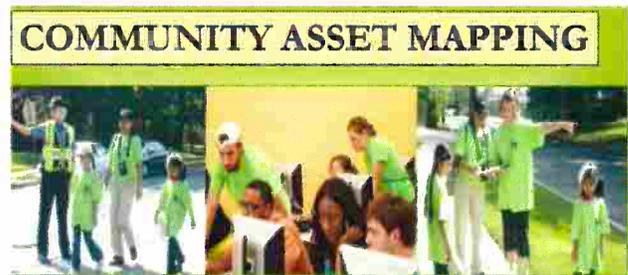
- Implemented web technologies (Intranet/Internet) for instant access from home to reduce the need to travel to various government locations and shopping;

- Established a Sustainable Woodbridge link to the Township website;

<http://www.sustainablewoodbridge.com>



- Consolidated 30 servers into six at the Municipal Data Center;
- Creation of a Day Forward program in digitizing all government documents reducing paper and saving the trees;
- Community Asset Mapping to develop walking routes to schools.



Recycling



- Established a recycling drop off center at public works;
- Established Township wide free special trash pickup days;



- Established permit-free garage sales the weekend before the special pick-ups;
- Implemented a voluntary “Cut it and Leave It” program for glass clippings.



Community Development Recommendations:

- **Increased Bicycle Use**

The Township can encourage bicycle use by developing a network of bicycle lanes throughout the ten sections of town. These bike paths will provide safe passage for cyclers, who are now forced to share the roads with all types of vehicles with no designations for bicycle use. Our goal is to put these lanes within right-of-ways that have the capacity to handle bicycle

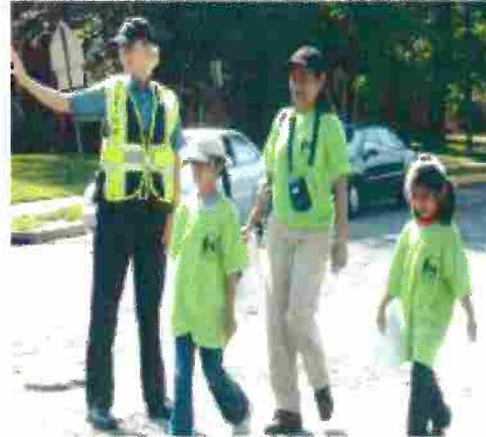


traffic. Ideally, bike lanes should connect residents to parks, shopping centers, and transportation services. Bicycle racks should be made available at government buildings, train stations, and retail centers. Bicycle parking locations should be heavily considered, especially in each of the downtown areas. A bike master plan could be developed to ensure a Township wide biking system is in place.



- **Improve Walkability**

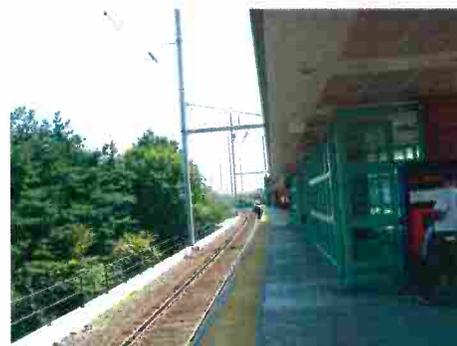
Walking is a healthy alternative to using the automobile, not only to the individual but to the environment. The Township should encourage walking by maintaining and developing a Township-wide sidewalk network, which would link walkers from their homes to parks, shopping centers, and downtown business districts.



Streetscape is important in the promotion of walking. The Main Street streetscape has been refurbished with new street trees, street lights, solar powered crosswalk signal light and a neighborhood façade program. The Township’s Tree Canopy program will improve the streetscape of neighborhoods throughout Woodbridge. By making areas more appealing to pedestrians, automobile use can be reduced and a cleaner and healthier environment is created. In addition, proper streetscape can help manage stormwater runoff.

- **Increased Mass Transit Use**

Woodbridge is fortunate enough to have three train stations and numerous bus routes. The Township can encourage residents to use these services by providing information to residents through the Township website, newsletter and television station. Schedules should be made more available to the public.



- **Continue the purchase of Hybrid Vehicles**

The Township has already undertaken the step of adding hybrid vehicles to its fleet.

In February 2007, the Township Council approved the purchase of 12 Ford Escape hybrid vehicles. This was the single largest purchase of hybrid vehicles by any municipality in Middlesex County. These vehicles are estimated to get 36 miles per



gallon. The Township’s purchase of the nation’s first green emergency management command vehicle furthers its commitment to using fuel efficient vehicles.

- **Expand Participation in the Green Challenge**

As part of the Township’s education and outreach program, in 2009, the Township initiated the “Green Challenge.” The Challenge highlights what residents can do today and offers recommendations for the future, to be energy efficient. It raises awareness of what energy conservation looks like in all of our residences. (A copy has been included for reference and use.) The Township also initiated a Green Business Challenge to show what businesses can do to be more sustainable.

Through the vision to initiate and implement all of these projects and programs, the Township Administration has fostered community development and participation. Our “green” focus and public initiatives have resulted in thousands of Township residents and businesses taking the “Green Challenge.” Because the field of energy efficiency is so quickly evolving, we expect to update this element frequently.



Take the Green Challenge!

Your name _____ How many in your household _____
 Address _____ City _____ Zip _____
 Email _____ Phone _____

GREEN LEVEL — My household pledges to do 5 of the following:

- _____ Change our light bulbs to CFL or LED
- _____ Adjust thermostat to save energy
- _____ Reduce water heater temperature
- _____ Do laundry in cold water
- _____ Run dishwasher and clothes washer only when full
- _____ Turn off water when brushing teeth
- _____ Turn off lights and computers when not in use
- _____ Take used clothing to local textile collection bins
- _____ Use ceramic (not paper or plastic) cups, utensils, plates
- _____ Use re-usable shopping bags
- _____ Use discarded paper for scrap paper
- _____ Walk or ride a bike instead of driving once a week
- _____ Shop locally to save auto fuel
- _____ Buy produce at a Farmers Market (*Woodbridge Market runs till Oct. 31*)
- _____ Participate actively in Township weekly home recycling pickup
- _____ Take large recyclable items to Township drop-off center
- _____ Stop car-idling; turn off engine when parked more than 30 seconds
- _____ Share sustainable living and energy saving ideas with family and friends

Every Day Steps YOU Can Take
to Help Make Our Community
Green, Greener and Greenest!

Please return this form to:

“Greenable Woodbridge”
Town Hall, 1 Main Street
Woodbridge, NJ 07095



GREENER LEVEL — My household pledges to do 8 actions from the list above and 2 from this group:

- _____ Plant a tree a year
- _____ Make a Rain Garden in our yard
- _____ Use organic fertilizer on our lawn
- _____ Use non-phosphate detergents
- _____ Stop using bottled water
- _____ Buy “Energy Star” appliances
- _____ Carpool to work
- _____ Add aerators to tap and shower heads to save water
- _____ Buy home furnishings made from sustainable/harvested wood products
- _____ Replace single-pane windows with energy efficient double-panes



GREENEST LEVEL — My household pledges to do 15 from the Green & Greener groups and 1 of these:

- _____ Drive a hybrid car
- _____ Drive no car at all
- _____ Install solar panels on my home or business



John E. McCormac, Mayor ♦ Woodbridge Township Environmental Commission



LAND USE, LANDSCAPES AND ECOLOGY

Proper land use and the preservation of land is a vital component of reducing pollution and conserving natural resources. Suburban sprawl and overdevelopment are great concerns in New Jersey. From 1995 to 2002, undeveloped land cover was converted to urban/residential land uses at a rate of 10,000 acres per year. The amount of forested land decreased significantly between 1986 and 2002 at a rate of 2,700 acres per year. Barren lands, lands generally being prepared for development, increased in conversion rate by 300 percent between 1986-1995 and 1995-2002. The conversion rate of wetlands continued at a rate of 1339 acres per year, between the periods 1986-1995 and 1995-2002.

Woodbridge Township is unique that it is one of the most accessible municipalities in New Jersey thanks to its many roadways and mass transit options. It is the only municipality in New Jersey where the Garden State Parkway and New Jersey Turnpike intersect. Other major roadways that can be found in the Township are Route 287, Route 1, Route 9, Route 27, Route 35, and Route 440.



As a post World War II community, residents rely heavily on the automobile for everyday travel needs. Automobile use and other automotive modes of transport pollute the environment as the Environmental Protection Agency estimates the transportation sector accounts for 30 percent of U.S. greenhouse gas emissions.

According to the U.S. Bureau of Transit Statistics, there were approximately 250 million



registered passenger vehicles in the United States in 2010. According the 2000 U.S. Census, of the 46,327 employed commuting residents who are 16 years of age and older, 40,085 commute to work by automobile. Only 4,114 residents take advantage of all forms of public transportation to commute to work and only 976 walk to work. It is Woodbridge's hope that by providing mixed use development and reliable public transportation options, the pollution caused by automobiles specifically, can be lessened.

Woodbridge Township has seen a decline in the number of people commuting to work by car, while the number of employed commuting residents has increased. In 2000, 87 percent of employed residents commuted to work by car. According to the 2010 American Community Survey (3-year estimate), the number of employed commuting residents increased to 47,885, while the number of residents commuting by car decreased to 37,476 or 85 percent. From 2000 to 2010, the percentage of residents commuting to work by car decreased by two percent. During the same time period, the number of people commuting by public transportation increased by 1.7 percent.

The Township provides various housing options that meet the needs of its residents. One type of housing that is especially environmentally-friendly is found in mixed-use developments. Mixed-use development promotes a range of housing types in creation of blocks and neighborhoods that provide amenity type services for the residents and visitors, including a wide range of retail, personal services, and entertainment opportunities. This type of development can already be found on Main Street in Woodbridge proper and New Brunswick Avenue in the Fords section of the Township. The Main Street Rehabilitation & Transit Village Plan, the New Brunswick Rehabilitation Plan, and the Avenel Street/Rahway Avenue Corridor Rehabilitation Plan all permit the development of multi-storied, mixed-use buildings and transit-oriented development. This Element further encourages mixed-use development where appropriate, which will allow residents to live in areas with more services closer to home. This would reduce dependence on the automobile as residents could walk to stores, businesses, and government offices. Mixed-use development will contribute to decreasing the Township's carbon footprint, while providing a healthier way of life

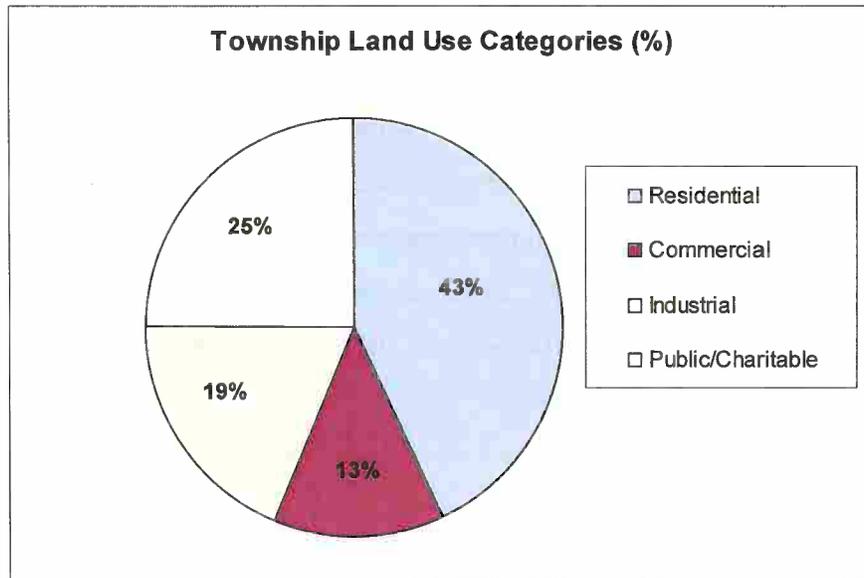


The Township offers train service at three stations: Avenel, Woodbridge and Metropark. All three stations provide direct service to Newark and New York City. Connections to Monmouth County – including many Jersey Shore attractions- are available from Avenel and Woodbridge. New Jersey Transit provides service to Trenton from Metropark, which also provides Amtrak service with direct connections to Philadelphia, Boston and Washington. According to the 2010 Census, 3,302 residents use the train to commute to work.

Recreation plays a large role in Woodbridge. The Township maintains over 695 acres of parkland and has a state-of-the-art “YMCA Woodbridge Community Center.” The YMCA runs various fitness and health-related programs as well as summer camps for Township youth. This plan recommends the continued support of outdoor recreation facilities in the promotion of good health and forming a relationship with the natural environment.

Woodbridge Township is 97 percent built-out. Residential land uses comprise 43 percent of total land use in the Township. Industrial properties make up 19 percent of the land uses. Commercial properties encompass 13 percent of total land uses. The remaining 25 percent of land include public properties and properties owned by charitable organizations. The Township currently has 695 acres of parkland.





The “New Jersey State Development and Redevelopment Plan” designates Woodbridge as a Metropolitan Planning Area (PA1). The State plan suggests that such areas shall “provide for much of the state’s future redevelopment; revitalize cities and towns; promote growth in compact forms; stabilize older suburbs;...protect the character of existing stable communities.”

In the past two years, the Township has initiated a very aggressive and forward thinking schedule of visioning and planning for all areas of the Town. The Township’s redevelopment and rehabilitation efforts will provide opportunities for energy efficient development.

Land Use, Landscape, and Ecology Recommendations

- **Transit Oriented Development “Centers”**

Of the plans adopted within the past two years, all have provided for mixed-use, multi-storied development, providing for community spaces, including plazas, parks, recreation and art center creation. The Township should strongly consider and encourage development and redevelopment of density be organized into “centers”, which would be comprised of neighborhoods in mixed-use, multi-storied



buildings, fostering an existing or creating a new “downtown.” These “centers” must be developed so that the dispersion of jobs, retail, and housing is balanced so that adequate retail and service establishments are provided in appropriate locations. This focus should be fostered through any necessary zoning amendments, plan amendments, and creation.

- **Open Space: Purchase, Creation, Preservation**

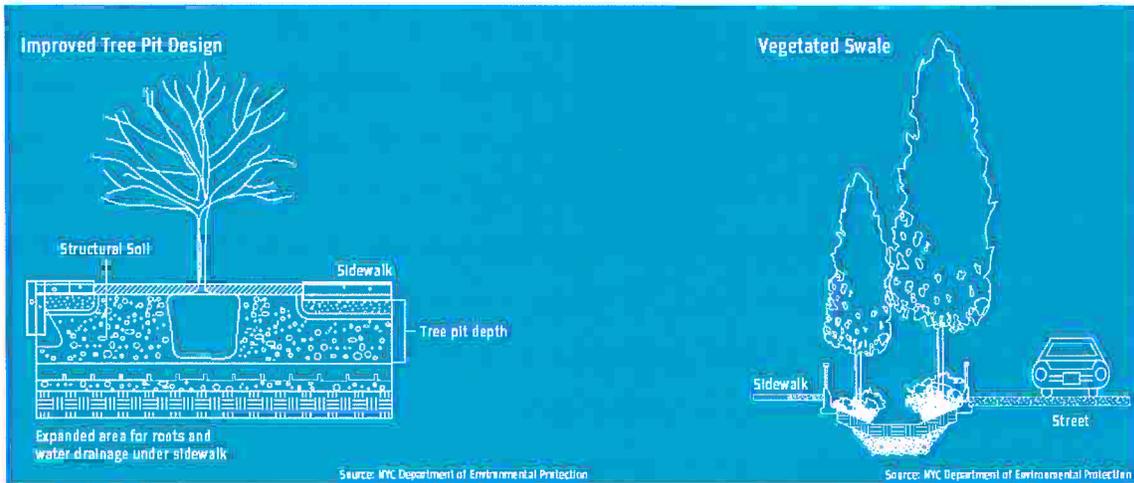
In 2008 the Township was able to obtain approval for the County to purchase a 95-acre addition to the Pin Oak Forest, located in the Avenel section of the Township, by utilizing the Middlesex County’s Open Space funds. In 2010, the Township used an open space grant to purchase the nearly five acre land previously known as Camel Creek. The property is now owned by the Township’s Redevelopment Agency, which is preserving the land as open space and protecting it from development. In 2011, the Township purchased the development rights of the 104 acre Colonia Country Club, to remain as an open space 18-hole golf course. The Township should continue to seek open space parcels and funding for additional acquisitions of acres to be utilized for active and passive recreation.



Having already created a “quasi-public” zone to assist the Township in acquisition of low-density parcels privately owned by charitable and civic organizations, the Township should actively pursue these parcel types for conservation easement, transfer of development rights or other legal vehicles to add recreation sites.



Greenways can be characterized as linear open spaces used by walkers, runners, and cyclists along either natural corridors, such as streams and rivers, or right-of-ways, such as roads and railroad tracks, used for this recreation. These open spaces can connect parks, local natural resources, cultural features, and historic sites with each other. Greenways enhance the natural beauty of towns and provide recreation opportunities for residents to remain healthy. The Township has participated and assisted the County in its purchase and development of a County utilizing an abandoned rail line through several municipalities and located along the southern section of Fords. These connections can be used to form a boundary or buffer around development, such as areas commonly referred to as “green belts.” The ultimate goal is to create, purchase and establish green landscapes, natural lands, through and around all development and have that grid connection exist throughout the Township.



- **Water Efficient Natural Structures**

Rain gardens are an effective way to manage stormwater runoff. A rain garden is a planted depression that allows rainwater runoff from impervious surfaces, such as streets, driveway, sidewalks, and roofs to be absorbed, instead of running into the Township’s stormwater system. Rain gardens can decrease the amount of pollution found on hard surfaces from reaching creeks and streams, which are usual the terminus for municipal stormwater drains.



Native plants, which should be wetland edge vegetation, are recommended for rain gardens because they generally do not require fertilizer and are more tolerant of the local climate, soil, and water conditions. The Township currently maintains a rain garden at the Health Center.

- **Brownfield Redevelopment**

Redeveloping and reinvesting in brownfields protects the environment, reduces blight, and takes development pressures off greenspaces and working lands. This redevelopment

will promote the remediation of contaminated sites. The Township already designated contaminated brownfields for redevelopment, throughout most of the industrial properities in town. Also, the Township created a steering committee, made application and was designated a Brownfields Development Area (BDA) in 2009. The designation entitles the Town to priority grant dollars up to \$5 million annually from the DEP's Hazardous Discharge Site Remediation Fund, to target stewardship of applications for these properties, and to obtain priority preference on matters at a state and national level. Earlier this year the Township entered a public/private environmental partnership to locate a natural gas-fueled electric generation facility at the former EPEC site in the Keasbey section of the Township. The future site of the energy complex is part of ongoing remediation, restoration and redevelopment of the Keasbey waterfront. It is the redevelopment of the EPEC property that is giving rise to the remediation and restoration of the waterfront.

- **Preservation**

There are many benefits of preserving open space throughout the Township. Woodbridge already has over 695 acres of parkland. In 2008, the Middlesex County acquired the 96 acre Pin Oak Forest, which is on the Township's Recreation and Open Space Inventory. Preservation will maintain our connection with the natural landscape and decrease pollution by absorbing contaminants from our air and water. It will also provide and maintain places of tranquility and recreation.



- **Protection and Creation of Wetlands**

Approximately eight percent of land in the Township is comprised of wetlands. Wetlands play a major role in maintaining and improving water quality. The Township has currently undertaken the process of developing a comprehensive inventory of public and private wetlands. When complete, this inventory will provide the exact location and sizes of all wetlands throughout Woodbridge Township.



Throughout the Redevelopment and Rehabilitation plan process, the Township should seek to preserve wetlands, and enhance those existing, while also creating passive and active access to the waterfront.



Creation of the EPEC waterfront park preserves, protects, and restores existing wetlands. Additionally, this 100-acre plus park will provide unique educational and recreation opportunities quite unlike any previously seen within the Township.

- **Landscaping**

The Township is committed to using land efficiently. Where appropriate, the Township will use “Smart Growth” practices when planning redevelopment areas. These practices include compact development, such as transit oriented development. These areas have greater levels of walkability and residents are more likely to use mass transit. The Land

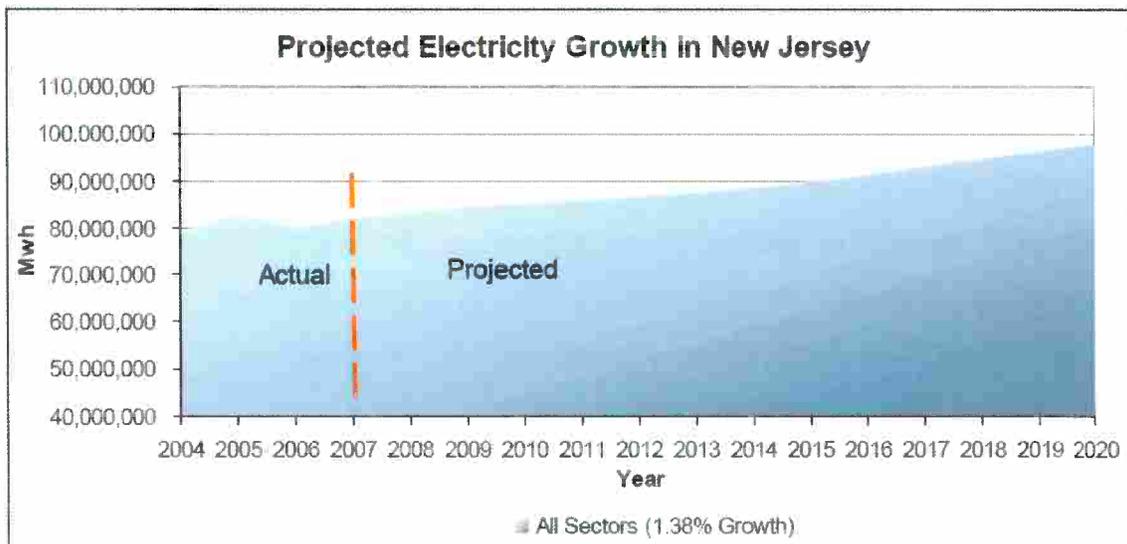
Use Pledge aims to discourage development where it may impair or destroy natural resources or the natural environment.

As outgrowth of the sustainable land use pledge, the Township should consistently review its Landscape Ordinance to ensure it provides for evolution consistent with the emerging design models and those developed in the future. Today's emerging design elements which the Township may wish to include in an Ordinance form include: planting of native species, rain gardens, roof top gardens, tree canopy, growth and initiation of a "Green Streets" program.



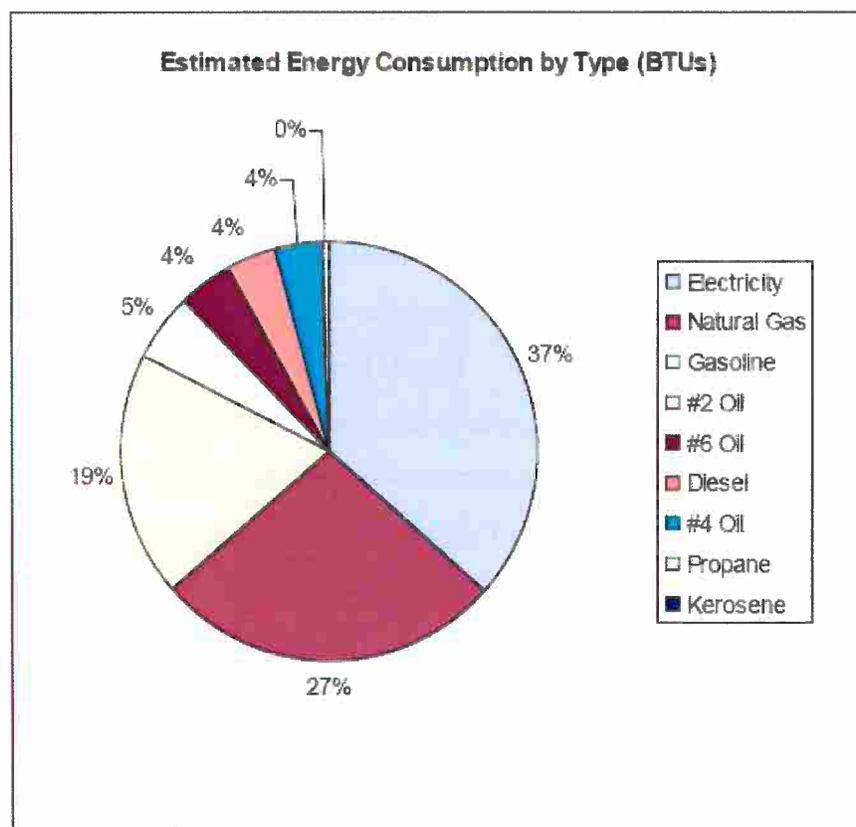
ENERGY EFFICIENCY

Changing energy practices is vital to decreasing greenhouse gas emissions and conserving natural resources. The production of electricity and the use of fossil fuels for automobiles and home heating systems contribute to global climate change by releasing carbon dioxide into our environment. Fossil fuel-based generation accounts for 50 percent of New Jersey’s total in-state electricity production. Commercial and residential buildings consume 40 percent of our nation’s energy and are responsible for 40 percent of the greenhouse gas emissions in the United States. As technology has evolved with inventions such as the microwave, personal computer, plasma and LCD televisions, the demand for energy has increased dramatically. This demand has challenged our power plants to supply more power. The increase in demand is expected to continue at a rate of 1.38 percent per year through 2020, according to the 2008 New Jersey Energy Master Plan.



Source: NJ Energy Master Plan





Source: NJ Energy Master Plan

According to the 2008 NJ Energy Master Plan, the price of natural gas doubled between 2002-2007, which drives the corresponding increases in electricity and heating fuels. Since 2002, the cost of heating oil and natural gas for residential customers in the northeast has increased by more than 200 percent. In 2005, energy costs consumed about 4.4 percent of total New Jersey personal income, according to the New Jersey Department of Labor & Workforce Development.

The Township's primary objective in becoming more energy efficient is to encourage the practice of energy conservation. This is consistent with the updated New Jersey Energy Master Plan of 2011, which states one of its main goals is to "reward energy efficiency and reward energy conservation and reduce peak demand". The Energy Master Plan also sets a target for the state of New Jersey to have a renewable energy portfolio standard of

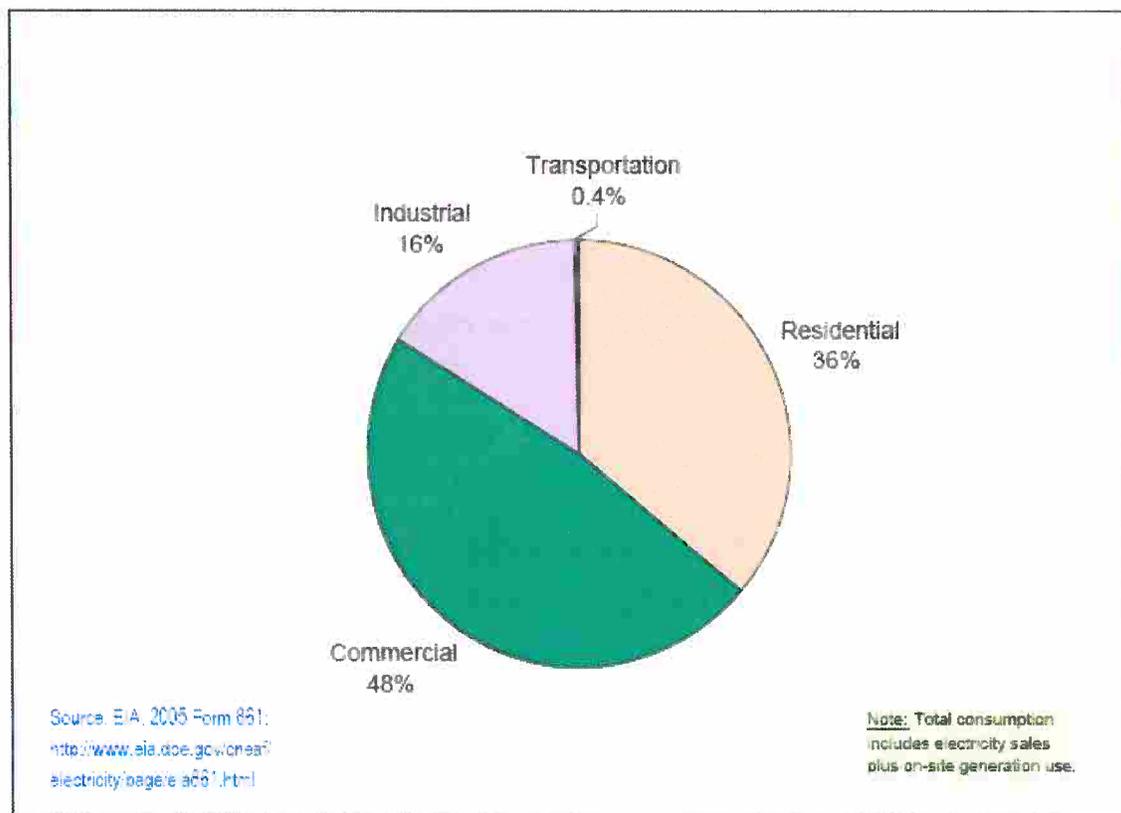


22.5% of energy from renewable sources by 2021. By doing so, greenhouse gas production and energy costs will decrease.

Energy Efficiency Recommendations

- **Green Building Practices**

In the United States, the 300 billion square feet of buildings are the single largest contributor to global warming in the nation. Buildings are responsible for 48 percent of all energy consumption and greenhouse gas emissions in the country. The U.S. alone is projected to need 1,300 to 1,900 new power plants over the next 20 years. Seventy-Six percent of all power plant generated electricity is used to operate buildings.



The following are some green building practices to reduce energy consumption:

Efficient Heating, Ventilation and Cooling

Not only do HVAC systems use electricity, they also use natural gas and heating oil, both of which are limited natural resources. Both, natural gas and heating oil have experienced significant increases and tremendous volatility in their prices, according to the New Jersey Energy Master Plan. An efficient HVAC will help decrease the use of these resources.

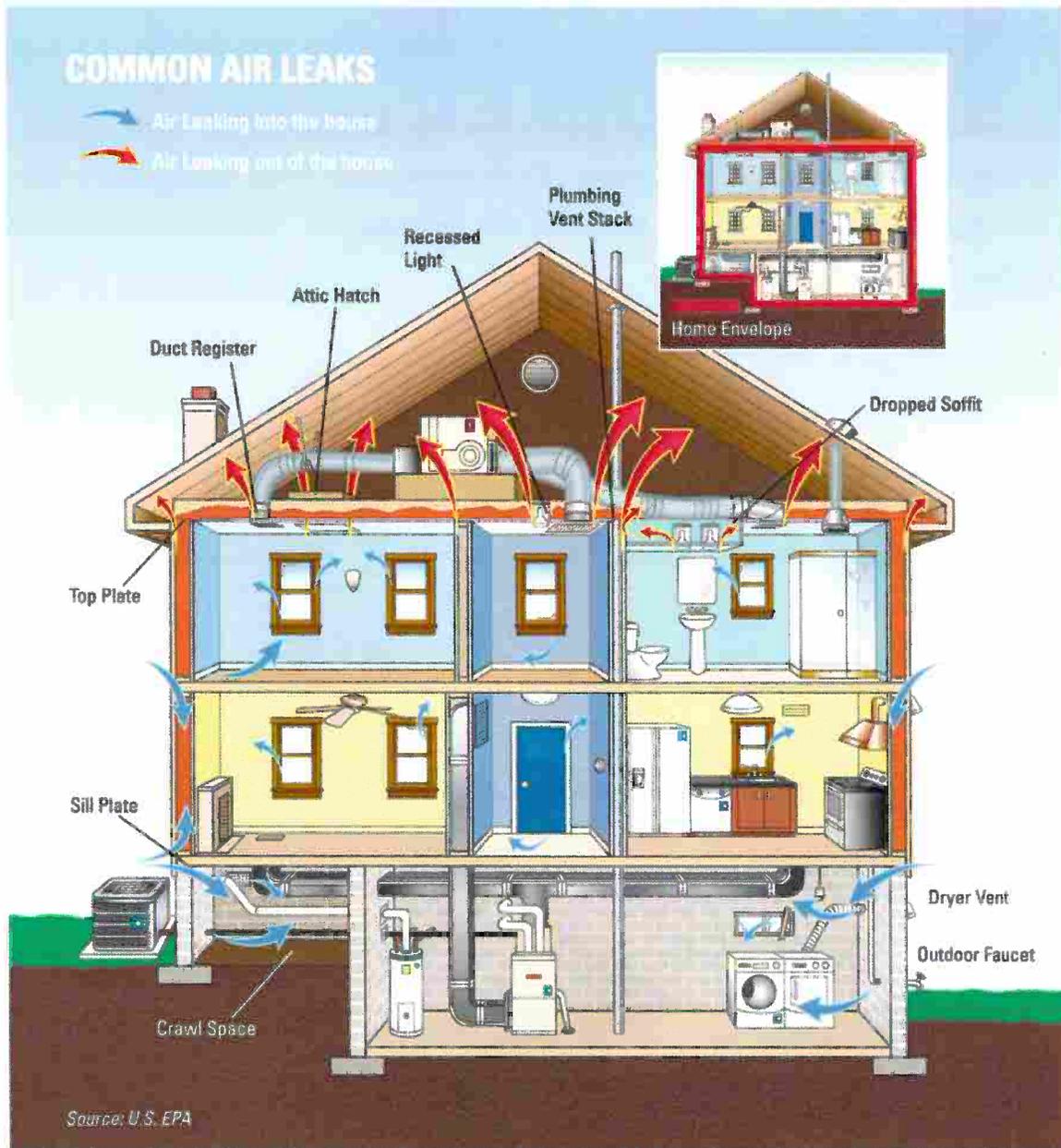
According to “Build It Green’s” “Green Building Remodeling Guidelines” “high efficiency heating equipment increases comfort, reduces pollution, and lowers energy use and associated greenhouse gas emissions.” “Build it Green” recommends ENERGY STAR certified products when installing a new heating system.

An energy-efficient cooling system can potentially save homeowners thousands of dollars in electric costs and reduces demand for electricity from power plants. In larger buildings and homes a “zone” air conditioning system should be considered. This system allows the user to cool only the areas that he or she is using and not waste energy cooling in other areas. In addition, the Township recommends installation of effective ductwork, high efficiency HVAC filters and effective exhaust systems in bathrooms and kitchens.

Improve Insulation

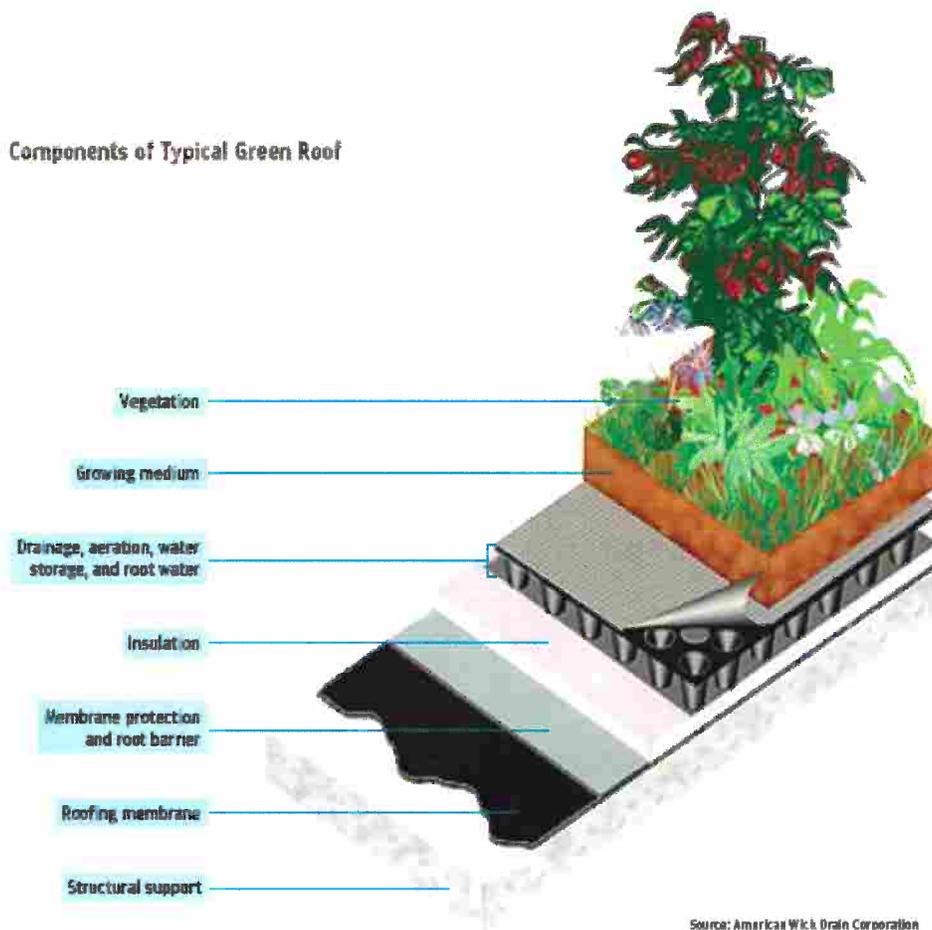
Proper insulation is an important part of using energy efficiently and maintains the indoor temperature so that heating and cooling units operate less. Previously energy has been wasted often and at less capacity. Through implementation of the State’s Energy Code, construction and plan review will now be brought up to the levels that meet this code. However, there are many opportunities to insulate a building beyond the minimum required by the Code.





“Green’ Roofs”

A green roof system contains a high quality waterproofing and root repellent system, a drainage system, filter cloth, and plants. These rooftops can lower heating and cooling costs because they are designed to absorb heat and filter air. They also improve air quality.



- **Green Building Practices Implementation**

Construction rating systems have been established in many individual states and several at the national level. The most widely recognized is that of LEED (Leadership in Energy & Environmental Design). It is the goal of these systems to establish in the absence of building code requirements, innovative and evolutionary design of structures that maximize conservation of natural resources and construction in the most energy efficient format. This lowers carbon footprint and lowers over the life of the building all the costs of maintenance and operation. The Township has already begun working with construction ready applicants to determine what has been and what can be done within these guidelines. This is an educational and interactive process and the Township shall continue to expand its programs and pilot efforts in this arena. One such program is attached on the next page. The Green Score Card will address the implementation of green practices in construction and design as part of the site planning process.





Woodbridge Township Green Building Scorecard (Checklist)

Sustainable Sites		Sustainable Sites (continued)
Site Selection		Site taller buildings to minimize shadows on an open space and other buildings
Development Density and Community Connectivity		Orient open space to maximize winter solar exposure
Brownfield Redevelopment		Provide tree canopy cover and reduce hardscape for areas with high summer solar exposure
Alternative Transportation - Public Transportation Access		Minimize disturbed areas by limiting clearing and grading to a carefully described development envelope
Alternative Transportation - Bicycle Storage and Changing Rooms		Encourage growth of native and well-adapted species and eliminate the need for fertilization and pesticides
Site Development - Protect or Restore Habitat		Reduce soil erosion
Stormwater Design - Quantity Control		Promote natural recharge and infiltration without the threat of surface contamination
Stormwater Design - Quality Control		Reduce runoff volumes and peak runoff rates
Heat Island Effect - Non-roof		Link landscape elements to form a continuous network of forage, water, and cover
Heat Island Effect - Roof		Create "finger" of habitat that reach into the urban landscape from the creek
Light Pollution Reduction		Create zones that provide a diversity of habitat and shelter through layers of plant heights and types
Use building massing to gather wind for the dispersion of air pollutants		Select native plants that provide food and shelter for song birds, small mammals, insects, etc
Use building massing to mitigate noise pollution		
Use building massing and vegetated screening to gather wind for the filtration/dispersion of air pollutants		
Use roof-top gardens and adjacent courtyards to mitigate air pollution and noise		
Orient buildings toward the southern exposure		
Create Rain Gardens to manage stormwater		
When Waterways are Adjacent		
		Stabilization and protection of slopes, water quality, and existing vegetation
		Access via pathways, bridges, boardwalks, and concerns for safety
		Connections to stormwater systems, habitat networks, pedestrian and recreation areas



Water Efficiency	Energy and Atmosphere
Water Efficient Landscaping - Reduce water needed for vegetation	On-Site Renewable Energy
Water Efficient Landscaping - No Potable Use or No Irrigation	Green Power
Increase the extent of on-site landscaping Graywater Systems	Provide opportunities for vegetated screens, awnings, overhangs, and adjustable shade structures on buildings with high summer solar exposure
Blackwater Systems	Indoor Air Quality
Materials & Resources	Up-draft ventilation and air scoop, for natural ventilation
Storage and Collection of Recyclables	Under floor displacement ventilation
Building Reuse, Maintain Existing Walls, Floors, Roof	Orient the majority of glazing to optimize daylighting potential and heat gain during winter season
Construction Waste Management - Waste Divert from Disposal	Orient thermal mass (materials that absorb, store, and conduct heat) and insulation to take advantage of southern exposure while blocking north winds
Materials Reuse - 5%	Use roof-top gardens to reduce solar gain and insulate in winter
Materials Reuse - 10%	Atrium spaces
Recycled Content - (post consumer + 1/2 pre-consumer)	Shade structures, awnings, overhangs
Local/Regional Materials - Materials are Extracted, Processed, and Manufactured Locally/Regionally	Internal heat recovery
Rapidly Renewable Materials	Thermal mass and insulation
Certified Wood	Photovoltaic integration
Crush gravel and concrete-use as sub-base	Separation of mechanical spaces
Saw cut concrete used as dry-laid retaining walls, edging for planting beds; unit pavers	Innovation & Design Process
Crushed glass, gravel, ceramics or aggregate for asphalt and concrete	Innovation in Design
Asphalt reuse (as sub-base or aggregate)	LEED Accredited Professional Utilization
Re-use of gravel and tar roofing materials (from demolished building) avoiding large fees to dump material	

To be discussed during site planning review. Look to see how many of these criteria your construction and design process includes.



Promote the Use of “ENERGY STAR” Products

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping to reduce electric costs through energy efficient products and practices. The EPA estimates energy efficient choices can save households about a third on their energy bill with similar savings of greenhouse gas emissions.



ENERGY STAR certified products meet strict energy efficiency guidelines set by the EPA and US Department of Energy. The following are recommendations from ENERGY STAR:

- If looking for a new home, look for one that has earned the ENERGY STAR certification an ENERGY STAR Home or inquire whether the home contains ENERGY STAR appliances.
- If looking to make larger improvements to your home, the EPA offers tools and resources to help you plan and undertake projects to reduce your energy bills and improve home comfort. ENERGY STAR information can be found on its website at www.energystar.gov.
- If looking for new household appliances, look for ones that have earned the ENERGY STAR. They meet strict energy efficiency guidelines set by the EPA and US Department of Energy.

The EPA provides an original energy performance rating system which businesses have already used for more than 80,000 buildings across the country. EPA also recognizes top performing buildings with the ENERGY STAR designation.



The Township should encourage residents and businesses to purchase ENERGY STAR compact fluorescent light bulbs as a way to improve energy efficiency. It is estimated an ENERGY STAR compact fluorescent light bulb may save about \$30 of electric costs over its lifetime and pay for itself in about six months. Standard fluorescent light bulbs use about 75 percent more energy than the ENERGY STAR compact fluorescent light bulbs and have about a 90 percent less lifespan.



- **Expand Solar Lighting**



At a municipal level the Township can continue to install LED lights in street lamps and traffic signals. The Township has already applied for multiple grants for energy efficient street lights.

- **Use Township Energy Audit Data**

An energy audit on Township facilities provided information on where energy is being used the most. This information is being used to analyze where energy is wasted and where energy can be conserved. The audit allowed the Township to take action to use energy more efficiently. For example, motion sensors were put on light fixtures after the audit at the Township Municipal Complex.



- **Utilize Township's Climate Action Plan**

The Township conducted a Climate Action Plan in 2010 and is currently using it as a guide to further reduce energy consumption in municipal buildings and schools and facilitate healthy lifestyles in our residents.

- **Utilize Geographic Information**

Geographic information is a tool which can be used to analyze data from an individual parcel of land to a township as a whole. Specifically, the Township has developed a computer based route smart system for garbage pick up, street cleaning and snow removal. These routes are planned more efficiently which results in reduced fuel consumption by public works vehicles. Now that the Township is armed with geographic data it should continue to utilize this information in innovative ways for other municipal services.

Promote Renewable Energy

Renewable energy can be a viable alternative to using conventional energy sources. Renewable energy practices use resources that emit zero or much less greenhouse gas than fossil fuels. The range of renewable energy benefits also includes lower energy costs and reduced need to develop new power plants. New Jersey's Renewable Portfolio Standard requires that 22.5 percent of the State's electricity consumption comes from renewable energy sources by 2021.

The NJ Energy Master Plan indicates renewable energy sources include the following: solar energy, wind energy, wave or tidal action, geothermal energy, landfill gas, anaerobic digestion, fuel cells using renewable fuels, biomass geothermal processes, hydropower and resource-recovery facilities.



- **Continue Installation of Solar Panels**

Photovoltaic Systems produce electricity when sunlight strikes the PV cells. This electricity is then utilized in the building, in place of electricity produced by fossil fuels. The Township has already installed such devices on six municipal buildings and will also install solar panel operated street lights along Inman Avenue in Colonia. The Township will continue to encourage innovative methods of green energy.



- **Investigate Windmill Usage**

Wind is a renewable energy source because the wind will blow as long as the sun shines. Wind machines use blades to collect the wind's kinetic energy and wind flows over the airfoil shaped blades causing the blades to turn. The blades are connected to a drive shaft that turns an electric generator to produce electricity. The Township is currently investigating the possibility of putting windmills on municipal property to generate electricity.

- **Green Technology Park** (map included on the next page)

The Township has established a lot acre mixed-use Clean Energy/Construction Technology Incubator along Pennval Road. It is essential that the Township works to bring this to innovative redevelopment area designation to fruition: This incubator will

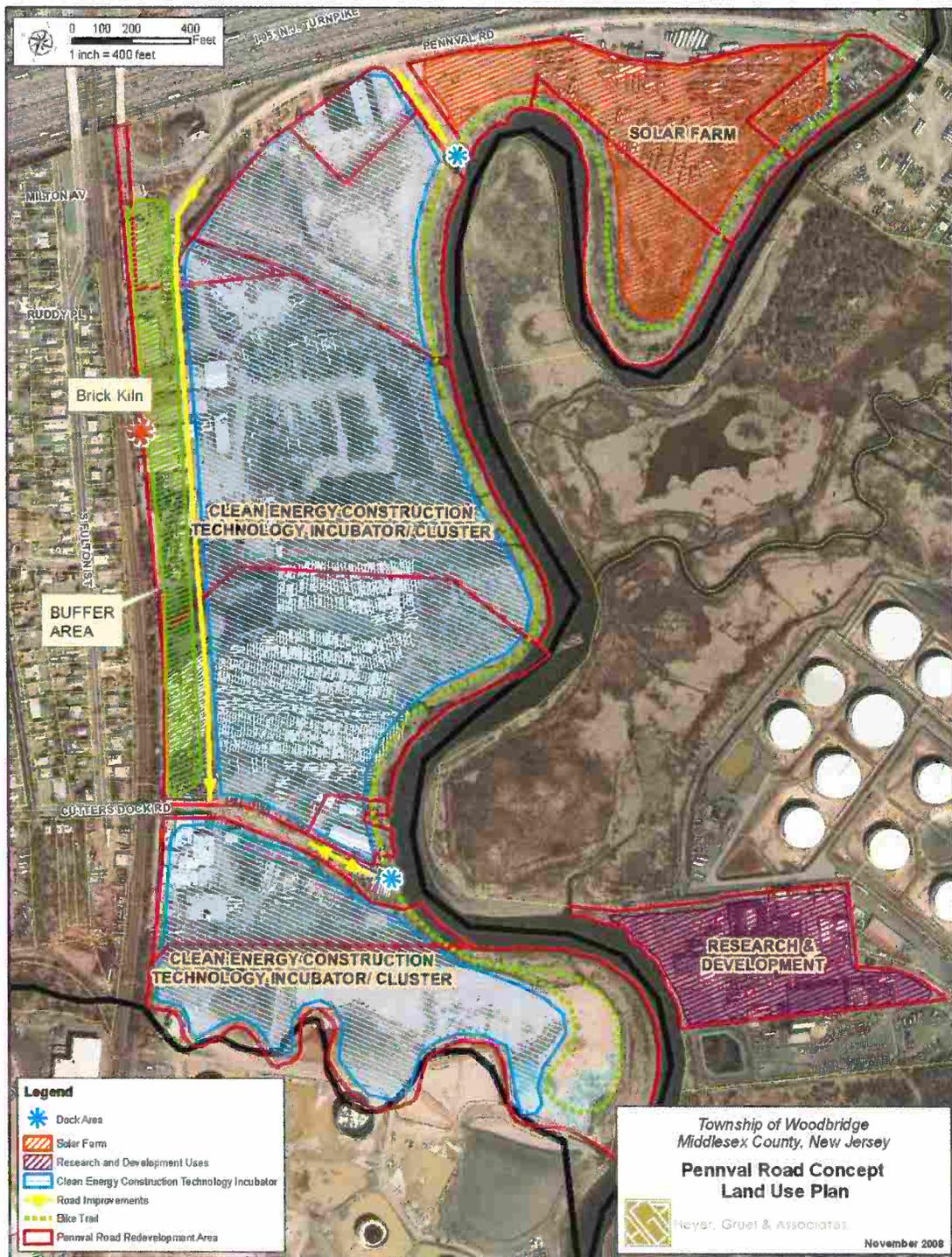
support start up businesses that develop new technologies to conserve energy and natural resources and reduce the environmental impact in the construction industry.

- **Location of Traditional and Renewable Energy Resources in Power Generation Plants**

It is essential the Township utilize the vacant land of the proposed Brownfields Development Area in the Keasbey section of Town to explore the possibility of location of resource and point source generation of additional energy production.

Both the Green Technology (Incubator) Park and location of renewable energy production, through siting “plant” location are ground breaking initiatives worth pursuit. These assets if brought to operation will be life altering improvements to our town, our State, and the Northeast Region.





WATER EFFICIENCY & CONSERVATION

Water is an important natural resource that is limited in supply. At the time of the 2000 Census, the U.S. Geological survey estimated that Americans used approximately 408 billion gallons per day.



Landscape irrigation practices in the United States consume large quantities of potable water. Improved landscaping practices can dramatically reduce and even eliminate irrigation needs. Maintaining or reestablishing native or adapted plants on building sites fosters a self-sustaining landscape that requires minimal supplemental water and provides other environmental benefits. Improved irrigation systems can also reduce water consumption. Irrigation typically uses potable water, although non-potable water (e.g., rainwater, graywater or reclaimed water) is equally effective. Irrigation system efficiency varies widely, and high-efficiency irrigation systems can also reduce potable water consumption. For example, high-efficiency drip irrigation systems can be 95 percent efficient, while sprinkler or spray irrigation systems are only 60 percent to 70 percent efficient.



Native or adapted landscaping can reduce the amount of water needed for irrigation while also attracting native wildlife and creating a building site integrated with its natural surroundings. In addition, native or adapted plants tend to require less fertilizer and pesticides, and thus reduce water quality degradation and other environmental impacts.

Currently, the most effective strategy to avoid escalating water costs for irrigation is to design landscaping adapted to the local climate and the site's microclimate. The cost can be reduced or eliminated through thoughtful planning and careful plant selection and layout.

Water-efficient landscaping helps to conserve local and regional potable water resources. Maintaining natural aquifer conditions is important to providing reliable water sources for future generations. Consideration of water issues during planning can encourage development when resources can support it, and prevent development if it exceeds the resource capacity.

Successful water-efficient landscaping depends on site location and design. It is advantageous to couple landscape improvements with water use reduction strategies. The use of native or adapted plants can reduce site maintenance needs. Landscape plantings can mitigate climate conditions and reduce building energy consumption, for example by shading south-facing windows. Vegetation can aid passive solar design, serve as a windbreak, provide pleasant views for building occupants, and muffle off-site noise. Native plants can restore habitat for wildlife. In addition to reduce potable water consumption, rainwater capture systems can be used to manage rainwater runoff. Using graywater for irrigation reduces the amount of wastewater delivered to water treatment facilities.

For interior building construction, high-efficiency fixtures and dry fixtures such as reuse of toilet systems and using waterless urinals to reduce wastewater volumes. Consider reusing stormwater or graywater for sewage conveyance or on-site wastewater treatment systems (mechanical and/or natural can be considered). Options for on-site wastewater



treatment include packaged biological nutrient removal systems, constructed wetlands, and high efficiency filtration systems.

Collection and use of rainwater for non-potable water applications has significantly fewer code requirements and associated costs. The highest cost in most rainwater systems is for water storage. Storage tanks and cisterns come in a variety of sizes and materials. Designers can lower construction costs by finding synergies such as adding a cistern



to collect rainwater to a stormwater detention system. In some systems, pumps are required for distribution, incurring additional energy costs required for operation.

Water Efficiency & Conservation Recommendations:

- **Outreach and Mobilization**

Long term solutions to conserving, protecting, and managing our water resources will require that all users understand the importance of our waterways, the issues facing these resources, and what citizens can do to help.

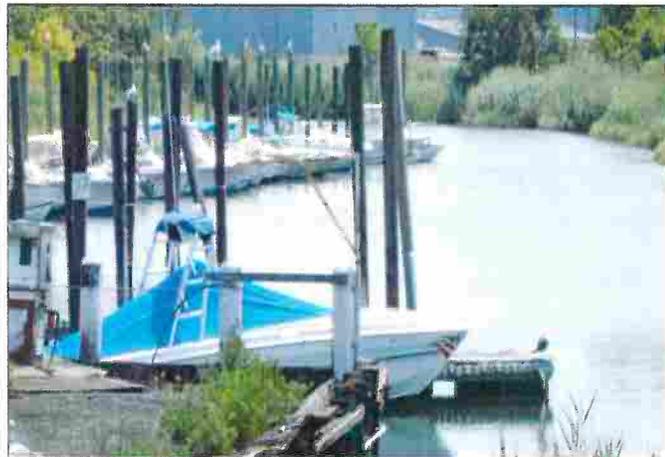
With a goal of improving stewardship among Township and area residents, the Town should implement a citizen education campaign that will help highlight the importance of water issues.



Some issues that will be addressed include the following:

- Changing the public perception of a limitless water supply;
- Explaining the connection between stormwater and the quality of water in our rivers;
- Increasing awareness about the growing number of public access opportunities;
- Educating recreational users about the importance of good stewardship.

To effectively spread the message the campaign will utilize mass media, area schools, and include partnerships with groups like the Environmental Commission and Woodbridge River Watch.



- **Stormwater and Water Quality Management**

The Township does much to manage storm and sanitary water flow. Stormwater and water quality management will evolve over time and the Township must and will evolve management practices accordingly.



MATERIALS & RESOURCES

Materials

Building materials choices are important in sustainable design because of the extensive network of extraction, processing and transportation steps required to process them. Activities to create building materials may pollute the air and water, destroy natural habitats and deplete natural resources. Construction and demolition wastes constitute about 40 percent of the total solid waste stream in the United States.

When materials are selected for a project, it is important to evaluate new and different sources. Salvaged materials can be substituted for new materials, save costs and add character. Recycled-content materials reuse waste products that would be deposited in landfills. Use of local materials supports the local economy and reduces transportation. Use of rapidly renewable consumption and has the potential to better match the harvest cycle of the resource with the life of the material in buildings. Use of third-party certified wood improves the stewardship of forests and the related ecosystems.

Reuse of existing buildings, versus building new structures, is one the most effective strategies for minimizing environmental impacts. When rehabilitation of existing building components is included in the strategy, waste volumes can be reduced or diverted from landfills. Reuse results in less habitat disturbance and typically less infrastructure. An effective way to use salvaged interior components is to specify them in the construction documents. The actions of an increasing number of public and private waste management operations have reduced construction debris volumes by recycling these materials. Recovery activities typically begin with job-site separation into multiple bins or disposal areas. In some areas, regional recycling facilities are being constructed to accept comingled waste and separate the recyclable materials from those that must go to the landfill. These facilities are achieving waste diversion rates of 80 percent or greater.



Use of salvaged and refurbished materials in new building projects extends the life of materials and can reduce overall first costs of construction materials. Use of salvaged materials can also add character to the building and can be used effectively as architectural details. Some areas of the United States, such as New England, the Pacific Northwest and California, have well-developed markets for salvaged materials while other regions are just beginning to develop these markets.



Many conventional building materials require large inputs of land, natural resources, capital and time. Conversely, rapidly renewable materials generally require less of these inputs and are therefore likely to be more environmentally responsible. Rapidly renewable resources are those materials that substantially replenish themselves faster than traditional extraction demand (i.e., planted and harvested in less than a 10-year cycle).

Rapidly renewable resources sometimes provide the opportunity to displace raw materials that have greater environmental impacts. Common examples include composite panels



that are made from agricultural fiber such as wheat, substituting for composite wood panels. Irresponsible forestry practices cause ecosystem and habitat destruction, soil erosion and stream sedimentation. Rapidly renewable crops require significantly less land – often due to higher density and shorter growing cycles- to produce the same amount of end product, and are often by-products that are otherwise considered waste. Biobased plastics (e.g., from corn starch) and other rapidly renewable resources are beginning to provide alternatives to some petroleum-based plastics.

Another important decision is to purchase materials locally or regionally. By purchasing regionally manufactured building materials, the local economy is supported, transportation costs and environmental impacts are reduced, and money paid for these materials is retained in the region, supporting the regional economy. The availability of regionally manufactured building materials is dependent on the project location. In some areas, the majority of products needed for the project can be obtained within a 500-mile radius. In other areas, only a small portion or none of the building materials can be sourced locally. It also is important to address the source of raw materials used to manufacture building projects. Raw materials for some building projects are harvested or extracted from the point of manufacture, contributing to air and water pollution due to environmental impacts associated with transportation between point of extraction and point of manufacture.

The use of regional building materials reduces transportation activities and the accompanying pollution associated with delivering materials to the job site. Trucks, trains, ships and other vehicles deplete finite resources of fossil fuels and generate air pollution. By selecting building materials that are produced from regional materials, transportation impacts are further reduced.

Regional building materials are more cost effective for projects due to reduced transportation costs. Also, the support of regional manufacturers and labor forces retains capital for the community, contributing to a more stable tax base and a healthier local economy.



Recycling

The disposal of construction and demolition materials must also be considered carefully. Construction and demolition (C&D) activities generate enormous quantities of solid waste. The U.S. EPA estimates that 136 million tons of C&D debris (versus 209.7 million tons of municipal solid waste) was generated in 1996 -57 percent of it from non-residential construction, renovation and demolition activities. This equates to 2.8 pounds per capita per day. Commercial construction generates between 2 and 2.5 pounds of solid waste per square foot, and the majority of this waste can potentially be recycled.

The greatest environmental benefit is achieved by source control- reducing the total waste generated.

Reusing existing buildings significantly reduces construction waste volumes. Reuse strategies also reduce environmental impacts associated with raw material extraction, manufacture and transportation.

Recycling of construction and demolition debris reduces demand for virgin resource and, in turn, reduces the environmental impacts associated with resource extraction, processing and, in many cases, transportation. Landfills contaminate groundwater and encroach upon valuable green space. Through effective construction waste management, it is possible to extend the lifetime of existing landfills, avoiding the need for expansion or new landfill sites.

The availability of recycling opportunities tends to vary by region. In urban areas, recycling resources are typically more developed, and projects will have choices about whether to separate waste on-site or to hire a comingled waste recycler. Often, recycling construction waste can reduce project costs by significantly reducing landfill tipping fees. Comingled recycling may increase recycling costs but will simplify waste management effort on-site and ensure that diversion rates will be high.





By creating convenient recycling opportunities for building occupants, a significant portion of the solid waste stream can be diverted from landfills. Recycling of paper, metals, cardboard and plastics reduces the need to extract virgin natural resources. For example, recycling one ton of paper prevents the processing of 17 trees and saves three cubic yards of landfill space. Recycled aluminum requires only 5 percent of the energy required to produce virgin aluminum from bauxite, its raw material. Recycling also reduces environmental impacts of waste in landfills. Land, water and air pollution impacts can all be reduced by minimizing the volume of waste sent to landfills.

Reducing waste and conserving resources relates to good materials management. The three R's - **Reduce, Reuse and Recycle** – are good strategies to limit the amount of waste we throw away. They conserve natural resources, landfill space and energy. Plus, the three R's save land and money used for collection and treatment of waste. By following the three R's Woodbridge Township can meet these goals and save natural resources.



Materials & Resources Recommendations:

- **Reuse Existing Components**

Reuse of existing components can reduce the cost of construction substantially. For instance, the Southern California Gas Company reused an existing building for its Energy Resource Center and estimated savings of approximately \$3.2 million, based on typical first costs for a 44,000 square-foot building. The largest savings were realized in masonry (87 percent savings), site work (57 percent savings), concrete (49 percent savings) and carpentry (70 percent savings).

- **Use Professional Recyclers**

Identify construction haulers and recyclers to handle the designated materials; they often serve as valuable partners in this effort. Make sure jobsite personnel understand and participate in the program, with updates throughout the construction process. Obtain and retain verification records (waste haul receipts, waste management reports, spreadsheets, etc.) to confirm the diverted materials have been recycled or salvaged as intended. Note that diversion may include donations to charitable organizations such as Habitat for Humanity.

- **Use Locally Manufactured Materials**

Businesses and residents should whenever possible attempt to obtain materials and products from local resources and manufacturers (within Central New Jersey).

- **Use Robust Materials**

The Township encourages the use of products or materials (including masonry, steel, glass, and some timber products such as beams, columns, floorboards, etc.) that are



durable (with a life cycle of at least 50-75 years), that withstand the natural elements, and last more than one building lifetime (i.e., through a remodel or reuse).

- **Use Materials with Low Life-Cycle Cost**

When available, use materials that employ a life-cycle methodology. These types of materials generally have a low environmental impact.

- **Design Buildings for Less Material Use**

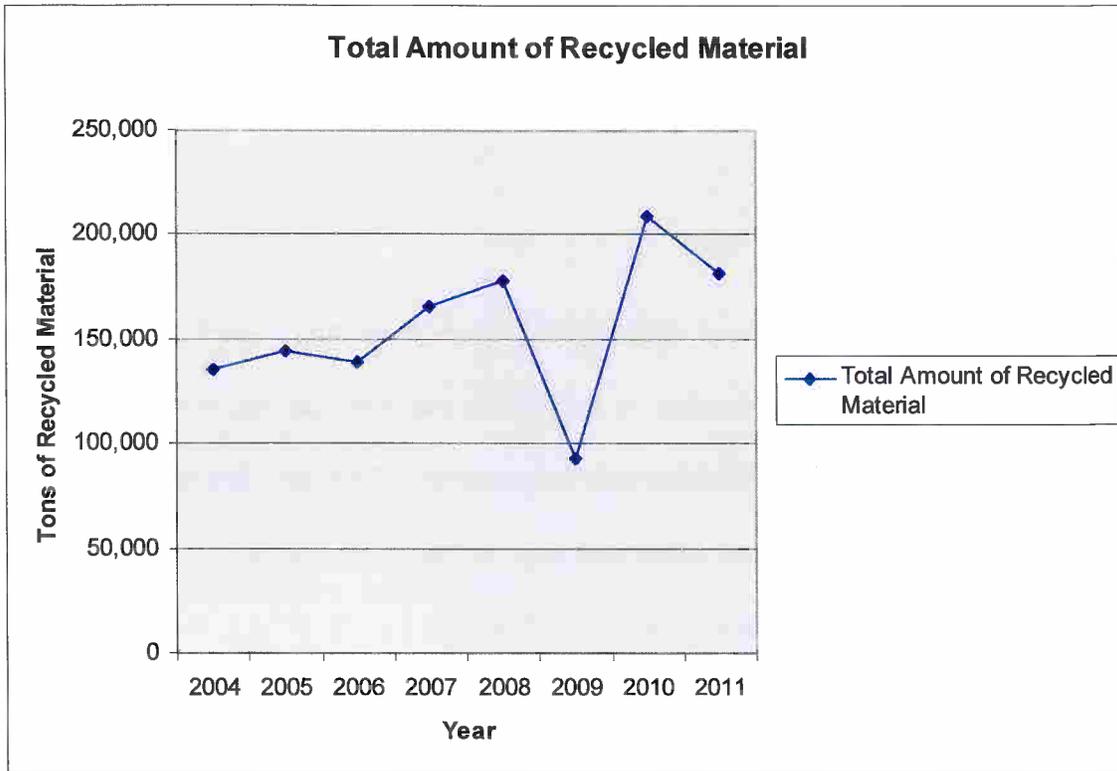
Design strategies can be utilized so that fewer materials are used. This can include reducing the size of the building and spaces; eliminating architectural and finish materials that are not needed; using modular and standard dimensioning; and utilizing ideas that limit refuse. For example, we reused a former pump station in Sewaren to house our Township Animal Shelter, rather than build a new building.



Recycling Waste

Recycling waste properly can reduce the use of natural resources. The environmental benefit of recycling is vital as materials can be reused rather than newly created. Recycling products such as aluminum, glass, cardboard and newspapers is a common household practice in the United States. Currently in Woodbridge, residents have recyclable materials picked up once a week. Recycling in the Township totaled over 180,000 tons in 2011. Total recycling in the Township has increased three of the last five years and was up 24 percent from 2006.





- **Expansion of Commercial Recycling**

The Township has recently developed a construction and demolition debris ordinance which diverts waste materials from landfills to local certified recyclers. The Township has also established a recycling drop off center at public works and distributed recycling calendars to all residents. Recycling cans have been placed throughout Town Hall and Main Street and a permit free garage sale weekend is held annually throughout the Township.



CONCLUSION

Energy efficiency is the greatest challenge of the next century. New Jersey's future competitiveness depends on creating an energy environment that encourages its homes and businesses to be more efficient in their consumption of energy. We must change the way we think about energy, and must find ways to "do more with less" by growing the State's economy while increasing its overall efficiency.

In the energy evolution each strategy builds on another. For example, encouraging transit-oriented growth is not only a housing strategy; it will also reduce our dependence on automobiles, which in turn alleviates congestion and improves our air quality. We have also discovered that every smart choice equals one ultimate impact: a reduction in global warming emissions.

The process of the "Reduce, Reuse, Recycle" mantra can only be achieved through massive and repetitive public education with a focus on raising public awareness.

It is understood that, this element would be routinely revisited to effectuate goals, objectives, and forecast based upon changes in the environment and our actions.



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