TOWNSHIP OF HOPEWELL

MERCER COUNTY

201 Washington Crossing Pennington Road
Titusville, New Jersey 08560-1410
609.737.0605 Ext. 664
609.737.6839 Fax

August 3, 2009

MUNICIPALITY: Hopewell Township, Mercer County NJ

PROJECT: Green Design Criteria and Ordinance Development

GRANT AMOUNT: $6,500.

PURPOSE: Land use ordinances are each community's regulatory guide to land development. These ordinances are created under the New Jersey Municipal Land Use Law which dictates what each ordinance may include Hopewell Township contracted with Rutgers Center for Green Building (RCGB) to research and propose green design criteria for incorporation into the Township's existing land use ordinances for commercial and residential development. .

By creating land use ordinances that include sustainable design elements, land development will be guided toward sustainable practices. It is recognized that obligating developers to comply with criteria such as LEEDS ™ as a pre-requisite to receipt of land use approvals, goes beyond the scope of the New Jersey Municipal Land Use Law. However, by including sustainable land use design elements into sections of the land use ordinance that can be waived as a matter of law, will drive sustainable thought and stimulate regular conversation on sustainable practices. Such thought and conversation will help drive changes leading to a more sustainable environment.

RCGB collaborated with the Project Team which included representatives from the Environmental Commission, Planning and Zoning Boards, and Township planning and legal professionals. The Township Administrator/Engineer converted the Project Team's recommendations into ordinance format. The Project Team presented ordinances to the Township Planning Board with a recommendation to adopt. The Project Team publicized this effort and hosted hearings on the subject which led to revisions that were again advanced to the Planning Board for consideration.

In its latest review, the Planning Board has requested a final set of changes to the documents to include sustainable elements into the new Design Standard section entitled Sustainable Design and has also requested existing sections be completely rewritten to include other sustainable practices such as establishing maximum parking criteria rather than "minima" criteria.

June 1 through Aug. 31, 2007	• Township designates Project Team • ANJEC Agreement signed by both parties • Township contracts with RCGB
Sept. 1 through Sept. 30, 2007	• "Project kickoff" meeting with RCGB and Project Team; ANJEC liaison invited; set dates for public outreach meetings • RCGB begins research • Environmental Commission develops newspaper article on project, also posts on website and in Township newsletter
Oct. 1 through Nov. 15, 2007	• RCGB meets with Project Team to review initial findings and plan first public input session • Project Team publicizes public input session, invites municipal boards, ANJEC and interest groups
Nov. 16 through Dec. 31, 2007	• Project Team and RCGB host public input session • Project Team and RCGB review and revise recommendations
Jan. 1 through Feb. 29, 2008	• RCGB delivers final recommendations and outreach/education plan • Project Team develops newspaper article on recommendations; also posts on website and in Township newsletter • Township attorney develops draft ordinances
Mar. 1 through April 30, 2008	• Project Team meets with attorney to review draft ordinances • Project Team presents ordinances to Township Committee with recommendation to adopt • Project Team and RCGB publicize adoption hearings on ordinances, invite municipal boards, ANJEC liaison; help to host hearings
May 1 through May 30, 2008	• Project Team carries out balance of community education activities, including local tour of green residences • Township submits final report, documentation on expenditure of funds, and copies of all grant products to ANJEC to request reimbursement

PROGRESS REPORTS SUBMITTED TO ANJEC: Aug. 15, 2007, Nov. 15, 2007; Feb. 15, 2008; May 15, 2008

TOWNSHIP OF HOPEWELL AGREEMENT COMPLIANCE:

1. Use the grant funds solely for the purposes described in the written proposal (April, 2007) and schedule set out above, and to forego/repay any portion not used for the purpose of this grant. √

2. Provide matching funds in the amount $6,500. In kind services provided. Expenditures included costs for Township Planner Review, Planning Attorney review and Township Engineer efforts to rewrite design standards, coordinate all meetings and public presentations. Approximately 50 hours @ $150 = $7500. √

3. Maintain complete and accurate records of all expenditures related to the project. √

4. Submit brief quarterly reports and a full final report on the manner in which the funds (including matching funds) are spent and the progress made in accomplishing the tasks set out above. √

5. Notify ANJEC staff liaison of at least one meeting date per reporting period (quarterly); liaison may attend. √

6. Work cooperatively with ANJEC staff to ensure that the project is carried to completion according to the proposal and the schedule set out above. √

7. Provide to ANJEC copies of final materials (plans, study reports, ordinances) developed for this project, for use as models in other municipalities. √

Very Truly Yours,

Paul E. Pogorzelski, P.E.
Township Administrator/Engineer

RUTGERS

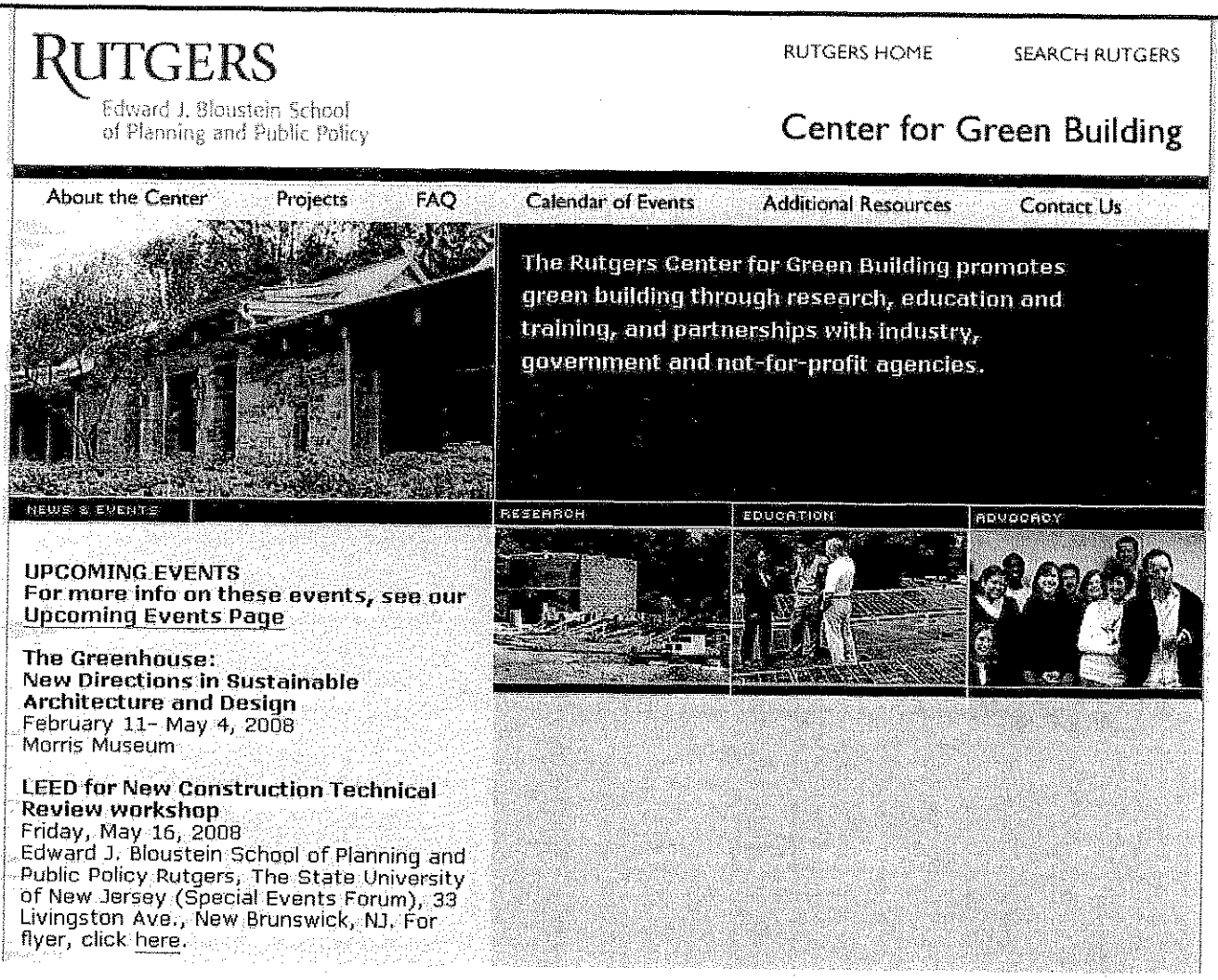
Edward J. Bloustein School
of Planning and Public Policy

Center for Green Building Presents

Living Greener Project Update

June 10, 2008

Rutgers Center for Green Building



- **Research**
- **Education**
- **Advocacy**

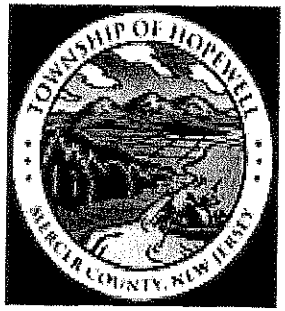
Agenda

- **Review: Living Greener Project**
  - Jennifer Senick, Director, RCGB
- **Update: Green Ordinances & Design Standards**
  - Paul Pogorzelski, Administrator/Engineer, Hopewell Township
- **Presentation: Living Greener Resource Guide**
  - Maren Haus, Research Project Manager, RCGB
- **Discussion: Next Steps**

"Living Greener" Project Team

Partnership between:

- Hopewell Township Environmental Commission (EC)
- The Association of New Jersey Environmental Commissions (ANJEC)
- The Rutgers Center for Green Building (RCGB)



anjec

RUTGERS
Edward J. Bloustein School
of Planning and Public Policy
Center for Green Building

Hopewell Township Environmental Commission

- Established in 1974
- Seven members, appointed by Mayor for 3 year terms
- Conducts research on the uses of open lands
- Makes recommendations on plans and programs for Master Plan

Association of New Jersey Environmental Commissions (ANJEC) http://www.anjec.org/

- Nonprofit organization that helps environmental commissions, individuals, local and state agencies preserve natural resources and promote sustainable communities (since 1969)
- Information, guidance and resources to New Jersey's 566 municipalities

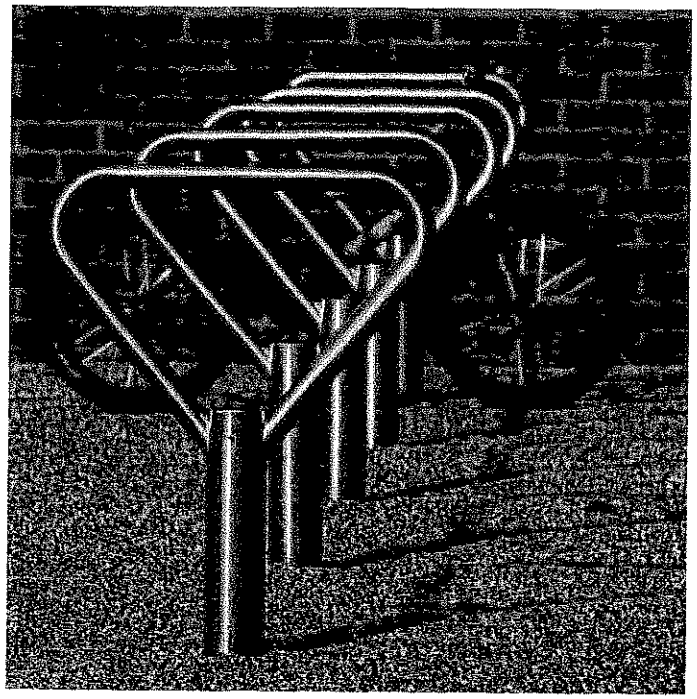
anjec

Update: Green Ordinances & Design Guidelines

"Greening" Hopewell's Land Use Ordinances –

Sustainable design techniques were incorporated into select local ordinances as requirements and incentives.

Green Ordinance Example:
Site Amenities. Development plans shall include site amenities that enhance safety and convenience and promote walking or bicycling as an alternative means of transportation.



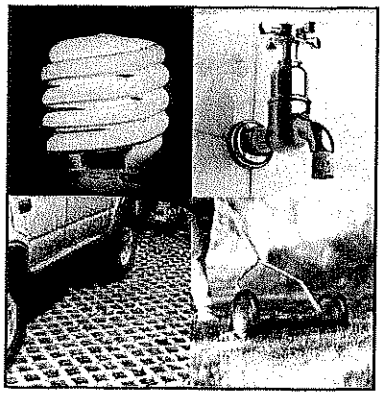
Hopewell Township

Living Greener Resource Guide

Living Greener Resource Guide -

The guide serves to inform Hopewell Township residents about green living practices that are easy to implement in typical residential settings. It is broken down into five sections including:

- Energy Resources
- Water Conservation Resources
- Waste Reduction Resources
- Lawn and Garden Care Resources
- Healthy Home Indoor Environment Resources



Energy Resources

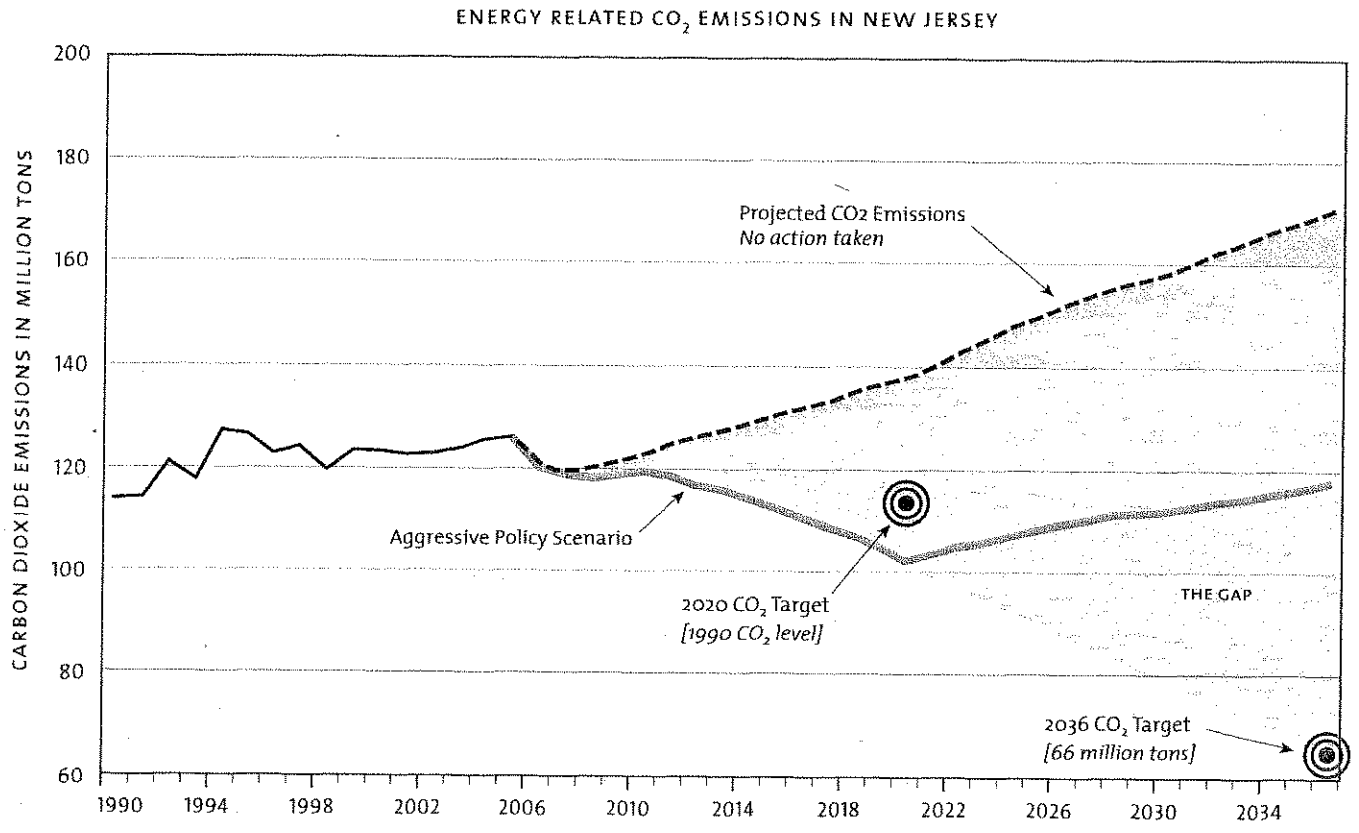


FIGURE 1

THE TARGET

Reduction to 1990 level by 2020 and 80% reduction from 2006 level by 2050.

THE GAP

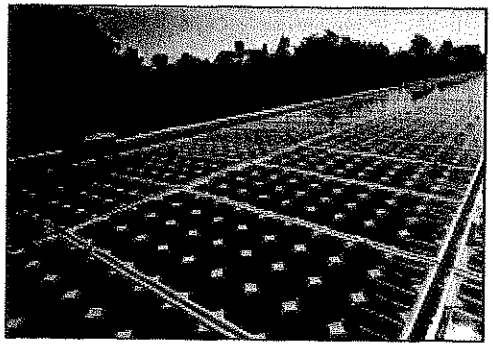
Aggressive policy scenario

Aggressive implementation of known policies and technologies can reduce emissions sufficiently to achieve the 2020 target. *(see p. 7 for scenario description)*

The unknown future

After 2020, known policies fail to keep up with growth and we still need to reduce emissions dramatically to reach the 2036 and 2050 targets.

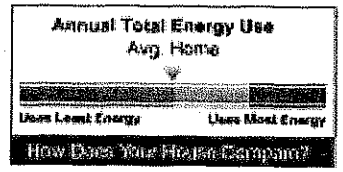
Energy Resources

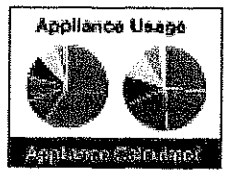


1) Conduct a home energy audit
2) Use a programmable thermostat
3) Buy ENERGYSTAR® appliances and electronics
4) In summer, open windows at night and close windows and shades during the day
5) Sign up for clean, renewable energy

NJ Clean Power Choice Program™

NJ Clean Energy Home Energy Analysis Tool
Home Performance with Energy Star Program
http://www.njcleanenergy.com

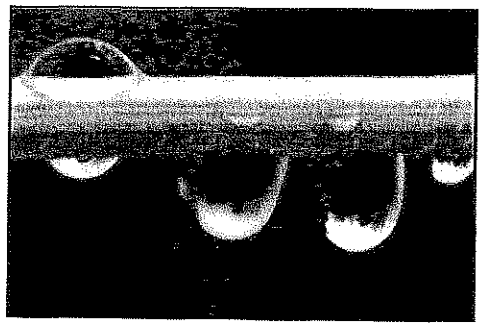




Water Conservation Resources

1) Conduct a Home Water Audit
2) Replace old toilets and clothes washers
3) Install low-flow fixtures
4) Use your dishwasher and washing machine only on full loads

Water Use it Wisely- Water Audit Tool
http://www.wateruseitwisely.com/



Water Conservation Resources

- **Replacing a dishwasher purchased before 1994 with an Energy Star dishwasher will save approximately $30/year.[1]**
- **Newer front-loading washing machines cost more initially but use only 20 to 28 gallons per load as opposed to 45 gallons, and save $60 to $100/year in water and energy costs.[2]**
- **Older toilets use between 3.5-7 gallons of water per flush as opposed to high efficiency toilets which use 1.3 gallons/flush.[3]**
- **Showering with a conventional showerhead uses 12 gal/min as opposed to using only 3 gal/min with a flow restrictor.[4]**

- *[1] Energy Star Dishwashers [Internet] Energy Star; c2008 [Cited 2008 02/28] Available at: http://www.energystar.gov/index.cfm?c=dishwash.pr_dishwashers*
- *[2] Johnston, David and Kim Master. Green Remodeling: Changing the World One Room at a Time. New Society Publishers: Canada, 2004.*
- *[3] NAHB Nation's Building News, "PATH Releases Nation's Top 10 Energy-Efficient Remodeling Projects". http://www.nbnnews.com/NBN/issues/2007-11-05/Remodelers/index.html. Accessed February 29, 2008.*
- *[4] Johnston, David and Kim Master. Green Remodeling: Changing the World One Room at a Time. New Society Publishers: Canada, 2004.*

Waste Reduction Resources

Officials in Naples have run out of nearby places to dispose of the city's trash.

The New York Times, 9 June 2008

Waste Reduction Resources

1) Reduce-Reuse-Recycle

2) Compost leaves and food scraps

3) Greener purchasing practices

EPA, Environmentally Preferable Purchasing
http://www.epa.gov/epp/

Lawn and Garden Care Resources

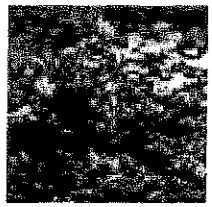
1) Plant native species

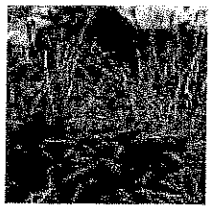
2) Create backyard habitats

3) Leave clippings on the lawn

4) Utilize Integrated Pest Management

5) Plant shade trees to save energy



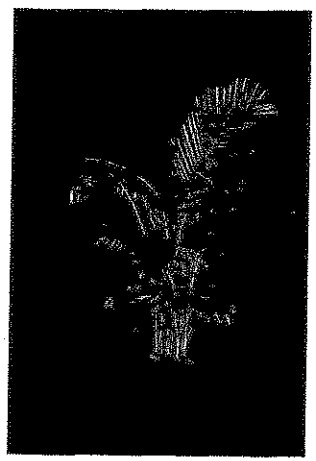


National Wildlife Federation's Backyard Habitat
www.nwf.org/backyardwildlifehabitat

Healthy Home Indoor Environment Resources

1) Use green cleaning products
2) Use low or no volatile organic compound (VOC) paints
3) Decorate living space with plants
4) Use renewable materials and non-toxic furnishings

Green Seal Certified Products
http://www.greenseal.org



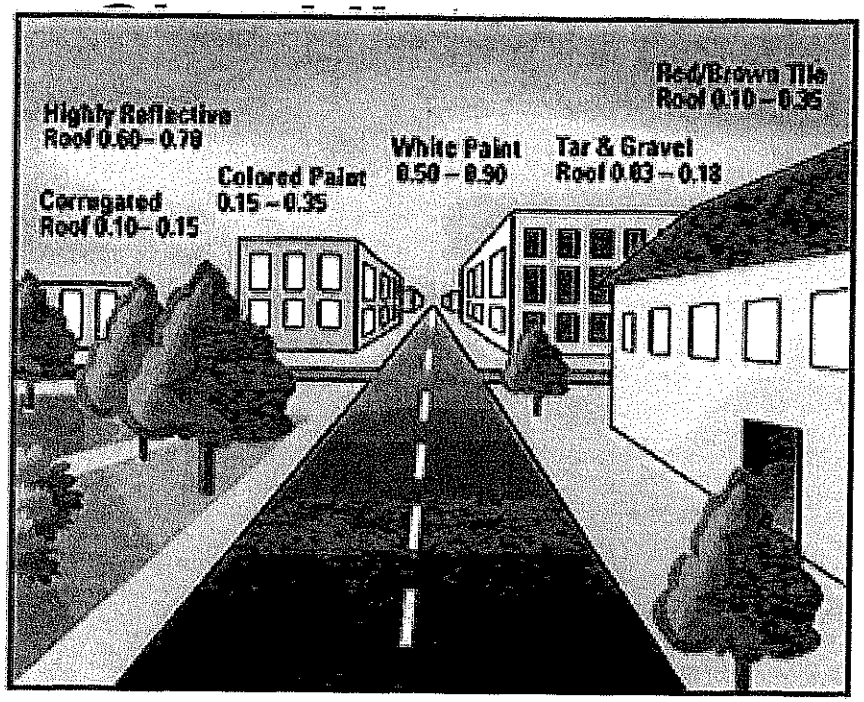
Living Greener Next Steps:

Possible Pathways for Going Green

- **Education and Engagement**
  - Increase knowledge and awareness about green practices and promote healthy lifestyles
- **Regulations**
  - Greening of Municipal Land Use Ordinances and Design Standards
- **Incentives**
  - Provide rewards for going green (i.e., faster permitting, reduced permit fees, density bonuses, etc.)

What we have done

- **Research, Review, Recommend**
- **Requirements, Incentives,**



Green Ordinance Example: Roof Coloring. To reduce the urban heat island effect, use roofing materials that are no darker than a light gray or demonstrate how alternate roofing materials reduce the urban heat island effect. (ENERGY STAR roof criteria)

For More Information

Rutgers Center for Green Building
Rutgers, The State University of New Jersey
33 Livingston Avenue
New Brunswick, NJ 08901

jsenick@rci.rutgers.edu
732-932-4101, ext. 520
Fax: 732-932-0934

Hopewell Township Living Greener Resource Guide

Introduction

The *Living Greener Resource Guide* was prepared by the Rutgers Center for Green Building to help inform residents of Hopewell Township about green living practices that are easy to implement in typical residential settings. This guide is broken down into five sections including Energy Resources, Water Conservation Resources, Waste Reduction Resources, Lawn and Garden Care Resources, and Healthy Home Indoor Environment Resources.[1]

Energy Resources

The positives associated with energy, which enables home appliances, lighting, heating and cooling, are indisputable, but energy is often wasted as a result of outdated appliances and practices leading to preventable pollution and expense. Modern technology has supplied us with new, innovative appliances that are lighter, faster, cleaner and more efficient. Although some of these technologies have an added up-front cost, they pay for themselves over time, sometimes by a large factor. Additional opportunities to make efficient financial and environmental decisions are found in simple changes to routine habits and design decisions taken when renovating a home. Examples of these follow.

10 Easy-to-Implement Energy Saving Tips

1) Conduct a home energy audit to determine the largest savings potential.
2) Use a programmable thermostat to control the heating and cooling in your home.
3) Turn down the water heater thermostat to 120° F.
4) Use energy-saving settings on refrigerators, dishwashers, washing machines, and clothes dryers.
5) Dry your laundry on a clothes line or drying rack.
6) Save 100-kilowatt hours (and $12) a month by plugging appliances and electronics into power strips and turning them off when they are not in use.[2]
7) Change your computer setting to power save mode when not in use. Better yet, turn it off!
8) Install energy efficient lighting such as compact fluorescent light bulbs (cfl) the next time light bulbs burn out. You'll save electricity and replace bulbs less frequently.
9) Turn off incandescent lights when leaving a room and cfls when not returning for more than 15 minutes.
10) Lower the amount of gas or electricity used to heat and cool your home. In summer, open windows at night to let in cool air and close both windows and shades during the day to keep out

[1] The ideas presented in this guide are considered best practices and easy-to-implement actions that by and large were deemed a good fit for residents of Hopewell Township. However, the suggestions are in no way intended to be a substitute for seeking professional advice. In some cases, users should check with Hopewell Township to make sure that actions comply with local land use codes and regulations.

[2] www.popularmechanics.com

heat. During winter, do the opposite. Open shades in the morning to capture sunlight and close them at night to retain the heat.

Appliances

In a typical U.S. home, appliances and home electronics are responsible for about 20% of the energy bill. These appliances and electronics include clothes washers and dryers, computers, refrigerators and freezers, home audio equipment, room air conditioners, televisions, dvd players, and water heaters.[3] When purchasing an appliance, cost considerations include both the up front cost of the purchase and the operating cost through its lifetime, which can be many times greater than the initial purchase cost.

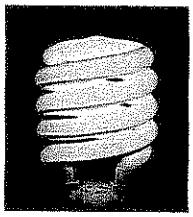
The best way to reduce energy consumption by home appliances is to look for the EnergyGuide and ENERGY STAR® labels. The Federal Trade Commission requires EnergyGuide labels on most home appliances, but not stove ranges and ovens or home electronics, such as computers, televisions, and home audio equipment. EnergyGuide labels provide an estimate of a product's energy consumption or energy efficiency. They also show the highest and lowest energy consumption or efficiency estimates of similar appliance models. ENERGY STAR labels appear on appliances and home electronics that meet strict energy efficiency criteria established by the U.S. Department of Energy and U.S. Environmental Protection Agency. The ENERGY STAR labeling program includes most home electronics and appliances except for water heaters, stove ranges, and ovens.

For more information on purchasing energy efficient appliances visit the following websites:

- *U.S. Department of Energy, "A Consumer's Guide to Energy Efficiency and Renewable Energy"*
  http://www.eere.energy.gov/consumer/
- *American Council for an Energy Efficient Economy, "Home Energy Checklist for Action"*
  http://www.aceee.org/consumerguide/checklist.htm
- *Energy Star Appliances*
  http://www.energystar.gov/index.cfm?c=appliances.pr_appliances
- *Alliance to Save Energy*
  http://www.ase.org/content/article/detail/4050
- *New Jersey Clean Energy Program- Online Home Energy Analysis (Energy Audit)*
  http://www.njcleanenergy.com/residential/tools-and-resources/home-energy-analysis/online-analysis/online-home-energy-analysis

[3] US DOE, *Appliances and Home Electronics.*
http://www.eere.energy.gov/consumer/your_home/appliances/index.cfm/mytopic=10020

Lighting



Lighting upgrades are a high-return, low-risk investment. Residents can improve the lighting efficiency of their homes by installing dimmer switches, motion sensor lights, compact florescent lights (cfls), solar powered lights, and light-emitting diodes (LEDs). In order to save the most energy and money, the most frequently used fixtures or the light bulbs in them should be replaced with energy-efficient models. The five highest use fixtures in a home are typically kitchen ceiling lights, living or family room table and floor lamps, and outdoor porch or post lamps. ENERGY STAR qualified lighting fixtures and replacement bulbs can be found at home improvement and hardware stores, lighting showrooms, and other retail stores, including on-line outlets. You can also find retailers in the Mercer County area by visiting the official ENERGY STAR website listed below.[4]

Residents can also improve lighting efficiency by considering implementing more daylighting techniques when renovating a home. When properly designed and effectively integrated with the electrical lighting system, daylighting can offer significant energy savings by offsetting a portion of the electric lighting load. A related benefit is the reduction in cooling capacity and use by limiting internal heat sources. Windows also provide visual relief, contact with nature, time orientation, opportunities for ventilation, and emergency egress.[5]

For more information on energy efficient lighting visit the following websites:

- *U.S. Department of Energy, "A Consumer's Guide to Energy Efficiency and Renewable Energy"* http://www.eere.energy.gov/consumer/
- *Energy Star Lighting* http://www.energystar.gov/index.cfm?c=lighting.pr_lighting
- *Edison Electric Institute* http://www.eei.org/industry_issues/retail_services_and_delivery/wise_energy_use/programs_and_incentives/progs.pdf
- *U.S. Department of Energy, "Daylighting"* http://www.eere.energy.gov/buildings/info/design/integratedbuilding/passivedaylighting.html

[4] Energy Star, *Light Bulbs and Fixtures*. http://www.energystar.gov/index.cfm?c=lighting.pr_lighting
[5] US DOE, *Building Technologies Program.* *http://www.eere.energy.gov/buildings/info/design/integratedbuilding/passivedaylighting.html*

Heating and Cooling

According to the U.S. Department of Energy (DOE), heating and cooling collectively account for about 56% of energy use in a typical U.S. home, making it the largest energy expense for most homeowners. Heating and cooling systems in the United States together emit 150 million tons of carbon dioxide into the atmosphere each year, adding to global climate change. They also generate about 12% of the nation's sulfur dioxide and 4% of the nitrogen oxides, the primary ingredients in acid rain.

No matter what kind of heating, ventilation, and air-conditioning system installed, homeowners can save money and increase comfort by properly maintaining and upgrading equipment. This, combined with appropriate insulation, air sealing, and thermostat settings, residents can cut energy use for heating and cooling, and reduce environmental emissions, by 20% to 50%.[6]

Heating and Cooling Tips[7]

- Set thermostat as low as is comfortable in winter and as high as is comfortable in summer.
- Clean or replace filters on furnaces once a month or as needed.
- Clean warm-air registers, baseboard heaters, and radiators as needed; make sure they're not blocked by furniture, carpeting, or drapes.
- Bleed trapped air from hot-water radiators once or twice a season.
- Turn off kitchen, bath, and other exhaust fans within 20 minutes after use; when replacing exhaust fans, consider installing high-efficiency, low-noise models.
- During the heating season, keep drapes and shades on south facing windows open during the day to allow sunlight to enter and closed at night to reduce chill.
- During the cooling season, keep window coverings closed during the day to prevent solar gain.
- Select energy efficient products when buying new heating and cooling equipment. Contractors should be able to provide energy fact sheets for different types, models, and designs for energy usage comparison. Look for high Annual Fuel Utilization Efficiency (AFUE) ratings on furnaces. The national minimum is 78% AFUE, but there are ENERGY STAR models on the market that exceed 90% AFUE.
- Look for high Seasonal Energy Efficiency Ratio (SEER) air conditioners. The current minimum is 13 SEER for central air conditioners. ENERGY STAR models are 13 SEER or more.

For more information on reducing energy consumption related to heating and cooling visit the following websites:

- *U.S. Department of Energy, "A Consumer's Guide to Energy Efficiency and Renewable Energy"*
  http://www.eere.energy.gov/consumer/
- *American Council for an Energy Efficient Economy, "Home Energy Checklist for Action"*
  http://www.aceee.org/consumerguide/checklist.htm
- *Energy Star, "Heat and Cool Efficiently"*
  http://www.energystar.gov/index.cfm?c=heat_cool.pr_hvac

[6] US DOE, Energy Savers http://www1.eere.energy.gov/consumer/tips/heating_cooling.html
[7] US DOE, Energy Savers http://www1.eere.energy.gov/consumer/tips/heating_cooling.html

Renewable Energy

The United States currently relies heavily on *nonrenewable* fossil fuels like coal, oil, and natural gas for its energy. Burning of fossil fuels is a significant source of carbon dioxide, sulfur dioxides and nitrogen oxides in our atmosphere, and their production draws on finite resources that will eventually dwindle, becoming too expensive or environmentally damaging to retrieve. In contrast, *renewable energy* resources—such as wind, biomass, geothermal, hydroelectric, and solar energy—are constantly replenished and will never run out.

Solar Energy- Most renewable energy comes either directly or indirectly from the sun. Sunlight, or solar energy, can be used directly for generating electricity and heating water.

- **Solar water heaters.** Solar water heating is a reliable and renewable energy technology used to heat water. Sunlight strikes and heats an "absorber" surface within a "solar collector" or a storage tank. Either a heat-transfer fluid or the actual potable water to be used, flows through tubes attached to the absorber and "absorbs" heat. The heated water is stored in a separate tank or a conventional water heater tank until needed. If additional heat is needed, it is provided by electricity or fossil-fuel energy by the conventional water-heating system. Home solar water heating systems cost on average $3000 to $6000 and can cut the average family's energy costs to heat water by 20% to 40%.

  For more information, see *Whole Building Design Guide: Solar Water Heating* http://www.wbdg.org/resources/swheating.php

- **Solar panels.** Solar cells convert one form of energy (sunlight) into another form of energy (electricity). When the sunlight is reduced or stopped, for example, when a cloud passes in front of the sun or when the sun goes down in the evening, the conversion process slows down or stops completely. When the sunlight returns, the conversion process resumes. Solar cells do not store electricity and therefore, when the conversion process slows, a solar electric system needs some form of energy storage, usually batteries, to draw upon instead of the solar cells.

  While solar rebates are no longer being offered for residential projects in New Jersey due to overwhelming demand, registrations are still being accepted for the Solar Renewable Energy Certificate (SREC) Program through 2008. All solar system owners in New Jersey with grid-connected generators can participate in the SREC program. Each time a solar system generates10000kWh (1MWh) of electricity, an SREC is issued which can then be sold or traded, helping individuals finance and invest in clean, emission free solar power.

  For more information, visit the *NJ Clean Energy* website (http://www.njcleanenergy.com/) and click on the *Solar Renewable Energy Certificate Program link (SREC)* or email njsrec@cleanpowermarkets.com

Wind Energy- The terms "wind energy" or "wind power" describe the process by which wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity.

- **Small wind systems.**[8] Homeowners have the option to purchase a small wind system. "Small wind" refers to wind-powered electric systems sized for homes, farms, and small businesses. These turbines are defined as 100 kilowatts in capacity and below.

  For more information, see the *New Jersey Anemometer Loan Program*
  http://www.rowan.edu/colleges/engineering/clinics/cleanenergy/anemometer_homepage.htm

Geothermal Energy- The Earth's heat, which constantly flows outward from its core, provides an enormous source of energy called *geothermal energy.*

- **Geothermal heat pump.** Geothermal heat pumps (sometimes referred to as GeoExchange, earth-coupled, ground-source, or water-source heat pumps) have been in use since the late 1940s. Geothermal heat pumps (GHPs) use the constant temperature of the earth as the exchange medium instead of the outside air temperature. According to the EPA, geothermal heat pumps can reduce energy consumption and corresponding emissions up to 44% compared to air-source heat pumps and up to 72% compared to electric resistance heating with standard air-conditioning equipment.

  For more information, see:
  - *U.S. Department of Energy: Consumer's Guide to Energy Efficiency and Renewable Energy- Geothermal Heat Pumps.*
    http://www.eere.energy.gov/consumer/your_home/space_heating_cooling/index.cfm/mytopic=12640
  - *Energy Star Geothermal Heat Pumps*
    http://www.energystar.gov/index.cfm?c=geo_heat.pr_geo_heat_pumps
  - *PATH (Partnership for Advancing Technology in Housing) Technology Inventory*
    http://www.toolbase.org/TechInventory/techDetails.aspx?ContentDetailID=754

Biomass Energy- Energy that is stored in green plants and other organic matter is referred to as biomass. Biomass facilities burn wood, agricultural wastes and/or methane gases from landfills to spin a turbine that generates electricity. Using biomass in this way helps reduce the amount of material that goes to landfills and reduces the amount of greenhouse gases that would otherwise be released into the atmosphere. Before the 20th Century, 90% of Americans burned wood to heat their homes. Today, residents can choose from a new generation of wood- and pellet-burning appliances that are cleaner burning, more efficient, and powerful enough to heat many average-sized, modern homes.

[8] Residents should consult Hopewell Township Land Use Code to see if an ordinance to allow small wind turbines has been passed. In 2007, NJ Board of Public Utilities' New Jersey Small Wind Working Group developed a NJ Small Wind Model Ordinance for use by NJ municipalities.

- **Pellet burning appliances**.[9] Pellet stoves burn small pellets made from compacted sawdust, wood chips, bark, agricultural crop waste, waste paper, and other organic materials. Some pellet fuel appliances can burn a wide variety of biomass fuels, including nutshells, corn kernels, small wood chips, barley, beet pulp, sunflowers, dried cherry pits, and soybeans. They are more convenient to operate and have much higher combustion and heating efficiencies than ordinary wood stoves or fireplaces. As a consequence of this, they produce very little air pollution. In fact, pellet stoves are the cleanest of solid fuel-burning residential heating appliances. With combustion efficiencies of 78% to 85%, they are also exempt from United States Environmental Protection Agency (EPA) smoke-emission testing requirements. Pellet stoves have heating capacities that range between 8,000 and 90,000 Btu per hour. They are suitable for single family homes, apartments and condominiums.

  For more information, see *U.S. Department of Energy: Consumer's Guide to Energy Efficiency and Renewable Energy- Wood and Pellet Burning Stoves.*
  http://www.eere.energy.gov/consumer/your_home/space_heating_cooling/index.cfm/mytopic=12570

Hydroelectric Energy- The energy produced from flowing water, called hydropower or hydroelectric power, is the oldest and most readily available form of renewable energy. Residents that have access to flowing water on their property may be able to use a microhydropower system to generate their own electricity.

- **Microhyropower systems**. Microhydropower systems usually generate up to 100 kilowatts (kW) of electricity. Most of the hydropower systems used by homeowners, including farmers, qualify as microhydropower systems. A 10-kilowatt microhydropower system can generally provide enough power for a large home.

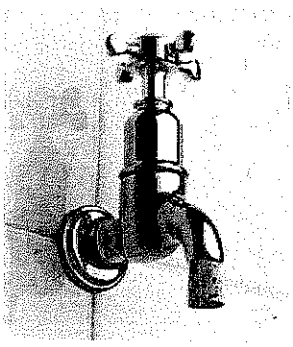
Renewable Energy Providers- Residents can support renewable energy in New Jersey without installing their own solar panels, microhydropower systems, or wind turbines by signing up for the CleanPower Choice Program from the New Jersey Board of Public Utilities' Office of Clean Energy. The program allows residents to choose a clean, renewable energy provider that supplies energy from sources including solar, wind, geothermal, and sustainable biomass.

For more information on renewable energy and purchasing renewable energy and systems for your home, visit the following websites:

- *New Jersey's Clean Energy Program*
  http://www.njcleanenergy.com/residential/programs/
- *National Renewable Energy Laboratory*
  http://www.nrel.gov/learning/
- *U.S. Department of Energy, "Renewable Energy"*
  http://www.eere.energy.gov/consumer/renewable_energy/

[9] Before purchasing and installing a pellet stove, refer to the 2006 International Residential Code New Jersey Edition under sections R1003.11.6 and R1003.11.1 for information on proper installation for pellet burning appliances.

Water Conservation Resources



Global water consumption rose almost tenfold in the last century, and many parts of the world are now reaching the limits of their supply. Populations continue to increase while water supplies dwindle. To highlight this growing problem, the United Nations (U.N.) declared 2003 The International Year of Freshwater. According to the U.N., if current trends continue, "two out of every three people on earth will suffer moderate to severe water shortages in little more than two decades from now. Globally, one in six people still have no regular access to safe drinking water, and more than twice that number (2.4 billion people) lack access to adequate sanitation facilities."

The problem is local as well as global. Water is in demand for a myriad of uses: recreation, mining and industry, irrigation, and riparian habitat preservation, among others. In the U.S., almost 90 gallons per day of drinking water are used per capita.[10] Residents can do their part to conserve water by making changes to some of their routine habits. Examples of these follow.

10 Easy–to-Implement Water Conservation Tips

1) Conduct a Home Water Audit at www.wateruseitwisely.com
2) Test toilets for "invisible leaks" by placing a few drops of food coloring or a dye tablet into the toilet's tank. Wait a few minutes and if the coloring appears in the bowl, the toilet is leaking and needs to be fixed.
3) Fix leaky faucets.
4) Retrofit your house with high-efficiency toilets, which use 60% less water than pre-1994 models and can save you roughly $100 a year.[11]
5) Don't run water when brushing your teeth. Every minute you reduce your faucet use saves 3 gallons of water.
6) Use your dishwasher and washing machines only for full loads.
7) Use a broom instead of a hose to clean your driveway or sidewalk.
8) Designate one glass for your drinking water each day to cut down on dishwasher cycles.
9) Install low-flow fixtures such as faucets and showerheads.
10) Use the air dry option on dishwashers.

For additional suggestions about conserving water at home visit the following websites:

- *City of Cambridge Water Department*
  http://www.cambridgema.gov/CWD/
- *Greener Choices, Consumer Reports*
  http://www.greenerchoices.org/products.cfm?product=watersaving
- *Water Conservation, Energy Star*
  http://www.energystar.gov/index.cfm?c=products.pr_protect_water_supplies

---

[10] EPA. Water on Tap- what you need to know http://www.epa.gov/safewater/wot/pdfs/book_waterontap_full.pdf page 10
[11] www.popularmechanics.com

Waste Reduction Resources

According to New Jersey Future, New Jersey's solid waste generation has steadily increased from 11.4 million tons in 1985 to 21.5 million tons in 2005.[12] To put that number in perspective, New Jersey generates enough trash to fill 5,600 garbage trucks per day. On a per-capita basis, New Jersey residents produce about 5.4 pounds of trash per day—more than twice the daily output of most industrialized countries.[13] Trash poses significant costs to the environment, no matter how it is disposed of. While burning it in one of the state's five incinerators produces energy, it also increases air pollution and greenhouse gas emissions. Alternately, dumping trash in one of the state's 12 active commercial landfills poses a series of adverse long-term impacts on water and air quality. For instance, biodegradation can emit hazardous gases for centuries, among them methane—a greenhouse gas 21 times more potent than carbon dioxide.[14] Preventing generation of waste in the first place is the most preferred method of waste management and residents can do this by practicing the 3 Rs: Reduce, Reuse, and Recycle. Examples of these follow.

10 Easy–to-Implement Waste Reduction Tips

REDUCE

1) Avoid products that are packaged for single use. Buy items in bulk and transfer the products to your own reusable containers.
2) Carry a mug with you wherever you go for takeout beverages.
3) For small purchases, skip the shopping bag. For larger purchases, bring your own.

REUSE

4) Switch from disposable to reusable products: food and beverage containers, cups, plates, writing pens, razors, towels, shopping bags, batteries, etc.
5) Buy products that will last and take care of them.
6) Join in with neighbors to purchase infrequently used products such as lawn mowers, ladders, etc.
7) Buy, sell or donate used goods instead of throwing them out.

RECYCLE

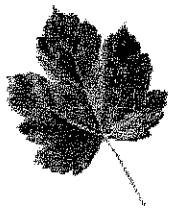
8) Create designated holding "bins" for each type of recycled product and place in convenient locations in your home/garage.
9) Select products made from recycled materials.
10) Compost yard trimmings and food scraps.

For more information on how to reduce, reuse and recycle, see:

- *Mercer County Improvement Authority*
  http://www.mcia-nj.com/recyclingcurbside.html
- *EPA's Consumer Guide for Reducing Solid Waste*
  http://www.epa.gov/epaoswer/non-hw/reduce/catbook/problem.htm
- *Freecycle*
  http://www.freecycle.org/

[12] New Jersey Future (2007). New Jersey Facts, Oct 16, 2007. www.njfuture.org
[13] New Jersey Future
[14] U.S. Environmental Protection Agency: Methane http://www.epa.gov/methane/scientific.html

Composting Resources



Backyard composting is an easy and inexpensive way to dispose of yard waste such as grass clippings, fallen leaves and small prunings. [15] By mixing yard waste in a pile with enough air and water to start the natural decaying process, compost with valuable nutrients for plants is formed.[9]

In season, leaves may account for over half the municipal solid waste collected and on a yearly basis may comprise 5% to 30% of the total municipal solid waste stream.[16] From an environmental perspective, composting saves valuable landfill space, reduces costs and concerns associated with incineration, and produces compost which can be used to improve soil.

Follow these simple steps to establish a compost pile:

1) Collect fall leaves in a pile.
2) Keep pile moist but not soggy.
3) Mix pile periodically.

For more information on composting visit the following websites:

- *Sustainable Princeton: Starting a Compost Pile*
  http://njssi.org/princeton/green_challenge.asp?Level2ItemID=2
- *Rutgers Backyard Leaf Composting*
  http://njaes.rutgers.edu/pubs/publication.asp?pid=fs074
- *Mercer County Compost Center*
  http://www.mgofmc.org/compostbins.html
- *US EPA, "Compost"*
  http://www.epa.gov/compost/
- *The Lazy Composter*
  http://www.guvswd.org/compost

[15] NJSSI, *Sustainable Princeton.* http://njssi.org/princeton/green_challenge.asp?Level2ItemID=2
[16] NJ DEP. Leaf composting manual for NJ municipalities. http://www.nj.gov/dep/dshw/rrtp/compost/intro.htm

Green Purchasing

Green purchasing includes the purchase of products that have a lesser or reduced effect on human health and the environment when compared with competing products that serve the same purpose. Many factors are taken into account when making these comparisons, such as:

1) Raw materials, including energy and water, used in the manufacture of the product
2) Type of production, (i.e., use of cleaner production processes)
3) Packaging and method of distribution
4) Distance of transport/local production

Price and performance are also important factors to consider and are critical determinants for consumers.[17] Green purchasing practices can be incorporated into your buying habits by researching products and following some simple suggestions listed below.

1) Buy recycled
2) Buy in bulk or multi-packs
3) Buy used
4) Trade with friends
5) Use canvas shopping bags
6) Look for the ENERGY STAR label when purchasing electronics

For more information on green purchasing visit the following websites:

- *Building Green, "Green Products"*
  http://www.buildinggreen.com/menus/index.cfm
- *EPA, "Green Purchasing"*
  http://www.epa.gov/epaoswer/osw/specials/funfacts/shopping.htm
- *New American Dream*
  http://www.newdream.org/buy/
- *Green Seal*
  http://greenseal.org/
- *Green Purchasing: A Guide for Local Governments and Communities*
  http://www.state.nj.us/dep/dsr/bscit/epp.pdf
- *National Geographic: The Green Guide*
  http://www.thegreenguide.com/

[17] NJ DEP, *Green Purchasing: A Guide for Local Governments and Communities*, http://www.state.nj.us/dep/dsr/bscit/epp.pdf.

Lawn and Garden Care Resources

All residents can have a profound impact on the environmental health of Hopewell Township. By making smart decisions about lawn maintenance and landscaping techniques, water quality and local habitat can be improved. Environmentally responsible landscaping increases native plant diversity, provides food, cover, and nesting areas for wildlife, and reduces stormwater runoff that dumps sediment and pollutants into local rivers and streams.[18]

Easy-to-Implement Lawn and Garden Care Tips

1) Plant native species and/or plants.
2) Plant bushes, shrubs and trees that bear berries or other fruits for birds.
3) Don't use herbicides and pesticides.
4) Use companion plants in your vegetable plot.
5) Choose plants that thrive in local soil conditions and therefore do not need fertilizers or extra watering to survive.
6) Use mixed grasses or herbs such as chamomile for your lawn.
7) Keep a compost pile.
8) Grasscycle, i.e. leave your grass clippings on the lawn.
9) Mulch flower beds and trees with 3 inches of organic material.
10) Plant a tree and save energy and money by shading your houses in the summer.

Conventional Lawn Alternatives and Organic Lawns

Environmental concerns across the nation have spurred the movement to reduce the size of lawns or replace grass with other plants. Non-native grasses put an unnecessary strain on water resources while synthetic fertilizers and pesticides used to keep grass green and weed-free are degrading water quality and harming non-target animals and plants.

There are a number of viable strategies that can be employed to reduce the negative environmental impacts of a conventional lawn. To begin, native meadow and prairie plantings can be logical substitutes for conventional turf grass because they require less water. They can still be mowed at a low height to preserve the accepted neat appearance of a lawn or create a soft playing surface. Residents can also consider reducing the size of their lawns by allowing part of the yard to return to natural habitat and still maintain a small area as a conventional lawn.[19]

Many residents enjoy maintaining a conventional lawn however, and may not want to reduce its size or replace the vegetation with an alternative grass. These residents can still help to reduce some of the

[18] Chesapeake Bay Foundation, *In Your Backyard: Bay-Friendly Lawns.* http://www.cbf.org/site/PageServer?pagename=act_sub_yourpart_yard_landscaping.
[19] Brooklyn Botanic Garden, *Easy Lawns.* http://www.bbg.org/gar2/topics/sustainable/handbooks/lawns/index.html

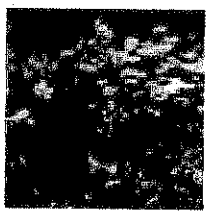
negative environmental impacts of lawn care by employing the following organic lawn maintenance techniques:[20]

1) Mow high – The simplest way to help lawns grow up healthy and dense is to adjust the cutting height to the highest setting and cut grass to a height of 3-4 inches.
2) Leave clippings on the lawn - As grass clippings decompose, they contribute valuable nitrogen to the soil - almost 2 pounds of nitrogen per 1,000 square feet of soil each season or about half of the lawn's annual fertilizer needs. They also add organic matter and provide a variety of other benefits to the soil and grass.
3) Forgo fertilizers – There will be no need to use fertilizers if grass is mowed often (but not too low) with a sharp blade and grown in soil that's rich in organic matter and biological activity.

For more information on organic lawn best management practices visit the following websites:

- *Brooklyn Botanic Garden - "Easy Lawns"* http://www.bbg.org/gar2/topics/sustainable/handbooks/lawns/index.html
- *Organic Gardening - "Organic Lawn Care"* http://www.organicgardening.com/feature/0,7518,s1-4-77-142,00.html
- *NOFA Guide to Organic Lawn Care* http://www.ctnofa.org/documents/OrganicLandCareGuide_000.pdf

Water Efficient Landscaping and Native Plants

Although New Jersey has relatively abundant water, fluctuations in precipitation do cause periodic shortages. In addition, the demands of a growing population are straining some water supplies. In rapidly growing communities, summertime water shortages are no longer uncommon and restricted water use, particularly outdoors, is increasingly familiar. New Jersey's most easily exploited water supplies have already been developed. Understandably, concerns about the environment and rising labor and capital costs have delayed additional development. For these reasons, water conservation looms ever more important, and our use of water to irrigate landscaping becomes an appropriate subject for examination. Experts agree that properly designed and managed landscaping can save large amounts of water. By wisely using water outdoors, we can reduce peak water demand, prevent drops in water pressure that endanger a community's fire-fighting ability, eliminate watering restrictions, and save energy needed to pump water into storage areas around town.[21]

One way to improve the water efficiency of landscaping is to use native plants, which not only require minimal watering, but are also better acclimated to the local environment, reduce the need for fertilizers and pesticides, and eliminate the problems associated with the introduction of invasive species. Because native plants require minimal maintenance, these species limit the need for upkeep with fossil fuel powered equipment, saving valuable natural resources and funds.

[20] Organic Gardening, *Organic Lawn Care.* http://www.organicgardening.com/feature/0,7518,s1-4-77-142,00.html
[21] NJ Agricultural Experiment Station, *Landscaping for Water Conservation.* http://njaes.rutgers.edu/pubs/publication.asp?pid=E080

For more information on water efficient landscaping and native plants visit the following websites:

- *Landscaping for Water Conservation: A Guide for New Jersey*
  http://njaes.rutgers.edu/pubs/publication.asp?pid=E080
- *Native Plant Society of New Jersey*
  http://www.npsnj.org/

Backyard Habitats

Wildlife habitat restoration is especially needed in locations where commercial and residential development has degraded natural ecosystems. Creating habitat benefits the entire community of people, plants and wildlife through the creation of sustainable landscapes that require little or no pesticides, fertilizers and excess watering. These landscapes help keep water and air resources clean and are healthier for people and the environment. Residents are able to create backyard habitats for local wildlife by providing the four basic elements that all wildlife need: food, water, cover and places to raise young. In order to create a backyard habitat, follow the steps below.[22]

1) Make a map of your backyard, showing:
   a. plants that might provide food (such as acorns, nuts, berries, seeds, buds, or nectar) for wildlife
   b. birdfeeders
   c. birdbaths or other water sources
   d. plants that provide shelter (such as dense shrubs, evergreens, brush piles)
   e. places for birds and wildlife to raise their young (trees, shrubs, birdhouses)
2) Think about what types of wildlife you want to attract to your yard. Research the types of plants and trees that will attract them (i.e., provide food, shelter, and/or places to raise young). The National Wildlife Federation's (NWF's) Backyard Habitat web site is a good place to start: www.nwf.org/backyardwildlifehabitat.
3) If you don't have them already, plant some of your favorite wildflowers, shrubs, and/or trees that will attract wildlife and provide food, shelter, and places to raise young.
4) Make sure that your backyard has a year-round source of water. This can be as simple as the bottom of a clay pot (for the summer) and a basic heated birdbath for winter months.

For additional information on this topic and to find out how to certify the entire Township as a Community Wildlife Habitat under the National Wildlife Federation, visit the following websites:

- *National Wildlife Federation's Backyard Wildlife Habitat*
  http://www.nwf.org/backyard/
- *Burlington Community Wildlife Habitat Initiative*
  http://www.burlingtongardens.org/Burlington_Habitat_Initiative.html

[22] Friends of Burlington Gardens and the Vermont Community Garden Network. *Burlington Community Wildlife Habitat Initiative*. http://www.burlingtongardens.org/Burlington_Habitat_Initiative.html.

Integrated Pest Management

Pesticides, including insecticides, herbicides, rodenticides, and fungicides, are poisonous chemicals designed to kill a variety of plants or animals. Both the active chemical compounds and inert ingredients in pesticides may ultimately be toxic to humans and wildlife.

In general, pesticide use can impose many health and environmental risks. Continued dependence on pesticides has caused the evolution of strains of insects with a high resistance to pesticides. Outbreaks of secondary pests due to the destruction of their natural controls and damaging impacts on wildlife have occurred because of concentrations of pesticides in various food chains. During routine residential applications, pesticides can drift and settle on ponds, laundry, toys, pools and furniture among other household items. They can also make their way into homes when family members and pets pick up toxic residues and track them inside.

Integrated Pest Management (IPM) minimizes environmental impacts by using environmentally friendly methods to control pests. IPM's preventative, monitoring, and controlling techniques serve as an alternative to routine, indiscriminate spraying of chemical pesticides. IPM techniques enhance sustainability of vital natural systems and help promote lawns, trees and shrubs that are more resistant to insects and disease. IPM protects beneficial insects since it uses little or no pesticides. IPM also reduces threats to wildlife and water quality by lessening the amount of chemicals that will reach our drinking and recreational water resources.[23]

For more information on integrated pest management techniques visit the following websites:

- *ANJEC Integrated Pest Management*
  http://www.anjec.org/html/ipm.htm
- *Beyond Pesticides*
  http://www.beyondpesticides.org/
- *Northeastern IPM Center*
  http://northeastipm.org/
- *Pest Management Office of Rutgers Cooperative Extension*
  http://www.pestmanagement.rutgers.edu/
- *IPM Institute of North America*
  http://www.ipminstitute.org/

[23] ANJEC, *Integrated Pest Management.* http://www.anjec.org/html/ipm.htm.

Porous Paving Materials

Impervious surfaces significantly impact water quality because as storm water runs off an impervious surface, it carries pollutants into local water bodies and groundwater sources. Impervious surfaces collect particulate matter from the atmosphere, nitrogen oxides from car exhaust, rubber particles from tires, debris from brake systems, phosphates from residential and agricultural fertilizers, and dozens of other pollutants.

Porous paving materials used for driveways and landscape construction projects can help mitigate the problem of storm water runoff. There are different types of porous paving materials and techniques, which include open-jointed pavers that can be filled with turf or aggregate, "soft" paving materials such as wood mulch and crushed shell, and traditional decking. Other families of porous materials include porous concretes and asphalts, which still provide solid, safe surfaces for foot and vehicle traffic, but allow rainwater to percolate down into subsurface soils.[24]

For more information on the issue of storm water runoff and porous paving materials visit the following websites:

- *Paving Paradise: The Peril of Impervious Surfaces*
  http://www.ehponline.org/members/2005/113-7/ehp0113-a00456.pdf
- *New Jersey Stormwater Best Management Practices Manual*
  http://www.state.nj.us/dep/watershedmgt/DOCS/BMP_DOCS/bmpfeb2004pdfs/feb2004chap9_7.pdf
- *Research Links for Permeable Paving*
  http://www.plantsf.org/Research_PermPavers_0511_Friedel.pdf

[24] Environmental Health Perspectives, *Paving Paradise: The Peril of Impervious Surfaces.* http://www.ehponline.org/members/2005/113-7/ehp0113-a00456.pdf

Healthy Home Indoor Environment Resources

Indoor environmental quality refers to the quality of the air and environment inside buildings, based on pollutant concentrations and conditions that can affect the health, comfort and performance of occupants - including temperature, relative humidity, light, sound and other factors. Improving indoor environmental quality in an existing home involves renovating and maintaining a house in ways that reduce pollution sources and remove indoor pollutants while ensuring that fresh air is continually supplied and properly circulated.[25]

10 Easy–to-Implement Healthy Home Tips

1) Use non-toxic, biodegradable cleaners.
2) Use low or no volatile organic compound (VOC) paints in home improvement projects.
3) Use renewable materials such as bamboo flooring and non-toxic furniture to avoid off-gassing.
4) Use organic fertilizers and pest control to cut down on the pollutants tracked into your home by pets and people.
5) Use plants to improve indoor air quality.
6) Keep your home well-ventilated by leaving doors between rooms open, opening windows to allow for a good supply of outdoor air, and installing exhaust fans in bathrooms to remove moisture and chemicals from the house.
7) Test your home for radon. www.epa.gov/radon/zonemap/newjersey.htm
8) Test your home for lead. www.nj.gov/dca/dcr/leadsafe/index.shtml
9) Burn only wood in your fireplace--never garbage, plastic, petroleum products or charcoal.
10) Use stainless steel, cast iron and enameled cast iron cookware instead of non-stick pans that when heated above 680 degrees, release toxic fumes.

Green Cleaning

Many standard cleaning products contain and emit harmful chemicals and volatile organic compounds (VOCs). This can be especially dangerous due to the proximity to occupants and the frequency in which these products are used. There are many options for safe, non-toxic cleaning products from environmentally responsible companies. These natural cleaners are free of chemicals, phosphates, artificial colors, fragrance, harsh fumes, and clean well. Concentrated products save on packaging and can save you money. By making informed choices, exposure to unhealthy chemicals and the impact on the environment can be limited.[26]

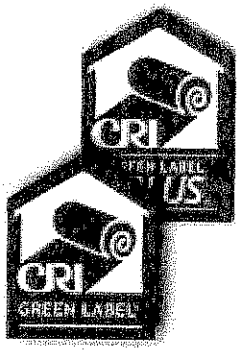
Further information on these techniques and products can be found by visiting the websites below.

- *Green Home Cleaning Tips* http://www.newdream.org/newsletter/greencleaning.php
- *"Greening the Cleaning"* http://www.dienviro.com/index1.aspx?BD=17793
- *Green Seal Certified Products* http://www.greenseal.org/findaproduct/index.cfm

[25] US EPA, *Green Indoor Environments*. http://www.epa.gov/iaq/greenbuilding/index.html.
[26] USGBC *REGREEN Draft*. Strategy Library, "Indoor Environmental Quality-Use."

- *Seventh Generation*
  http://www.seventhgeneration.com/living_green/toxic_cleaning/cleaning_tips.html
- *NC State University Family and Consumer Sciences*
  http://www.ces.ncsu.edu/depts/fcs/index.html

Low-emitting Materials Selection



Many materials and furnishings found inside the home emit odorous, irritating, or harmful contaminants that cause discomfort to installers and occupants. Some of these materials include paints, coatings, adhesives, carpets, and wood paneling products. When planning home renovation projects, low-emitting products can be chosen to control the level of indoor pollution.

Paints and Coatings: Paints and coatings fall into the following categories: Architectural paints and coatings, anti-corrosive and anti-rust paints, and clear-wood coatings, finishes and stains. Paints and coatings should meet the minimum low volatile organic compound limit established by Green Seal standards.[27]

Carpet Systems: All carpets and carpet cushions should meet testing and product requirements of the *Carpet and Rug Institute's Green Label Plus Program.* In addition, all carpet adhesive should demonstrate a volatile organic compound limit of 50g/L.[28] All carpet suppliers and installers should be aware of these characteristics and able to answer questions about the materials they are selling or installing.

Wood Paneling Products: Ensure that particleboard, medium-density fiberboard (MDF), and hardwood plywood substrates are certified to low formaldehyde emission standards ANSI A208.1, ANSI A208.2, and ANSI/HPVA HP1, respectively. Select composite wood/agrifiber panel products that either contain no added urea-formaldehyde resins or are third-party certified for low formaldehyde emissions.[29]

For more information on purchasing low-emitting materials visit the following websites:

- *Green Seal Certified Products*
  http://www.greenseal.org/findaproduct/index.cfm
- *Building Green, "Green Products"*
  http://www.buildinggreen.com/menus/index.cfm
- *Carpet and Rug Institute's Green Label Plus Program*
  http://www.carpet-rug.org/commercial-customers/green-building-and-the-environment/green-label-plus/index.cfm
- *EPA, "Indoor Air Quality for Homes"*
  http://www.epa.gov/iaq/homes/
- *Energy Star, "Indoor Air Package"*
  http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_iap

[27] LEED New Construction 2.2, Low-emitting materials: Paints and Coatings.
[28] LEED New Construction 2.2, Low-emitting materials: Carpet Systems.
[29] NAHB Green Home Guidelines, Indoor Environmental Quality.

Hopewell Township
Environmental Commission

RUTGERS
Edward J. Bloustein School
of Planning and Public Policy
Center for Green Building

"Living Greener" Initiative

January 16, 2008

Agenda

- **Welcome**

  Mayor Vanessa Sandom

- **Why the "Living Greener" Initiative?**

  Paul Pogorzelski, Administrator/Engineer, Hopewell Township

- **Greening Land Use Ordinances & Design Standards**

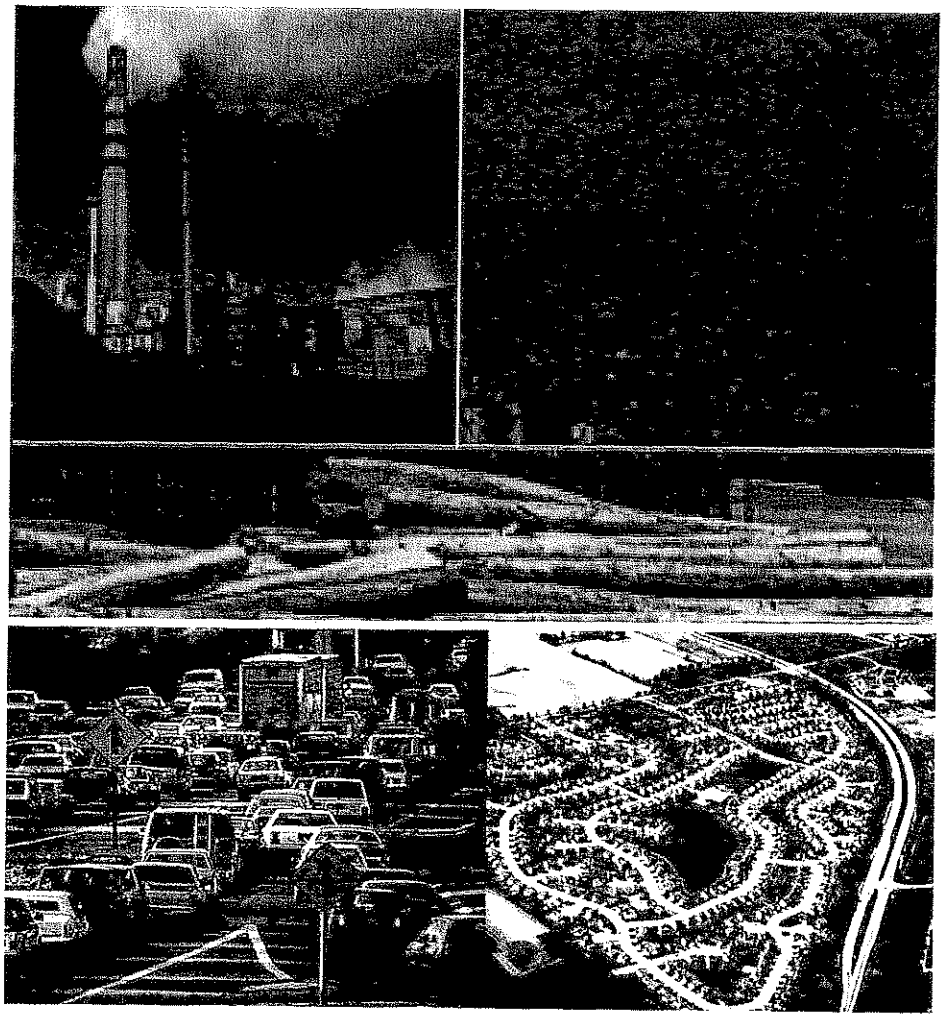
  Jennifer Senick, Director, Rutgers Center for Green Building

- **Open Discussion**

Center for Green Building

Why the "Living Greener" Initiative?

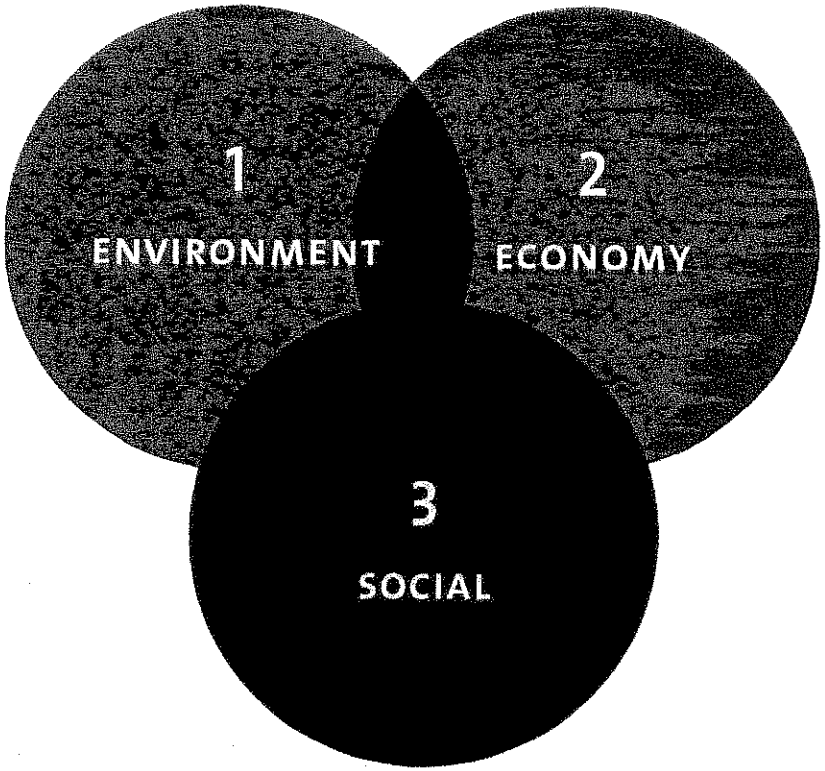
- Greenhouse Gas Emissions & Climate Change
- Deforestation
- Energy and Food Insecurity
- Water Quality & Scarcity
- Pollution & Toxic Materials
- Consumption & Waste
- Unhealthy Lifestyles



Green/Sustainable Community Movement

- Cities, towns and counties are adopting **sustainability** as a guiding principle for development

- Seattle, WA
- Portland, OR
- Madison, WI
- Denver, CO
- Montclair, NJ
- Highland Park, NJ
- Hillsborough, NJ
- West Windsor, NJ

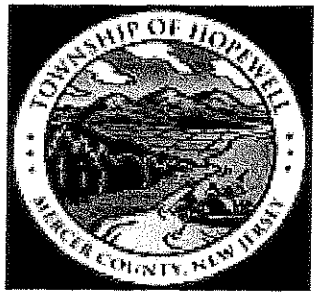


Preserving Quality of Life for Us and Future Generations

"Living Greener" Project Team

Partnership between:

- Hopewell Township Environmental Commission (EC)
- The Association of New Jersey Environmental Commissions (ANJEC)
- The Rutgers Center for Green Building (RCGB)



anjec

RUTGERS

Edward J. Bloustein School
of Planning and Public Policy

Center for Green Building

Hopewell Township Environmental Commission

- Established in 1974
- Seven members, appointed by Mayor for 3 year terms
- Conducts research on the uses of open lands
- Makes recommendations on plans and programs for Master Plan
- **Members**
  - Michael Aucott, Chair
  - Gail Downey
  - R. Hart Jr.
  - George Kerr
  - Rex Parker
  - Ray Nichols
  - Nora Sirbaugh

Association of New Jersey Environmental Commissions (ANJEC)
http://www.anjec.org/

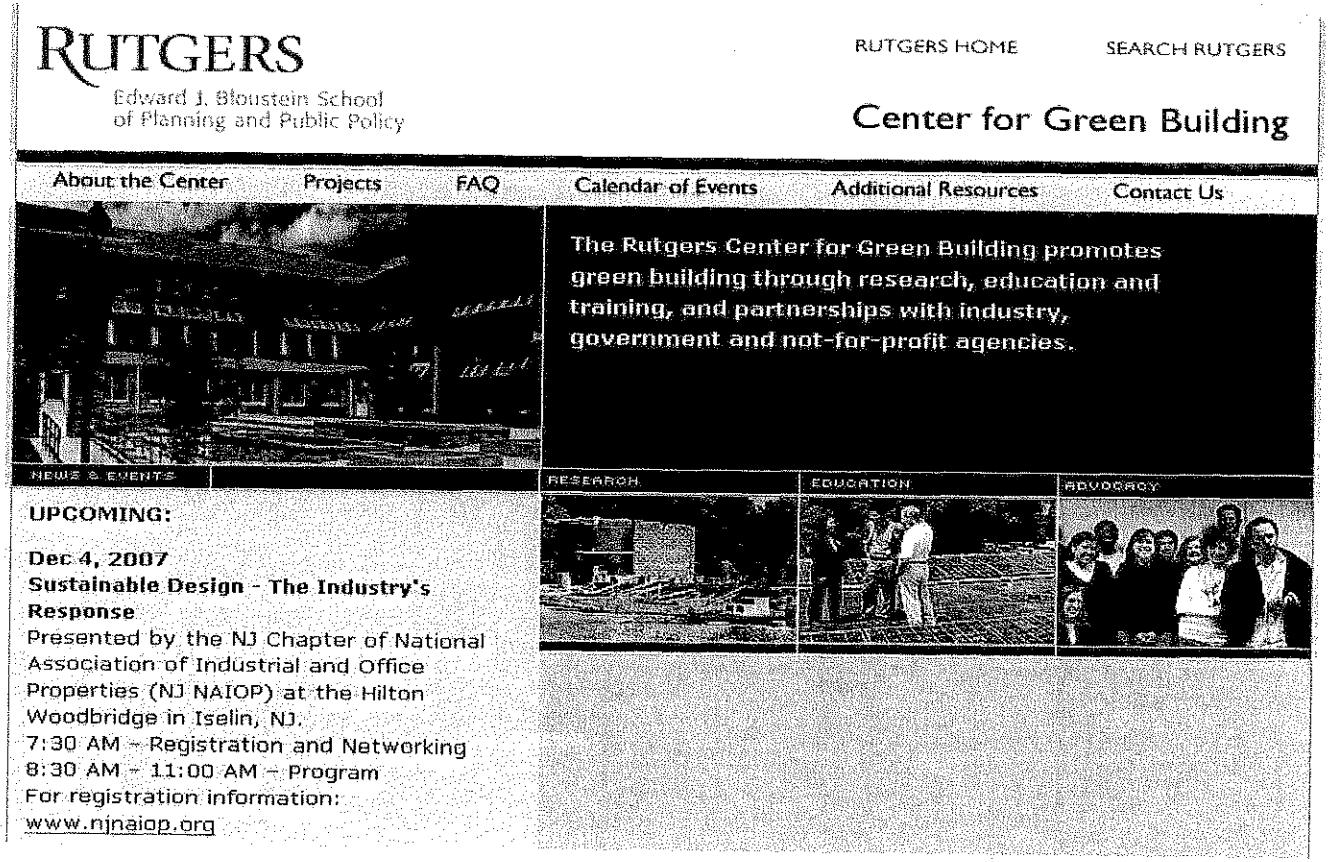
- Nonprofit organization that helps environmental commissions, individuals, local and state agencies preserve natural resources and promote sustainable communities (since 1969)
- Information, guidance and resources to New Jersey's 566 municipalities

anjec

Rutgers Center for Green Building

www.greenbuilding.rutgers.edu

- Research
- Training
- Advocacy



What Is Green Building/Development?

- **Sustainable site planning**
- **Safeguarding water and water efficiency**
- **Energy efficiency and renewable energy**
- **Conservation of materials and resources**
- **Indoor environmental quality**

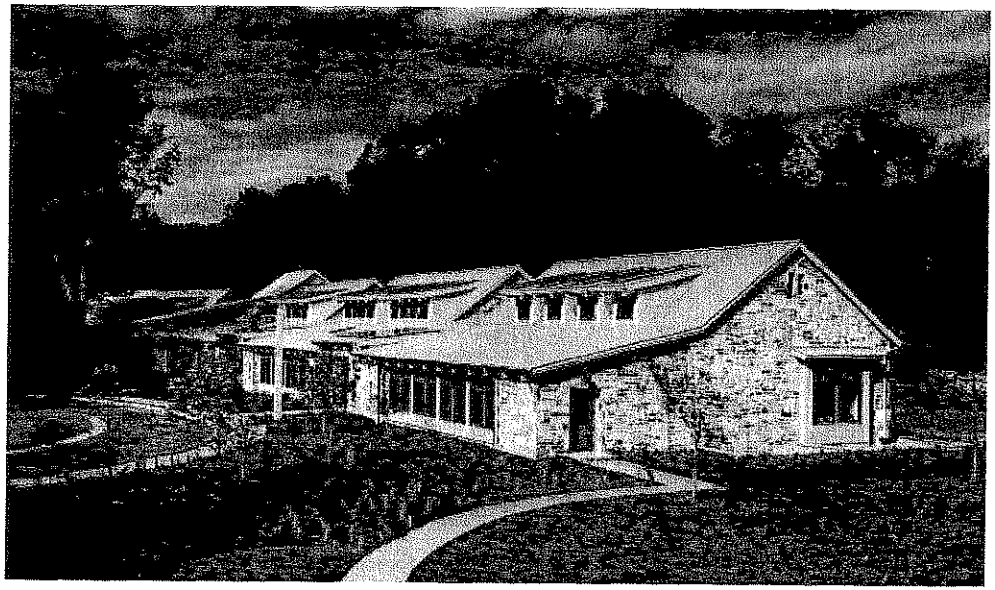
– US Green Building Council

Green Building incorporates many principles of SMART GROWTH such as TRANSIT-FRIENDLY DESIGN, REDEVELOPMENT.

Why Green Building?

- **35% of total energy consumed**
- **65% of US consumption of electricity overall**
- **30% of greenhouse gas emissions**
- **30% of raw materials use**
- **12% of potable water consumption**
- **30% of waste output**
- **28% of landfill material**

What is a Green Building?



The Willow School

Gladstone, NJ

LEED Gold Certification

Project Highlights

Sustainable Sites

- Stormwater Management
- Protect and Restore Habitat

Energy Efficiency

- Optimized Energy Performance
- Use of Renewable Energy

Indoor Air Quality

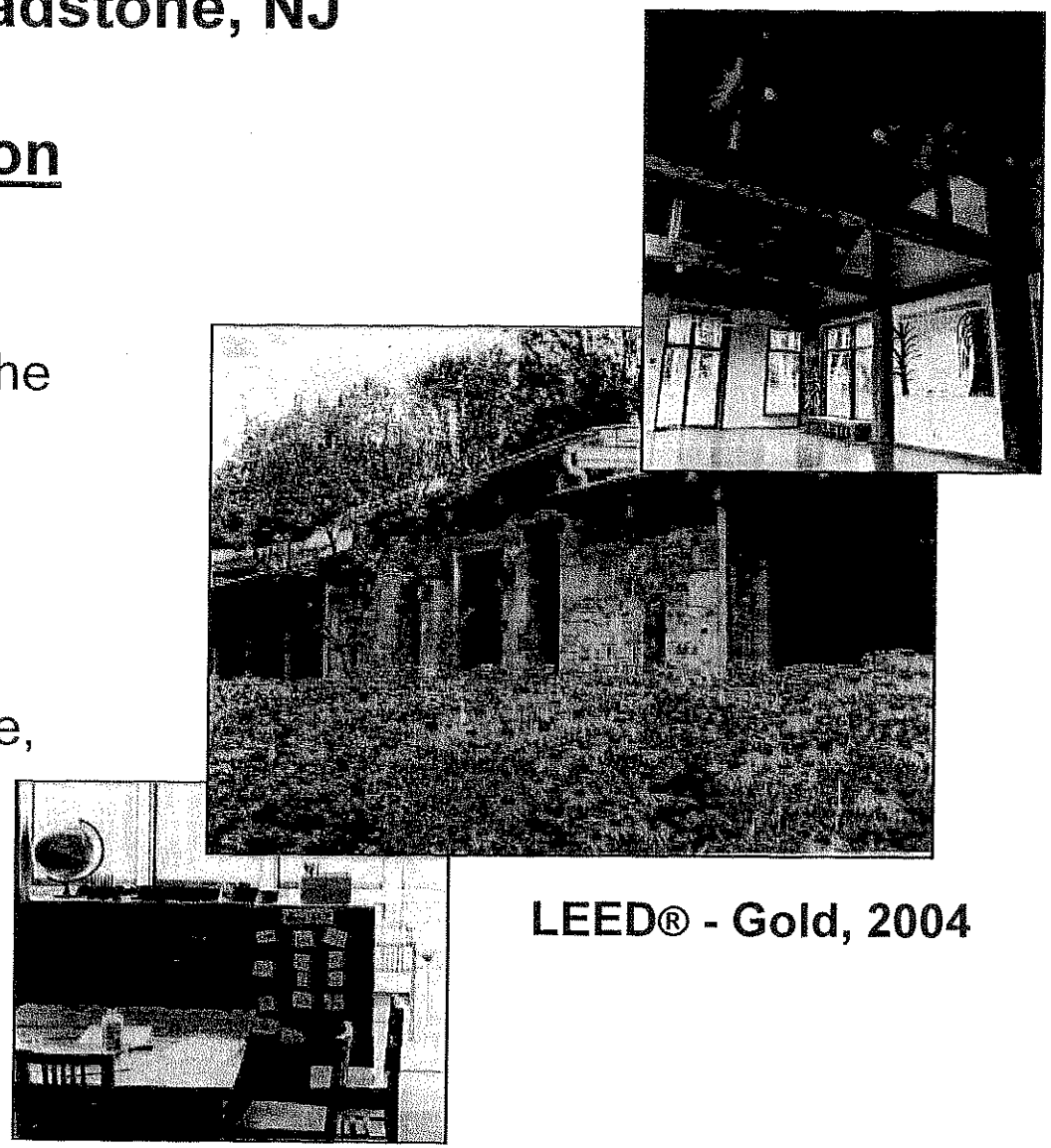
- Daylighting and Views
- Low-emitting Materials

The Willow School

Gladstone, NJ

Site & Water Conservation

- Minimal site disturbance
- Constructed wetlands regenerate and re-saturate the site's exhausted soil.
- Planted 840 native trees.
- 85-90% of building's construction waste recycled.
- Storm water managed on site, instead of dumped into the municipality's storm sewers.



LEED® - Gold, 2004

What is a Green Building?

PNC Bank

Long Branch, NJ

LEED Gold certification

Project Highlights

Materials and Resources

- Recycled materials
- Locally extracted materials

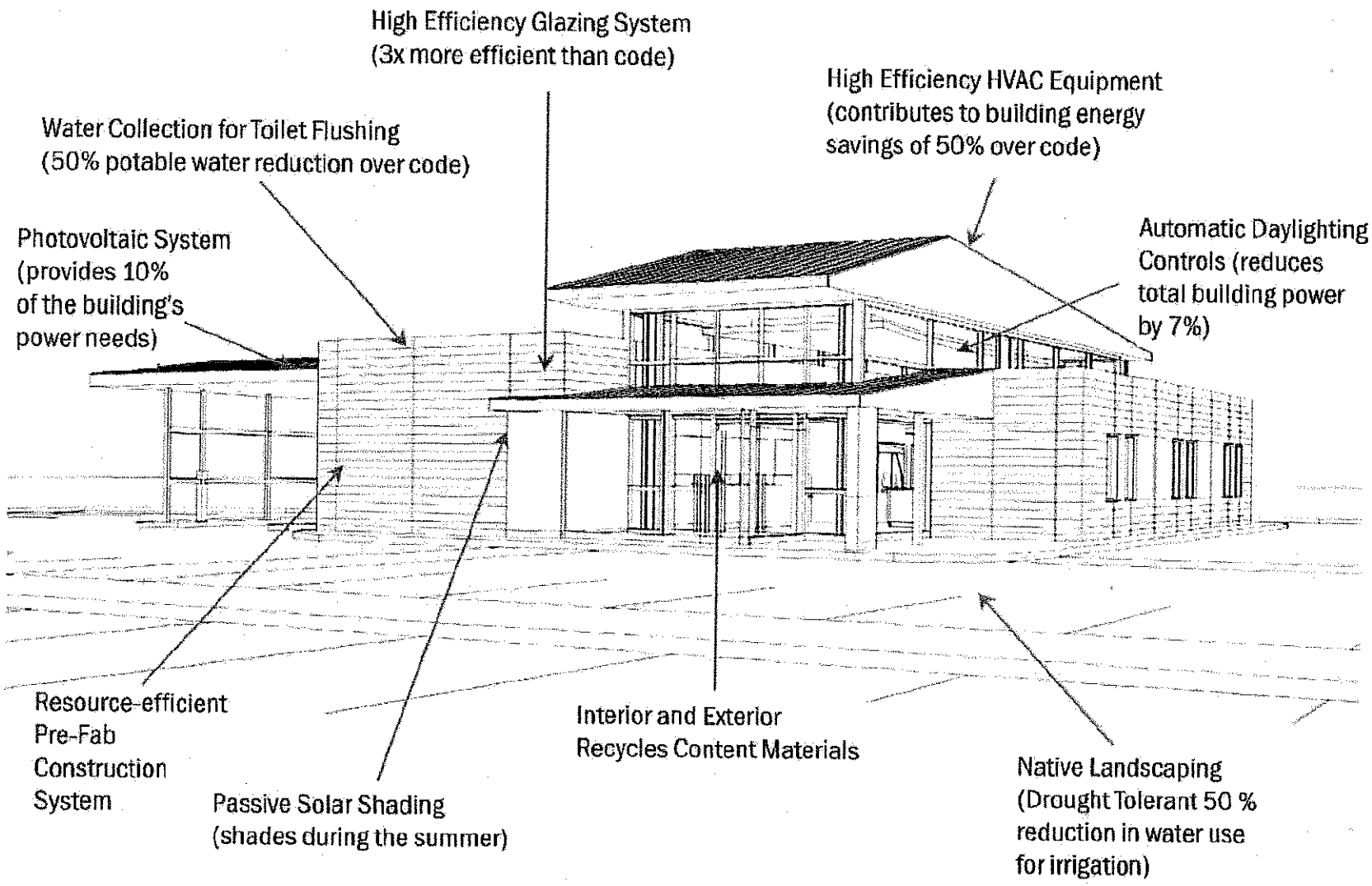
Energy & Atmosphere

- Energy performance optimized
- Enhanced commissioning

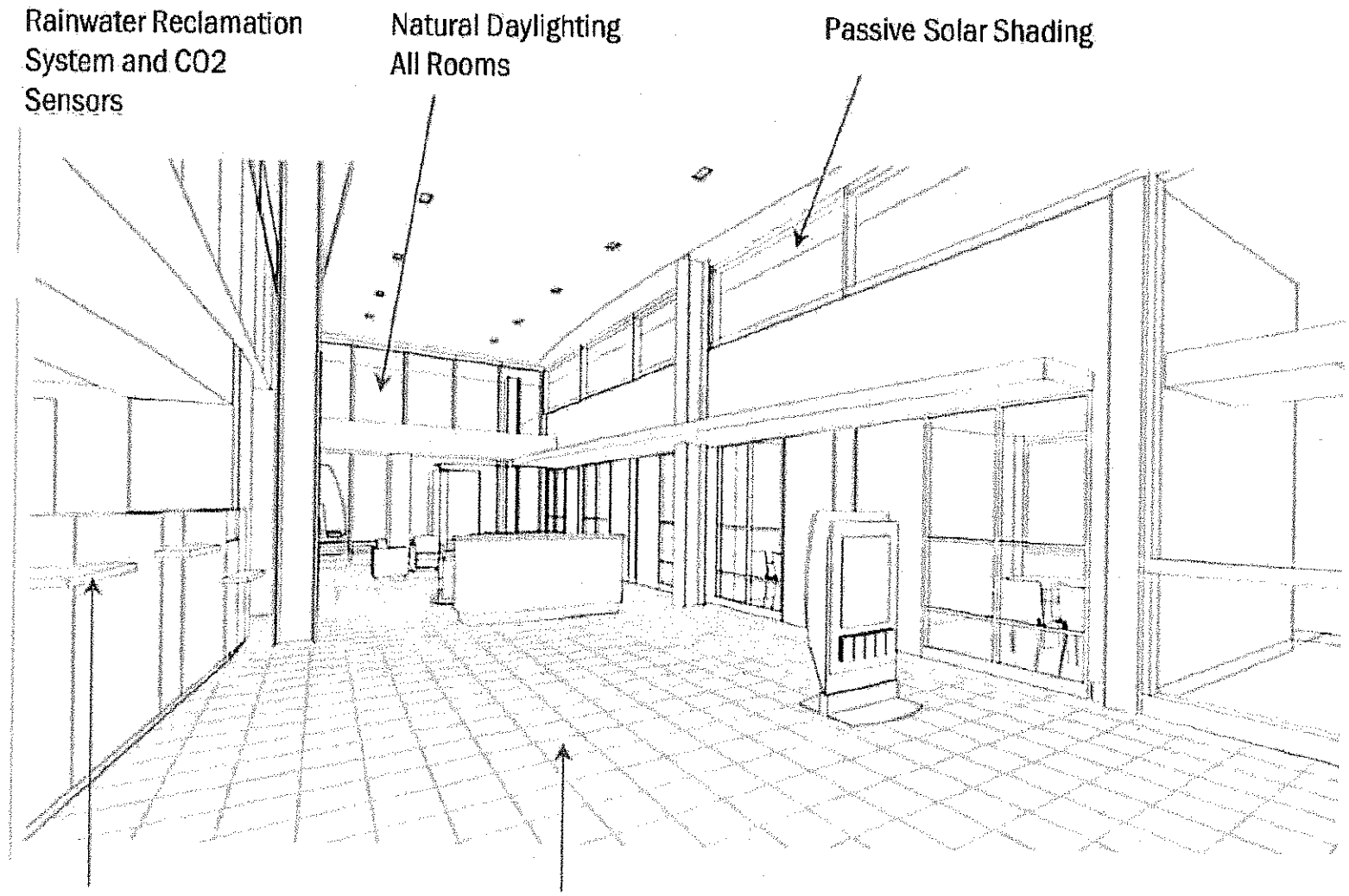
Innovation and Design

- Prototype design for enhanced energy efficiency

How does Green Building work?



How does Green Building work?

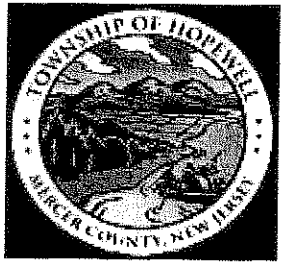


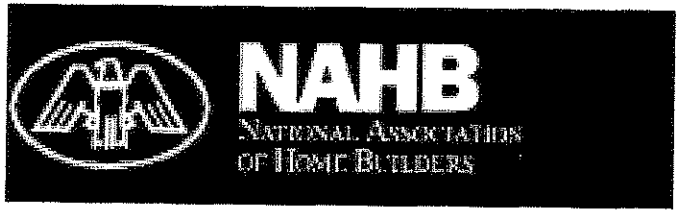
Pathways to Going Green

- **Education and Engagement**
  - Increase knowledge and awareness about green practices and promote healthy lifestyles
- **Regulations**
  - Greening of Municipal Land Use Ordinances and Design Standards
- **Incentives**
  - Provide rewards for going green (i.e., faster permitting, reduced permit fees, density bonuses, etc.)

What have we done?

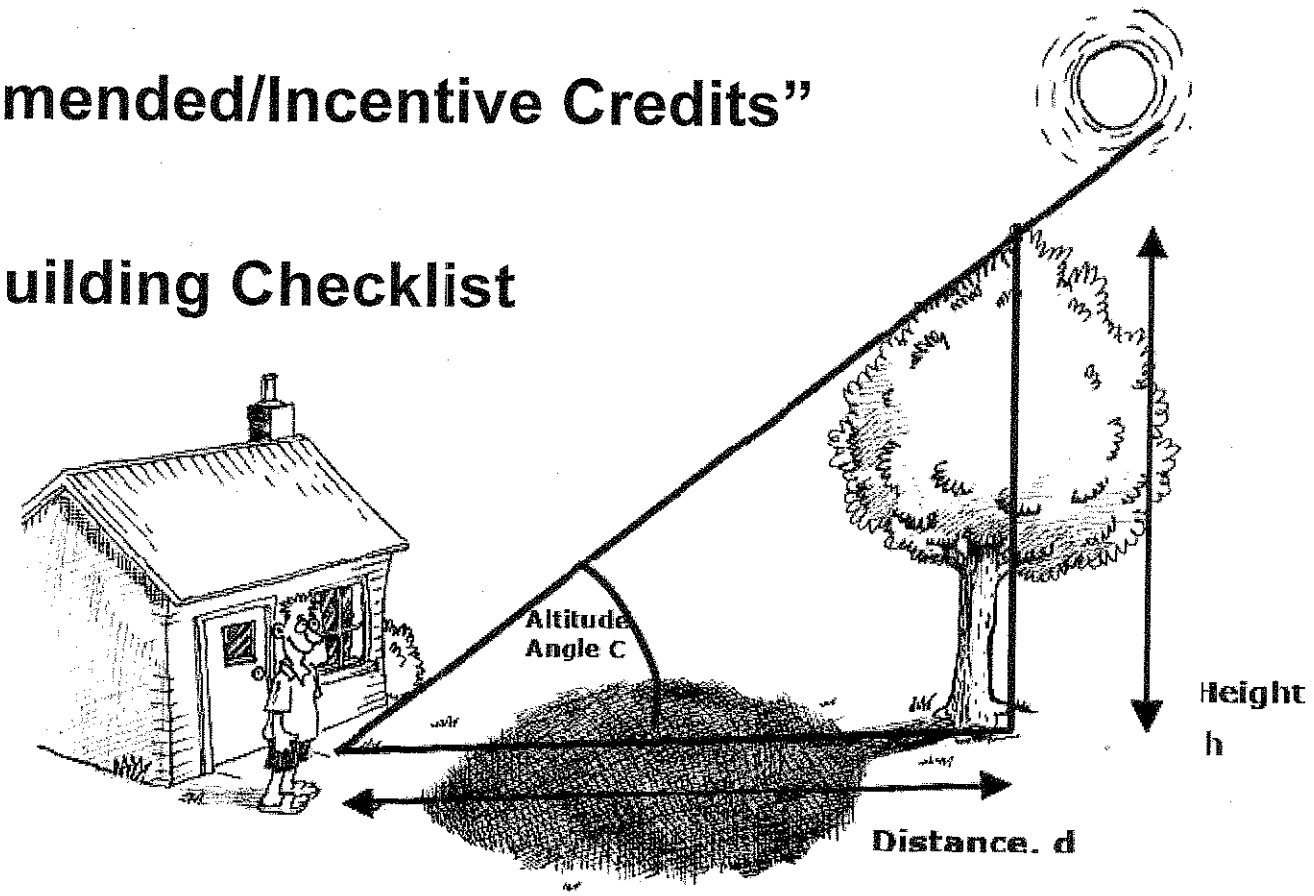
- **Research**
- **Review**
- **Recommend**





Types of Recommendations

- **"Baseline Requirements"**
- **"Recommended/Incentive Credits"**
- **Green Building Checklist**



Bikeways and Amenities

- **Require bicycle racks/storage** be provided at large commercial buildings for 5% or more of all building users at peak periods and for multi-family residential buildings for 15% of building occupants.

Reference:

- LEED Alternative Transportation

Landscaping

- **Design landscape features to minimize use of water and synthetic chemicals.** Do not use invasive plant species. Consider planting only with drought tolerant turf, and adding mulch or soil amendments as necessary.

Reference:

- LEED Homes, Landscaping
- Model Ordinances

Energy Efficiency: Residential Buildings

- **Energy Star Home Certification.** Encourage all new single-family dwelling and multiple-family dwellings to comply with ENERGY STAR Labeled home guidelines, thus ensuring that the dwellings will use considerably less energy than if built to prevailing building standards.

Reference:

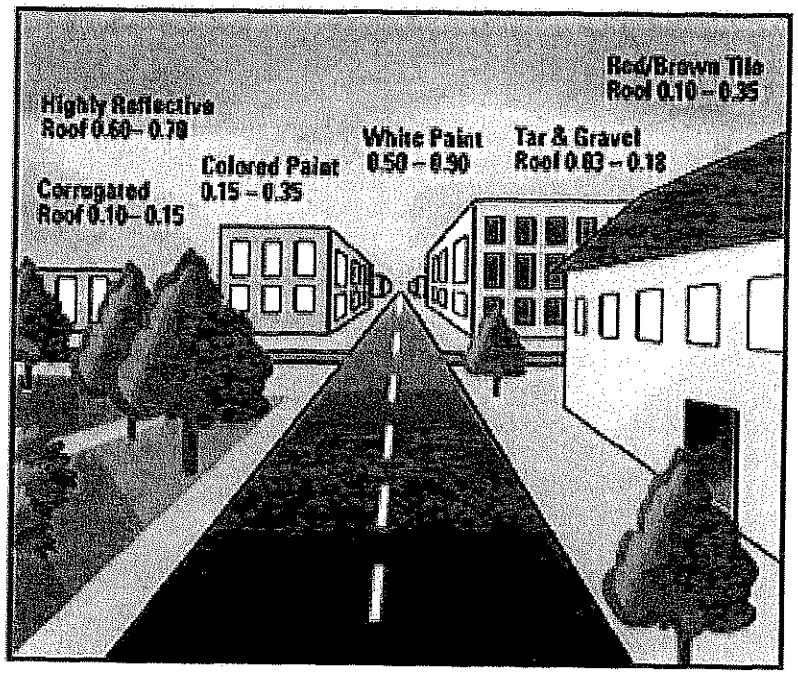
- Energy Star Labeled Home;
- Brookhaven, NY- Energy Star Ordinance

Roofing: Residential

- **Roof Coloring.** To reduce the urban heat island effect, use roofing materials that are no darker than a light gray or demonstrate how alternate roofing materials reduce the urban heat island effect.

Reference:

- Energy Star roof criteria

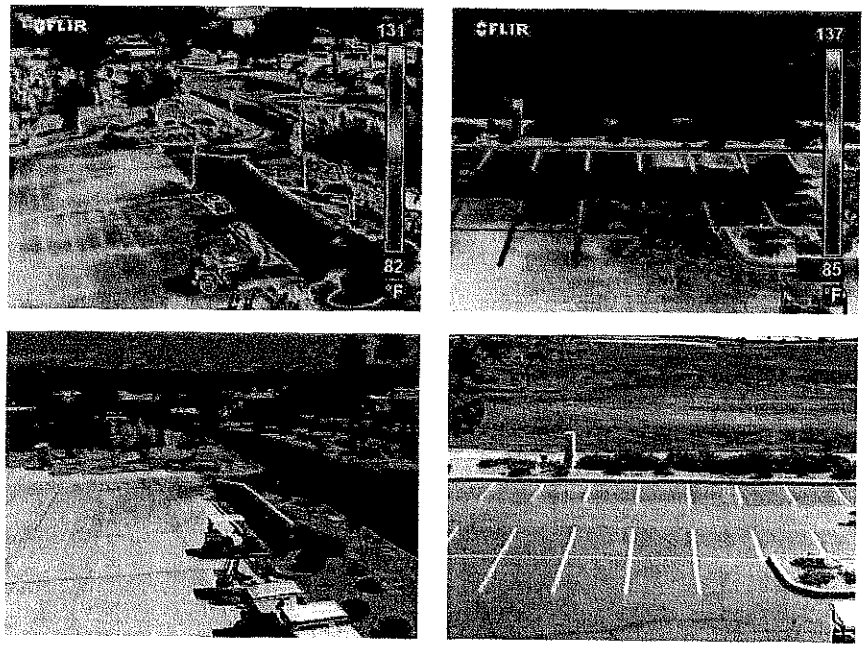


Off-Street Parking and Loading

- **Place a minimum of 50% of parking spaces under cover** (defined as underground, under deck, under roof, or under a building).

Reference:

- LEED Heat Island Effect

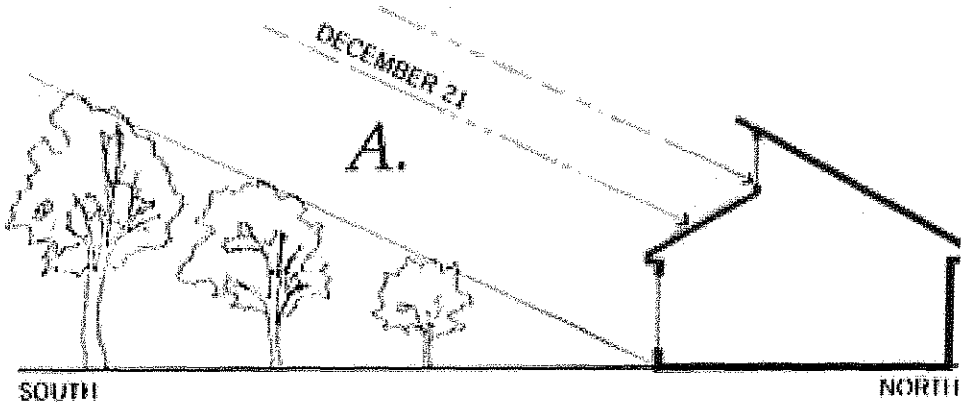


Solar Access

- **Orient building for solar access.** Design buildings to increase solar gains during the heating season and to reduce gains during the cooling season.

References:

- NAHB Green Guidelines



Construction Waste Management

- **Divert 50% of construction debris from disposal.** Recycle and reuse materials where applicable.

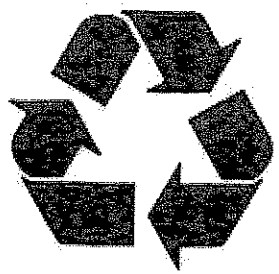
Reference:

- LEED Construction Waste Management

- **Use salvaged, refurbished or reused materials for at least 5%** (based on cost) of the total value of materials on the project.

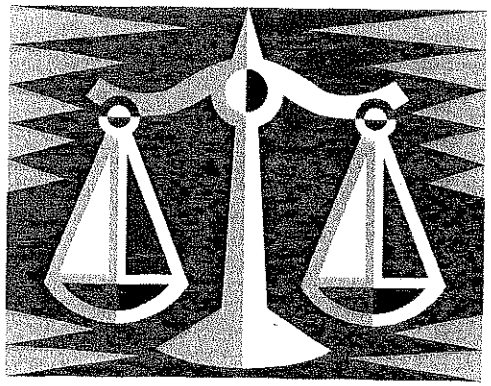
Reference:

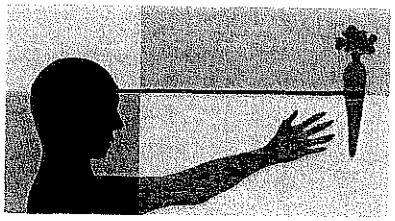
- LEED Materials Reuse
- Model Ordinances

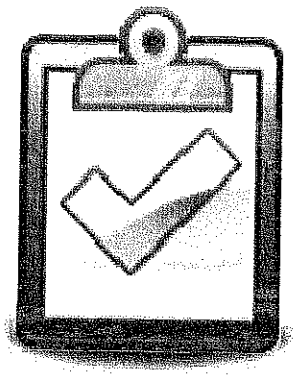


Next Steps

- **Review & Refine Recommendations**
- **Select Requirements**
- **Develop Incentives**
- **Create Green Building Checklist**







For More Information:

- **Rutgers Center for Green Building**
- Rutgers, The State University of New Jersey
- 33 Livingston Avenue
- New Brunswick, NJ 08901

- http://greenbuilding.rutgers.edu
- 732-932-4101, ext. 520
- Fax: 732-932-0934

RUTGERS
Edward J. Bloustein School
of Planning and Public Policy

Rutgers Center for Green Building
Rutgers, The State University of New Jersey
33 Livingston Avenue
New Brunswick, NJ 08901

http://greenbuilding.rutgers.edu
732-932-4101, ext. 520
Fax: 732-932-0934

Mr. Darren Port
New Jersey Division of Codes and Standards
Department of Community Affairs
P. O. Box 800
Trenton, NJ 08625-0800

November 26, 2007

Dear Mr. Port,

The Rutgers Center for Green Building is working with Hopewell Township to update and "green" their land use ordinances. We are unsure about the level of stringency that is permitted in municipal code for a number of items detailed below. Please inform us about whether state law allows the township to implement the following standards as described.

- **Construction Waste Management** –*Divert 50% from Disposal.* Divert construction, demolition and land-clearing debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites. (LEED Construction Waste Management, Online, p51)
    a. Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or co-mingled.
    b. Excavated soil and land-clearing debris do not contribute. Calculations can be done by weight or volume, but must be consistent throughout.
    c. Consider recycling cardboard, metal, brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a specific area(s) on the construction site for segregated or commingled collection of recyclable materials, and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site.

- **Materials Reuse** – Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources. (LEED Materials Reuse, Online, p53)
    a. Use salvaged, refurbished or reused materials such that the sum of these materials constitutes at least 5%, based on cost, of the total value of materials on the project. Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculaton. Only include materials permanently installed in the project. Furniture may be included.

b. Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items.

- **Recycled Material Content** – *Recycled Content Materials: 10%.* Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of materials that have not previously been harvested or collected. (LEED Recycled Content, Online, p55)

- **Energy Star Appliances** – All installed appliances must be Energy Star labeled (for all appliances for which Energy Star labels are available). (Austin, TX) Appliance standards regulated by federal government.

- **Regional and Sustainable Materials Specification** – Demonstrate that building materials meet or exceed at least two of the following selection criteria:
    a. *Regional Materials: 10% Extracted, Processed & Manufactured Regionally.* Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and local economies, and reducing the environmental impacts resulting from transportation. (LEED Regional Materials, Online, p57) Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% (based on cost) of the total materials value. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed. Consider a range of environmental, economic and performance attributes when selecting products and material.

    b. *Rapidly Renewable Materials.* Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials. (LEED Rapidly Renewable Materials, Online, p59) Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) for 2.5% of the total value of all building materials and products used in the project, based on cost. Identify products and suppliers that can support achievement of this goal. Consider materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard and cork. During construction, ensure that the specified renewable materials are installed.

    c. *Certified Wood.* During construction, ensure that the FSC-certified wood products are installed. (LEED Certified Wood, Online, p60)

d. *Low-VOC Emitting Materials.* Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.
   i. *Low/no VOC adhesives, sealants, and sealant primers (South Coast Air Quality Management District Rule 1113, Architectural Coatings)*
   ii. *Low/no VOC paints, coatings, primers applied to interior walls (Green Seal Standard GS-11)Note: higher than EPA standards.*
   iii. *Carpet and Rug Institute's Green Label Plus certified carpet*

e. *Materials finish.* Use building materials that require no additional finish resources to complete application onsite. (NAHB, p15)

f. *Framing (applicable to homes).* Use advanced framing techniques that reduce the amount of building material while maintaining the structural integrity of the home. (NAHB, p15)

- **Commissioning** – Commission of a commercial building's energy and lighting systems.
  a. Verify that the building's energy related systems are installed, calibrated and perform according to the owner's project requirements, basis of design, and construction documents. (LEED Fundamental Commissioning, online, p32)
  b. The indoor and outdoor lighting system must be commissioned in order to ensure that it was installed correctly, is operating properly, and meets the criteria specified in Hopewell's Design Criteria ordinance. (LEED Light Pollution Reduction, Approach and Implementation, Exterior Light Distribution #9, p106)

- **Energy Star Homes vs. Commercial Buildings** – We have learned from you (conversation w/ D. Port) that Energy Star Homes represents an alternative compliance path for meeting energy standards established by international code in the residential sector; are there any alternative compliance paths in the commercial sector?

- **Commercial Indoor Air Quality** – Generally, we are unclear about whether Hopewell can implement standards that are more stringent than the ASHRAE requirements as designated by the Division of Codes and Standards. We were also unsure about whether Hopewell could require the following:

  Construction Indoor Air Quality Plan: During Construction. Reduce indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants. Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows: (LEED Construction Indoor Air Quality Plan, Online, p66)

a. During construction meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995, Chapter 3.
b. Protect stored on-site or installed absorptive materials from moisture damage.
c. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace all filtration media immediately prior to occupancy.

- **Low/No VOC products** - All paints, solvents, and adhesives used in the interior of the building must meet or exceed the VOC (volatile organic compound) limit of Green Seal environmental standards GS-II. Note: The Green Seal organization sets much more stringent standards than the EPA for acceptable VOC levels in paint. For interior flat paint, the EPA allows levels of 250 grams per liter (g/L) while Green Seal allows only 50 g/L. (Green Seal environmental standards GS-II)

- **Balanced Housing** – You suggested that Balanced Housing rules supersede code. What does this mean, more specifically?

- **Daylighting** - Daylight 75% of spaces in new commercial and municipal buildings. Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building. Three options are available to achieve the daylighting requirement; however in all cases the following requirements must be met. Only the square footage associated with the portions of rooms or spaces meeting the minimum illumination requirements can be applied towards the 75% of total area calculation required. Additionally, provide daylight redirection and/or glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits. (LEED Daylight & Views, Online, p77)
    a. Option 1 - Achieve a minimum glazing factor of 2% in a minimum of 75% of all regularly occupied areas.
    b. Option 2 - Demonstrate, through computer simulation, that a minimum daylight illumination level of 25 footcandles has been achieved in a minimum of 75% of all regularly occupied areas. Modeling must demonstrate 25 horizontal footcandles under clear sky conditions, at noon, on the equinox, at 30 inches above the floor.
    c. Option 3 - Demonstrate, through records of indoor light measurements, that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75% of all regularly occupied areas. Measurements must be taken on a 10-foot grid for all occupied spaces and must be recorded on building floor plans.

- **Roofs** – (Commercial) Choose one of the following to contribute to the reduction of the urban heat island effect on commercial buildings.

a. Require that roofing materials have a Solar Reflectance Index (SRI) equal to or greater than 78 for a low-sloped roof (less than or equal to 2:12) or 29 for a steep-sloped roof (greater than 2:12) covering 75% of the roof surface. When calculating the surface area of a roof deduct areas with equipment, solar energy panels, and appurtenances. (LEED Heat Island Effect, p95)
b. Install a vegetated roof for at least 50% of the roof area. (LEED Heat Island Effect, p95)
c. Provide any combination of the following strategies for 50% of the site hardscape: shade (within 5 years of occupancy), paving materials with a solar reflectance index (SRI) of at least 29, or employs and open grid system.
d. Use Energy Star compliant, high-reflectance roofing (according to Energy Star roof criteria) for a minimum of 75% of the roof surface (Austin, TX)

(Residential) - *Roof Coloring.* To reduce the urban heat island effect, use roofing materials that are no darker than a light gray or demonstrate how alternate roofing materials reduce the urban heat island effect.

Thank you for all of your help during this process.

Sincerely,

RUTGERS

Edward J. Bloustein School
of Planning and Public Policy

Hopewell Township, New Jersey
Green Land Use Ordinances
Draft
October 18, 2007

Prepared by:
The Rutgers Center for Green Building
Edward J. Bloustein School of Planning &
Public Policy
Rutgers, The State University of New Jersey
33 Livingston Avenue
New Brunswick, New Jersey 08901

Phone: 732/932-4101 x520 ↓ www.greenbuilding.rutgers.edu ↓ Fax: 732/932-0934

TABLE OF CONTENTS

ARTICLE V- SUBDIVISION AND SITE PLAN REQUIREMENTS, PLAT DETAILS

ARTICLE VI – DESIGN STANDARDS

ARTICLE V
SUBDIVISION AND SITE PLAN REQUIREMENTS, PLAT DETAILS

RECOGNITION OF ENVIRONMENTAL CONSTRAINTS AND COMPLIANCE WITH ZONING ORDINANCE AND OFFICIAL MAP, IF ANY

Baseline Requirements:

Development plans shall not include the following sensitive site elements and restrictive land types: land that is specifically identified as habitat for any species on federal or state threatened or endangered lists, within 100 feet of any wetlands, on land which prior to acquisition for the project was public parkland (unless land of equal or greater value as parkland is accepted in trade by the public landowner), previously undeveloped land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by FEMA, previously undeveloped land within 50 feet of a waterbody, or prime farmland as defined by the United State Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5). (LEED Site Selection, Requirements, p27).

ARTICLE VI – DESIGN STANDARDS

APPLIANCES

Recommended/Incentive Credits:

1. Energy Star Rated Appliances: All installed appliances must be Energy Star labeled (for all appliances for which Energy Star labels are available). (Austin, TX) Appliance standards regulated by federal government.

BIKEWAYS AND AMENITIES

Baseline Requirements:

1. Require that secure bicycle racks/and or storage be provided at large commercial or institutional buildings for 5% or more of all building users at peak periods and for multi-family residential buildings for 15% of building occupants. Secure bicycle spaces should be easily accessible by occupants during all seasons of the year and free of charge. (LEED Alternative Transportation, Bicycle Storage & Changing Rooms, Requirements, p53-55)

    a. To determine the number of secure bicycle spaces required for a commercial or institutional building, first identify the total number of full-time and part time occupants. Calculate the FTE occupants based on a standard 8-hour occupancy period and assign each full-time occupant a value of 1.0 and each part-time occupant a value of the number of hours worked divided by eight. Estimate the transient occupants such as students, visitors, and customers during the peak period for the facility. Calculate peak building users by combining FTE occupants and transient occupants. The minimum number of secure bicycle spaces is 5% of the peak building users.
    b. To determine the number of secure bicycle spaces required for a residential building identify the number of total occupants. Multiply the number of occupants by 15%.

Recommended/Incentive Credits:

1. Provide shower and changing facilities in large commercial or institutional buildings for 5% of Full-Time Equivalent (FTE) occupants. (LEED Alternative Transportation, Bicycle Storage & Changing Rooms, Requirements, p53-55)

    a. Shower and changing facilities should be easily accessible from the bicycle storage areas.

Calculate the number of FTE occupants using the same method found above in 1a. The minimum number of shower and changing facilities is 5% of peak building users.

BUILDING MATERIALS

Baseline Requirements:

1. *Resource Efficiency.* Demonstrate that building materials meet or exceed at least two of the following selection criteria:

    a. *Regional Materials: 10% Extracted, Processed & Manufactured Regionally.* Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and local economies, and reducing the environmental impacts resulting from transportation. (LEED Regional Materials, Online, p57) Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% (based on cost) of the total materials value. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed. Consider a range of environmental, economic and performance attributes when selecting products and material.

    b. *Rapidly Renewable Materials.* Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials. (LEED Rapidly Renewable Materials, Online, p59) Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) for 2.5% of the total value of all building materials and products used in the project, based on cost. Identify products and suppliers that can support achievement of this goal. Consider materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard and cork. During construction, ensure that the specified renewable materials are installed.

    c. *Certified Wood.* Encourage environmentally responsible forest management. (LEED Certified Wood, Online, p60). During construction, ensure that the FSC-certified wood products are installed.

    d. *Low-VOC Emitting Materials.* Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.
        i. *Low/no VOC adhesives, sealants, and sealant primers (South Coast Air Quality Management District Rule 1113, Architectural Coatings)*
        ii. *Low/no VOC paints, coatings, primers applied to interior walls (Green Seal Standard GS-11)Note: higher than EPA standards.*
        iii. *Carpet and Rug Institute's Green Label Plus certified carpet*

e. *Materials finish.* Use building materials that require no additional finish resources to complete application onsite. (NAHB, p15)

f. *Framing (applicable to homes).* Use advanced framing techniques that reduce the amount of building material while maintaining the structural integrity of the home. (NAHB, p15)

CONSTRUCTION WASTE MANAGEMENT

Baseline Requirements:

1. *Construction Waste Management: Divert 50% from Disposal.* Divert construction, demolition and land-clearing debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites. (LEED Construction Waste Management, Online, p51)
    a. Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or co-mingled.
    b. Excavated soil and land-clearing debris do not contribute. Calculations can be done by weight or volume, but must be consistent throughout.
    c. Consider recycling cardboard, metal, brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a specific area(s) on the construction site for segregated or commingled collection of recyclable materials, and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site.

Recommendations/Incentive Credits:

1. *Materials Reuse.* Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources. (LEED Materials Reuse, Online, p53)
    a. Use salvaged, refurbished or reused materials such that the sum of these materials constitutes at least 5%, based on cost, of the total value of materials on the project. Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included.
    b. Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items.

2. *Recycled Content Materials: 10%).* Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials. (LEED Recycled Content, Online, p55)

DRIVEWAYS

Baseline Requirement:

1. Porous Pavement: Construct residential and commercial driveways of porous pavements such as open-jointed pavers, "soft" paving materials including wood mulch and crushed shell, porous concretes and asphalts, and plastic geocells or lattice-like materials that hold aggregate or topsoil in their cells to prevent displacement and compaction.

ENERGY EFFICIENCY: COMMERCIAL BUILDINGS

Baseline Requirements:

1. Commission the building's energy systems. Verify that the building's energy related systems are installed, calibrated and perform according to the owner's project requirements, basis of design, and construction documents. (LEED Fundamental Commissioning, online, p32)
    a. Designate an individual as the Commissioning Authority (CxA) to lead, review and oversee the completion of the commissioning process activities. The Owner shall document the Owner's Project Requirements (OPR). The design team shall develop the Basis of Design (BOD). The CxA shall review these documents for clarity and completeness. The Owner and design team shall be responsible for updates to their respective documents.

    b. In order to complete the commissioning process the following steps must be completed:
        a. Develop and incorporate commissioning requirements into the construction documents.
        b. Develop and implement a commissioning plan.
        c. Verify the installation and performance of the systems to be commissioned.
        d. Complete a summary commissioning report.
        e. Commissioning process activities shall be completed for the following energy-related systems, at a minimum: HVAC & R systems and associated controls, lighting and daylighting

controls, domestic hot water systems, and renewable energy systems.

2. Re-commission the building's energy systems on an ongoing basis to provide for the ongoing accountability of building of energy consumption over time.

3. Eliminate use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phase-out conversion prior to project completion. Phase-out plans extending beyond the project completion date will be considered on their merits. Zero use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phase-out conversion prior to project completion. Phase-out plans extending beyond the project completion date will be considered on their merits.

ENERGY EFFICIENCY: RESIDENTIAL BUILDINGS

Baseline Requirements:

1. *Energy Star Home Certification:* All new single-family dwelling and multiple-family dwellings including apartments and townhouses must comply with ENERGY STAR Labeled home guidelines, thus ensuring that the dwellings will use considerably less energy than if built to prevailing building standards. *Energy Star Labeled Home.* (LEED Homes, Energy Star Labeled Home, online, p77)
    a. Meet requirements of ENERGY STAR for HOMES; home must be third-party inspected.
    b. Exceed requirements of ENERGY STAR for HOMES; home must be third-party inspected.

1. Complete all the verification requirements for an ENERGY STAR HOME including: performing and HERS rating on the house, thermal bypass (insulation) inspection, envelope air leakage testing with blower door, duct leakage testing with duct pressurization fan.

(See attached Ordinance from Town of Brookhaven in Suffolk County, New York as an example)

2. Provide homeowner with information and enrollment materials about options to purchase green power from the local electric utility. (NAHB, p26)

Recommendations/Credit Incentives:

1. *Energy-efficient products and materials which utilize alternative energy sources*: Business owner or homeowner who "makes an application to renovate, convert, construct or replace existing home equipment with energy-efficient products and material which utilize alternative energy sources...to heat and cool the residential unit will be waived of constructions permit costs." (pending ordinance for

Medford Township, NJ http://www.phillyburbs.com/pb-dyn/news/112-09062007-1403108.html)

ENVIRONMENTAL IMPACT REPORT

Baseline Requirements:

1. Complete a natural resources inventory used to drive and create the site plan. Maintain wildlife habitat. (NAHB, p10)

2. Locate roads, buildings, and other built features to conserve high-priority vegetation. (NAHB, p50)

3. Align roads with natural topography to minimize grade to reduce cut and fill. (NAHB, p50)

EXISTING TREE PROTECTION

Baseline Requirements:

1. If trees are present at development sites, a required percentage of the stand must be preserved.

2. All trees of a 12-inch caliper or greater must appear on construction plans and be considered during the planning process if the developer intends to remove them. (Lake Forest, Illinois example, http://www.nahb.org/generic.aspx?genericContentID=19086)

3. Trees shall be required when single-family dwelling units are constructed. The minimum number of caliper inches of tree required per lot may be met through using either the tree preservation option or tree planting option set forth below, or through a combination of preservation and planting. This requirement may be met by planting or preserving street trees in the public right-of-way.

    a. *Tree preservation option.* For lots over three thousand (3000) square feet, at least two (2) caliper inches of existing tree per one thousand (1000) square feet of lot area must be preserved. On lots that are three thousand (3000) square feet or smaller, at least three (3) caliper inches of existing tree must be preserved per lot. When this option is used, a tree preservation plan is required. A tree preservation plan must be submitted and approved. Tree preservation plans shall provide for protection of trees

during construction according to standards promulgated by the Department of Design, Construction and Land Use.

b. *Tree planting option.* For lots over three thousand (3000) square feet, at least two (2) caliper inches of tree per one thousand (1000) square feet of lot area must be planted. On lots that are three thousand (3000) square ft or smaller, at least three (3) caliper inches of tree must be planted per lot.

FENCES AND HEDGES

Baseline Requirements:

1. Screening should employ the use of vegetation to the maximum extent practicable before the use of walls or berms. (See Landscaping and Water-Efficient Landscaping requirements for native and xeriscape species)

INDOOR AIR QUALITY: COMMERCIAL BUILDINGS

Baseline Requirements:

1. Construction Indoor Air Quality Plan: During Construction. Reduce indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants. Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows: (LEED Construction Indoor Air Quality Plan, Online, p66)
    a. During construction meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995, Chapter 3.
    b. Protect stored on-site or installed absorptive materials from moisture damage.
    c. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace all filtration media immediately prior to occupancy.

INDOOR AIR QUALITY: RESIDENTIAL BUILDINGS

Baseline Requirements:

1. *Low/no VOC products.* All paints, solvents, and adhesives used in the interior of the building must meet or exceed the VOC (volatile organic compound) limit of Green Seal environmental standards GS-II. Note: The Green Seal organization

sets much more stringent standards than the EPA for acceptable VOC levels in paint. For interior flat paint, the EPA allows levels of 250 grams per liter (g/L) while Green Seal allows only 50 g/L.

2. Use formaldehyde-free or sealed building products.
3. For vented space heating and heated water equipment install direct vent equipment or install induced/mechanical draft combustion equipment.
4. Mask HVAC outlets during construction and vacuum ducts, boots, and grilles before turning on central heating/cooling system.

Recommendations/Incentive Credits:

1. *Moisture management.* Demonstrate moisture management compliance by meeting one of the following criteria.
    a. Control bathroom exhaust fan with a timer or humidistat.
    b. Install moisture resistant backer-board – not paper-faced sheathing – under tiled surfaces in wet areas.
    c. Keep plumbing supply lines out of exterior walls.
    d. Insulate cold water pipes in unconditioned spaces with one-half inch insulation or other coating that comparably prevents condensation.
    e. Insulate HVAC ducts, plenums, and trunks in unconditioned basements and crawl spaces to avoid condensation.

LIGHTING

Baseline Requirements:

1. The indoor and outdoor lighting system must be commissioned in order to ensure that it was installed correctly, is operating properly, and meets the criteria specified in Hopewell's Design Criteria ordinance. (LEED Light Pollution Reduction, Approach and Implementation, Exterior Light Distribution #9, p106)

Expanded Requirements/Incentive Credits:

1. Indoor lighting control. Provide a high level of lighting system control by individual occupants or by specific groups in multi-occupant spaces (i.e. classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants. (LEED Controllability of Systems, Online, p75)
    a. Provide individual lighting controls for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences.
    b. Provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences.

2. Daylight 75% of spaces in new commercial and municipal buildings. Provide for the building occupants a connection between indoor spaces and the outdoors

through the introduction of daylight and views into the regularly occupied areas of the building. Three options are available to achieve the daylighting requirement; however in all cases the following requirements must be met. Only the square footage associated with the portions of rooms or spaces meeting the minimum illumination requirements can be applied towards the 75% of total area calculation required. Additionally, provide daylight redirection and/or glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits. (LEED Daylight & Views, Online, p77)

a. Option 1 - Achieve a minimum glazing factor of 2% in a minimum of 75% of all regularly occupied areas.
b. Option 2 - Demonstrate, through computer simulation, that a minimum daylight illumination level of 25 footcandles has been achieved in a minimum of 75% of all regularly occupied areas. Modeling must demonstrate 25 horizontal footcandles under clear sky conditions, at noon, on the equinox, at 30 inches above the floor.
c. Option 3 - Demonstrate, through records of indoor light measurements, that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75% of all regularly occupied areas. Measurements must be taken on a 10-foot grid for all occupied spaces and must be recorded on building floor plans.

OFF-STREET PARKING AND LOADING

Baseline Requirements:

1. Provide preferred parking for carpools or vanpools and low emission vehicles marked as such, for 5% of total provided parking spaces. (LEED Alternative Transportation, Parking Capacity, p63)

2. Install porous paving material in parking areas. Porous pavements can include open-jointed pavers, "soft" paving materials including wood mulch and crushed shell, porous concretes and asphalts, and plastic geocells or lattice-like materials that hold aggregate or topsoil in their cells to prevent displacement and compaction.

3. In appropriate residential settings, provide infrastructure and support programs to facilitate shared vehicle usage such as carpool drop-off areas, designated parking for vanpools, or car-share services, ride boards, and shuttle services to mass transit. (LEED Alternative Transportation, Parking Capacity, p63)

4. Off-street parking modification: The number of off-street parking spaces required by this ordinance may be increased or decreased in consideration of the following:

    a. Proximity to central business district or other employment center

b. Actual parking needs of any non-resident uses
c. Varying time periods of use, wherein joint uses of community parking is proposed
d. Available public transit

Expanded Requirements/Incentive Credits:

1. Place a minimum of 50% of parking spaces under cover (defined as underground, under deck, under roof, or under a building). Any roof used to shade of cover parking must have an SRI of at least 29. (LEED Heat Island Effect, p89).

RECYCLING

Baseline Requirements:

1. Building owners shall facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills. Provide an easily accessible area that serves the entire building and is dedicated to the collection and storage of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics and metals. Coordinate the size and functionality of the recycling areas with the anticipated collection services for glass, plastic, office paper, newspaper, cardboard and organic wastes to maximize the effectiveness of the dedicated areas. Consider employing cardboard balers, aluminum can crushers, recycling chutes and collection bins at individual workstations to further enhance the recycling program.

ROOFING: COMMERCIAL

Baseline Requirements:

1. Choose one of the following to contribute to the reduction of the urban heat island effect.
    a. Require that roofing materials have a Solar Reflectance Index (SRI) equal to or greater than 78 for a low-sloped roof (less than or equal to 2:12) or 29 for a steep-sloped roof (greater than 2:12) covering 75% of the roof surface. When calculating the surface area of a roof deduct areas with equipment, solar energy panels, and appurtenances. (LEED Heat Island Effect, p95)
    b. Install a vegetated roof for at least 50% of the roof area. (LEED Heat Island Effect, p95)
    c. Provide any combination of the following strategies for 50% of the site hardscape: shade (within 5 years of occupancy), paving materials with a solar reflectance index (SRI) of at least 29, or employs and open grid system.

d. Use Energy Star compliant, high-reflectance roofing (according to Energy Star roof criteria) for a minimum of 75% of the roof surface (Austin, TX)

ROOFING: RESIDENTIAL

Baseline Requirements:

1. *Roof Coloring.* To reduce the urban heat island effect, use roofing materials that are no darker than a light gray or demonstrate how alternate roofing materials reduce the urban heat island effect.

SIGNAGE

Baseline Requirements:

1. Signage Lighting. All new and updated illuminated commercial and exit signs must use LED and/or light fixtures of an equivalent energy efficiency standard.

STEEP SLOPE

Baseline Requirements:
Limit development footprint on steep slopes (slopes greater than or equal to 25%). Align road or extended driveway with natural topography to minimize its grade and reduce cut and fill. Reduce long-term erosion effects through the design and implementation of terracing, retaining walls, landscaping, and re-stabilization techniques. (NAHB, p10)

SOLAR ACCESS

Baseline Requirements:

Property owners may choose to obtain a solar easement as specified by New Jersey's Solar Easement Act, for the purpose of assuring adequate access to direct sunlight for solar energy systems. Any or all of the following recommended conditions may be specified by the property owner within the easement and provisions for compensation to the owner in the event of interference will be described.

1. Site the building and other built features to optimize access to solar resources and to future use of the sun for the proposed building and to neighboring properties, buildings and structures. Provide a site plan that shows that direct sunlight can reach the proposed building and neighboring buildings between

9AM and 3PM from October 21 to February 21. (NAHB, p10, 26, Ordinance Examples p27)

2. If applicable, provide natural summer shading for south and west windows. During the summer season when solar access is less efficient, shading techniques should be employed to reduce cooling loads. Shading could be accomplished by the use of site features including trees, roof overhangs, or other building components.

3. Orient the building on the site to increase solar gains during the heating season and to reduce gains during the cooling season, Align the primary axis of the building so that there is significant glazing on the south (+ or – 30 deg) and limited glazing within + or – 30 deg of east and west. South glazing is most efficient for passive solar gains in the winter; while its summer heat gain penalty is less than for east and west glass (south glass can also be shaded so that direct radiation in the summer is eliminated). East and west facing glazing generally gains little useful energy in the winter, and suffers large, unwanted gains in the summer.

WATER EFFICIENCY

Baseline Requirements:

3. Require the reduction of potable water use for building sewage conveyance by 50% through the use of water-conserving fixtures or non-potable water (LEED Innovative Wastewater Technologies, p127)
    a. Specify high-efficiency fixtures and dry fixtures such as dual flush toilets, composting toilet systems, and non-water using urinals to reduce wastewater volumes.

LANDSCAPING

Baseline Requirements:

1. Reduce potable water consumption or other natural surface or subsurface water resources consumption available on or near the project site for irrigation. Reduction of consumption can be accomplished by selecting climate-tolerant plants that can survive on natural rainfall quantities after initial establishment, irrigation efficiency, use of captured rainwater, use of recycled wastewater, or use of water treated and conveyed by a public agency specifically for non-potable uses. (LEED Water Efficient Landscaping, p115).

2. Design landscape features to minimize demand for water and synthetic chemicals. Introduce no invasive plant species into the landscape as defined by the local Agriculture Cooperative Extension Service. Consider planting only with drought

tolerant turf, planting turf on slopes not exceeding 25%, and adding mulch or soil amendments as necessary. (LEED Homes, Landscaping, Online, p57)

3. Establish an integrated pest management plan to minimize chemical use of pesticides and fertilizers. (NAHB, p51)

Expanded Requirements/Incentive Credits:

1. Design landscape features to reduce urban heat island effects. Either of the following two options will satisfy these criteria. (LEED Homes, Landscaping, Online, p60)
   - Option 1 - Design and install trees and shrubs to shade at least 50% of sidewalks, patios and driveways within 50 feet of the house (based on noon on June 21 at 5 years' growth).
   - Option 2 – Install light colored, high-albedo materials (reflectance of at least 0.3) for at least 50% of site's non-roof impervious surfaces.

RUTGERS

Edward J. Bloustein School
of Planning and Public Policy

Center for Green Building
Living Greener Proposal

September 18, 2007

Agenda

- **Welcome-Project Team**
- **Project Scope**
- **Methods**
- **Overview of Activities**
- **Project Work Plan**

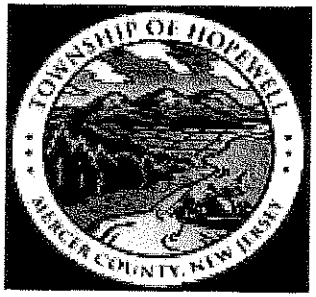
center for Green Building

Project Team

Partnership between:

- Hopewell Township Environmental Commission (EC)
- The Association of New Jersey Environmental Commissions (ANJEC)
- The Rutgers Center for Green Building (RCGB)

anjec



Center for Green Building

Project Scope

- Research and suggest green design criteria for incorporation into existing land use ordinances
- Meet and/or exceed green building guidelines and/or best practices
- Draw upon model ordinances and incentives
- Customize a set of green building land use ordinances that can also serve as a model for other New Jersey municipalities

Center for Green Building

Methods

- Critique through lens of U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) guidelines:
  - Sustainable Sites
  - Water Efficiency
  - Energy & Atmosphere
  - Materials & Resources
  - Indoor Air Quality
  - Innovation & Design
- Conduct comprehensive literature review of model green building ordinances and incentives

Overview of Activities

- Review existing land use ordinances and identify opportunities to:
  - insert green building language
  - add new green standards, and/or
  - omit existing impediments

- Research growing number of green building design standards, ordinances and incentives

- Provide green building resources and educational material for local residents and businesses

Granite for Green Building

Project Work Plan

- Form Working Group (mid-September)
- Report on progress (late-October)
- Help host first Public Meeting (mid-November)
- Conclude research and draft final recommendations (late-December)
- Township works with Planner & Attorney to incorporate suggestions. (mid-January)
- Unveil new green ordinances and disseminate information at second Public Meeting (late-January)

Center for Green Building

For More Information:

- **Rutgers Center for Green Building**
- Rutgers, The State University of New Jersey
- 33 Livingston Avenue
- New Brunswick, NJ 08901

- http://greenbuilding.rutgers.edu
- 732-932-4101, ext. 520
- Fax: 732-932-0934

Center for Green Building

Everything Jersey

The Times

Township to promote 'green' construction

Hopewell proposes sustainable standards

Tuesday, June 10, 2008

HOPEWELL TOWNSHIP -- Developers looking to build in the township would follow a greener blueprint under new design standards being considered tonight by the environmental commission.

Aimed at making the township a more environmentally sustainable community, the proposed amendments to the township's land-use regulations would require developers to incorporate environmentally friendly design standards into their plans.

"We're adding green thinking wherever we can," said Township Administrator Paul Pogorzelski.

Under the proposed standards, developers would have to lay out new construction in a way that maximizes solar energy access and use building materials that are extracted, processed and manufactured regionally. In general, developers would have to make every effort to conduct their business in a way that minimizes harm to the environment.

"Instead of us telling developers what we want them to do, we're writing the regulations into our land use design standards," Pogorzelski said.

Developers would have to adhere to the standards or provide a valid reason why they cannot, he said.

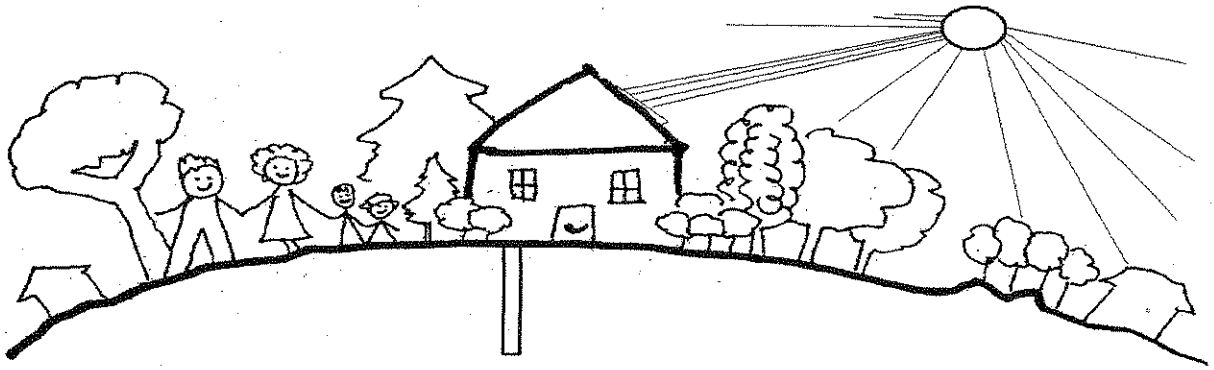
The Hopewell Township Environmental Commission will hold a public hearing on the regulations tonight at 7. Final recommendations will be forwarded to the planning board for consideration.

Hopewell Township Environmental Commission

presents the

LIVING GREENER TOUR

Saturday, November 15, from 11:00 a.m. to 4:00 p.m.



Hopewell Township's Environmental Commission invites you to take a free, self-guided tour of seven local sites that demonstrate various types of sustainable development. There will be hosts and guides at each of these sites to explain how and why the property owners have installed equipment that enables them to recycle energy, save money, and live a "greener lifestyle".

The tour is self-guided, meaning you read the following brief descriptions of the features at each site, look at the map and driving directions, and decide where you want to go. Except as noted below, off street parking is available at each site.

(1) **Pedestal-Mounted Tiltable Solar Power System with Battery Backup:** The home of Rex Parker and Carol Kleis, at **147 Church Road, Titusville** demonstrates what can be done to retrofit a 50's Cape Cod design to become a solar-powered home. The angles weren't optimal for roof installation, so they designed a pedestal-mounted tiltable panel system located behind the garage on the south side of the house. The 4.3 kW system is coupled to a sophisticated but trouble free inverter which maintains the charge of a bank of batteries. These batteries serve as an uninterrupted power supply in the event of electrical outages. Note: Please park either in the driveway of 147 Church Road, or in the neighboring driveway just down the hill.

(2) **Roof mounted solar collection system:** About three years ago, Lynn Lee & Mark Sherwood had Jersey Solar install a solar collection system on the roof of their house in Brandon Farms at **16 Navesink Drive** (off Denow Road, near Federal City Rd.). A representative of this local contractor will explain the system and the owners will describe the cost savings they have enjoyed. Please park on Navesink Drive.

(3) The Solar-Hydrogen House: This unique, internationally renowned residence uses 56 photovoltaic panels on the roof to change sunlight to electricity, which, in turn, runs an electrolyzer that extracts hydrogen from water. The hydrogen is then stored in tanks for future use. Since building the system, the owner, Mike Strizki, has paid nothing for electricity, oil, gas, or gasoline to fill up his hydrogen-powered car. This site has a Hopewell mailing address, but is actually in East Amwell Twp., at **26 Snydertown Road, between Stony Brook Road and Linvale Road**.

(4) Stony Brook Millstone Watershed Association: Visitors to the SWMWA property at **31 Titus Mill Road** will be able to see and learn about several water conservation techniques, including rain gardens, rain barrels, and the latest in water conserving bathroom fixtures. They will also be able to learn about how the photovoltaic panels installed on the Buttinger Environmental Center convert sunlight in to electricity.

(5) Timberlane Middle School at 51 S. Timberlane Drive: Recent additions include a geothermal based Heating, Ventilating and Air Conditioning (HVAC) system, a 50KW roof-mounted photovoltaic system, Energy Star roofing, and occupancy sensors, as well as an educational display panel about these alternative energy systems in the front lobby. Park in front lot and use front entrance.

(6) Mercer County Master Gardeners' Display Garden: Begun several years ago to display a wide variety of methods to compost yard and kitchen waste, this garden at **431A Federal City Road opposite Old Mill Road**, has grown to contain a display of native plants suitable for growing in Mercer County and a new planting area devoted to plants suitable for incorporating into rain gardens.

(7) Terhune Orchards: Located at **330 Cold Soil Road** in Lawrence Township, between the Pennington and Princeton tour sites, the Mount family invites tour-goers to stop and learn about the drip irrigation and integrated pest-management systems they use to grow a wide variety of fruits and vegetables.

To learn about the sites on the concurrent Green Home and Garden Tour sponsored by the Princeton Environmental Commission, and to obtain their tour map, see www.princetontwp.org.

Also, maps with detailed directions to the sites on each tour will be available at convenient locations, including area libraries and municipal buildings.

Maps of Hopewell's Greener Living tour will be available at www.hopewelltwp.org.

Princeton's and Hopewell Township's Environmental Commissions hope area residents will enjoy these free, educational tours. Children are very welcome to attend. Please be considerate of the hosts and bear in mind that they will want to resume their private lives after 4:00 p.m.

KEY to LIVING GREENER TOUR SITES

(1) **Pedestal-Mounted Tiltable Solar Power System:**
147 Church Road, Titusville

(2) **Roof mounted solar collection system:**
16 Navesink Drive in Brandon Farms, off Denow Road, near Federal City Rd..

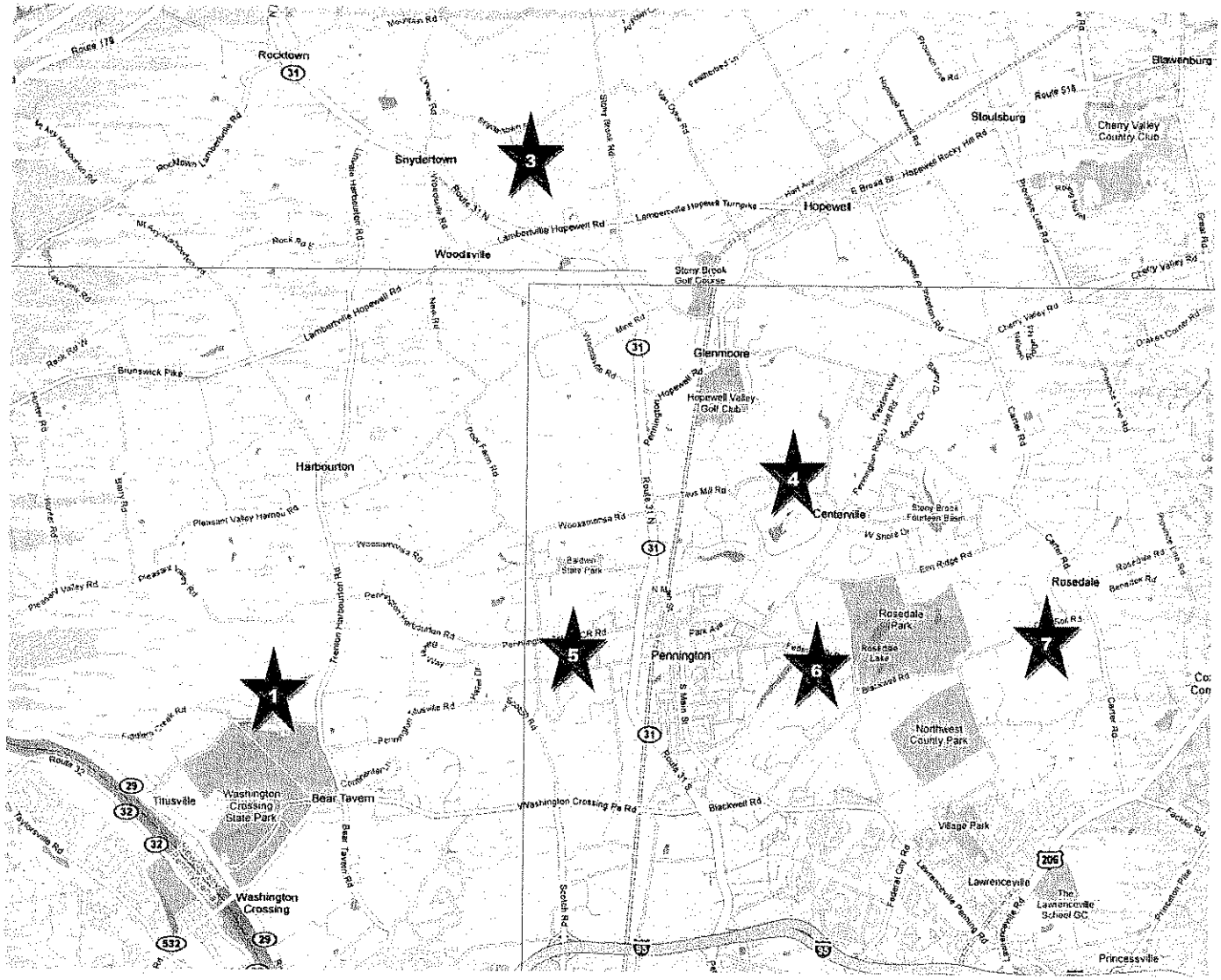
(3) **The Solar-Hydrogen House:**
26 Snydertown Road, between Stony Brook Rd. & Linvale Rd. in East Amwell Twp.,

(4) **Stony Brook Millstone Watershed Association:**
31 Titus Mill Road

(5) **Timberlane Middle School:**
51 Timberlane Drive

(6) **Mercer County Master Gardeners' Display Garden:**
431A Federal City Road opposite Old Mill Road (beside the County's Equestrian Center)

(7) **Terhune Orchards:**
330 Cold Soil Road in Lawrence Township



Hopewell Township and Princeton Environmental Commissions Promote Sustainability with Free Tours on November 15

Hopewell Township's Environmental Commission is inviting area residents to take a free, self-guided tour of seven sites that demonstrate various aspects of sustainable development. The event, dubbed "Living Greener Tour" will be held this Saturday, November 15, from 11:00 a.m. until 4:00 p.m. This event was planned to occur simultaneously with the second annual Green Home and Garden Tour sponsored by the Princeton Environmental Commission so that people can choose from a total 16 sites displaying examples of sustainable development.

Sustainable development is most frequently defined as development that addresses the needs of the present without compromising the ability of future generations to meet their needs. The two free, self-guided tours will feature area homes, gardens, commercial buildings, a school and a nature center that have incorporated a multitude of sustainable practices.

HOPEWELL SITES:
One of the featured homes is the unique, internationally renowned hydrogen-powered house that uses 56 photovoltaic panels on the roof to change sunlight to electricity, which, in turn, runs an electrolyzer that extracts hydrogen from water. The hydrogen is then stored in tanks for future use. The owner thus makes all the fuel he needs: Since building the system, he has paid nothing for electricity, oil, gas, or gasoline to fill up his hydrogen-powered car. The house's only waste product is water, which can be pumped right back into the system. "I can make fuel out of sunlight and water," owner Mike Stritski notes, "and I don't even use the water. If it's raining, it's fuel. If it's sunny, it's fuel. It's all fuel."

Visitors to the Stony Brook Millstone Watershed Association will be able to see and learn about several water conservation techniques, including rain gardens, rain barrels, and the latest in water conserving bathroom fixtures. They will also be able to learn how the photovoltaic panels installed on the Buttinger Environmental Center convert sunlight into electricity.

The Mercer County Master Gardeners will explain different ways to compost kitchen and garden waste at their Educational Display Garden near Pennington. They will also point out examples of plants suitable for incorporating into rain gardens.

The recently completed addition to Hopewell Valley's Timberlane Middle School, which included a geothermal HVAC system, a 50KW roof-mounted photovoltaic system, Energy Star roofing, and occupancy sensors will be described to tour-goers by school district's facilities director, Norman Torkelson, and Hugh Connolly, whose architectural firm was responsible for its design and construction.

In addition, the owners of two Hopewell township homes have invited the public to visit and learn about the photovoltaic systems they installed a few years ago and how they are saving them money.

For people interested in touring sites in both Hopewell and Princeton, Terhune Orchards on Cold Soil Road in Lawrenceville invites tour-goers to stop and learn about its drip irrigation and

integrated pest-management systems.

Maps with detailed directions to the sites on each tour will be available at convenient locations, including area libraries and municipal buildings. In addition, detailed directions and maps of Hopewell's Greener Living tour will be available at www.hopewelltwp.org. Similarly, Princeton tour maps will be available at www.princetontwp.org.

Last year's Princeton tour won a 2008 New Jersey Environmental Achievement Award. Homes and public buildings on this year's Princeton's tour again demonstrate the major kinds of environmental sustainability recommended by the U.S. Green Building Council. The first step in sustainable building, according to the Council's LEED standards (Leadership in Energy and Environmental Design), is choosing a site that can be developed without environmentally damaging the site itself or land nearby. Sustainable buildings can use complementary energy-saving strategies: carbon-based energy reduction or renewable-energy production. Sustainability also means saving water inside and out--with dual-flush toilets, for example, or drought-tolerant landscaping. Indoor environments figure in sustainability too: building materials shouldn't emit harmful gases; indoor temperatures should be comfortable; and most rooms should have daylight, even views. Sustainability includes, finally, using recycled building materials and recycling construction waste.

Older buildings can be retrofitted to produce renewable energy--with solar panels or geothermal wells, for example. New homes can build in energy savings and avoid harmful chemicals more cheaply, however, by including sustainability in the planning process. Princeton's and Hopewell's tours will let people inspect sustainable features before they begin building or renovating. And tour-goers will meet local architects, builders, suppliers, and landscapers who can help them achieve their environmental goals.

PRINCERTON SITES:

The Princeton tour will include Lasley and Brahaney's new LEED-compliant office building. Architect Leslie Dowling's home includes a salt-water chlorinated pool, ample sunlight, and, to cut down on heat and air conditioning, a green roof planted with succulents. Another home on the tour has a geothermal well installed by Ground Source Contractors. The tour also features a newly built, earth-friendly home from Herrontown Builders. A sustainable renovation by architect Ronald Berlin shows how to add space without greatly increasing a home's footprint, and how to combine many smaller green features to improve the efficiency and healthfulness of an older home.

Sustainable gardens on the Princeton tour include a rain garden at the Princeton Senior Resource Center, installed by volunteer Curtis Helm using plants donated by Pinelands Nursery. This garden shows how to reduce storm-water run-off, thereby protecting ground water from pollution. An organic garden, maintained by Richard McCoy Horticultural Services with help from Tech Terra Organics, features drought-resistant and native plants, shows how to maintain a lawn without chemicals, and demonstrates how root-collar excavation improves a tree's health.

Pleasant additions to the Princeton tour this year: the Whole Earth Center will not only display

the green cleaning materials it sells and signpost a self-guided tour of its LEED-compliant, energy-saving renovation: it will also offer free cups of locally-roasted, organic, Fair Trade coffee to boost tour-goers' energy for the rest of the tour. To end the tour, Terra Momo Corporation's new green-built restaurant, Eno Terra, which features locally-grown food and composts its food waste, will host a ten-dollar wine-tasting with light refreshments between two and four o'clock on November 15.

Princeton tour maps will be available at convenient locations in the Princeton area, or at www.princetontwp.org.

Also beginning November 10, maps of Hopewell's Living Greener tour will be available at area libraries, at Hopewell Township's Municipal Building, and at www.hopewelltwp.org.

Princeton's and Hopewell Township's Environmental Commissions hope area residents will enjoy these free, educational November 15 tours. Children are very welcome to attend.

Hopewell Township and Princeton Environmental Commissions Promote Sustainability with Free Tours on November 15

Hopewell Township's Environmental Commission is inviting area residents to take a free, self-guided tour of seven sites that demonstrate various aspects of sustainable development. The event, dubbed "Living Greener Tour" will be held this Saturday, November 15, from 11:00 a.m. until 4:00 p.m. This event was planned to occur simultaneously with the second annual Green Home and Garden Tour sponsored by the Princeton Environmental Commission so that people can choose from a total 16 sites displaying examples of sustainable development.

Sustainable development is most frequently defined as development that addresses the needs of the present without compromising the ability of future generations to meet their needs. The two free, self-guided tours will feature area homes, gardens, commercial buildings, a school and a nature center that have incorporated a multitude of sustainable practices.

HOPEWELL SITES:
One of the featured homes is the unique, internationally renowned hydrogen-powered house that uses 56 photovoltaic panels on the roof to change sunlight to electricity, which, in turn, runs an electrolyzer that extracts hydrogen from water. The hydrogen is then stored in tanks for future use. The owner thus makes all the fuel he needs: Since building the system, he has paid nothing for electricity, oil, gas, or gasoline to fill up his hydrogen-powered car. The house's only waste product is water, which can be pumped right back into the system. "I can make fuel out of sunlight and water," owner Mike Stritski notes, "and I don't even use the water. If it's raining, it's fuel. If it's sunny, it's fuel. It's all fuel."

Visitors to the Stony Brook Millstone Watershed Association will be able to see and learn about several water conservation techniques, including rain gardens, rain barrels, and the latest in water conserving bathroom fixtures. They will also be able to learn how the photovoltaic panels installed on the Buttinger Environmental Center convert sunlight into electricity.

The Mercer County Master Gardeners will explain different ways to compost kitchen and garden waste at their Educational Display Garden near Pennington. They will also point out examples of plants suitable for incorporating into rain gardens.

The recently completed addition to Hopewell Valley's Timberlane Middle School, which included a geothermal HVAC system, a 50KW roof-mounted photovoltaic system, Energy Star roofing, and occupancy sensors will be described to tour-goers by school district's facilities director, Norman Torkelson, and Hugh Connolly, whose architectural firm was responsible for its design and construction.

In addition, the owners of two Hopewell township homes have invited the public to visit and learn about the photovoltaic systems they installed a few years ago and how they are saving them money.

For people interested in touring sites in both Hopewell and Princeton, Terhune Orchards on Cold Soil Road in Lawrenceville invites tour-goers to stop and learn about its drip irrigation and

integrated pest-management systems.

Maps with detailed directions to the sites on each tour will be available at convenient locations, including area libraries and municipal buildings. In addition, detailed directions and maps of Hopewell's Greener Living tour will be available at www.hopewelltwp.org. Similarly, Princeton tour maps will be available at www.princetontwp.org.

Last year's Princeton tour won a 2008 New Jersey Environmental Achievement Award. Homes and public buildings on this year's Princeton's tour again demonstrate the major kinds of environmental sustainability recommended by the U.S. Green Building Council. The first step in sustainable building, according to the Council's LEED standards (Leadership in Energy and Environmental Design), is choosing a site that can be developed without environmentally damaging the site itself or land nearby. Sustainable buildings can use complementary energy-saving strategies: carbon-based energy reduction or renewable-energy production. Sustainability also means saving water inside and out--with dual-flush toilets, for example, or drought-tolerant landscaping. Indoor environments figure in sustainability too: building materials shouldn't emit harmful gases; indoor temperatures should be comfortable; and most rooms should have daylight, even views. Sustainability includes, finally, using recycled building materials and recycling construction waste.

Older buildings can be retrofitted to produce renewable energy--with solar panels or geothermal wells, for example. New homes can build in energy savings and avoid harmful chemicals more cheaply, however, by including sustainability in the planning process. Princeton's and Hopewell's tours will let people inspect sustainable features before they begin building or renovating. And tour-goers will meet local architects, builders, suppliers, and landscapers who can help them achieve their environmental goals.

PRINCERTON SITES:

The Princeton tour will include Lasley and Brahaney's new LEED-compliant office building. Architect Leslie Dowling's home includes a salt-water chlorinated pool, ample sunlight, and, to cut down on heat and air conditioning, a green roof planted with succulents. Another home on the tour has a geothermal well installed by Ground Source Contractors. The tour also features a newly built, earth-friendly home from Herrontown Builders. A sustainable renovation by architect Ronald Berlin shows how to add space without greatly increasing a home's footprint, and how to combine many smaller green features to improve the efficiency and healthfulness of an older home.

Sustainable gardens on the Princeton tour include a rain garden at the Princeton Senior Resource Center, installed by volunteer Curtis Helm using plants donated by Pinelands Nursery. This garden shows how to reduce storm-water run-off, thereby protecting ground water from pollution. An organic garden, maintained by Richard McCoy Horticultural Services with help from Tech Terra Organics, features drought-resistant and native plants, shows how to maintain a lawn without chemicals, and demonstrates how root-collar excavation improves a tree's health.

Pleasant additions to the Princeton tour this year: the Whole Earth Center will not only display

the green cleaning materials it sells and signpost a self-guided tour of its LEED-compliant, energy-saving renovation: it will also offer free cups of locally-roasted, organic, Fair Trade coffee to boost tour-goers' energy for the rest of the tour. To end the tour, Terra Momo Corporation's new green-built restaurant, Eno Terra, which features locally-grown food and composts its food waste, will host a ten-dollar wine-tasting with light refreshments between two and four o'clock on November 15.

Princeton tour maps will be available at convenient locations in the Princeton area, or at www.princetontwp.org.

Also beginning November 10, maps of Hopewell's Living Greener tour will be available at area libraries, at Hopewell Township's Municipal Building, and at www.hopewelltwp.org.

Princeton's and Hopewell Township's Environmental Commissions hope area residents will enjoy these free, educational November 15 tours. Children are very welcome to attend.

Environmental Commission Meeting Minutes 11/20/07

Convened at 7:45 p.m.
Present: Mike Aucott, Ray Nichols, George Pierson, Jim McManimon, Nora Sirbaugh

Minutes from October 2007 meeting were approved.

Plan reviews and related items:
1. BMS presented wastewater treatment plant improvements. 6 BMS staff people present, including Chris Tarr, attorney and Demetri Levitsky, presenter. Mr. Levitsky reviewed and summarized the plan. The existing building, covering approximately 1000 sq. ft., and processing tanks, sand beds, etc., will be demolished and replaced with a one story building. In the first phase it will be 8740 sq. ft. The second phase will add an addition 6140 sq. ft. The processing tanks, sand beds, etc. will be moved inside this building. An additional driveway will be created to eliminate a truck turn around. Landscaping will be created for screening from the road.

Discharge will be to the same place. Volume approved for 1724 gallons/month, and is well below this.

Jersey barriers will be put in place during construction to control soil erosion.

EC approved changes as presented.

2. Cynthia Joyce, block 47, lot 23, proposed construction of addition to bldg. at 65 Rt. 31 North, variance requested. Wish to move an existing structure, building C, within 15 ft. of property line. Carstar addition/Bridge Auto Body. This also involves a 6816 sq. ft. addition on to a 5261 sq. ft. existing building. Wetlands around property and a tributary of the Stony Brook near.

EC recommends the construction of a water quality swale within the 15 ft. area in question. There are run off concerns from the parking areas and the nature of the business. Roof run off should not be mixed with parking lot run off. Recommends an Oil Water Separator and a maintenance plan for it along each side lot line.

EC does not see the rationale for moving building C so close to the lot line.

3. Pollack and Weisburg, site plan variance C, facility on Pennington Rd. near Orchard Ave.

EC recommends that the design of the driveway be for right turn only, both in and out, with a central island to direct the traffic accordingly.

New Septic systems too close to route 31 and may interfere with a potential future widening of the road.

Insufficient justification for granting variance to build into set back.

Letters of Interpretation and similar information:

Midstate Equipment Co., Inc.. 6.66 acres and Wetlands Report. No action.

Reports of Subcommittees, discussion and updates re: ongoing projects:

1. Photo contest. Judges: Rex Parker, Ray Nichols, High School art teacher, Jim McManimon, 4th judge. As of meeting, 7 entries in junior division, 32 entries in adult. Decision must be done by 1st week of December.

2. Kill a Watt units. Huge demand for them. 4 more ordered and will be placed in library upon arrival.

3. ANJEC project update: The meeting scheduled for 12/13 will be postponed to the week of 14-17 January, 2008. Exact date tbd. Jennifer Senick at Rutgers must be notified of this change. EC should meet in a special meeting prior to that meeting in order to prepare (the week of 1/7/08).

4. Woodlands preservation ordinance. It was disclosed that the Woodlands Ordinance of Jackson Township was declared invalid, void and unenforceable in court. See article from Asbury Park Press attached to end of minutes. The Woodlands Ordinance subcommittee will check with ANJEC for existing tree ordinances to compare language in order to avoid a similar problem.

5. Steep slope ordinance awaiting a public meeting and final approval. Meeting scheduled for 11/27. After approval, there is a 20 day period before enforcement.

6. Water monitoring data loggers are about to be sent to us. This project is moving forward.

7. Mike Aucott reported that he attended the meeting of the Wild & Scenic Lower Delaware Management Committee. Present were reps of the Delaware Riverkeeper, DRBC and others. DRBC is holding a hearing 12/4 on whether to amend its rules to permanently assign the lower Delaware (which runs from just below the water gap to Trenton) the Special Protection Waters classification. It is currently temporary. Opposition to this could come from some, including POTWs and industries. Support from municipalities like Hopewell could help make SPW permanent and provide long-term protection to the River. Written comments are due 12/6. He strongly urged Hopewell Township to draft a letter in support of the designation, and volunteered to draft the document.. More info is available at the DRBC website, http://www.state.nj.us/drbc/notice_LDelSPW_092807.htm and at the Delaware Riverkeeper site, http://delawareriverkeeper.org/takeaction/urgent-actionlearnmore.asp?ID=42&cat=Regulation%20and%20Law&subcat=Special%20Protection%20Waters

8. Jim McManimon is planning to attend the NJ Transit public meeting concerning the W. Trenton-Bridgewater/Raritan Valley line to be held 12/06/07 at the former JCC building in Ewing, 999 Lower Ferry Road.

9. Some concern expressed to EC about new signs at the former Circle Liquor business. Questions concerning a blinking light. Is there a sign lighting ordinance allowing this? It will be looked into.

10. Questions concerning the Lawrence-Hopewell Train in C1 Wetlands. Ray Nichols will research concerns about this trail as well as porous pavement issues.

11. Discussion about the coordination of the upcoming ARC meeting with the next EC meeting. It was felt that it is important and expeditious to have that ARC meeting BEFORE the next EC meeting. Jim McManimon will look into this.

12. BMS has applied to DEP for a GP18 minor flood hazard permit. Implementation of maintenance activities to rehabilitate and stabilize portions of an existing earthen dam and the Large Pond Island shoreline. Proposed activities include installation of coconut fiber coir logs, biodegradable erosion control matting, and native herbaceous vegetation to reduce effects of wave action and ice scour, and provide ecological benefit, such as biodiversity and enhanced wildlife habitat in the project area.

13. Berwin/Technical Center of Princeton has applied to the state for water treatment. Refer back to 1/07 minute of the Environmental Commission for recommendations on this issue. In July no changes were made and they were referred back to the 1/07 recommendations. We are asking the Planning Board to formally address concerns expressed by the EC on this issue. Ray Nichols will draft language for this portion of the minutes. RE: NJPDES Permit #0000809.

14. Township is advised that DOT will have a temporary disturbance of the rail ditches at VanDyck and Greenwood Ave. bridges. Concerns the replacement of these bridges over the CSX W. Trenton Line RR.

15. Ray Nichols reported on the Green Home and Garden Tour in Princeton sponsored by their EC, sharing handouts and signage acquired at the event. It was recommended a similar event be held in Hopewell Township in the spring, linked to Earth Day celebrations in late April. All present agreed.

16. Identifying the overwhelmingly positive response to the article on the Kill-A-Watt program in the township, Nora Sirbaugh urged the EC to adopt a regular column in the Hopewell Valley News on Environmental Issues in the township. All present agreed. Nora will contact HVN staff and coordinate the writing the articles. Suggested topics included, but are not limited to, Environmental Commission, January ANJEC project meeting, new Steep Slope Ordinance, Spring Tour, Local Agriculture. Nora will draft the first article on the EC and distribute to committee for review.

Meeting adjourned at 10:15.

Respectfully submitted,
Nora Sirbaugh

Hopewell Township Environmental Commission
Minutes of EC Meeting 10-16-07

Prepared by Rex Parker, EC Secretary

EC Members attending: Mike Aucott, Ray Nichols, Nora Sirbaugh, George Kerr, Rex Parker

also attending: Paul Pogorzelsky, Jim McManimon, Miyuki Kaneko, Helaine Liwacz (Watershed Ambassador)

Sept 19 meeting minutes were approved without changes.

Site Plan Reviews

Merrill-Lynch Parking Lot.
M-L proposes to build a new parking lot with 327 car spaces, to support increased parking said to be needed as employees are moved from the Plainsboro site which is being closed. An increase in employees from about 6200 to 7000 is anticipated. The location is well positioned near the rail line where the future train station platform would potentially be located. Engineering drawings (by Wells Appel Land Strategies) call for porous paving stones using material similar to that used at the Township Municipal lot (stones to be sourced from Trap Rock). The crushed gravel layers of the design also trap oils and auto pollutants, keeping them from entering the watershed. It was noted that the underlying soil tends to be heavy clay with high water table. The lot would be fenced off from the proposed CHS parking lot. The proximity to Southfields Drive was not clear. Other questions include whether M-L will consider rain garden approach to the vegetative plan, noting that their plan calls for several wetlands facultative species.

The M-L parking lot drawings did not contain key details of the lighting plan, including lack of the photometric grid, required to ensure compliance with the Lighting Ordinance. Since the lot may receive infrequent nighttime use, a timer circuit would help decrease light pollution. This led to a brief discussion about lighting ordinance compliance, specifically for M-L and generally for the Township. **Action item:** The chairman asked Rex to lead a subcommittee to readdress the **Lighting Ordinance** for potential improvements, and to identify non-compliance concerns at M-L and elsewhere in the Township.

BMS water recycling system upgrades, revisited.
Following last month's EC discussion and Paul's memo (Oct 11), we are asked to reconsider aspects of the water plan for BMS and Pennington. One idea is to bring in a water pipeline from the north (NJ American Water *aka* Elizabethtown Water) via P'ton –Rocky Hill Rd, which could help Pennington as well as BMS meet future needs including emergency source. While BMS can meet projected needs using its wells, the idea proposed was that if they draw less well water volume (by having access to a pipeline) then other nearby users such as the organic farm could benefit by having greater allocation from the same aquifer. However, if BMS completes the proposed installation of new pumps and tanks system, they likely would not be amenable to paying and participating in a future water line plan that would help neighbors. Further, BMS does want to be required to amend their GDP and go through the approval process again.

Action item: From the EC viewpoint, an open discussion of these water options is good for the community, but we are also wary of the idea of a pipeline. The EC cautiously encourages exploratory discussions by BMS, the Watershed, Pennington, and the Township. As more groundwater data become available these will inform the discussions, consistent with the ECs water monitoring program.

Letters of Interpretation (LOI), wetlands etc.

Else Tract LOI. No comment.

Trinkle property. No comment.

Mercer County Park NW, LOI. The Lawrence-Hopewell Trail needed a LOI to determine where wetlands are so that the trail can be located and mapped accordingly. The trail mapping and construction will go out for bids soon. It is noted that 60% of the trail is within the new C1 designation area, and that the Wetlands Act permits trails in C1. It is expected that DEP will permit the entire trail for a 5 year period.

Golfinopolis LOI. In Ewing Twp adjacent to border on Scotch/I-95, near Marriott. No comment.

Barry Sussman property LOI. Property located near 31 and Denow running west to Reed Rd.. We examined wetlands on map, showing the approx. 18 acre property in which there is significant wetlands delineation, which will constrain about 50% of this tract from future development. Paul noted that the preferred plan is to have Denow Rd. cross through this property in re-routing to provide Diverty relief. **Action item:** EC needs to examine this more carefully next month, request details.

T-Mobil, footprint of disturbance letter. Paul proposed that all cell towers in the Township should be requested to **install a rain gauge** which could be telemetrized for township recording to assist the water monitoring program sponsored by the EC. **Action item:** further discuss how to carry out the rain gauge proposal for all cell towers.

Project Updates

Kill-a-Watt monitor program. Four meters have been purchased by the township with the EC budget, and Rex reported that the next steps are now in place and the meters are in the library. Andrea Merrick, supervisor of the Hopewell Branch of Mercer County Library, embraced the plan (as did the MCL Director) for the library to hold and loan the meters to MCL cardholders. The meters are bar-coded in the collection and searchable on-line under "Kill-a-Watt" and related terms (see the MCL website, http://webserver.mcl.org/). An instruction sheet was written and is included in the package. The library is interested to develop an environmental/energy sustainability educational display, including the meters, and would welcome input from the EC in developing the display. Rex wrote a draft press release for HVN outlining the Kill-a-Watt

program and announcing the "Living Greener" project. **Action item:** Rex to submit press release to HVN describing the Kill-a-Watt lending program and Living Greener project.

Living Greener project. Aiming for a public outreach meeting in first week of Dec. We brainstormed on ways to increase public awareness, including: talking to the high school environmental science class and other science AP course students and teachers, a possible film by high school students on energy conservation, enhancing the display for the library, an account of experience in "going solar" by EC members who have installed solar power systems in their homes, reaching out to the Jr. Master Gardener Program,. **Action item:** Ray and Paul with consultants to develop plans for early Dec public outreach meeting.

Water Monitoring Project. Mike reported further progress in developing the V-shaped weirs for stream flow measuring. Five sites have been identified for installation. Glen Carleton (USGS) is spearheading the streams project with Mike and will assist in data triage through USGS analysis.

Invasive Species Research. Jim met with Mike Van Clef of FOHVOS on the invasive species research project to correlate deer populations with invasive species, a proposal Mike is developing. Mike A. suggested that DEP could also support this project. It was also noted that hunting is being allowed on all FOHVOPS tracts this year. No current action by EC needed at this time.

Steep Slopes Ordinance. EC unanimously endorsed the current final draft (hard-copy was provided) and agree that this is ready to forward to Twp Committee and PB for formal treatment. **Action item:** Paul to advance the final draft to the Committee.

Streamside Living course offered. Noted by Nora (see email communicated to EC members) this upcoming weekend course covers key watershed and stream perturbation issues of interest to EC.

2008 Meeting Dates for EC. All dates will be 3rd Tues of month at 7:30 PM, except May-Aug will be 8:00 PM.

Hopewell Township Environmental Commission
Minutes of EC Meeting 05-15-07

Prepared by Rex Parker, EC Secretary

EC Members attending: Mike Aucott, Ray Nichols, George Pierson, John Hart, Rex Parker; also attending: Paul Pogorzelski, Jim McManimon, Miyuki Kaneko, Jeff Little, Francis Goeke, John Lovero, Stu Dember

April meeting minutes were approved with the typo correction "Tax" Map (page 2, para 2).

Improving EC Effectiveness. We discussed ways to improve identification and preparation for review of proposals, plans, applications, and other topics needing EC review each month. It was proposed that Jim M. will be responsible for collecting inputs from various departments and areas in the township, and providing a notice to EC members prior to the monthly meeting. Paul suggested we develop an FTP protocol and set up a web-based system to improve communication and access to needed information among EC members, with added benefit of reducing paper waste.

Application Reviews, etc.

(1) Stream Corridor Ordinance Violation. Jeff Little (Bl 28/Lot 1.04, 82 Lambertville Rd) requested EC attention to a Stream Corridor Ordinance violation on his 3.5 acre property. The property has an updated septic permit. He is asking for a variance in order to build a house on the east side of the lot (and east of the stream); the house would overlap substantially the stream corridor buffer. After discussion, we recommended that the stream corridor encroachment be mitigated by allowing the area on the west side of the stream to go natural without further grounds maintenance. This could be enabled by writing a conservation easement as a standard form of deed. Also suggested: install "level spreaders" to enhance the drainage perimeter, especially around the SW corner of house.

(2) Denow Road Extension/ Lovero Property/ Reed Road Industrial Park. Last month the EC discussed site plans dated April 3, 2007, involving 5 lots (totaling 46 acres) and the Denow Rd extension. This is part of the regional/county planning effort, where the history of this project includes Mercer County designating a transportation development district (TDD) at this location in the late 1980's. The project was proposed to support increases anticipated in the volume of peak hour traffic. Nearby Diverty Rd is considered untenable to support this volume of traffic, and a cul-de-sac for Diverty has been planned. The Denow Rd extension is therefore considered the most reasonable and cost effective way to aid transportation in the southern area of the Township, and is an essential part of the Beazer and Weidel plans for development. All projects approved in the TDD have a fee binder. The Township's considerations in favor of the Denow extension include potential solutions to anticipated increases in COAH obligations as well as southern district open space desires. The current plans also aim to preserve the southern half of the Weidel tract, which is located in the flight path of the airport and overlaps with wetlands according to current LOI.

COAH requirements for the Township are estimated now at 761 units based on office space already approved (including Jannsen and Berwind). The Township should do everything possible to avoid the "developers' solution" which allows building affordable housing at 1:8 ratio to regular houses, and the EC supports the suggestion that the Township could and should acquire land in appropriate locations and build housing that meets COAH obligations. To this end the Township would acquire a strip of land on the Lovero property, by process of condemnation, creating a right-of-way allowing the Denow extension to be built. Discussion followed on the best siting of the roadway so as to minimize disturbances to wetlands. It has been recommended that the township obtain access to the right-of-way and act as co-applicant. It is further noted that the current conservation easement was written in consideration of the planned configuration of Denow Rd.

(3) Other items reviewed in brief
Lutz- new driveway – okay
Herring Land Group, Embassy Suites (Scotch Rd near Marriott) – okay
BMS new condensate line – okay
Princeton Research Lands, LOI – okay

R & D

(1) Stream Corridor maintenance grant 2005. FoHVOS recently acquired Ted Stiles's records, including conservation easements, easement maps, drainage records, etc. Excellent progress has been made in confirming, updating, and organizing these documents, led by Mike Van Clef of FoHVOS. The Township is engaged in stewardship planning to make sure that the easements are not being encroached, and has agreed to help fund (partner with) FoHVOS efforts.

(2) ANJEC Grant for LEED certification ordinances. Good news! The ANJEC Grant was approved and the EC has been awarded a $6500 grant to be matched half by the Township and half by in-kind services. We acknowledged the **excellent contribution and leadership by EC member Ray Nichols,** who led the conception, initiation, and application for this grant. The EC and Township professionals will be working to identify a LEED (Leadership in Energy and Environmental Design) -certified specialist to work with us, our professionals (including Paul and Mike), and the Municipal Land Use Center to establish LEED ordinances and guidelines for the Township. Next steps include finalizing the contract with ANJEC and discussing ways forward with professionals. Contact persons include Randy Solomons (energy issues) and Jennifer Senich (LEEDs).

(3) Climate Change Work Group. Joan Held of Pennington has initiated this work group to find ways to act locally to respond to climate change and related sustainability issues. The group will have an information booth at Pennington Day. Future meetings will be announced and EC members are welcome to participate. To date, Mike and Ray have attended meetings of this group. It was also suggested we contact the person who presented to the EC on energy/materials sustainability 2 years ago, and refer her to this work group (seeking name of this person).

Ordinance Drafts

(1) Tree and Woodlands Ordinance. Paul provided an ordinance from Princeton Township which may be a good model for us. Hard-copies of this document were circulated for review and further discussion at the next EC meeting. George P provided a document showing data on acreage of farmland in the township and county. Mike asked for a subcommittee to focus on the woodlands ordinance; George P. and Mike volunteered and Nora volunteered *in absentia*. Rex will send Nora a copy of the model document provided by Paul.

(2) Steep Slopes Ordinance. A model ordinance from Clinton, NJ was circulated along with some suggested edits. Paul and Jim agreed to merge the relevant language from the two models and to provide this in advance of the next EC meeting.

(3) Well Monitoring Project. Well drilling at the Scotch Rd location at back Timberlane has been completed. The next step is to install the datalogger device at this site.

Hopewell Township Environmental Commission
Minutes of EC Meeting 03-20-07

Prepared by Rex Parker, EC Secretary

Members attending: Mike Aucott, Ray Nichols, George Pierson, John Hart, Rex Parker;
Also attending: Paul Pogorzelski, Jim McManimon; Jim Amon, Gary Hanson

February meeting minutes were amended as follows. The EC Goals for 2007 item, "Chem-lawn campaign" (education/outreach on over-fertilization and pesticides/ herbicides) should be referred to as: "Lawn maintenance campaign".

Jim Mcmanimon introduced himself and his new role in the township. He outlined his areas of responsibility relevant to the EC's activities. Those include: farmland preservation, open space, affordable housing, historic preservation, conservation and agricultural easement tracking, and the objective to generate a master inventory and maps of preserved land at all levels (FoHVOS, Green Acres, County, Township) in Hopewell Township.

Solar photovoltaic proposal. Paul discussed the status of the solar proposal initiated by the EC (and presented last month by Rex and Paul to the Township Committee). The state rebate application is going forward, and a revised resolution is being prepared for action by the Committee which would authorize going to contract within 180 days for the purchase and installation of a 50 kW system to be placed on the Municipal Building. There is broad support on the Committee and the EC for this proposal.

Resolving a Stream Corridor Ordinance violation from last month. It is noted that Jim McManimon recused himself during this discussion. Township resident **Gary Hansen**, 332 Pennington-Harbourton Rd., proposed a solution to the stream corridor violation which would be triggered by his proposed garage improvement/ expansion. Mr. Hansen provided a plan with drawings for horticultural improvements consistent with the EC's recommendations last month. The plan would provide for planting a variety of native plants and shrubs in the area in question, which would help reduce runoff, improve recharge, and mitigate other adverse effects of increasing the impervious footprint. The EC opinion is that this plan is adequate from the environmental perspective of protecting the stream corridor.

Cedar Ridge. Jim Amon spoke on behalf of D & R Greenway about a property the Greenway owns comprising 79 acres off of Van Dyke Rd known as "Cedar Ridge". The Greenway plans to expand a hiking trail and access to viewing/hunting wildlife on this parcel, and has a grant ($6500) for this purpose. They propose to establish a 4-car parking lot for hikers and hunters, and need to install a short driveway and parking lot using crushed stone/ with timbers for containment plus a short rail fence. This will be visible to the road for safety and is situated on an old field. The EC reviewed this plan and recommends "yes" – this is a "go" from the environmental perspective.

Applications/ Site Plans

Facompre Development application. The Facompre proposal ("Edge Brook") was discussed. The application is being directed next to ARC. This proposal seeks to split the ~29 acre property into three lots of 7.4, 9.8, and 12.3 acres for residential development. A common driveway would be shared connecting to Michael Way. The EC suggests that the wetlands components of these lots (which are approximately 1/3 of the acreage) should be deed-restricted in order to prevent future development activity in the wetland sections of these lots (eg. outbuildings, etc).

Reed Road Industrial Park. We discussed in detail this proposal which includes the Denow Rd extension connecting with Reed Rd. and going eastward. It is noted that the development crosses substantial wetlands, but there is no evidence of any mitigation planning. This is part of the Mercer County transportation development project, and Paul noted that it is a high priority for the County. The EC's recommendations are: (1) Keep intact as much of the existing natural area and native vegetation and soil conditions as possible in the wetlands area as shown on the drawings. It is important to protect the wetlands and avoid compression of the soil from heavy machines when developing this parcel. The EC further requests that no lights be installed along Denow Rd in this parcel, but if there are lights planned they must meet the Township lighting ordinance. The stormwater detention basin should be state-of-the-art design (the drawing indicated an old-style, outdated basin) which maximizes area with minimum depth and planted with shrubs and trees to enhance water recharge. The EC further questions why is the proposed roadway not laid out to minimize damage to the wetlands—it appears that the road follows an unnecessary path crossing wetlands more than needed. There should be no curbs on the road in order to allow water to flow into the wetlands. Multiple culverts should be built under the road to further help water flow. A bicycle path should be incorporated into the design of the road or in addition to the road to meet anticipated future needs for alternative transportation in this area.

Site Plan – Hogan Security Group on Reed Road west side. This plan calls for building a 60,000 sq. ft. personal storage facility ("mini-storage"). It would require tearing down an existing single family home on the 3.4 acre property. The proposal conforms to SI zoning (special industrial), except for **two variances** being sought. Those are: (1) the lot width required is 300 ft., but the lot is only 221 ft wide; (2) the floor/area ratio proposed is 0.40 (60,000 / 149163 sq ft) but the zoning requires a ratio of 0.20 or less. We question whether it is in the township interest to allow these variances. The EC is also concerned about possible adverse outdoor lighting issues-- any outdoor lighting must conform to our lighting ordinance. (Other examples of mini-storage warehouses have poorly aimed floodlights that would violate our ordinance.)

Well water monitoring update. Mike reported that the plan is going to phase 2 with intent to install the data loggers. The proposed grant would include USGS oversight which is believed to be feasible and to help the efficiency of data tracking (through Glenn Carleton's participation). Action item: Mike will provide a map of locations for the monitoring wells to update the EC at next meeting.

Discussion of EC objectives and other plans

EC 2007 Budget request. The EC requests a 2007 budget of $10,000 from the Township Committee.

Energy sustainability project. While the solar power plan is moving forward, we would benefit from thinking about how to improve energy sustainability outreach to residents. One question is how to obtain, as a baseline, the aggregate electricity and fuel oil consumption data for the whole township. The NJ Sustainable State Institute (Rutgers) could be a source for information and possible collaboration. Mike mentioned Randy Solomon, a graduate student working on this project at Rutgers.

ANJEC matching grant application for Sustainability project. Ray proposed that the EC apply for an **ANJEC matching grant** to analyze and develop ordinances and guidelines to improve energy efficiency and incorporate sustainability and "green building" concepts into the building/development codes for the Township. This would include hiring a consultant to develop the appropriate draft ordinances. This needs to be done by end of March deadline. The EC unanimously agreed to move forward with this proposal. **Action items: Ray** to draft the grant application to ANJEC; **Rex** to send a draft letter for **Mike** to sign as acting chair of EC, indicating EC's support of the plan requesting the Committee's endorsement.

Township Photo Contest. As discussed last month, the EC is asked to co-sponsor the annual photography contest focusing on the theme of township Water Resources. **Action item: Rex** agreed to represent the EC as a judge for the photo contest.

Pond cleanup plan was tabled but should be discussed next meeting.

Woodlands Ordinance drafts. Action items: **Jim M.** agreed to obtain and distribute to EC members a copy of the Princeton Township woodlands ordinance. **Mike** will circulate the 11-19-02 version of our previous draft.

HOPEWELL TOWNSHIP
PLANNING BOARD MINUTES
SEPTEMBER 18, 2008

A meeting of the Hopewell Township Planning Board was held in the Hopewell Township Municipal Building Auditorium at 7:30 p.m. on September 18, 2008.

Chairperson Karen Murphy called the meeting to order at 7:35 p.m. She stated that notice of the meeting was posted in the Municipal Building and had been forwarded to the Hopewell Valley News and Trenton Times in compliance with the Open Public Meetings Act.

Members present: Beyer, Connolly, Hart (arrived at 7:45 p.m.), Moore, Sandahl, Sandom, Swanson, Chairperson Murphy

Also present: Attorney Waterbury, Engineer Pogorzelski, Planner Bolan

Absent: Gunther, Krommes

Continued Review of Design Standard Revisions

Mr. Pogorzelski reviewed the latest Design Standard Revisions that included comments submitted by Chair Karen Murphy. A lengthy discussion ensued with respect to a proposed new section, "SUSTAINABILITY," and the suitability of the language in this ordinance. It was the consensus of the Board to move this section to the Environmental Impact Statement chapter of the ordinance. Mr. Pogorzelski indicated that he and Ms. Waterbury would rewrite the section on sustainability to conform to the Board's comments. A brief discussion was held concerning irrigation systems and where they are permissible in the township. It was the consensus of the Board that irrigation systems should be prohibited throughout the township even where public water is available.

Ms. Murphy solicited public comment.

Ray Nichols, a member of the township's Environmental Commission, commented on groundwater versus surface water issues. He suggested that language from a report on water resources in Hopewell Township prepared by M2 Associates be included in the land use ordinance. Mr. Pogorzelski agreed that there could be a reference in the design standards to Section 16-6 or Section 17-149 where the report is cited in the ordinance.

Mr. Connolly referred to a proposed new section of the design standard ordinance concerning water-conserving fixtures and indicated that such should only be addressed through the plumbing code, and Mr. Pogorzelski concurred. Mr. Pogorzelski suggested that a recommendation to include geothermal systems in the ordinance by incorporating in the Environmental Impact section.

Ms. Murphy raised the issue of future applications involving windmills erected to generate electricity. Mr. Bolan indicated that windmills are currently addressed through height limitations; however, he is working on such regulations for another town and will share the results when completed.

Mr. Nichols commented on the appropriateness of windmills in certain areas of the township.

Mr. Connolly referred to a section concerning off-street parking and suggested the use of new area-specific criteria developed by Rutgers for determining the amount of parking needed in a specific case. He noted that the older methodology often resulted in construction of excessive parking areas, creating unnecessary impervious surfaces.

Hopewell Township Environmental Resource Inventory (ERI)
Kick-off Meeting
September 10, 2008 – Meeting Notes

Present: Paul Pogorzelski (HT Adm/Engr), Jess Niederer (HTEC), Bruce Gunther (HTPB), Bob Miller (HTZB +), Rex Parker (HTEC), Vanessa Sandom (HTC), James Bennett (DVRPC), Chris Linn (DVRPC), Jim Gambino (HTEC).

Missing: Kerry Miller (ANJEC)

Handouts: Agenda, Questions, Draft ERI Outline, Draft news article

The meeting began at 1:15 PM with brief introductions from each person attending.

For the next 1 ½ hours, everyone participated in a lively discussion as a variety of individual questions were asked and answered concerning our new ERI report project.

- This project is being funded in part by a grant from the Association of New Jersey Environmental Commissions. In accordance with the grant award, there are specific tasks, grant requirements and a timetable for the project that must be adhered to. Quarterly reports are required to be submitted and ANJEC is to be notified of all progress meetings.

- Rex Parker distributed some printed copies of the 1990 report entitled "*The Woodlands of Hopewell Valley*"; a valuable resource that is to be included or incorporated into the new ERI report. Chris Linn received a copy.

- Bob Miller introduced a printed copy of the 1975 Hopewell Twp. ERI report and related maps. Bob agreed to have copies of this report and the maps reproduced for Chris and James to use on this project.

- Chris distributed an outline for a recent ERI that DVRPC conducted in Princeton. He also presented a color copy of the completed Lawrence Twp. ERI report to demonstrate some map details.

- Chris discussed the ERI schedule, including milestones and public meetings. (Note: this group also plans to reach out to the public through a local news article). ERI deliverables and formats were discussed; including posting the completed report on the Twp. web site.

- Vanessa Sandom agreed to choose an ERI topic for the annual Twp. photo contest which will start again this November.

- All agreed that a separate meeting will be scheduled jointly with the Twp's *groundwater report* expert, and HT and DVRPC members in the near future.

- An informational contact stream was established – HT members will submit any information to Paul Pogorzelski who will forward items to Chris; and vice-versa.

The meeting concluded at 2:45 PM.

Respectively submitted
Jim Gambino

HOPEWELL TOWNSHIP
PLANNING BOARD MINUTES
July 10, 2008

A regular meeting of the Hopewell Township Planning Board was held in the Hopewell Township Municipal Building Auditorium at 7:30 p.m. on Thursday, July 10, 2008.

Ms. Murphy, Chairperson, called the meeting to order at 7:36 p.m. She stated that notice of the meeting was posted in the Municipal Building and had been forwarded to the Hopewell Valley News and Trenton Times in compliance with the Open Public Meetings Act.

Members present: Karen Murphy, Chairperson, Robert Beyer, Christine Lewandoski, David Sandahl, Russell Swanson, Bruce Gunther and Janet Krommes. Also present: Trishka Waterbury, Esq., Michael Bolan, Planner, Paul Pogorzelski, Township Administrator/Engineer and Linda Smith, Recording Secretary. Absent: William M. Connolly, III, John R. Hart, Jr., Billie Moore and Vanessa Sandom.

Announcements

Mr. Sandahl stated that Governor Corzine is expected to sign Assembly Bill A-500 on July 17, 2008 at 2:00 p.m.

Update - Council on Affordable Housing (COAH) Revised Third Round Rules, Proposed Amendments to the Regulations and Legislation A-500 and S-1783

Mr. Bolan distributed a revised memorandum he had prepared dated July 10, 2008 regarding a Comparison of COAH Third Round Rules - 2004 and 2008 (a copy is hereby attached and made a part of these minutes.) He proceeded to review the memorandum with the Board. He explained that he added a column that addressed what would take place at total build-out, rather than projecting to the year 2014 or 2018, which were different sets of COAH rules. He commented that the memo was very confusing, but it was a good first step for the preparation of the Housing Plan that must be done by December 31, 2008. He hoped the memo would provide everyone with a consistent understanding of the COAH rules.

Mr. Bolan explained that the first column entitled, **December 2004 adopted rules,** contains the rules that were used to prepare the Township's Housing Plan, which was adopted on November 30, 2005. The Plan was endorsed by the Township Committee and sent to COAH in December 2005. The second column entitled, **June 2008 adopted rules,** contains the COAH rules that became effective as of June 2, 2008; the third column, entitled, **October 2008 proposed rules,** contains proposed rule changes; the final column entitled, **At Total Build-Out**, contains the projected total housing units (2004-2018) and the projected affordable units

Mr. Sandahl moved and Ms. Lewandoski seconded a motion authorizing the amendments to Condition 3 in Resolution 07-042 and Condition 10 in Resolution 07-043 as presented by Mr. Brown and reviewed by Mr. Schmierer and the Board. It was voted on and passed.

Roll call vote:

Ayes:	Beyer, Lewandoski, Sandahl, Swanson, Gunther, Krommes, Murphy
Nays:	None
Abstain:	None
Absent:	Connolly, Hart, Moore, Sandom
Not Voting:	None

Mr. Sandahl moved and Mr. Swanson seconded a motion recommending that the Township Committee accept an initial payment from CHS towards their non-residential affordable housing obligation in the amount of $639,633.75. It was voted on and passed by voice vote.

Discussion - Suggested Design Standard Revisions

Mr. Pogorzelski stated the Environmental Commission (EC) enlisted Rutgers University to prepare the Suggested Design Standard Revisions. The revisions were reviewed by Mr. Bolan, Ms. Waterbury and himself and were put into a format that would better fit the Township code. The Board proceeded to review the revisions dated January 14, 2008 (a copy of which is on file in the Planning Office.)

Mr. Pogorzelski stated that there have been two hearings on the revisions. He explained more attention should be given to **Section 17-95, Off-Street Parking and Loading**; specifically, taking a look at the numbers contained in that section to ensure they are the correct numbers given all of the testimony during the Berwind Property Group hearings. He explained that the Association of New Jersey Environmental Commissions (ANJEC) provided a grant to the Township to prepare the revisions; it was the first time that had ever been done in the State. In reviewing the revisions, there was a question as to whether the Township could require LEED (Leadership in Energy and Environmental Design) compliance. The discussions culminated with the idea that if the Township writes a script that begins to require site design where the end result would be LEED compliant, then the design standards do not have to spell out compliance with LEEDS, it has been done indirectly.

Mr. Bolan stated the revisions are a great start, but there may be other issues that could be added. He stated that fundamentally, the revisions were to satisfy the grant funding, which it does. He indicated that he had some comments regarding trails that he would like to see included. He commented that if the Board was going to be endorsing the revisions

and recommending them to the Township Committee for an Ordinance amendment, it would make sense to look at the big picture.

Mr. Pogorzelski stated the Township's landscaping design standards are inadequate. He has already started to do research with respect to landscaping design standards in other areas of the country. He stated many areas are way ahead of what the Township has done. He felt some of that information could be incorporated.

Mr. Bolan commented that the next grant application should be for a brochure that would be distributed to all homeowners. The brochure would simply articulate the prevailing ethic of the community, which he felt was a tremendous tool for any municipality.

There was a question as to whether certain information contained in the **Sustainability** section could be regulated and how the Township would enforce those regulations. Mr. Pogorzelski explained that the issues addressed in that section are not regulated. There is flexibility and it would be discretionary as to what would be done; it would not be mandated. He stated that Rutgers has spent much time talking with the Division of Community Affairs (DCA) regarding the section, which is a guide.

Mr. Pogorzelski asked the Board to send their comments to him by the end of August; the target date to revisit the revisions would be September. He would work with Mr. Bolan and Ms. Waterbury to incorporate the comments into the next draft. He would also be working with Jen Sennick of Rutgers University.

Correspondence

Mr. Pogorzelski stated that the Niederer subdivision that was previously approved by the Board would need to return to the Board. The State Agricultural Development Committee (SADC) has indicated that they are unhappy with the way the resolutions had been written and the way the subdivision was presented because it was presented with testimony to create the lots in the name of preservation. It was their feeling that because the word preservation was referenced in the resolutions, it diminishes the appraised value of the remainder of the property. Mr. Pogorzelski stated that the subdivision would be brought back to the Board, new testimony would be heard and new resolutions would be adopted. He will work with Mr. Bolan and Ms. Waterbury to produce new wording, which will be sent to the SADC for their approval. He explained that the Niederer family may need to return to the Board as the applicant, rather than the Township.

There being no further business, the meeting was adjourned at 9:50 p.m.

Respectfully submitted,

Linda Smith

Linda Smith, Recording Secretary

MICHAEL P. BOLAN, AICP/PP
P. O. Box 295
Pennington, NJ 08534-1814
609 466-4259 Fax 609 466-1588
michaelbolan@comcast.net

Memorandum (Revised)

To: Hopewell Township Planning Board

From: Michael P. Bolan, PP/AICP

Date: July 10, 2008

Re: Comparison of COAH Third Round Rules – 2004 and 2008

In the following Table I am highlighting the changes between the COAH Third Round rules adopted in December 2004, which were the basis for our November 2005 Housing Plan Element and Fair Share Plan (HPE/FSP), and the COAH Third Round rules which became effective in June 2008. In addition, in the last column I have provided a comparison with the proposed Third Round rules that were published on June 16, 2008 and will become effective in September or October 2008.

While the June 2008 Third Round rules presently are those in effect, the COAH Executive Director sent a letter (May 28, 2008) to Mayors indicating that in order to meet the December 31, 2008 deadline for submission, municipalities should use the adopted Third Round rules as "a guide", which will change if the proposed Third Round rules are adopted.

I understand this is confusing. For the 3 columns below simply try to categorize them as December 2004 adopted rules; June 2008 adopted rules; and October 2008 proposed rules.

17-77 BIKEWAYS, SIDEWALKS, TRAILS AND WALKWAYS. (Revises entire section and eliminates Section 17-)

a. Sidewalks shall be installed in locations determined by the planning board to be in the interest of public safety and proper pedestrian circulation considering the probable volume of pedestrian traffic, the adjoining street classification where sidewalks, parallel streets, school bus stops, recreation areas, schools, shopping facilities and other populated areas, and the circulation element of the Master Plan.

b. All parking and circulation systems within each development shall accommodate the movement of vehicles, bicycles, pedestrians and transit, throughout the proposed development and to and from surrounding areas, safely and conveniently, and shall contribute to the attractiveness of the development. The on-site pedestrian system must provide adequate directness, continuity, street crossings, visible interest and security as defined by the standards in this Section. The on-site bicycle system must connect to existing bikeway, trail or walkway networks.

c. All bikeways, sidewalks, trails and walkways shall meet the following design standards:

1. *Safety Considerations.* To the maximum extent feasible, pedestrians shall be separated from vehicles and bicycles.

a. Where complete separation of pedestrians and vehicles and bicycles is not possible, potential hazards shall be minimized by the use of techniques such as special paving, raised surfaces, pavement marking, signs or striping, bollards, median refuge areas, traffic calming features, landscaping, lighting or other means to clearly delineate pedestrian areas, for both day and night use.

b. Where pedestrians and bicyclists share walkways, the pedestrian/bicycle system shall be designed to be wide enough to easily accommodate the amount of pedestrian and bicycle traffic volumes that are anticipated. A minimum width of eight (8) feet shall be required and shall meet American Association of State Highway and Transportation Officials (AASHTO) guidelines, Guide for Development of Bicycle Facilities, August 1991, or any successor publication. Additional width of up to four (4) feet may be required where higher volumes of bicycle and pedestrian traffic may be experienced.

2. Curb cuts and ramps shall be located at convenient, safe locations for the physically disabled, for bicyclists and for people pushing strollers or carts. The location and design of curb cuts and ramps shall meet the requirements of the Americans With

Disabilities Act ramp standards and shall avoid crossing or funneling traffic through loading areas, drive-in lanes and outdoor trash storage/collection areas.

3. *Site Amenities.* Development plans shall include site amenities that enhance safety and convenience and promote walking or bicycling as an alternative means of transportation. Site amenities may include bike racks, drinking fountains, canopies and benches.

4. *Bicycle Facilities.* Bicycle facilities to meet the following standards:

a. A minimum number of bicycle parking spaces shall be provided, equal in number to five (5) percent of the total number of automobile parking spaces provided by the development, but not less than one. For large commercial or institutional buildings parking spaces may be provided for 5% or more of all building users at peak periods and for multi-family residential buildings for 15% of building occupants.

1. To determine the number of secure bicycle spaces required for a commercial or institutional building, first identify the total number of full-time and part time occupants. Calculate the FTE occupants based on a standard 8-hour occupancy period and assign each full-time occupant a value of 1.0 and each part-time occupant a value of the number of hours worked divided by eight. Estimate the transient occupants such as students, visitors, and customers during the peak period for the facility. Calculate peak building users by combining FTE occupants and transient occupants.
2. To determine the number of secure bicycle spaces required for a residential building identify the number of total occupants. Multiply the number of occupants by 15%.

b. For convenience and security, bicycle parking facilities shall be located near building entrances, shall be visible from the land uses they serve, and shall not be in remote automobile parking areas. Such facilities shall be easily accessible by occupants during all seasons of the year and shall not be located so as to impede pedestrian or automobile traffic flow nor so as to cause damage to plant material from bicycle traffic.

c. Bicycle parking facilities shall be designed to allow the bicycle frame and both wheels to be securely locked to the parking structure. The structure shall be of permanent construction such as heavy gauge tubular steel with angle bars permanently attached to the pavement foundation. Bicycle parking

facilities shall be at least two (2) feet in width and five and one-half (5½) feet in length, with additional back-out or maneuvering space of at least five (5) feet.

5. Sidewalks and Walkways.

a. Walkways within a site shall be located and aligned to directly and continuously connect areas or points of pedestrian origin and destination, and shall not be located and aligned solely based on the outline of a parking lot configuration that does not provide such direct pedestrian access. Walkways shall link sidewalks with building entries through parking lots. Such walkways shall be raised or enhanced with a paved surface not less than six (6) feet in width. Drive aisles leading to main entrances shall have walkways on both sides of the drive aisle.

b. Street Crossings. Where it is necessary for the primary pedestrian access to cross drive aisles or internal roadways, the pedestrian crossing shall emphasize and place priority on pedestrian access and safety. The material and layout of the pedestrian access shall be continuous as it crosses the driveway, with a break in continuity of the driveway paving and not in the pedestrian access way. The pedestrian crossings must be well-marked using pavement treatments, signs, striping, signals, lighting, traffic calming techniques, median refuge areas and landscaping. (See Figure 3.)

c. Sidewalks shall parallel streets and shall be at least four feet wide. Sidewalks not associated with a street, or the extension of a sidewalk from the end of a cul-de-sac to another street or walkway, may be required.

6. Pedestrian and Bicycle Destinations. The on-site pedestrian and bicycle circulation system shall be designed to provide, or allow for, direct connections to major pedestrian and bicycle destinations including, but not limited to, parks, schools, Neighborhood Centers, Neighborhood Commercial Districts and transit stops that are located either within the development or adjacent to the development as required, to the maximum extent feasible. The on-site pedestrian and bicycle circulation system must also provide, or allow for, on-site connections to existing or planned off-site pedestrian and bicycle facilities at points necessary to provide direct pedestrian and bicycle travel from the development to major pedestrian destinations located within the neighborhood. In order to provide direct pedestrian connections to these destinations, additional sidewalks or walkways not associated with a street, or the extension of a sidewalk from the end of a cul-de-sac to another street or walkway, may be required.

7. Bikeways, sidewalks, trails and walkways shall be constructed in accordance with NJDOT Standard Specification for Road and Bridge Construction unless otherwise required herein.

a. Bikeways, sidewalks, trails and walkways shall be constructed with a 4 inch minimum permeable stone base.

b. Surface treatment shall be constructed of porous bituminous concrete or porous Portland Cement concrete unless demonstrated to the satisfaction of the Planning Board that such surface treatments are inappropriate.

c. Bike lanes, if used for public streets, shall use porous bituminous concrete for surface treatment unless demonstrated to the satisfaction of the Planning Board that such surface treatments are inappropriate.

d. Surface treatments for sidewalks shall comply with the Americans with Disabilities Act.

1. Consideration shall be given for sidewalk surface materials being constructed of porous bituminous concrete or porous Portland Cement concrete unless demonstrated to the satisfaction of the Planning Board that such surface treatments are inappropriate.

2. Sidewalks shall be four inches thick, except at points of vehicular crossing where they shall be at least six inches thick, where Portland Cement concrete is used. Portland Cement concrete shall have a 28 day compressive strength of 4,500 p.s.i., and shall be air-entrained.

3. Where sidewalks cross curbs, curb ramps shall be provided. Preformed expansion joint material shall be installed according to NJDOT Standards for the material; type being used.

17-83 DRIVEWAYS.

Add "g." The surface treatment of driveways shall maximize, to the greatest extent practicable, the use of pavement materials for that include porous stone, porous bituminous concrete, porous Portland Cement concrete, other porous pavement treatments or any other surface such as open-jointed pavers, "soft" paving materials including wood mulch and crushed shell, and plastic geocells or lattice-like materials that hold aggregate or topsoil in their cells to prevent displacement and compaction or base construction such that the design and construction maximizes infiltration of rainfall runoff.

17-85 FENCES AND HEDGES.

Add "b." Fences shall be constructed of vegetation where possible. When vegetation is used, all vegetation shall be native, water efficient vegetation.

17-89 LANDSCAPING.

Pending

17-90 LIGHTING.

17-90.4 Outdoor Lighting Energy Conservation.

Add "c." Every effort shall be made to maximize the use of energy efficient fixtures and such efforts shall be demonstrated to the Planning Board.

17-91 LOTS.

Add "b." Lots shall comply with Section 17-???, Solar Access.

17-93 MODIFICATION OF LOT AREAS AND OTHER RESTRICTIONS.

Add "c." Lots shall comply with Section 17-???, Solar Access.

17-95 OFF-STREET PARKING AND LOADING.

a. Developments shall provide for safe and efficient vehicular and pedestrian circulation, parking and loading, and shall meet the following specific standards and requirements. No required parking facilities, loading areas or passageways shall be located within the required front, side or rear setback lines of any lot located within a residential district, except as otherwise provided by this chapter.

b. Parking facilities, loading areas or passageways in industrial or commercial districts may be located within any of the required yard areas, provided that none of the same are within 25 feet of the street line nor within five feet of adjacent property lines. In the event that any subject property abuts a residential district, no such parking facilities, loading areas, or passageways shall be located within 25 feet of the district boundary and sufficient landscape screening, as described in section 17-89 shall be installed to preclude the transmission of headlight glare across such district boundary.

c. No loading area or service facility for the handling of freight may face any street frontage nor be located on the side of the subject property which abuts a residential district, without an approved landscape or topographical buffer.

d. Off-street parking spaces shall be either **nine** feet wide,* except spaces serving retail uses shall be a minimum of ten feet wide. Parking spaces shall be a minimum of **18** feet in length* in accordance with the following schedule. **Handicapped parking shall be provided in accordance with the Americans with Disabilities Act.**

	Aisle Widths for Parking Spaces 9 Feet Wide		Aisle Widths for Parking Spaces 10 Feet Wide	
Angle of Parking Space	One-Way Aisle	Two-Way Aisle	One-Way Aisle	Two-Way Aisle
90 degrees	25'	25'	24'	24'
60 degrees	20'	22'	18'	20'
45 degrees	18'	20'	15'	18'
30 degrees	15'	18'	12'	18'
parallel	12'	18'	12'	18'

*In an effort to reduce paving costs and reduce the amount of paving to assist in storm water runoff control, the planning board may approve parking plans associated with nonresidential uses where specially designated and separate parking areas may be set aside for **"alternate fuel vehicles or compact vehicles"** provided such spaces shall be limited to employee parking and each area for **"alternate fuel vehicles or compact vehicles"** shall have at least 30 spaces. The **"alternate fuel vehicles or compact vehicles"** spaces shall be eight and one-half feet by 16 feet with aisles reduced to 90 percent of the dimensions shown above. The number of parking spaces which may be approved for **"alternate fuel vehicles or compact vehicles"** shall be a determination of the planning board based upon documentation by the applicant and any data submitted by others.

e. Off-street loading spaces shall have 15 feet of vertical clearance and be designed in accordance with the following schedule:

Loading Space		Apron/Aisle Length	
Length	Width	90 degrees	60 degrees
60 feet	10 feet	72 feet	66 feet
60 feet	12 feet	63 feet	57 feet
60 feet	14 feet	60 feet	54 feet

f. All parking facilities and all loading areas which either singly, or in combination, provide for more than six parking or loading spaces shall be so located and screened that they

cannot be seen from any location within a residential district other than the lot upon which such facilities are situate and all loading areas shall be considered as one unless separated by more than 100 feet.

g. All parking facilities and loading areas which, either singly or in combination, contain more than 9,000 square feet shall have curbed, landscaped islands located within the perimeters of the surfaced area except as waived in lower income housing developments as permitted in section 17-92. **Landscaped islands providing for the treatment of stormwater and/or groundwater recharge shall be defined by an appropriate method that minimizes maintenance and provides for non-erosive surface water runoff entry into the island.**

h. Except as may be waived and modified in lower income housing developments under section 17-92, off-street parking areas containing ten or more spaces and all off-street loading areas shall have concrete curbing around the perimeter of the parking and loading areas and along major interior driveways, with appropriate ramps for wheelchairs and bicycles. Where other equivalent methods of controlling drainage, defining the edge of paving, protecting the edge of paving from chipping, and preventing vehicles from encroaching on nonparking/loading areas can be demonstrated to the satisfaction of the planning board with the advice of its engineer, concrete curbing may be waived in whole or in part. **Wheel stops** shall be installed where necessary to protect adjoining walls, trees, shrubs, sidewalks and other facilities.

i. Appropriate areas for pick-up of trash and garbage shall be provided, separate from and in addition to loading areas. If outside a building, suitable enclosed containers shall be provided which shall be screened at all times from view from parking areas, streets and adjacent residential areas or uses **consistent with section 17-97.**

j. Minimum Off-Street Parking and Loading Requirements. The minimum number of off-street parking spaces including required spaces for the handicapped, and the minimum number of off-street loading spaces depends on the particular use of the parcel.

The following minimum requirements shall be met: in the case of uses not listed, the amount of parking and loading spaces shall be determined by the planning board on the basis of similar uses and the anticipated actual requirements for the particular use. Sufficient off-street parking facilities shall be provided to preclude on-street parking of any vehicles of employees or customers or visitors of any nonresidential structure, and to preclude on-street parking of any vehicles of residents of residential buildings.

Where either a proposed building or the proposed use of a tract consists of more than one use, each use with different parking requirements, or where the building design is such that it could be converted to a use requiring a higher parking ratio, the site plan shall either: (a) show an off-street parking design with a sufficient number of parking spaces to accommodate the use requiring the most number of spaces; or (b) include as a deed restriction a requirement that either the owner-occupied or tenant-occupied space, together with the type uses and the proportion of uses within either a building or on the lot, shall not change from the uses and layout approved on the site plan unless a revised site plan is submitted and

approved (see also section 17-15 regarding certificates of occupancy). Where the developer proposes to construct less parking than would be required for the use requiring the most parking spaces, the plan shall show where any additional spaces can be located in the event additional parking is needed. In the event the use changes and additional parking is required, or observation by the township engineer reveals additional parking is required, the township may require the owner to construct some or all of the additional parking in accordance with the approved plan. The plan and the deed to the property shall indicate that the township may require the expanded parking under either of these circumstances.
(See Schedule on next page)

k. Drainage. All parking and loading areas shall have drainage facilities installed in accordance with good engineering practice and in accordance with the "drainage" provisions of section 17-82. Where sub-base conditions are wet, springy, or of such nature that surfacing would be inadvisable without first treating the sub-base, these areas shall be excavated to a depth of at least 12 inches below the proposed sub-grade and filled with a suitable sub-base material. Where required, a system of porous concrete pipe, sub-surface drains shall be constructed beneath the surface of the paving and connected to a suitable drain. After the sub-base material has been properly placed and compacted, the parking area surfacing material shall be applied.

l. All required driveways, passageways, off-street parking facilities and loading areas shall be located on the same lot as the structure or use which they are designed to serve and shall be readily accessible thereto. Except as otherwise provided by this chapter, where more than one use exists on the same lot, the total passageways, parking facilities, loading areas and the capacity of the driveways shall be the sum of the requirements for each individual use.

m. All driveways, passageways, off-street parking facilities and loading areas shall be so designed, constructed and maintained as to permit free access and allow vehicles to enter, to leave and to turn within such places in a safe and orderly manner and without disrupting or causing hazard to the flow of traffic in any public right-of-way. No such driveway, passageways, off-street parking facilities or loading areas shall be encroached upon, reduced in any manner, or devoted to any other use.

n. In any case where special conditions exist respecting the proposed use of a particular lot or contiguous lots, the immediate development of all driveways, passageways, parking facilities and loading zones will not be required if the applicant demonstrates:

1. That appropriate areas are reserved for the possible future construction of all such facilities;
2. That the required number of parking facilities or loading areas would be greatly in excess of any immediate or reasonably to be anticipated need therefor;

3. That the probable time of maximum use of such parking facilities or loading areas will be such as to make the sharing of such facilities feasible;
4. That the location and capacity of both future and proposed passageways, parking facilities and loading areas is such that the joint use of driveways will not disrupt or cause hazard to the flow of traffic at or near their entrance onto a public right-of-way; and
5. Such joint use as is proposed is protected by recorded easements.

o. In general, except for lots containing one-family houses, all driveways, parking and loading areas and other off-street traffic facilities shall be paved. Areas likely to experience relatively heavy use shall be paved with at least four inches of compacted base course of plant-mixed bituminous stabilized base course constructed in layers not more than two inches compacted thickness, or equivalent, and a minimum two-inch thick compacted wearing surface of bituminous concrete (FABC), or equivalent. Porous Bituminous Concrete and Porous Portland Cement Concrete shall be given consideration as alternative surface treatments. All construction shall comply with the Standard Specifications of the New Jersey Department of Transportation.

17-97 PERFORMANCE STANDARDS.

a. Electricity. Electronic equipment shall not interfere with any radio or television reception beyond the operator's property.

b. Air, Water and Environmental Pollution. No use shall emit heat, odor, smoke, radiation, vibrations, noise, or any other pollutant into the ground, water, or air that exceeds the most stringent, applicable local County, State and Federal regulation. No building permit, zoning permit or certificate of occupancy shall be issued for any use where any other permit is required until the approving agency has approved the level of emission, quality of emission, type and quality of emission control, and level of monitoring to be conducted by the State, and such other agency regulations governing the emission of pollutants into the ground, water, or air.

c. Hazardous Materials. The purpose of this Section is to protect the community and neighborhood from potential harm caused directly or indirectly by hazardous materials. The proper location, construction and processing of hazardous materials facilities are important to controlling community risk. If the type and magnitude of hazardous materials emergencies can be predicted, the potential impact on adjacent land uses, emergency providers and the environment can be minimized.

1. If any use on the development site may entail the use or storage of hazardous materials (including hazardous wastes) on-site, the project shall be designed to comply

with all safety, fire and building codes for the use and storage of the hazardous materials involved. Adequate precautions shall be taken to protect against negative off-site impacts of a hazardous materials release, using the best available technology.

2. In order to evaluate the impact of hazardous materials risk, all development proposals that have the potential to cause off-site impacts during the release of a hazardous material shall include a Hazardous Materials Impact Analysis (HMIA) prepared by a qualified expert. Such proposals include gas stations, manufacturing facilities and similar establishments that require the use or storage of flammable or toxic substances.

3. This analysis shall provide basic information on the project (including site layout and proposed hazardous materials use), describe likely incident scenarios, describe mitigation actions designed to limit the potential for off-site impacts on adjacent land uses or environment and describe emergency response measures in the event of a spill. Based on the information provided in the impact analysis, recommendations will be made by the Fire Commissioners to protect against off-site impacts. If a HIMA is required for a development proposal, a statement indicating that such a study has been required will be included in all required written notices to property owners as defined by Section 2.2.6 of this Code, to the extent reasonably feasible.

d. Glare or Heat. No use shall direct or reflect a steady or flashing light beyond its lot lines. Exterior lighting and lighting resulting from any manufacturing or assembly operations shall be shielded, buffered, and directed as approved on the site plan so that any glare, direct light, flashes, or reflection will not interfere with the normal use of nearby properties, dwelling units and streets. Also see section entitled "Lighting", section 17-90.

1. If any proposed activity produces intense glare or heat, whether direct or reflected, that is perceptible from any point along the site's property lines, the operation shall be conducted within an enclosed building or with other effective screening sufficient to make such glare or heat imperceptible at the property line.

2. Manufacturing processes that create glare, such as welding, shall be conducted within an enclosed building or be effectively screened from public view. If the source of the glare is proposed to be screened with plant material, then the applicant must show that the screening will be effective year-round.

e. Historic and Cultural Resources. Historic sites, structures or objects shall be preserved and incorporated into any proposed development and any undertaking that may

potentially alter the characteristics of the historic property is done in a way that does not adversely affect the integrity of the historic property. New construction shall be designed to respect the historic character of the site and any historic properties in the surrounding neighborhood. This Section is intended to protect designated or individually eligible historic sites, structures or objects as well as sites, structures or objects in designated historic districts, whether on or adjacent to the development site consistent with the regulations of the Hopewell Township Historic Preservation Commission from which approvals shall be sought prior to seeking planning board or zoning board approvals.

Revised "f." Storage and Waste Disposal. Except for agricultural operations, no materials or wastes shall be deposited upon a lot in such form or manner that they can be transferred off the lot, directly or indirectly, by natural forces such as precipitation, surface water, evaporation or wind. All materials or wastes which might create a pollutant, be a safety hazard, or be a health hazard shall be stored indoors, in closed containers, or in any manner consistent with law or industry standard and approved by the Health Department and Fire Commissioners to eliminate such pollutant or hazard.

1. There shall be provision of areas, compatible with surrounding land uses, for the collection, separation, storage, loading and pickup of recyclable materials by requiring that adequate, convenient space is functionally located at multi-family residential, commercial and industrial land use sites.
2. All new commercial or multi-family structures and all existing commercial or multi-family structures proposed to be enlarged by more than twenty-five (25) percent, or where a change of use is proposed, shall provide adequate space for the collection and storage of refuse and recyclable materials.
3. The amount of space provided for the collection and storage of recyclable materials shall be designed to accommodate collection and storage containers that are appropriate for the recyclable materials generated. Areas for storage of trash and recyclable materials shall be adequate in capacity, number and distribution to serve the development project.
4. Recyclable materials storage areas shall be located abutting refuse collection and storage areas.
5. Each trash and recycling enclosure shall be designed to allow walk-in access without having to open the main enclosure service gates.
6. Trash and recycling areas must be enclosed so that they are screened from public view. The enclosure shall be constructed of durable materials such as masonry and shall be compatible with the structure to which it is associated. Gates on the enclosures shall be constructed of metal or some other comparable durable material, shall be painted to match the enclosure and shall be properly maintained.
7. Enclosure areas shall be designed to provide adequate, safe and efficient accessibility for service vehicles.

8. Enclosure areas shall be constructed on a cement concrete pad.

9. The property owner shall supply and maintain adequate containers for recycling and waste disposal. Containers must be clearly marked for recycling.

Add "g." Construction Waste Management: Divert construction, demolition and land-clearing debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

1. Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or co-mingled.

a. Excavated soil and land-clearing debris do not contribute. Calculations can be done by weight or volume, but must be consistent throughout.

b. Consider recycling cardboard, metal, brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a specific area(s) on the construction site for segregated or commingled collection of recyclable materials, and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site.

2. Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.

3. Use salvaged, refurbished or reused materials such that the sum of these materials constitutes at least 5%, based on cost, of the total value of materials on the project. Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items. Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included.

4. Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

17-106 SIGNS. (Revisions in red)

Revised "10." Illuminated Signs. Signs shall be illuminated in accordance with section 17-90. Illuminated signs shall be arranged to reflect the light and glare away from adjoining or nearby lots and streets. All illuminated signs shall have the light source shielded from adjoining

or nearby lots, streets, and interior drives. All lights shall be either shielded or have translucent fixtures to reduce off-site effects. LED fixtures and/or light fixtures of equivalent energy efficiency shall be used where possible consistent with section 17-90.

17-??? SOLAR ACCESS (New Section)

The use of both active and passive solar energy systems for providing and storing electricity and heating air and water in homes and businesses is encouraged, as long as natural topography, soil or other subsurface conditions or other natural conditions peculiar to the site are preserved. While the use of solar energy systems is optional, the right to solar access is protected. Solar collectors generally require access to available sunshine during the entire year, including between the hours of 9:00 am and 3:00 pm, EST, on December 21, when the longest shadows occur.

a. Solar-Oriented Lots. The elements of the development plan (e.g., buildings, circulation, open space and landscaping) shall be located and designed, to the maximum extent feasible, to protect access to sunshine for planned solar energy systems or for solar-oriented rooftop surfaces that can support a solar collector or collectors capable of providing for the anticipated energy needs of the project between the hours of 9:00 am and 3:00 pm EST, on December 21.

b. Shading. *A* goal of this Section is to ensure that site plan elements do not excessively shade adjacent properties, creating a significant adverse impact upon adjacent property owners.

1. The physical elements of the development plan shall be, to the maximum extent feasible, located and designed so as not to cast a shadow onto structures on adjacent property greater than the shadow which would be cast by a twenty-five-foot hypothetical wall located along the property lines of the project between the hours of 9:00 am and 3:00 pm, EST, on December 21. This provision shall not apply to structures within the following high-density zone districts: Downtown, Community Commercial.

2. The impact of trees shall be evaluated on an individual basis considering the potential impacts of the shading and the potential adverse impacts that the shading could create for the adjacent properties in terms of blocking sunlight in indoor living areas, outdoor activity areas, gardens and similar spaces benefiting from access to sunlight. Shading caused by deciduous trees can be beneficial and is not prohibited.

c. Alternative Compliance. Upon request by an applicant, an alternative site layout that may be substituted in whole or in part for a plan meeting the standards of this Section. An alternative design enhances neighborhood continuity and connectivity, fosters non-vehicular access, and preserves existing natural or topographic conditions on the site.

17-??? SUSTAINABILITY (New Section)

a. Building Materials. When possible, Building materials should meet or exceed at least two of the following:

1. Regional Materials: 10% Extracted, Processed & Manufactured Regionally. Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and local economies, and reducing the environmental impacts resulting from transportation. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% (based on cost) of the total materials value. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed. Consider a range of environmental, economic and performance attributes when selecting products and material.

2. Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials. Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) for 2.5% of the total value of all building materials and products used in the project, based on cost. Identify products and suppliers that can support achievement of this goal. Consider materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard and cork. During construction, ensure that the specified renewable materials are installed.

b. Framing. Without compromising structural integrity, use advanced framing techniques that reduce the amount of building material while maintaining the structural integrity of the home.

c. Roofing Alternatives. Reduce the urban heat island effect by use of the following:

1. Materials that are no darker than a light gray or demonstrate how alternate roofing materials reduce the urban heat island effect.

2. Roofing materials have a Solar Reflectance Index (SRI) equal to or greater than 78 for a low-sloped roof (less than or equal to 2:12) or 29 for a steep-sloped roof (greater than 2:12) covering 75% of the roof surface. When calculating the surface area of a roof, deduct areas with equipment, solar energy panels, and appurtenances.

3. Install a vegetated roof for at least 50% of the roof area.

e. Non-Residential Construction

1. Commission the building's energy systems. Verify that the building's energy related systems are installed, calibrated and perform according to the owner's project requirements, basis of design, and construction documents.

a. Designate an individual as the Commissioning Authority (CA) to lead, review and oversee the completion of the commissioning process activities. The Owner shall document the Owner's Project Requirements (OPR). The design team shall develop the Basis of Design (BOD). The CA shall review these documents for clarity and completeness. The Owner and design team shall be responsible for updates to their respective documents.

b. In order to complete the commissioning process the following steps must be completed:

1. Develop and incorporate commissioning requirements into the construction documents.

2. Develop and implement a commissioning plan.

3. Verify the installation and performance of the systems to be commissioned.

4. Complete a summary commissioning report.

5. Commissioning process activities shall be completed for the following energy-related systems, at a minimum: HVAC & R systems and associated controls, lighting and daylighting controls, domestic hot water systems, and renewable energy systems.

2. Re-commission the building's energy systems on an ongoing basis to provide for the ongoing accountability of building of energy consumption over time.

3. Eliminate use of ozone depleting refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phase-out conversion prior to project completion. Phase-out plans extending beyond the project completion date will be considered on their merits. Zero use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC

phase-out conversion prior to project completion. Phase-out plans extending beyond the project completion date will be considered on their merits.

f. Residential Construction

1. Provide homeowner with information and enrollment materials about options to purchase green power from the local electric utility.

17-114 WATER. (Revision in red)

a. An adequate **potable** water supply for the residents and occupants of the site shall be provided. If a public water supply is available, water mains shall be connected to the existing mains, **if Hopewell Township approves**, and the developer shall contribute the entire cost of any necessary new wells, additional storage facilities, extension of water mains and increased size of water mains, except as provided in section 17-96 with respect to off-tract improvements.

b. If a public water supply is not available, or if in the judgment of the planning board it is not economically feasible to extend public water lines to the site, the planning board shall determine whether individual wells are appropriate, or whether a central water system should be installed, subject to the approval **by Hopewell Township of** the arrangements for transferring ownership of the system to the municipal utilities authority. In addition, compliance with section 16-6 of the Revised General Ordinances shall be required.

c. Whenever a public water supply or central water system is installed or expanded, the developer shall include fire hydrants, with approved coupling devices, sufficient for firefighting purposes.

New "d." Use water-conserving fixtures and minimize water consumption. When possible, specify high-efficiency fixtures and dry fixtures such as dual flush toilets, and non-water using urinals to reduce water consumption.