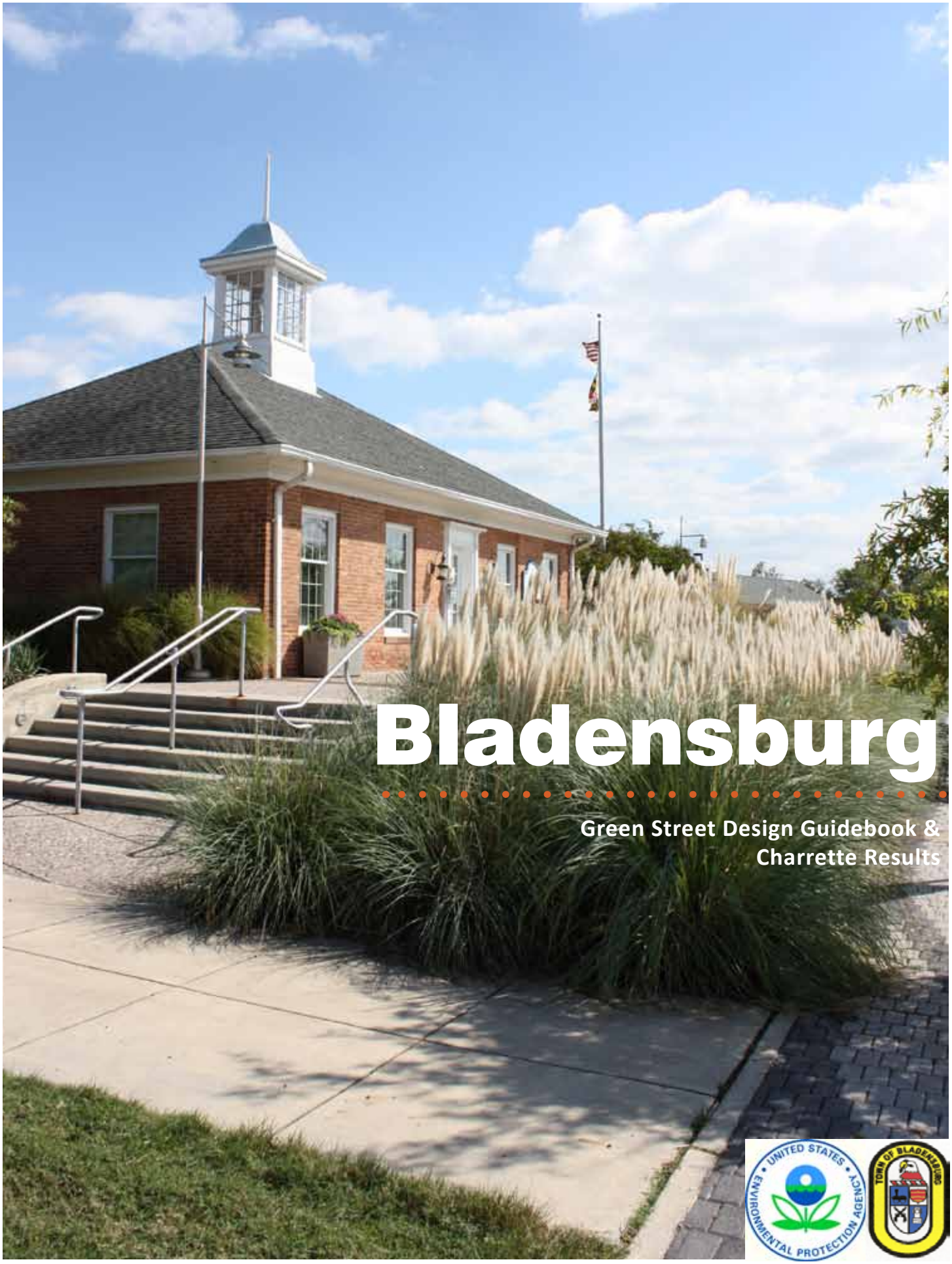

Bladensburg

Green Street Design Guidebook & Charrette Results

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Project Summary

The Chesapeake Bay Green Streets-Green Jobs Initiative is included in the Chesapeake Bay Executive Order Implementation Strategy for stormwater. The Green Streets–Green Jobs Initiative unites a town's vision for a sustainable future with the tools to accelerate local greening efforts, yielding positive results in watershed protection, community livability, and economic vitality. Through this effort, focused in the Chesapeake Bay – starting in the highly urbanized Anacostia Watershed - the initiative will build a better avenue to support and connect grassroots efforts as exemplified by the inspiring Edmonston, Maryland Green Streets project. The first step in building this network is through the technical transfer of lessons learned from the Edmonston project to communities in the Chesapeake Bay. The mechanism for this transfer is a Green Streets design charrette with technical expertise on low impact development (LID) techniques and other green technologies. The charrette will assist in the design of a green street, which will be modeled after Decatur Street in Edmonston.

Within the Chesapeake Bay and Anacostia watersheds, small to mid-sized communities, such as Edmonston and Bladensburg, Maryland, are seeking ways to boost their local economies while helping to protect water resources through integrated planning, design, and construction of stormwater best management practices. Building green streets and associated green infrastructure projects marry three important issues and concerns that these Chesapeake Bay towns face: jobs, livability, and the environment. These are not separate elements but part of the important whole that we know as community – green, healthy, prosperous, and whole.

The Town of Bladensburg's Green Streets-Green Jobs design charrette launches the first official project of the Green Streets-Green Jobs Academy, a collaborative network of stewards, practitioners, and sponsors offering community leaders and local stakeholders better access to technical, planning, policy, funding, and job creation opportunities related to the creation of green streets and green jobs.

Executive Summary

All streets have an expiration date: a time when they must be repaired, resurfaced, or replaced. This includes the infrastructure, such as electric, water, and gas, and sewer lines that are part of the street. When this occurs, towns have the opportunity to utilize the best environmentally responsible practices to fix them. Green techniques can be incorporated into all aspects of construction and design, both above and underground. These techniques can address a wide range of environmental and health issues, such as energy, air quality, and water quality. For example, the street lights can use efficient bulbs and ballasts and be powered by an alternative energy source. Green streets also make accommodations for greener transportation (walking, running, biking) and use recycled materials in the street design.

The project being proposed is the first phase of the creation of a green street on State Highway Route 450/Annapolis Road in Bladensburg, Maryland. The area from the Memorial Peace Cross to Bladensburg Elementary School (the 4500 to 5200 block) is among one of the richest historical locations in Maryland. Much of MD 450/Annapolis Road in Bladensburg is located in a Chesapeake Bay Critical Area with a great deal of new wetland and waterfront access.

The current condition of the road as well as its design does not lend itself to easy or safe mobility. Bike and pedestrian access is very poor; some areas lack adequate sidewalk or crosswalk facilities, especially near the Waterfront Park and battle memorials at the Peace Cross area. The thoroughfare remains unsightly, lacking median strips, plantings, or wayfinding. A recent study by the Urban Land Institute (ULI), commissioned on behalf of the Town of Bladensburg by the Port Towns Community Development Corporation, pointed to the degraded roadway as an impediment to revitalization, and urged redesign as a significant aspect of future economic development for the town.

On October 25th , 2005, the Maryland National Capital Park and Planning Commission (M-NCPPC) began a Sector Plan and Sectional Map Amendment (SMA) for the Bladensburg/Annapolis Road corridor. The goal of this plan was to implement recommendations of the 2002 Prince George's County Approved General Plan, update parts of the 1994 Approved Master Plan and Sectional Map Amendment for Bladensburg, amend the zoning map, and to set policies that will guide future development pertaining to urban design, historic resources, economic development, roads, trails, transit, public facilities, park and recreation and most importantly environmental infrastructure in the planning area. The Green Streets-Green Jobs inititave looks to further develop the findings of the M-NCPPC.

Leveraging the efforts undertaken by the Port Towns Partnership and through the funding support of the U.S. EPA's Green Streets-Green Jobs Initiative, the Town of Bladensburg envisions that this project will not only help reduce discharge of pollutants to these areas, but will also be an excellent opportunity to create a "Green Street" that may serve as a national model for future highway transportation endeavors. The town intends to incorporate significant cutting-edge green infrastructure concepts such as the use of permeable pavements, efficient bioretention facilities for advanced stormwater management, and green technologies such as energy efficient light-emitting diode (LED) lighting, alternative energy, and beneficial reuse of industrial materials in construction.

Part 1 of the following literature provides an introduction of how green technology can be used to create a green street. While it is formatted for a general audience, technical details are included to assist the community in making an informed decision.

Part 2 of the literature includes an overview of the October 25th, 2010 charrette held at the Bladensburg Recreation Center and the resulting masterplan for Bladensburg. Included in Appendix B, is a detailed write up of both the speakers during the charrette, notes and discussion topics during the charrette itself. The following document includes the following:

- A brief introduction to Bladensburg, MD and its regional connections. A description of the Port Towns Partnership and the Green Streets-Green Jobs Initiative.

- An introduction to going green, including why it makes sense, what makes a green street, and definitions and background information on green technologies and approaches. These technologies focus on achieving watershed protection through green infrastructure and LID techniques, renewable energy, green construction, and recycled materials use. Information will also be provided on green financing, green jobs, and green business incubation.

- A description of the anatomy of a green street and where each of the described LID or green infrastructure elements can be implemented on a typical street section.

- A description of the charrette findings and an overview of the masterplan.

- An explanation of the Maryland State Highway Administration's role in implementing green streets along route 450/Annapolis Road, funding sources, and grant information.

- A glossary of terms, appendices, and additional resources including case studies and links to additional information.

Historic Port of Bladensburg Ropewalk Pavilion at the Bladensburg Waterfront Park

Bladensburg

Green Streets Charrette and Street Design Guidebook

Mural Along Annapolis Road
Bladensburg, MD

Contents

Setting and Background

Past

Originally named Garrison Landing, the Town of Bladensburg has a rich history in war and commerce. The Town of Bladensburg, located one mile north-east of Washington D.C., was named after Thomas Bladen, the Governor of Maryland in 1742. This area has strong historical ties to the war of 1812. It contains part of the actual march path of the British to the capital, location of military encampments, and limited engagement with local militia. A replica of Commodore Joshua Barney's flotilla is on display alongside interpretative historical markers at the Bladensburg Waterfront Park. Other historic sites clustered along these seven blocks include the Bostwick House, Magruder House, George Washington House, Free Hope Baptist Church, and the Market Masters House, many of which played key roles in the history of commerce and emancipation in Maryland.

Operating as a busy port in the late 19th century, the Town of Bladensburg primarily shipped flour and tobacco, but because of poor farming habits prevalent in the 19th century, the soil began to deteriorate and silt-up the Anacostia River. By 1836, the town saw its last shipping vessel, the Rover, leave its port. This, in combination with the outward growth of the Washington metropolitan region, led to economic instability in the area. Although once a bustling agricultural port town, Bladensburg struggled to regain stability amidst an industrializing nation. After the introduction of a street car and railroad, Bladensburg slowly turned into a bedroom community for workers commuting into the city.

Port Towns Partnership

Launched in 1994, the Port Towns Partnership is comprised of Bladensburg, Colmar Manor, Cottage City, and Edmonston. The partnership focuses on neighborhood and commercial revitalization within the beltway communities. The partnership organizes community friendly events such as "Port Towns Day," and manages community outreach efforts such as the Port Towns Economic Development Center.

The Port Towns are home to approximately 12,000 residents with over half of them living in Bladensburg. Soon after establishment, the Port Towns Partners implemented the "Port Towns Action Plan," which was based on the uniting motto "A rising tide raises all ships". The Port Towns Partnership has worked on several projects in Bladensburg, including the reopening of Bladensburg Waterfront Park in 2000 after raising over $5 million for renovations. Bladensburg has also partnered with the University of Maryland, the Anacostia Trails Heritage Area, Anacostia Watershed Society, and the Bladensburg Pastoral Lay, creating a unique and beneficial source of funding for projects within the town.

Recognizing the importance of environmental protection and sustainability to neighborhood, commercial, and community revitalization, the Port Towns Partnership has embraced the green street approach to infrastructure improvement. The "From Main Streets to Green Streets!: Collaboration for Prosperity and Sustainability" campaign with the Town of Edmonston, Maryland's Green Street is the premier example. Utilizing American Recovery and Reinvestment Act of 2009 (ARRA) funding, the Town of Edmonston's Decatur Street is a model for sustainable, green land use planning for low income communities in the Anacostia Watershed of the Chesapeake Bay. The Town of Edmonston has already implemented their green street initiative and has received national acclaim for their efforts.

Green Streets-Green Jobs Initiative

The Green Streets–Green Jobs Initiative is designed to encourage local greening efforts by providing communities with the tools needed to achieve positive results in watershed protection, community livability, and economic vitality. The initiative will pave the way for a support network that connects grassroots efforts in the Chesapeake Bay. The center hub of this effort will be the highly urbanized Anacostia Watershed, which is home to the inspiring Edmonston, Maryland Green Streets project.

The Green Streets–Green Jobs Initiative is a key component of the Chesapeake Bay Executive Order which will bring a town's "Green Vision" together with tools to accelerate local greening efforts. The Executive Order commits to holding the first regional Green Streets-Green Jobs training forum in Anacostia in 2010/2011 and holding three additional training forums throughout the watershed in 2011-2013. U.S. EPA will work with up to ten demonstration communities per year for the next three to five years to create Green Streets-Green Jobs plans and designs that support local and Bay water quality and watershed protection plans.

Another key component of the Chesapeake Bay Executive Order is the recent development of the Green Streets-Green Jobs Academy, a collaborative network of stewards, practitioners, and sponsors offering community support relating to the creation of green streets and green jobs. The Academy provides access to technical, planning, policy, funding, and job creation opportunities to community leaders and local stakeholders. In addition to being a source of information, the Academy will provide hands-on guidance for communities in the Chesapeake Bay.

The bottom-line goal is to empower communities that have felt disenfranchised to gain better access to restoration resources, while being recognized for their contributions in Bay protection.

The Green Streets-Green Jobs Academy will partner with the Green Highways Partnership Training and Development Center and other related programs and activities at U.S. EPA, for example, EPA's Green infrastructure program, to achieve the following performance outputs/outcomes:

- **Bring integrative planning** to Chesapeake Bay communities that supports water resource restoration, protection, and implementation of green infrastructure best management practices
- **Provide access to training** on best management practices, watershed restoration, and financial strategies
- Work with local communities and local talent to **design and build green infrastructure projects**

University of Maryland Archeological Dig
Bladensburg, MD

1 Overlook from bridge looking back at Bladensburg Waterfront Park.

2 Looking East down 450/Annapolis Road at the overpass of Kenilworth Avenue.

3 Streetscape at the intersection of 46th Street and 450/Annapolis Road.

4 Intersection of Edmonston Road and 450/Annapolis Road.

- **Develop policies, including local ordinances, and assist in compliance** of existing federal, state, and local regulations that will enable towns to become more environmentally and economically sustainable.

- **Create transparency in funding availability and financial assistance** by working with funding partners to match local green infrastructure projects with available federal, state, and private funding. Partners will seek to coordinate regulatory obligations (if required) and funding opportunities in order to get 'boots on the ground' quickly.

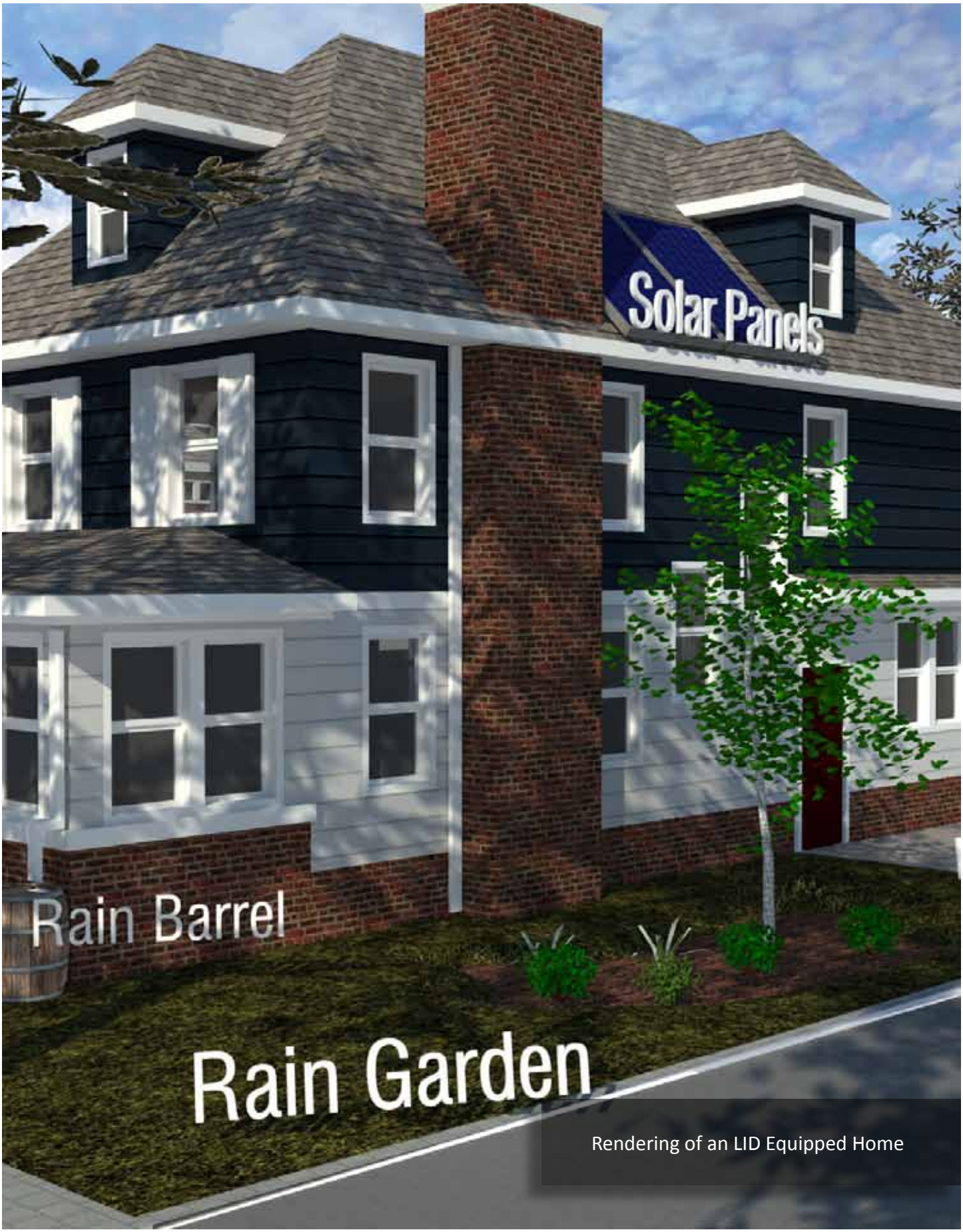
- **Create more green jobs** by "growing" more green work. This effort can help to increase the demand for green projects, and the resultant green jobs, by supporting the design and retrofits of more green streets and other green infrastructure projects. A green workforce can be created by bringing engineers, universities, technical schools, and other training organizations together to explore ways that training workshops, certificate programs, and work study programs can support of the environment and local community sustainability, keeping jobs and the flow of money in the community.

The Town of Bladensburg, MD Green Streets-Green Jobs charrette is the first official project launched by the Green Streets-Green Jobs Academy. Building upon the Edmonston greening of Decatur Street project, U.S. EPA and its partners will use this as a template for working with the demonstration communities. The key aspects of the Edmonston experience include a collaborative decision-making process, community participation, and integrated green technology design.

Green street designs demonstrate a multi-benefit infrastructure approach which provides a Top to Bottom Plan (Tree Canopy to Water Quality). A comprehensive green plan includes planting native tree canopies, installing energy efficient lighting and using clean energy, and integrating placement of stormwater management features with walkways and bikeways while adding traffic calming techniques. Green practices, including rain gardens, permeable pavements, and native trees, will treat rain where it falls and reduce the flow of stormwater pollution to local streams. New green infrastructure practices can be sized to treat 90 percent of the annual total rainfall and provide improved air quality and other environmental benefits.

Bladensburg

The development of a green street along MD 450/ Annapolis Road provides a great opportunity to showcase and make a statement about Bladensburg's commitment to Going Green. By "Going Green" with a green street, Bladensburg will help to reduce stormwater runoff, increase energy efficiency, reduce green house gases through the use of recycled materials, revitalize neighborhoods, reduce pollution into the Anacostia, and develop a more pedestrian friendly and aesthetically pleasing street. Connecting Bladensburg to its waterfront amenities in a sustainable and responsible way will help both the community and business owners. Community members will benefit from the creation of access to the Bladensburg Waterfront Park which will help enhance its use as a community amenity and further promote Bladensburg's commitment to going green. Businesses in this corridor will see a rise in patrons due to a more pedestrian friendly environment and better store frontage. As part of the project, street trees, wide sidewalks, and façade improvements will help draw in customers.



Rendering of an LID Equipped Home

Going Green

Going green means many different things, including green jobs, energy conservation, recycling, landscaping, and low impact development stormwater management practices. In this case "Going green" also includes empowering small communities such as Bladensburg with the tools and mechanisms to reach their goals of improved livability, healthier environment, prosperous green economy, and creating green jobs. These are not separate elements but part of the important whole that is the essence of community.

Urban areas contain aging infrastructure and degraded waters. At the edge of Bladensburg lies the convergence of the northwest and northeast branches of the Anacostia River; one of the nation's most polluted rivers. Most of the pollution in the Anacostia River is caused by stormwater runoff. The goals of "Going Green" are to take more eco-friendly actions which result in multiple environmental benefits, while providing for economic viability, improved quality of life, and community sustainability.

Why go green?

Aside from protecting the environment, investing in green technologies will provide the Town of Bladensburg with the opportunity to enhance existing infrastructure, bringing it up to 21st century standards, while generating green jobs, creating demand for innovation in green technologies, and revitalizing local neighborhoods. The Town of Bladensburg realizes the value of going green and is committed to a future that includes social, environmental, and economic sustainability. The subsequent sections of this report outline suggestions for how Bladensburg can actualize these goals through watershed protection through stormwater management. Examples include LID, energy conservation, green construction, and recycled materials use. Information will also be provided on green financing, green jobs, and green business incubation.

What makes a Green Street?

When a town is faced with aging infrastructure, an opportunity arises to turn an unsightly street into an aesthetic investment. Using environmentally responsible practices, a street can be transformed to address a wide range of environmental and health issues, such as energy, air quality, and water quality. Green streets also invite greener transportation, such as walking, running, and biking; these activities promote community interaction and personal health through physical fitness. Economic benefits can be seen through a reduction in town costs of stormwater management through conventional practices. Further, green jobs create social benefits through assistance in a green street's development and subsequent maintenance. The numerous benefits are the result of the variety of green techniques that can be incorporated into all aspects of a retrofit effort for construction and design, both above and underground. Depending on the goals and objectives of the town, specific green techniques will be selected to achieve the desired outcome.

Objectives of Bladensburg Complete Green Street

- Decrease stormwater runoff which is the major source of pollution in the Anacostia River and Chesapeake Bay;
- Increase energy efficiency and use of renewable energy technologies through incorporation of green design technologies;
- Reduction of greenhouse gases and landfill disposal through use of recycled materials in construction;
- Connect walking and biking opportunities for residents and connect new bike paths to the community;

- Create and sustain green jobs and careers in the Anacostia Watershed;
- Improve pedestrian safety and address the town's goal of being a walkable, safe community;
- Upgrade walking safety features for visitors expected at the Bicentennial of 1812;
- Promote economic revitalization.

What is Stormwater?

Stormwater differs from rain water because it is the portion of rainfall that is intercepted by impervious surfaces, such as roads, sidewalks, and rooftops, before the water has a chance to infiltrate into the ground. Conventionally, stormwater is captured and conveyed into local water bodies through the curb and gutter system, which is designed to move water as quickly as possible. Water that hits impervious surface is directed down the curb and into the gutter on the street. The water is then piped underground and is eventually discharged into local rivers. This process compounds the negative effects of runoff by increasing the velocity and volume of stormwater, which causes erosion and the delivery of urban pollutants such as fertilizers, heavy metals, and bacteria to our local water systems.

Although these systems are maintained by the local municipalities and state governments, every citizen is ultimately responsible for stormwater pollution. Towns like Bladensburg are stepping up and addressing this issue by implementing innovative technologies and educating the public on how to reduce this pollution. The best chance of saving our local waters is through education and individual action.

LID

Low Impact Development (LID) attempts to mitigate the shortcomings of conventional stormwater conveyance by addressing the pollution, volume, and velocity issues. LID can reduce pollutant loads to local streams, reduce erosion, prevent downstream flooding, and recharge groundwater supplies. LID is defined as an ecosystem-based approach to designing a built environment that remains a functioning part of an ecosystem rather than existing apart from it. LID has been developed to work outside of the conventional end-of-pipe structural methods, integrating stormwater management into the urban landscape. LID features such as bioretention, bioswales, permeable pavement, and rain barrels will be detailed later in the report.

Green Infrastructure

The U.S. EPA's Office of Water defines Green Infrastructure (GI) as encouraging infiltration, evapotranspiration, or reuse of stormwater, with significant utilization of soils and vegetation rather than traditional hardscape collection, conveyance, and storage structures.

Green infrastructure has also been defined as a strategically planned and managed interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and nature. It incorporates principles of landscape ecology, conservation biology, restoration ecology, and watershed management.

Encompassing both definitions, some examples of green infrastructure approaches include green roofs, trees and tree boxes, rain gardens, vegetated swales, pocket wetlands, infiltration planters, vegetated median strips, reforestation, and protection and enhancement of riparian buffers and floodplains.

Energy Conservation, Energy Efficiency & Renewable Energy

Energy conservation, energy efficiency, and renewable energy can play important roles in enhancing Bladensburg's Green Streets initiative.

Energy conservation is any behavior that results in the use of less energy. For example, turning off the lights before leaving a room helps conserve energy. Energy

efficiency is the use of technology that requires less energy to perform the same function. For example, a compact fluorescent light (CFL) bulb uses less energy to perform the same function as a standard incandescent bulb. Renewable energy refers to energy derived from resources that are regenerative or for all practical purposes cannot be depleted, such as solar energy, wind, or water.

Whether it is upgrading street lights or improving the energy efficiency of a building's heating and cooling system, measures to reduce energy use and our dependence on fossil fuels can have lasting environmental, economic, and social benefits.

Environmental Benefits

- **Air quality** – Many urban areas in the Mid-Atlantic region are in non-attainment of the federal air quality standards for ozone and fine particulate matter. Reducing our energy use and switching to cleaner fuels will result in less air pollution and improved public health.

- **Greenhouse gases and climate change** – Reducing energy use and reliance on fossil fuels can significantly reduce carbon dioxide (CO2) and other greenhouse gas emissions.

Economic Benefits

- **Cost savings** – Using less energy, and using the energy that we do need more efficiently, will result in tremendous savings both on energy bills and maintenance fees. Low Impact Development (LID) strategies for stormwater management, such as green roofs, often have ancillary energy cost saving benefits.

- **Green jobs** – Implementing energy efficiency and conservation measures can generate new green job opportunities at the local level.

Social Benefits

- **Urban heat island effect** – The lack of permeable surfaces, open land, and vegetation in built communities results in higher temperatures than surrounding rural areas. Tree planting can reduce this effect, improving the quality of life for residents.
- **Street ambiance** – The same measures that improve energy efficiency and conservation will also improve quality of life for residents. For example, the newer, more efficient street lamps also produce a higher quality light.

Measures to reduce energy consumption and improve energy efficiency should be the first steps considered. With the resulting cost savings, the second step to consider would be making the switch to renewable energy. Cost savings can also be set aside and used toward further energy conservation and efficiency improvements.

Street Lighting: Replace older, inefficient street lights with light-emitting diode (LED) fixtures.

While high-pressure sodium (HPS) lamps and metal halide lamps are two of the most common street lighting options installed, they are also two of the most inefficient options. The inefficiency comes from the high energy use and frequency of maintenance required to keep streets lit. A practical and responsible substitute is an LED fixture. While start up costs are higher, environmentally friendly LED lamps last up to five times longer and produce more light while consuming half of the electricity compared to older technologies. Whether a property is municipal, commercial, or residential, energy efficient upgrades can be considered for the lighting of streets, parking lots, driveways, and walkways.

Street Trees: Increase and enhance the street tree canopy.

Reduction in energy use and urban heat island effect can be accomplished through increased street tree planting. For maximum benefit, trees should be planted in a location where they will shade buildings and the streetscape at appropriate times of day. An additional benefit of an improved street canopy is the sequestering of greenhouse gases, which leads to global climate change.

Buildings: Improve energy conservation and efficiency in commercial, institutional, and residential buildings.

- **Commercial and Institutional**: The Energy Star program is a government-backed effort that offers technical assistance, tools, and a recognition program for commercial and institutional buildings to reduce energy use and save money. Common building energy improvements include upgrading to energy efficient lighting technology and controls, upgrading the efficiency of the facility's Heating, Ventilating, and Air Conditioning (HVAC) system, and replacing older, leaky windows with newer, more efficient ones.

- **Residential:** The Energy Star program's Home Energy Yardstick is an easy online tool to help homeowners assess their energy usage – the first step toward making home energy efficiency improvements. Common residential energy improvements include sealing air leaks, adding insulation, purchasing Energy Star-rated appliances and equipment, and swapping standard incandescent light bulbs for CFLs.

A wide variety of grant, rebate, and incentive programs are available for building energy conservation and efficiency improvements.

Renewable Energy: Make a municipal commitment to purchasing renewable energy.

Purchasing renewable energy through the local electricity provider helps ensure that municipal-run operations (street lighting, municipal buildings, etc.) set an example for the rest of the community. Municipalities can purchase all or a portion of their electricity from clean energy through renewable energy certificates (RECs). RECs represent the environmental attributes of the power produced from renewable energy projects and are sold separately from commodity electricity. RECs can be purchased through the local electricity provider.

The U.S. EPA's Green Power Partnership program is a voluntary program that supports the organizational procurement of green power by offering expert advice, technical support, tools, and resources. By partnering with U.S. EPA, the Town of Bladensburg can lower the transaction costs of purchasing renewable energy, reduce its carbon footprint, and receive recognition for its greening efforts.

Outreach and Education: Expand the green streets initiative to residents, businesses, and beyond.

With all of the above green streets recommendations, there is ample opportunity for outreach and education on energy conservation, energy efficiency, and renewable energy, both in the proximity of this specific green streets project, as well as throughout the Town of Bladensburg. For example, one of the buildings along the streetscape could become a demo building, showcasing energy efficiency and conservation improvements that have resulted in cost savings and environmental benefits.

Industrial Materials Recycling

Industrial materials recycling, also referred to as beneficial use, means reusing or recycling byproduct materials generated from industrial processes. These materials can be used as substitutions for raw materials in the manufacturing of consumer products, roads, bridges, buildings, and other construction projects. Thousands of manufacturing and industrial processes and electric utility generators create hundreds of millions of tons of nonhazardous industrial materials that are often wasted.

Nonhazardous industrial materials, such as coal ash, synthetic gypsum, foundry sand, construction and demolition materials, and slags are valuable products of industrial processes. Each material may be recycled in a variety of diverse applications. These materials have many of the same chemical and physical properties as the virgin materials they replace; they can even improve the quality of a product. Recycling industrial materials additionally reduces costs associated with disposal and material transportation.

Putting these commodities into productive use saves resources and energy, reduces greenhouse gas emissions, reduces landfilling, and contributes to a sustainable future.

To achieve the green street goals of protecting and preserving green infrastructure and restoring and enhancing water quality, the recommendations below include focus on perviousness, recycled material content, high reflectivity for portland cement concrete (PCC) to prevent heat island effect, materials availability to contractors, and MDSHA specifications.

1. Recycled Asphalt Pavement (RAP) in asphalt pavement. Meet Superpave® N50 or a similar design criterion which allows use of RAP. Superpave® N50 can also be used for pervious pavement/HMA. MDSHA to determine if the criteria for N50 appropriate for porous HMA given the anticipated loading and expected durability.

2. Recycled Concrete Aggregate (RCA) in Road Base. In 2009, MDSHA OMT approved its use of Graded Aggregate Base (GAB) for recycled concrete for widening of Baltimore-Washington Parkway. http://www.concretemonthly.com/monthly/art.php?3570

3. Recycled Asphalt Shingles (RAS) in hot mix asphalt. MDSHA has special provision 904.02 for tabs only. Processor located in Maryland. http://www.epa.gov/osw/conserve/rrr/imr/cdm/pubs/roof_br.pdf

4. Scrap tires in asphalt concrete/sidewalks. MDSHA does not have a specification for tires in asphalt concrete; however its use is addressed in "Superpave," a reference system developed by the Strategic Highway Research Program (SHRP). The use of liquid ground tire rubber can enhance the ability of the porous asphalt concrete to adhere to the aggregate matrix and increases the temperature range under which the pavement can resist rutting and thermal cracking.[1] There are seven scrap tire processors located in Maryland.[2] In addition, recycled tires have also been used in sidewalks (Rubbersidewalks, Inc.). See City of Baltimore for projects (Pratt Street and University Parkway). Maryland Department of Environment also has Scrap Tire Design Guide: http://www.mde.state.md.us/assets/document/Guidance_Manual_For_Scrap_Tires.pdf

5. Scrap tires in embankments/utility backfill. MDSHA is considering and looking for markets and projects, especially for use in embankment. Processors located in Maryland.

6. Recycled plastic lumber in bench slats.

Potential Drawbacks/Pitfalls/Complications involved with these practices:

Though fly ash possesses engineering properties that have allowed its use in many applications (cement, structural fill), its use is not addressed here. The U.S. EPA is currently proposing regulations for management of coal combustion residues (CCRs) in landfills and surface impoundments with options to manage as Special Waste under Subtitle C or Solid Waste under Subtitle D. The impact of the proposed regulations on the continued beneficial use of fly ash and other CCR's is not known at this time.

Use of RAP and RCA in pervious pavements increases void space. Due to this extra void space, the pervious pavement will have reduced strength – Public Roads (Greener Alleys) Vol. 73 No. 6. Design considerations also include reverse crown to ensure positive flow in the event of clogging. Maintenance required in the form of vacuuming, dry sweeping, and pressure washing, recommended twice a year.

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1 See Public Roads May/June 2010; http://www.fhwa.dot.gov/publications/publicroads/10mayjun/index.cfm

2 Anne Arundel County, MD, Maryland Licensed Scrap Tire Processing Facilities; accessed October 2010. http://www.aacounty.org/DPW/WasteManagement/tireFacilities.cfm

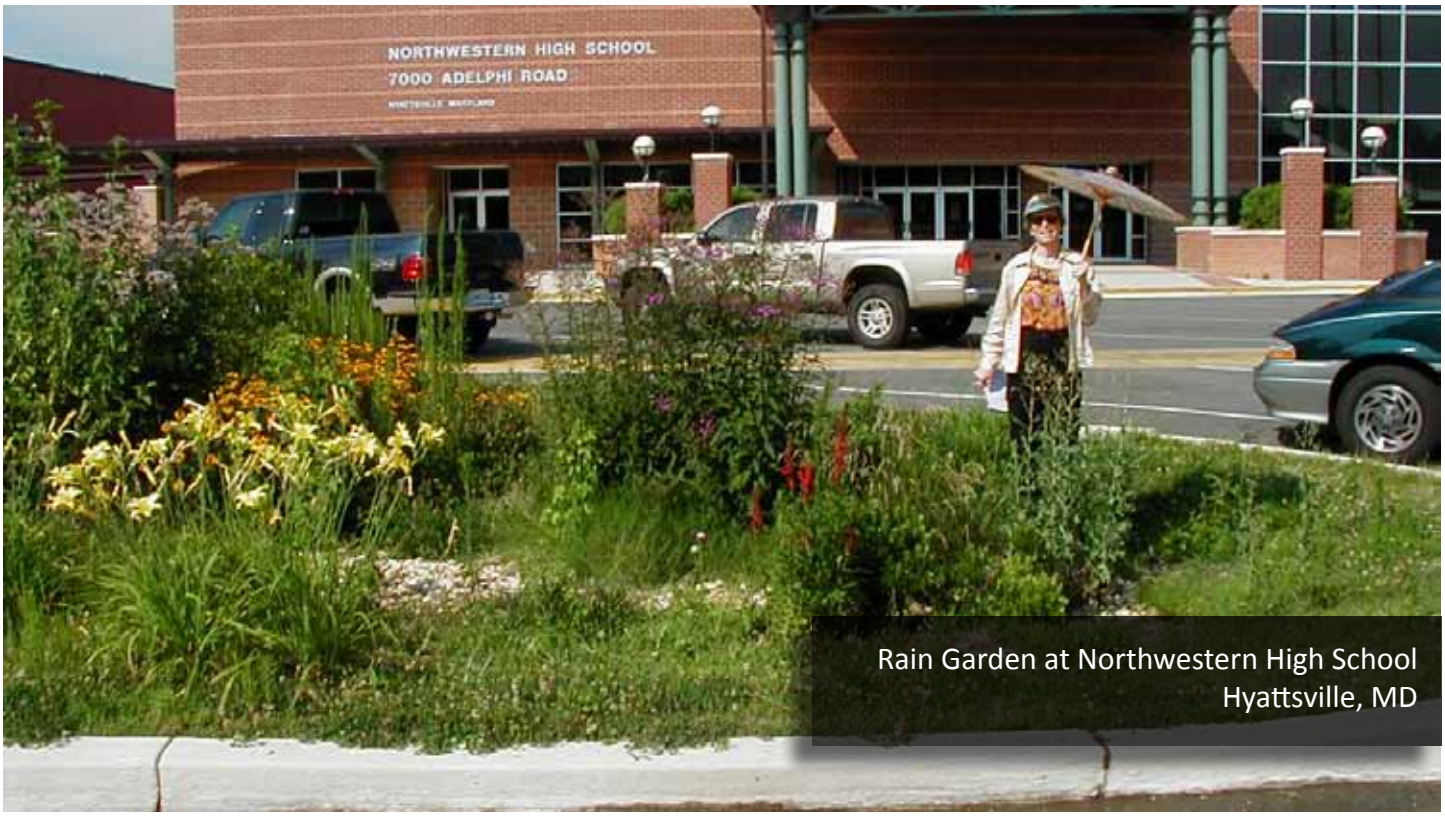
LID Features

Many different LID features can be implemented in retrofitting a standard roadway into a green street. Integrating these individual LID features in a strategic manner along the green street provides a unique way to address the complex problems found in an individual locality. However, it is important to understand the limitations and attributes that each LID feature has so that it can be used effectively. To better understand what a green street really is, first a vocabulary of LID features must be developed. The following LID features will be described below:

- Bioretention Cells
- Bioswales
- Permeable Pavement
- Rain Barrels + Cisterns
- Infiltration Planters
- Green Roofs
- Compost Amended Soils + Vegetation
- Tree Box Filter

Bioretention Cells

Bioretention cells represent the most basic form of LID. Many other LID features are built off of the bioretention model. Infiltration planters, bioswales, and tree boxes are all variants of bioretention cells. Bioretention cells, more commonly known as rain gardens, are depressed vegetated areas that collect, store, infiltrate, and evapotranspire rainwater. They are constructed of special soil mixes that facilitate the storage of water within the soil. In some instances underdrains can be installed to divert excess water to storm drains, but this is only after it has been filtered by the cell itself. The main advantage to rain gardens is that they are versatile, adaptable, and treat water physically, chemically, and biologically, leaving stormwater with reduced pollutant loads. In addition to providing stormwater benefits, rain gardens can be aesthetically pleasing additions to any neighborhood.



Rain Garden at Northwestern High School
Hyattsville, MD

Bioswale along Adelphi Road

Bioswales

Similar to bioretention cells, bioswales differ in that they are used for the conveyance of stormwater instead of collection. Defined as an open, above ground drainage channel with a bioretention base, bioswales have a wide variety of applications from residential lots to roadway construction. Resembling a typical grass swale, the base of a bioswale is constructed of bioretention soil and sometimes a gravel bottom to increase storage. Just as bioretention cells use their storage capacity and vegetation to reduce the volume of water, bioswales use the same methods, but are typically connected to a conventional stormwater system to convey excess stormwater.

Permeable Pavement

Coming in many varieties, all permeable pavements infiltrate stormwater through the pavement and into the ground below. The most typical methods of permeable pavement are open grid and interlocking pavers, porous concrete, and asphalt. While the infiltration rate varies for each method, permeable pavements are noted for their extremely high infiltration rates. With a wide range of applications, permeable pavements are good for walking, biking, and driving. Conventional pavement causes flooding, excessive runoff, and damage to downstream ecosystems. Permeable pavement can be used to mitigate these problems.

Rain Barrels + Cisterns

Coming in two varieties, rain barrels and cisterns, these rainwater collection systems function the same way. Rain barrels and cisterns collect rainwater from a downspout off of a building and store water. The advantage to using these systems is that the water can then be reused for non-potable uses. Rain barrels, typically a residential or small commercial application, collect the water off of the roof of a building and store it for later use, reducing the overall volume of stormwater. Water from rain barrels is typically used for residential landscape irrigation. Rain barrels are cost effective because of the water savings in irrigation.

Cisterns are very similar to rain barrels; however, cisterns are storage tanks that can be above or below grade and can hold up to 10,000 gallons of water. In commercial application, cisterns can be used to run fountains, irrigate landscape, or flush toilets. Water collected in these cisterns can be used for any non-potable water usage, and can reduce energy costs dramatically for commercial and industrial outfits.

Infiltration Planters

Another variant of the bioretention cell, infiltration planters work in urban settings to store, infiltrate, and evapotranspire stormwater. Typically constructed either in line or as a curb extension, these infiltration planters collect stormwater flowing down the curb and use bioretention soil to filter and reduce

stormwater volume. Other types of infiltration planters can be used in plazas and open areas to collect and treat stormwater. Used in conjunction with permeable pavement systems, they can significantly reduce the amount of stormwater runoff in urban situations.

Green Roofs

A green roof, also known as an eco or vegetated roof, is a cover of vegetation on the top of a building. Ranging from small sheds to large big box retail, green roofs have wide application on both urban and rural structures. Green roofs improve water quality by capturing and storing water on the roof of a structure, and letting it filter through the soil, or evapotranspire into the air. Installing a green roof helps to decrease HVAC costs through reduced energy demand and a reduction in the urban heat island effect.

Green roofs are divided into two categories based on the type of application, intensive and extensive. Intensive green roofs are generally reserved for new construction or buildings with the structural capacity to hold deep soil. Typically consisting of approximately 6 inches of soil, intensive green roofs can hold shrubs and small trees. These features, often integrated with a rooftop terrace, also provide an aesthetically pleasing area for residents or workers. Conversely, extensive green roofs are often used in retrofit conditions where load bearing capacity may be low. These systems are also used on sloped or pitched roofs and comprised of 2-6 inches of soil that holds small shrubs and sedums.

Extensive Green Roof

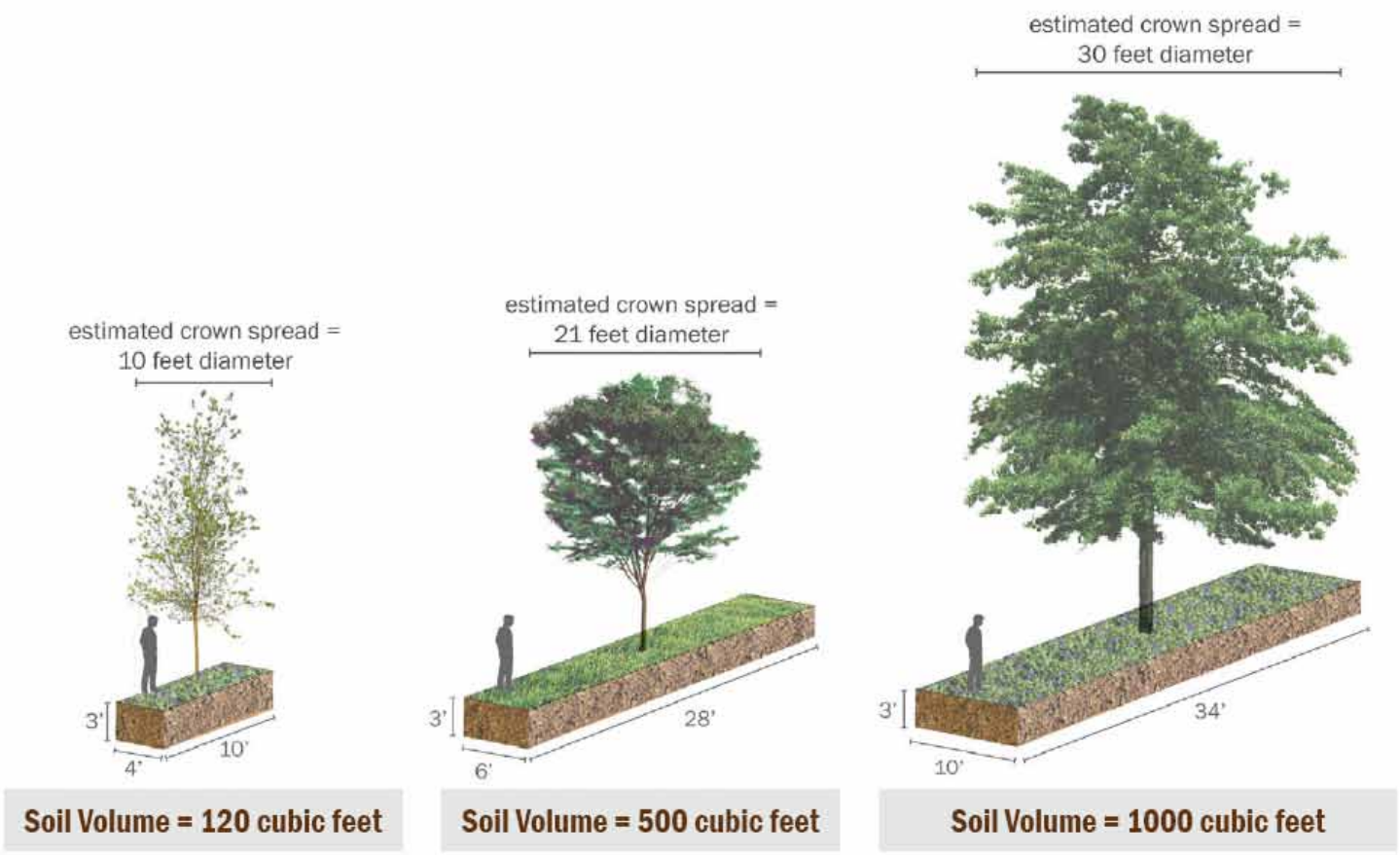
Compost Amended Soils + Vegetation

Urban soils differ greatly from their predevelopment conditions. Leveling, infill, compaction, and pollution produce harsh soil for vegetation. Compost amended soils try to restore the urban soil to its predevelopment condition, increasing infiltration rates and producing a more viable planting medium. When vegetation is added to these soils, it creates a sort of sponge that soaks up and stores stormwater, letting it filter and infiltrate over time. According to Casey Trees (2008), the size and composition of soil areas for street trees dramatically affects canopy size. Having a dense urban canopy decreases the urban heat island effect, better infiltrates and evapotranspires stormwater, and creates an aesthetically pleasing pedestrian street.

Infiltration Planter

Tree Box Filters

Similar to infiltration planters, tree boxes have a higher filtration rate to allow water to more quickly enter conventional stormwater treatment. Tree boxes intercept stormwater before a regular curb inlet and filter the water through a soil mix which then under drains the water into the conventional system. Tree box filters are used to reduce peak stormwater volume and pollutant loads.



Casey Trees study correlating tree crown to tree box size

Anatomy of a Green Street

An overview of the green opportunities that can be found in a green street design on both the public right-of-way and private property is provided by this document. While predominately focusing on LID features, other green opportunities will be discussed where appropriate in the street design. Implementing all of these green features will holistically describe what a green street is.

Public Right-of-Way

The public right-of-way is the space on a street between two building fronts. Typically consisting of a sidewalk, green strip for trees, the street, and sometimes a median, the public right-of-way is the project boundary for integrating LID in Bladensburg. Many of the aforementioned LID features can be found in this space. Using these "street elements," solutions can be provided for individual stormwater problems.

Buildings

The primary LID features for buildings include green roofs and rain barrels and cisterns. In some cases, permeable pavement can be used on intensive green roofs, but the overall system is considered a green roof. Buildings in urban settings can increase the urban heat island effect and displace a large amount of water to conventional systems. Using a green roof will capture stormwater where it falls, and store, filter, and evapotranspire much of the initial rain. For rain events that are larger, rain barrels and cisterns can be incorporated into the system to store the water for irrigation surrounding the building, or for non-potable water uses such as fountains and flushing toilets.

From an energy conservation and efficiency perspective:

- **Commercial and Institutional**: Since 1992, the Energy Star program has offered businesses energy management strategies that help reduce energy use while also reducing bottom line costs. Backed by the U.S. EPA and the U.S. Department of Energy, Energy Star offers technical assistance, tools, and a recognition programs to set goals and reward efforts. Common building energy improvements include upgrading to energy efficient lighting technology and controls, upgrading the efficiency of the facility's HVAC system, and replacing older, leaky windows with newer, more efficient ones.

- **Residential:** Residents may now access their energy usage online through the Energy Star program's Home Energy Yardstick. After entering some basic information about the home, this easy-to-use tool will make recommendations for energy-saving home improvements. Common improvements include sealing air leaks, adding insulation, purchasing Energy Star-rated appliances and equipment, and swapping standard incandescent light bulbs for CFLs.

Sidewalks

Sidewalks can use permeable pavement, infiltration planters, tree boxes, and compost amended soils and vegetation. Permeable pavement can be used to replace existing concrete or brick pavement, while infiltration planters and tree box filters can replace conventional tree boxes to provide for larger, denser street tree canopies. The compost amended soil can be used in the tree boxes and infiltration planters to further increase their storage and filtering capacity.

From an energy conservation and efficiency perspective:

Street Lighting: light-emitting diode (LED) fixtures.

Two of the most common, inefficient types of street lighting are high-pressure sodium (HPS) lamps and metal halide lamps. While the initial cost of one of these older-model street lamps is less than an LED fixture, the lifetime energy and maintenance cost


Green Street Elements
Street Trees with Dense Spacing
Bike Racks
Public Space
Permeable Pavers
Tree Box with amended soils

savings of an LED lamp far outweigh their upfront cost. LED lamps consume half the electricity, last up to five times longer, and produce more light than older technologies. They contain no mercury and far fewer toxins than traditional street lights. In addition to street lighting, energy efficiency upgrades should be considered for parking lot and driveway lights, as well as any other light fixtures found along the streetscape – whether municipal-owned, commercially-owned, or residential lighting that transitions into the streetscape.

Street Trees: Increase and enhance the street tree canopy.

Increased street tree planting efforts and a careful consideration for tree positioning can help decrease energy use and reduce the urban heat island effect. Street tree canopy improvements can also help sequester greenhouse gases, which lead to global climate change. Planting trees so they shade buildings and the streetscape at appropriate times of day is important.

Industrial materials recycling perspective

Scrap tires in asphalt concrete/sidewalks. While MDSHA does not have a specification for tires in asphalt concrete, its use is addressed in Superpave®. Liquid ground tire rubber can enhance the ability of the porous asphalt concrete to adhere to the aggregate matrix and increases the temperature range under which the pavement can resist rutting and thermal cracking. (See Public Roads May/June 2010). There are seven scrap tire processors located in Maryland. In addition, recycled tires have been used in sidewalks (Rubbersidewalks, Inc.). The City of Baltimore's Pratt Street and University Parkway scrap tire design projects are good examples. Also view the Maryland Department of Environment Scrap Tire Design Guide:
http://www.mde.state.md.us/assets/document/Guidance_Manual_For_Scrap_Tires.pdf

Curb and Gutter

Curb and gutter is a conventional way of directing stormwater to stormwater inlets. In some instances, such as residential streets, it is possible to remove these systems altogether and replace them with bioswales and bioretention cells. In urban settings, however, this is not possible. Urban solutions include infiltration planters and tree box filters. The curb and gutter can be retrofitted to redirect stormwater to these LID features in order to store and filter rainwater before it enters the storm drain.

Parking Lanes

Although parking lanes, bike lanes, and travel lanes may seem similar, the average amounts of travel on these lanes differ and present themselves for different techniques. Parking lanes are typically traveled at low speeds and infrequently. This low usage allows for parking lanes to be candidates for interlocking pavers, permeable concrete, and permeable asphalt.

Bike Lanes

Bike lanes are similar to parking lanes in their usage, but because of bike tires, a smooth continuous surface is preferable for biker safety. Permeable concrete and asphalt are preferred LID techniques for bike lanes. Other methods of bike lanes for off-road purposes may consist of stamped soil with a stabilization compound to harden the soil.

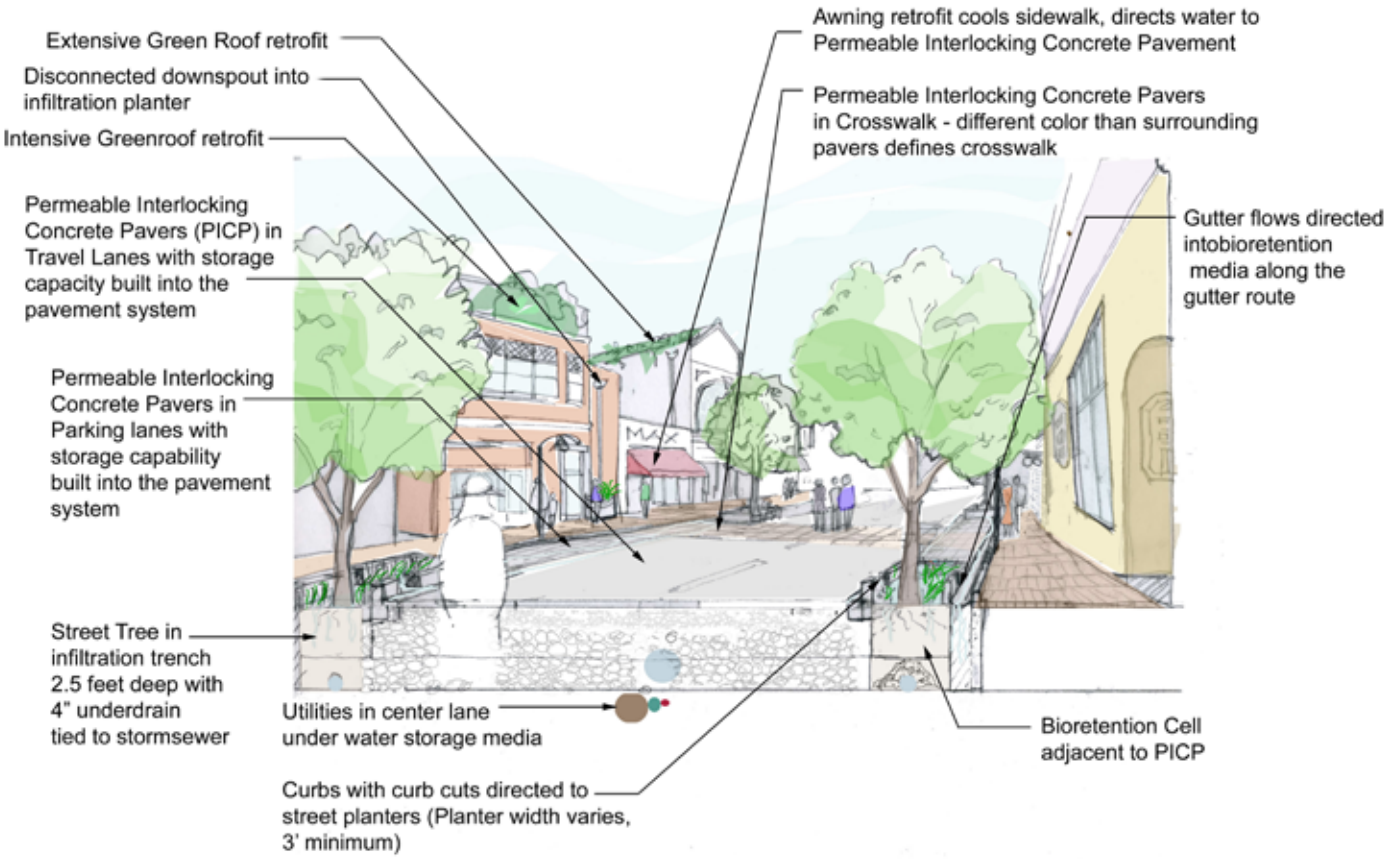
Travel Lanes

Travel lanes are the most highly impacted surfaces on the road. Depending on the size of the road, residential street versus freeway, there are different pavement techniques that can be used. For residential streets and main streets, all three types of pavement can be used. Due to low traffic volumes and slower speeds, these streets are more accepting to interlocking pavers. As the speed and volume of traffic increases, permeable concrete and asphalt pavement become the preferred method.

Industrial materials recycling perspective

Recycled Asphalt Pavement (RAP) in asphalt pavement. RAP has been incorporated into pavements for many years, with much success. Design criteria for Superpave® N50 or similar can be followed for the use of RAP. Superpave® N50 can also be used

Decentralized Stormwater Controls in Urban Retrofit Streetscape



for pervious pavement/hot mix asphalt (HMA). The appropriateness of the criteria for Superpave® N50 for porous HMA is determined by MDSHA, based on the anticipated loading and expected durability.

Recycled Concrete Aggregate (RCA) in Road Base. In 2009, the use of Graded Aggregate Base (GAB) for recycled concrete was approved by MDSHA OMT for the widening of the Baltimore-Washington Parkway. http://www.concretemonthly.com/monthly/art.php?3570

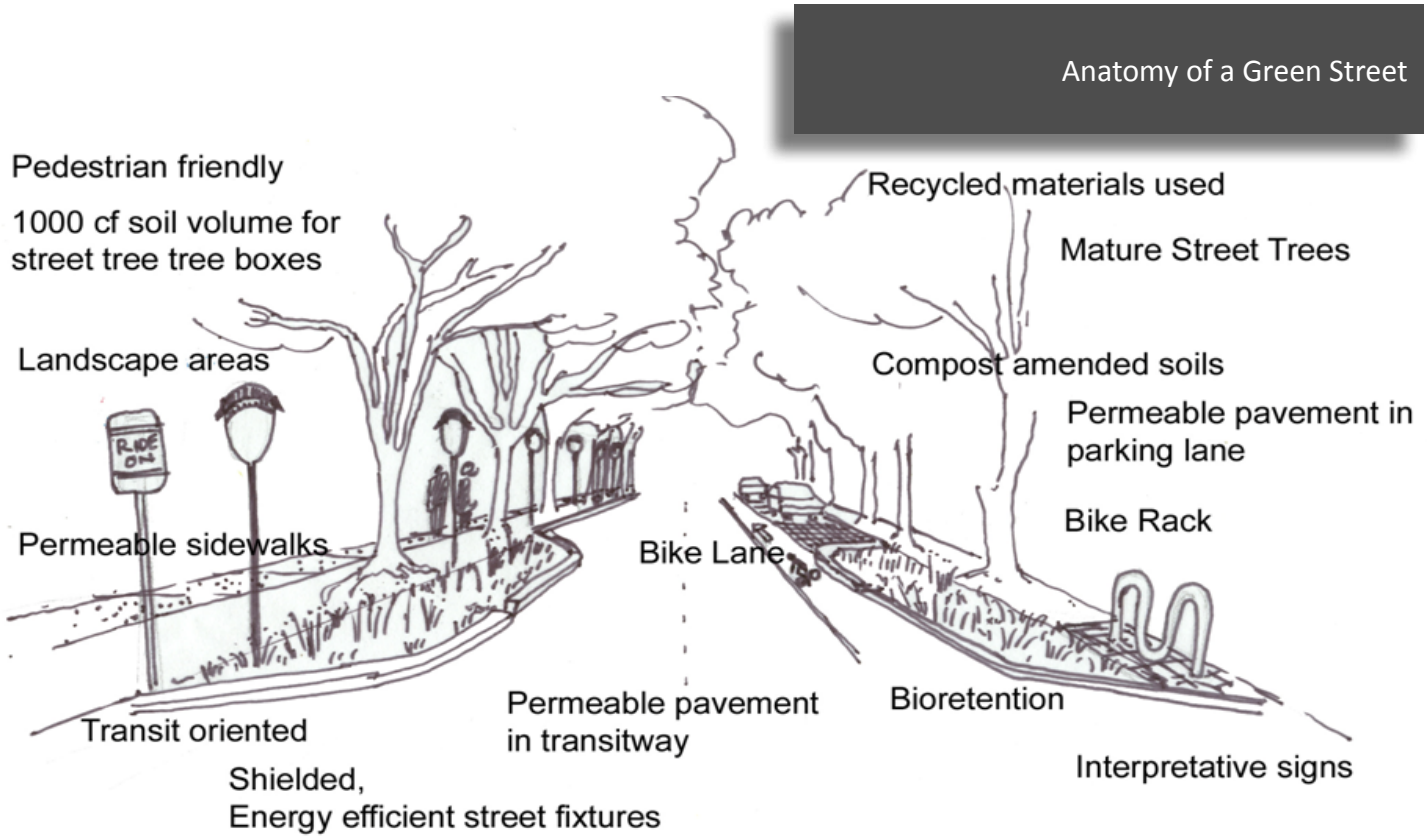
Recycled Asphalt Shingles (RAS) in hot mix asphalt. MDSHA has special provision 904.02 for tabs only. Processor located in Maryland. http://www.epa.gov/osw/conserve/rrr/imr/cdm/pubs/roof_br.pdf

Medians

The median of a highway or boulevard can be the perfect location to handle stormwater in areas where permeable pavement is not an option. Bioretention cells and bioswales can be used to direct and store water along highways where the land is otherwise vacant. Permeable pavements, infiltration planters, and tree box filters can be used where pedestrian crossings extend through medians or where emergency turnarounds are needed. Medians provide the best location for bioretention along highways and parkways.

Private Property

Although our project boundary ends where private property begins, we can provide helpful solutions for rainwater on your property. Many of the same features that are used above can be adapted for home use.



In the Home + At Work

LID in the home and at work are the responsibility of the homeowners and businessmen of Bladensburg. Implementing these technologies can reduce energy costs, reduce potable water usage, and reduce the strain on the public stormwater infrastructure, delaying the need for expensive repairs. Implementing LID in the home and at work adds to the effectiveness of a green street.

Patios + Walkways

As with the sidewalk and paved lanes in the public realm, private patios and walkways can benefit from the addition of permeable pavement. Implementing a permeable patio decreases the amount of impervious surface and will help prevent localized flooding and erosion. The cost associated with permeable pavement options varies widely, but the associated environmental benefits put it ahead of conventional pavement options.

Driveways + Parking Lots

Driveways, like patios and walkways, can be paved with permeable pavement. With driveways, all three permeable options should be considered. Depending on frequency of use and vehicle size, as well as angle and slope of the driveway or parking lot, porous concrete or porous asphalt may be a better option. For parking lots, infiltration planters and bioswales should be considered if replacing pavement is not possible. These methods of LID can work to mitigate the runoff coming from a parking lot or driveway. In some instances, a combination of conventional pavement and permeable pavement can be considered, much like the combination used on roads and bike lanes. The use of infiltration planters and bioretention cells or bioswales in conjunction with permeable pavement will further mitigate runoff volumes.

Roofs

Whether installed on a residential or commercial property, green roofs have the ability to dramatically affect both energy costs and aesthetics. The vegetative cover produced by a green roof better reflects solar energy, causing less heat to be transferred into the structure. The layer of vegetation and soil also acts as insulation, keeping heat in the building during the cold months. These two factors directly relate to a reduced cost for HVAC.

For residential buildings, a green roof with integrated rain barrels will help reduce stormwater volume, HVAC costs, and provide a more sustainable watering system for landscaping. Although landscaping irrigation is the most common use for this water, it can also be used to flush toilets and run small fountains.

Commercial structures using a green roof and cistern system can also benefit from reduced stormwater volume, HVAC costs, and a sustainable watering system for irrigation. The use of a cistern on a commercial site also allows for the use of that water in toilets and running outdoor fountains without using potable water.

Aesthetically, both residential and commercial green roofs can add to a garden's charm or a business' storefront. In some instances, where structurally feasible, commercial institutions can provide outdoor space above their building for private or public use. Residents can also enjoy an outdoor green roof as a small patio or garden to grow herbs and vegetables.

Inside

Inside the home, the benefits of LID can be seen as well. From reduced HVAC costs due to green roof installation or the incorporation of rainwater in your home to flush toilets, LID can dramatically impact energy costs. Using rainwater from a rain barrel to irrigate a garden is another great way of saving money both at the tap and at the store.

Landscaping

By harvesting rainwater from your roof and impervious structures, landscaping in a sustainable way can help free up hours spent doing yard work. Reducing the amount of grassed lawn on your property and installing a dense native landscape will reduce mowing time and watering. In instances where watering is a must, such as the maintenance of a vegetable garden or herb garden, the rain harvested from your roof can help keep your energy bill down while out in the yard.

Maryland State Highway Administration's Role:

MDSHA is responsible for maintenance of Route 450/Bladensburg Road

The Maryland State Highway Administration (MDSHA) has a strategy of "Thinking Beyond the Pavement" (MDOT, 2002), that aligns transportation strategies with land use strategies by placing emphasis on people, neighborhoods, and businesses that must be served by the transportation network as well as emphasis on the environmentally sensitive areas of the state that must be protected. The aim is to make our existing communities functional and vibrant places to work and live, take advantage of the road and transit systems that already exist, and offer our citizens a balanced transportation system: one that fits with communities, is oriented to all users, and where walking, bicycling, and transit are realistic options. The following is a list of the major programs that MDSHA uses to support community redevelopment:

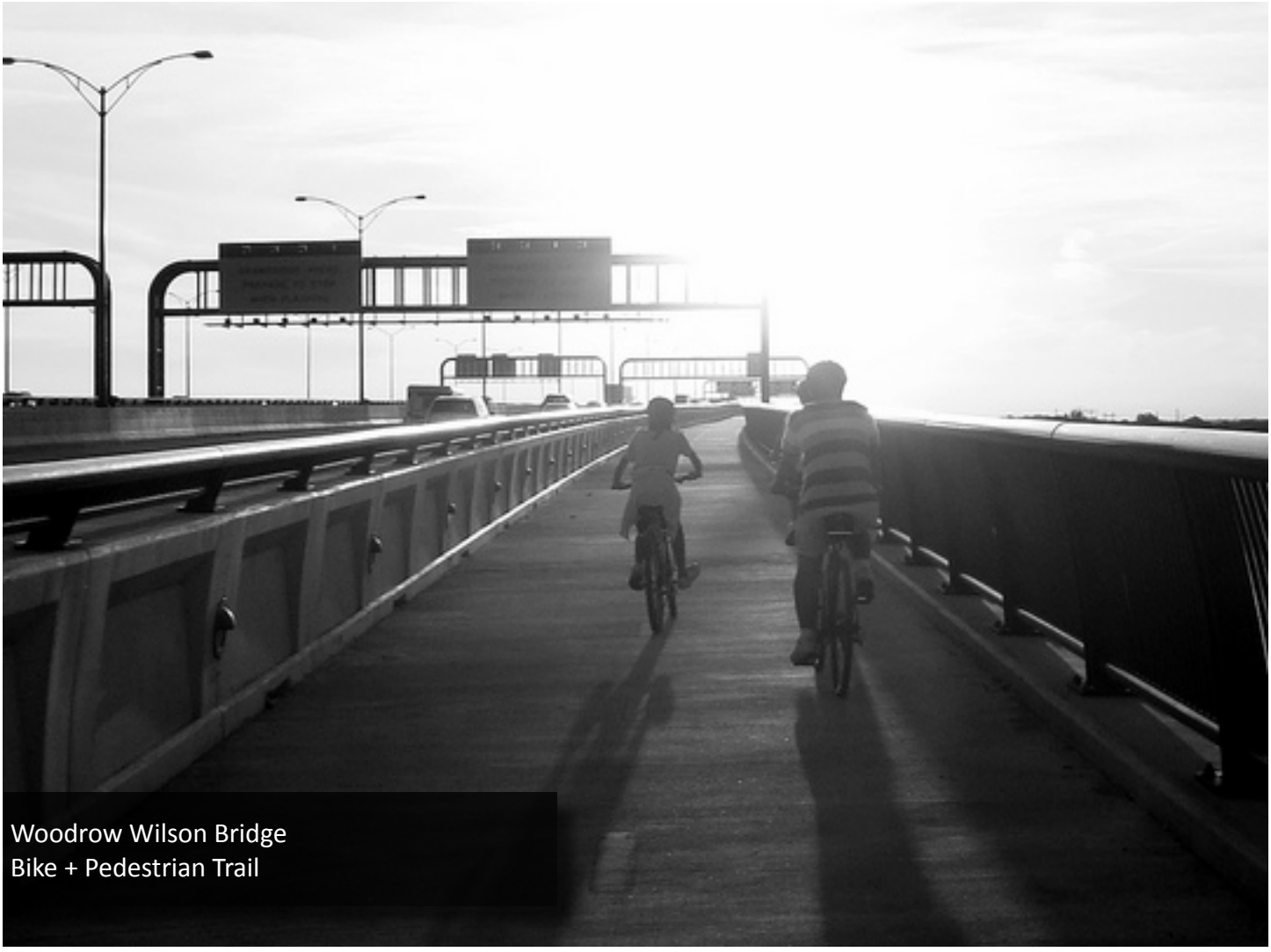
- **Neighborhood Conservation and Urban Reconstruction.** Transportation improvements that support economic revitalization through enhancement of the existing transportation network.
- **Sidewalk Retrofit Program.** Repair or construct new sidewalks along state highways in partner ship with the local community.
- **Retrofit Bicycle Program**. On-road spot improvements and accessibility for cyclists.
- **National Recreational Trails Programs.** Provide funding for all types of trails including pedestrian, bicycling, equestrian, and in-line skating that tie into the highway system.
- **Partnership Planting Program.** Construction of landscaping improvements along the right-of-way that are maintained by the community and local partners.
- **Access Management Program.** Coordination of access to state highways for local development and redevelopment activities.
- **Sound Barrier Program**. Construction of improvements to communities that predate the highway system where eligibility criteria are met.
- **Transportation Enhancement Program.** Participation in non-traditional transportation projects such as bike paths, beautification, and preservation of historic structures through partnerships and a 50 percent cost match.

An accordance with its mission, MDSHA constructs and maintains its drainage systems and stormwater systems within the state road rights-of-way. The Maryland Department of the Environment (MDE) issues a National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit to MDSHA that guides the management of stormwater within the right-of-way and MDSHA facilities. This includes roads as well as other institutional areas such as vehicle and equipment maintenance yards. Activities associated with the NPDES permit include:

- Inventory and inspection of its Stormwater Management Facilities (SWMF)
- Remediation of these SWMFs
- Monitoring of illicit discharges connected to its storm drains
- Verification of impervious surface accounting
- Total Maximum Daily Load (TMDL) compliance
- Enhancement of existing stormwater management facilities
- Conducting research associated with highway runoff
- Coordination with local governments on their road drainage systems
- Training and outreach activities that help reduce pollution
    - Training of MDSHA employees in various offices
    - Participation at MDSHA sponsored events such as Earth Day
    - Participation in groups such as the Green Highways Partnership

References

Maryland Department of Transportation (MDOT), 2002. When Main Street is a State Highway. MDSHA, Baltimore.



Woodrow Wilson Bridge
Bike + Pedestrian Trail

Coupling Green Infrastructure and Performance-Based Financing

The following section briefly describes a proposed initiative targeting local green infrastructure financing capacity. For more information, please contact:

Dan Nees, Director
Chesapeake Fund Program
Forest Trends
(202)368-6054

Jeremy Sokulsky, President
Environmental Incentives
(530)541-2980

Introduction

Local communities often lack the capacity and resources necessary for financing and implementing comprehensive green infrastructure projects and programs. Therefore, there is a need for establishing a new initiative to increase the capacity of local leaders, specifically targeting green infrastructure financing needs and the implementation of performance and incentive-based financing tools.

Background

Federal, state, and local stormwater regulations and policies are becoming more stringent and, in some cases, very complex. The strengthening of federal stormwater rules, Total Maximum Daily Loads (TMDLs), and Municipal Separate Storm Sewer System (MS4) permitting programs will almost certainly add to this complexity. In addition, local stormwater requirements are often influenced by broader regional watershed needs and concerns. The result is a complex policy and financial environment that community leaders must navigate through.

In spite of, or perhaps because of these complex new rules and requirements, communities are increasingly looking to Green Infrastructure (GI) and natural systems to manage stormwater and wet weather conditions. Though the value of these natural mitigation systems is clear, the short-term and upfront costs associated with retrofitting existing urban infrastructure can be a significant deterrent to GI adoption at the local level. As a result, community leaders are looking for innovative financing systems as part of comprehensive implementation strategies.

Performance and incentive-based financing systems provide local communities with unique opportunities to realize the full value that green infrastructure and natural stormwater management systems offer. When designed and implemented effectively, performance-based financing systems can accelerate conservation, innovation, and investment by creating and unlocking opportunities to improve the environment and develop the ecosystem services that green infrastructure offers. In addition, these systems can inspire the energy and creativity of entrepreneurs and the financial power of investors to assist in quickly and effectively addressing community environmental financing challenges.

Increasing capacity at the local level

Over the past ten years, significant attention has been given to addressing the funding and financing gap associated with urban wet weather management. Much of the focus has been on establishing dedicated funding programs. The next step is to establish financing systems that will enable community leaders to generate the greatest return on the investment of limited financial resources these enterprise programs provide. We are recommending the establishment of a new federal initiative to increase the capacity of local communities to design and implement performance-based financing systems. Specifically, this initiative will:

- Provide community leaders with access to state-of-the-art financing tools, green infrastructure technologies, and technical assistance necessary for efficiently and effectively addressing stormwater needs and requirements;

- Help community leaders couple performance-based financing systems with other financing and investment opportunities that GI projects offer; and,

- Serve as a demonstration of how intensive, locally led capacity development can increase the adoption of sustainable green infrastructure and financing systems. The result will be a national model for effectively engaging communities and financing local stormwater requirements and needs.

For more information, please contact the Chesapeake Fund:

Chesapeake Fund
1050 Potomac Street NW
Washington, DC 20007
(202) 298-3000
http://www.chesapeakefund.org

Bladensburg Charrette

The Bladensburg charrette took place on October 25, 2010 and initiated the first project in the Green Street-Green Jobs Initiative. The presentations at the charrette in conjunction with over 30 stakeholders, officals, and agency representatives helped facilitate the group breakout sessions. The groups were divided into five categories: renewable energy, green infrastructure/LID, industrial material recycling, green jobs, and financing. A full list of presenters and their topics can be found in the appendix.

The 5 breakout groups focused on ways that their topic could promote Bladensburg's green vision and how that relates to the Green Street-Green Job Initiative. The summaries listed below point out the major recommendations from each of the 5 groups. Additional notes from the charrette groups can be found in Appendix B.

Breakout Group Summaries

Renewable Energy

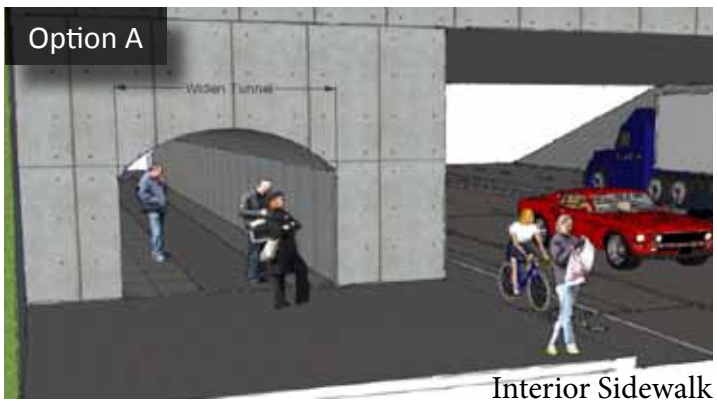
- Retrofit streetlights to LED to reduce energy use, maintenance costs, and light pollution. Next steps include identifying a suitable LED replacement for existing streetlights and a funding mechanism for retrofits.
- Investigate the options of installed solar panel systems on municipal buildings to supplement traditional electricity demand and reduce energy costs.
- Increase tree coverage by strategically placing trees around buildings and streets in order to reduce energy use and mitigate urban heat islands.
- Transform the existing city hall into a new, green city hall
- Invest in alternative transportation (bus, bike, and walking) by developing bike-friendly roadways; providing new trail, bike, and pedestrian connections to major community facilities; and building attractive, durable, all-weather solar transit shelters .
- Reduce the volume of urban runoff pumped/ treated during storm events in order to reduce pumping costs.

Financing

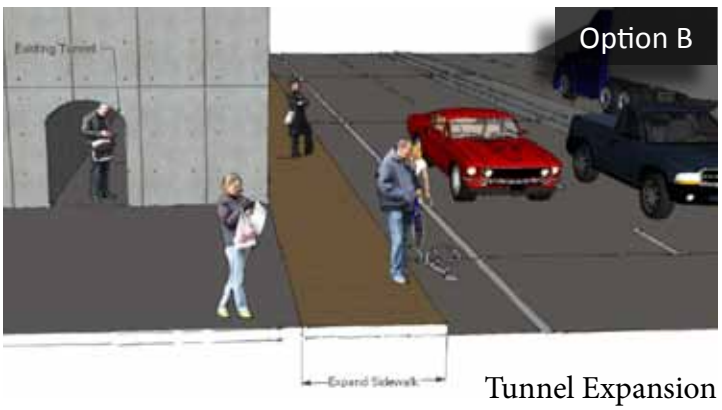
- Develop strong, clear goals for each of the four categories (renewable energy, green infrastructure/LID, recycling, and green jobs) to achieve financing goals.
- Analyze savings and costs, and determine the community's existing and needed capacity for project funding
- Evaluate relevant funding opportunities

Green Jobs

- Evaluate the potential for "green collar" jobs in Bladensburg and their economic impact. Evaluate regional opportunities and enact policies and tools such as local bid incentives to drive investment into targeted activity and to increase demand for local green collar workers.
- Build job-training partnerships with local community colleges and to identify and meet

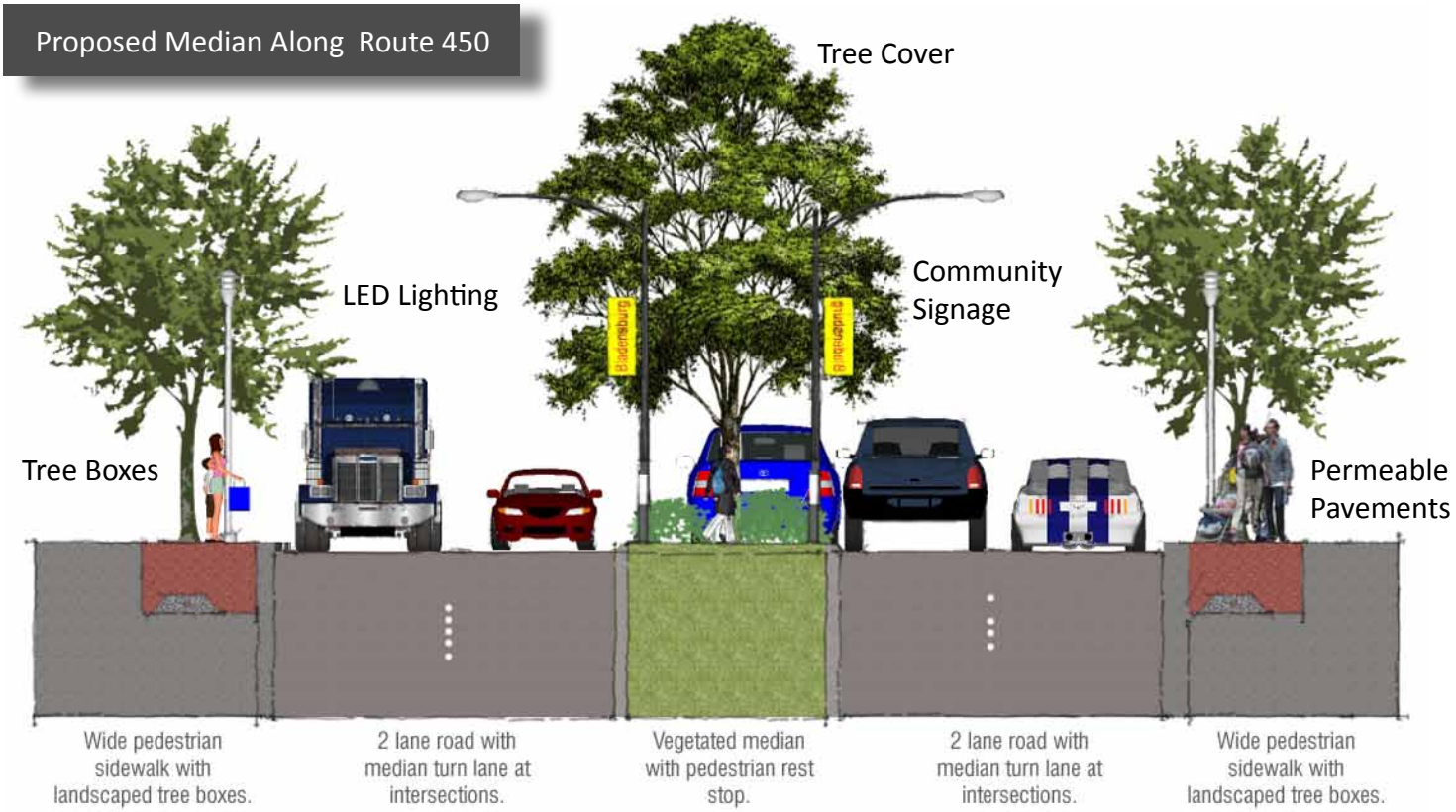


Interior Sidewalk



Tunnel Expansion

Proposed Median Along Route 450



workforce training needs.
- Prepare the workforce through apprenticeship opportunities, local community college programs, school job placement programs, and community work force agreements.

Industrial Material Recycling

- Encourage the reuse or recycling of byproduct materials generated from industrial processes
- Utilize local suppliers for industrial material recycling

Wayfinding Tools

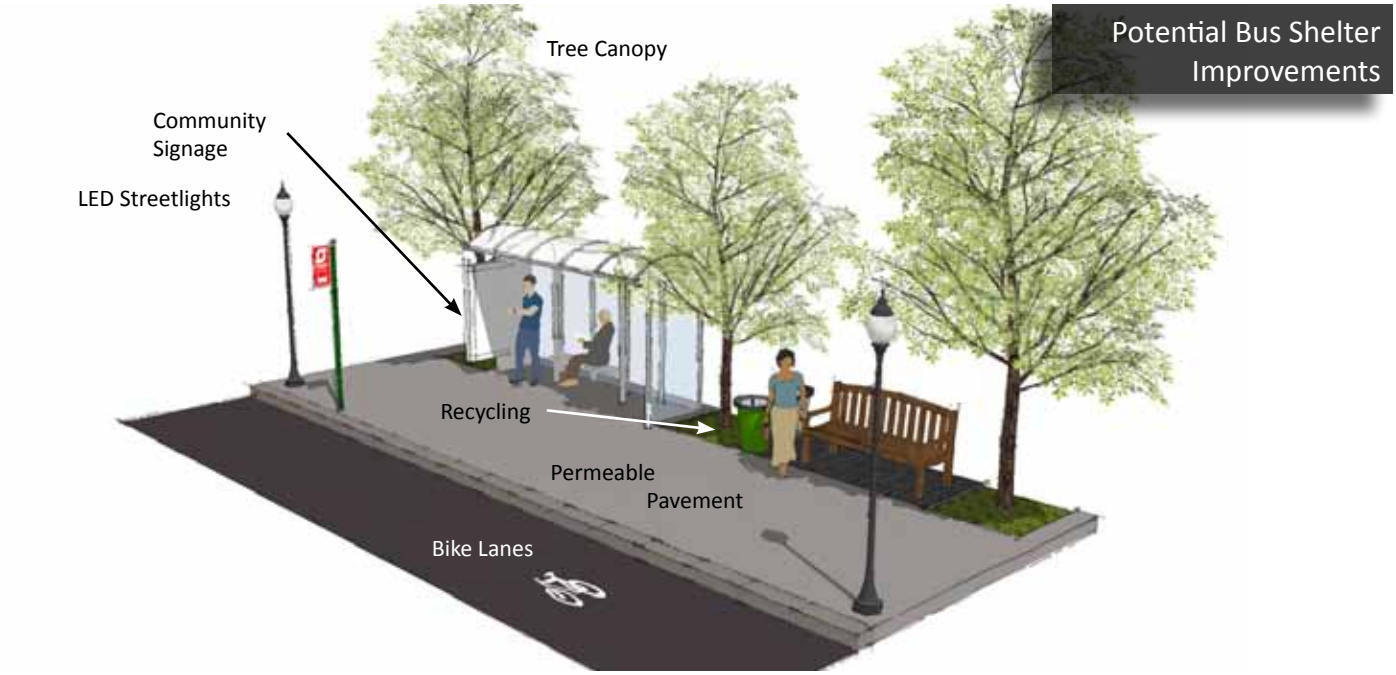
- Use local stormwater in industrial processes such as concrete manufacturing, etc.
- Develop town-wide recycling program that includes the salvage and sale of used or reclaimed building supplies and a tool exchange program.

Green Infrastructure/LID

- Build greener, safer transportations systems by developing safer sidewalks and intersections, reducing the number of turns on/off MD 450, enhancing public transportation systems, and creating access trails from the elementary school to the Bladensburg Waterfront Park.
- Maintain current transit shelters.
- Enhance public transportation shelters.
- Minimize the number of parking spaces and provide for shared parking solutions that will reduce the area of impervious surfaces.

Site Inventory and Analysis

On October 26, 2010, the project team visited Bladensburg to investigate further the findings of the charrette. The site visit study area included the corridor between the train tracks to just beyond



Bladensburg Elementary School. The visit confirmed many of the findings from the charrette, including improving sidewalk and crosswalk conditions, improvement to bus shelters, and finding ways to implement green opportunities into existing parking lots. During the site visit, several other opportunities were examined as well. Widening the pedestrian tunnel under 201, restriping parking lots, and reconfiguring how 450 and 201 interchange were some of the topics discussed during the site visit.

Green Street Master Plan Recommendations

The combined findings from the research, charrette and site visit were combined to create a green vision that promotes local labor and the use of sustainable materials for Bladensburg Green Streets Corridor. The proposals for Bladensburg are focused around developing a green initiative and involving local labor and sustainable materials. Following the combined proposals is a map of the improvement areas and proposed connections.

Enhance 450's pedestrian and mass-transit to increase safety

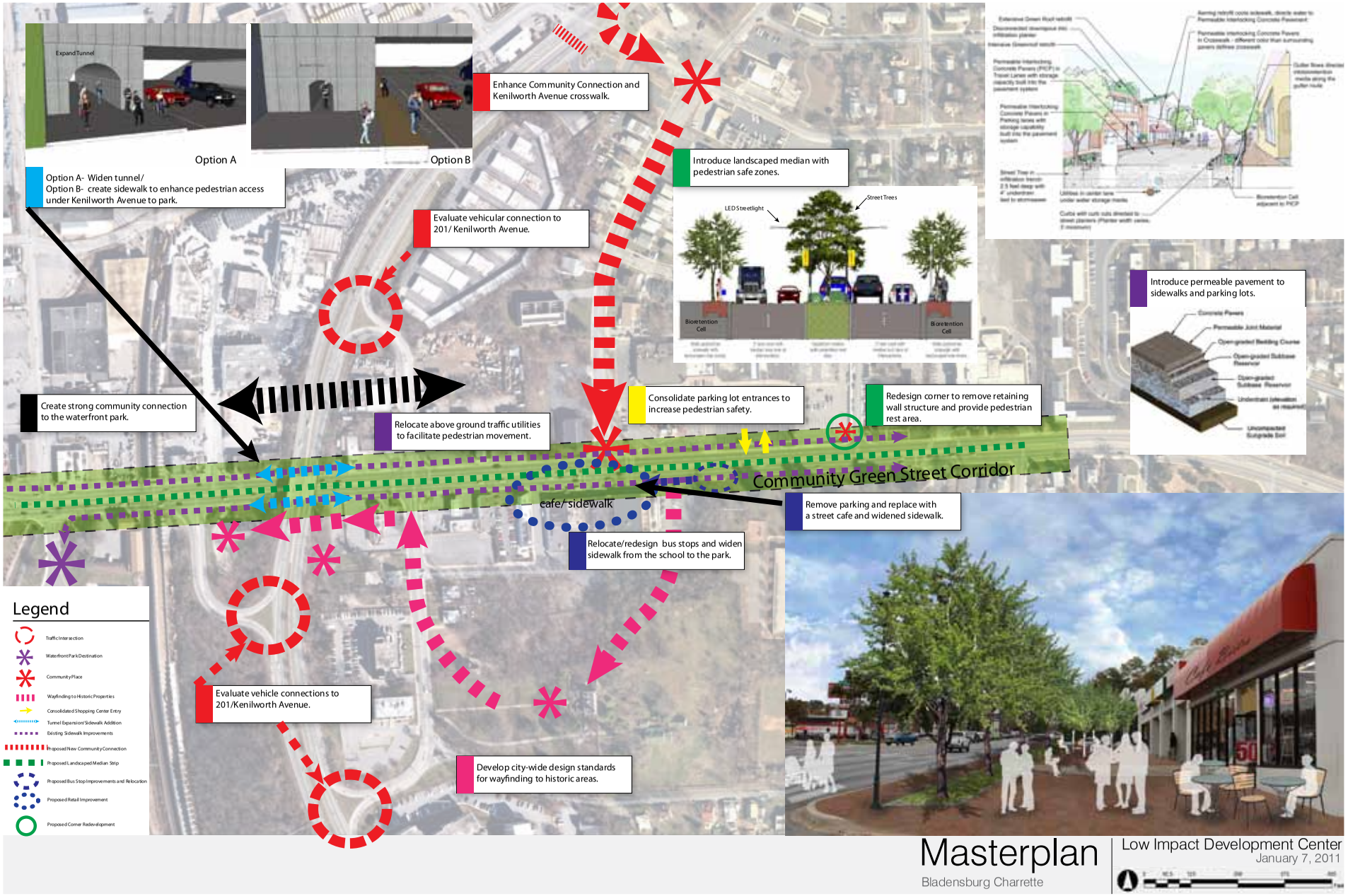
- **Replace street lights with new LED lamps**
- **Reduce number of intersections**
  - Combine commercial entrances
  - Introduce a median down 450 with bike lane
- **Develop safe pedestrian connectivity**
  - Improve/widen sidewalks
  - Re-strip crosswalks and parking lots
  - Widen 201 tunnel/introduce new sidewalk/bike lane
  - Develop a safe trail between Bladensburg Elementary School and the Waterfront Park
- **Move bus stop locations to better serve the community**
- **Use green principles in road and pedestrian improvements**
  - Permeable pavement
  - Street trees
  - LID
  - Investigate solar and wind opportunities
  - Implement a recycling program

Use local green jobs and materials

- **Local bid incentive**
  - Utilize local suppliers in bid
- **Employ local residents and youth**
- **Create apprenticeship/credit-earning opportunities with local community colleges**

Existing Parking and Sidewalk

Street Cafe Proposed to Replace Parking



Masterplan

Bladensburg Charrette

Low Impact Development Center

January 7, 2011

Glossary of Terms

A

Aquifer: An underground bed or layer of earth, gravel, or porous stone that is saturated and sufficiently permeable to yield water to wells or springs. Typically used or could be used as a source of water, for drinking or other purposes.

B

Bioretention: Also known as a rain garden. On-lot retention of stormwater through the use of vegetated depressions engineered to collect, store , and infiltrate runoff.

BMP: Best Management Practice; a practice or combination of practices that are the most effective and practicable (including technological, economic, and institutional considerations) means of controlling point or nonpoint source pollutants at levels compatible with environmental quality goals.

C

Curb: Concrete barriers on the edges of streets used to direct stormwater runoff to an inlet or storm drain and to protect lawns and sidewalks from vehicles.

E

EPA: Environmental Protection Agency.

Erosion: The process of soil detachment and movement by the forces of water.

Evapotranspiration: The term used to describe the combination of evaporation from soil and plants and the transpiration of water vapor from plants into the atmosphere.

G

Green Infrastructure: *An adaptable term used to describe an array of products, technologies and practices that use natural systems - or engineered systems that mimic natural processes - to balance overall environmental quality and provide utility services. As a general principal, green infrastructure techniques use soils and vegetation to infiltrate, evapotraspirate and/or recycle stormwater runoff. When used as components of a stormwater management system, green infrastructure practices such as green roofs, porous pavement, rain gardens, and vegetated swales can produce a variety of environmental benefits. In addition to effectively retaining and infiltrating rainfall, these technologies can simultaneously help filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits.* (U.S. EPA green infrastructure Website, Glossary of Commonly Used Terms, Accessed: October 4, 2010)
(See low impact development.)

Groundwater: Water stored underground in the pore spaces between soil particles and rock fractures.

H

Habitat: An area that supports plant or animal life.

Hydrology: The science dealing with the water of the earth, its distribution on the surface and underground, and the cycle involving evaporation, precipitation, flow to the seas, etc.

I

Impervious Surface: A hard surface area (e.g., parking lot or rooftop) that prevents or retards the entry of water into the soil, thus causing water to run off the surface in greater quantities and at an increased rate of flow.

L

Low Impact Development (LID): The integration of site ecological and environmental goals and requirements into all phases of urban planning and

design from the individual residential lot level to the entire watershed. Examples of LID techniques are permeable pavement, rain gardens/bioretention, rain barrels and cisterns, and green roofs. (See green infrastructure.)

P

Permeable: Soil or other material that allows the infiltration or passage of water or other liquids.

R

Rain Barrels: Barrels designed to collect and store rooftop runoff.

Rain Garden: Synonymous with bioretention, this term is typically used for general audience discussions when referring to a small garden sited close to the source of runoff.
(See bioretention)

Runoff: Water from rain, melted snow, or irrigation that flow over the land surface.

S

Stormwater: Precipitation such as rain or snowmelt that flows across a surface rather than evaporating or seeping into the ground.

Swale: An open drainage channel designed to detain or infiltrate stormwater runoff.

U

Underdrain: A perforated pipe, typically 4-6" in diameter, placed longitudinally at the invert of a bioretention facility for the purpose of achieving a desired discharge rate.

Urban Heat Island Effect: *The term "heat island" describes built up areas that are hotter than nearby rural areas. The annual mean air temperature of a city with 1 million people or more can be 1.8–5.4°F (1–3°C) warmer than its surroundings. In the evening, the difference can be as high as 22°F (12°C). Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality.* (U.S. EPA Heat Island Effect Website, Accessed: October 4, 2010)

W

Watershed: The topographic boundary within which water drains into a particular river, stream, wetland, or body of water.

Suggested Resources

Case Studies

Stormwater Case Studies
http://cfpub.epa.gov/npdes/str/casestudies.cfm

Chicago Green Alley Handbook
http://www.cityofchicago.org/content/dam/city/depts/cdot/Green_Alley_Handbook_2010.pdf

Websites

U.S. EPA Green Infrastructure
http://cfpub.epa.gov/npdes/home.cfm?program_id=298

National Menu of Stormwater Best Management Practices
http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

The Low Impact Development Center, Inc.
http://www.lowimpactdevelopment.org

U.S. EPA Heat Island Effect
http://www.epa.gov/heatisld/index.htm

Casey Trees Tree Space Design Guide
http://www.caseytrees.org/planning/design-resources/for-designers/tree-space/index.php

National Asphalt Pavement Association
http://www.hotmix.org

Interlocking Concrete Pavement Institute
http://www.icpi.org

Pervious Concrete
http://www.perviouspavement.org

Green Highways Partnership
http://www.greenhighwayspartnership.org

Appendix A

Photo Credits

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23	The Low Impact Development Center, Inc. Tree Space Design Guide, Casey Trees
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Appendix B

The following is a brief overview of the speakers at the Bladensburg charrette, listed in order of appearance. Also provided is a list of all charrette attendees, organized by breakout group.

Speakers

---Morning---

Mayor Walter Lee James Jr.
Welcomed everyone to charrette and initiated group introductions. Introduced Mayor Adam Ortiz.

Mayor Adam Ortiz
Discussed greet street process in Edmonston, MD and promoted the charrette and the Green Street-Green Jobs Initiative. Video tour of Decatur Street did not play. Introduced Dominique Lueckenhoff, U.S. EPA, Region 3.

Dominique Lueckenhoff, U.S. EPA, Region 3
Introduced the Green Streets-Green Jobs Initiative and discussed the order of ceremonies. Gave history of the GSGJ Initiative and congratulated Bladensburg on being the first official project of the initiative. Introduced Shawn M. Garvin, Regional Administrator, U.S. EPA Region 3.

The Honorable Shawn M. Garvin, Regional Administrator, U.S. EPA Region 3
Endorsed the Green Streets-Green Jobs Initiative. Introduced John Moss, Town Administrator.

John Moss, Town Administrator
Gave brief history of Bladensburg.
James Foster, President Anacostia Watershed Society
Endorsed the Green Street-Green Job Initiative.

Tom Liptan, Bureau of Environmental Services, City of Portland, OR
Keynote speaker, presented "City of Portland's Green Street Program-Secrets to Success".

Neil Weinstein, LID Center
Gave a background on the Decatur Street green street. Presented possible scenarios for the Bladensburg Green Street and, introduced briefing booklet. LID group leader.

---Break---

Intern/The Honorable Donna F. Edwards, 4th Congressional District, U.S. House of Representatives
Endorsed and fully supported Green Streets-Green Jobs Initiative.

Laura Bachle, U.S. EPA HQ, Facilitator
Introduced the expert panel of speakers for Environmental Components to the charrette.

Joanne Throwe, Director, Center for Smart Growth, University of Maryland
Presented on Sustainable Maryland-Helping Communities Invest for a more Livable Tomorrow.

Dominique Lueckenhoff, U.S. EPA Region 3
Presented "A Watershed Protection-Driven Approach to Integrating the Grey & the Green – The Green Highways Partnership"

Andrew Kreider, U.S. EPA
Introduced renewable energy techniques to facilitate the Renewable Energy breakout group discussion. Renewable Energy group leader.

Mary Hunt, EPA, Representative, MDSHA
Discussed opportunities for Industrial Recycling in her presentation entitled "Green Construction/GHG Reduction through Recycled Materials Use. Recycled Materials group leader.

---Lunch---

Dan Nees, Director, Chesapeake Fund, Forest Trends
Discussed Green Financing/Market-Driven Options. Financing group leader.

Allen Hance, Director, Chesapeake Bay Trust
Introduced Green Jobs/Green Business Incubation. Green Jobs group leader.

---Break---

Charrette Breakout Groups
Report-out's supervised by Laura Bachle on Recommended Actions.

Neil Weinstein
Summary and closing comments, summary of next steps.

Mayor James, John Moss, Dominique Lueckenhoff
Closing comments.

Charrette Attendees By Breakout Group

Low Impact Development (LID) Group

Doug Marshall	Mont. Co. DEP
Jeff Folden	MDSHA
Walter George	Town Council Member
Dennis Germen	MDSHA
Karen Buxbaum	M-NCPPC
Dana Minerva	AWRP
Jenny Molloy	U.S. EPA
Adriene McGray	LAI
Hiev Truong	CBT
Mike Arnold	PGHI/1812
Roberto Duke	M-NCPPC
Sara Chadwick	M-NCPPC
Neil Weinstein	LID Center

Green Jobs Group

Sue McDowell	U.S. EPA, Region 3
Wanda Shelton-Martin	Union
Rev Gail A. Addison	Port Towns Youth Council
Peter Ensign	DC Greenworks
Allen Hance	CBT
Aaron Marcavitch	Anacostia Trails Heritage Area
Reggie Parrish	EPA Chesapeake Bay Program
Dave Byro	U.S. EPA, Region 3

Financing Group

Jennifer Cotting	EFC, UMD
Dan Nees	Forest Trends
Eric Reed	Intrinsecus
Catherine King	U.S. EPA, Region 3
Jessica Jones	M-NCPPC
Doug Davies	LID Center
Chris Kloss	LID Center

Renewable Energy

Andrew Kreider	U.S. EPA
Emily Linn	U.S. EPA
Tom Liptan	Portland BES
Ken Hendrickson	U.S. EPA
Jeff Lee	LAI
RJ Eldridge	Toole Design Group

The following are the consolidated notes from each charrette group. No interpretation of the notes is included. These are the direct notes as recorded by the group. They are:

I. Green Infrastructure

Project Area: 450

- Strip Shopping
- Schools
- ROW curb to Curb
- Sidewalks against Road and Property Line
- 5 Lane Road 2, 2 Turing
- 5' Sidewalks

2001 Study

- Continuous Sidewalks
- Medians
- Bike lanes
- Missing
- SWM Green Strategies, Water Quality
- Traffic study done in 2000

- Sidewalks- Maintained by property owner's right of entry, "chy" upgrades done for compliance then walk away.

Issues

- Steep Grade towards river
- Inlets no state quality
- Soils-Urban Clay Loam
- Not much erosion from adjacent property- mostly street and sidewalk runoff
- Distance .5 mile to little less
- Create path from school to the park
- Extend limits to the river, not addressing historic connections
- Before 5:00 pm, parking lots not full, after 5:00pm crossroads parking
- Shifting Roadways
- narrow sidewalk one side,
- wider sidewalk other
- Create connections
  Park,
- School,
- Business,
- Historic Features
- Enhance transportation
- Bus stops,
- trails
- intersection crossing
- Alternative High School Opportunities for open space
- Viability for businesses needs to be on 450- Main Streetscape development
- Provide Multiple routes
- Street Enhancements I.450
- Historic Trail, behind businesses off main road
- Danger for children walking on 450
- Jemal Property Challenge to get ROW
- Mango Café potential opportunity for open space on 450
- Port Town Sector Plan
- Reduce parking to 80% of zoning requirement (2009)
- Pedestrian Tunnels
- Owner SHA?
- Curb Strip too narrow for pedestrian
- No room for Bike Lanes
- Option for Shared Lane

Green Infrastructure Poster Board

Issues

- Steep Grades
- No water Quality or Quantity control
- I-450 Danger for pedestrian
- Pedestrian tunnels lack of sidewalk
- Lack of Safe Pedestrian crossing
- Lack of green streetscape in front of businesses
- Lack of wide public ROW

Goals

- Create connections
- Historic features
- Schools
- Parks
- Businesses
- Enhance Transportation Network
- Bus Stop
- Bike Lanes
- Provide Multiple routes
- Street enhancement
- Historic trails

ROW IDEAS

- Remove/ reduce turn lanes
- Reduce some entrances to properties
- Reduce slop of road
- Cross walk improvement
- Bump outs
- Tunnels, widen
- Sidewalks, reduce middle lane
- Merge bike ped lanes under bridge
- Pedestrian crossing opportunity
- Light
- Overpass

Adjacent Property Ideas

- Review parking needs and opportunities to consolidate or reduce
- Take trail connection off main road 450 to back roads. Elem. School- Park. Historical Trails
- Intersection nodes to direct pedestrian to safe routes
- Reduce parking to 80% of zoning- based on 2009 study- Port Town Sector
- Move parking to back of buildings
- Green building fronts more inviting
- Consolidate entrances to buildings/ developments
- Backward facing businesses to pedestrian connections
- Capture runoff from street, redirect to key locations for bioretention

II. Industrial Materials Recycling/ Green Construction

- **Recommendations:**
  - Utilize local materials suppliers to provide products related to the green streets design
  - Pervious concrete, asphalt
  - Pervious paver block
  - Recycles rubber surfaces
  - (Note: products incorporate industrial byproducts such as slag, fly ash, siclica fume, foundry sand, recycled asphalt (RAP), recycled concrete)
  - Warm Mix
  - Ernest Mayer
  - Concrete Block potential for tree boxes, retaining walls
  - Resurfacing roadway
  - old commuter route to Annapolis
  - Traffic Movement- Pass Through
  - Elementary School to waterfront park and port
  - Connect commercial properties to waterfront with sidewalk
  - DC materials- aggregate/recycled concrete
  - Train Track
  - Aggregate Industrials-
  - Concrete plant
  - Asphalt plant
  - Aggregate

Opportunities

- Under Road storage
- Resurfacing street
- Sidewalk improvements
- Channel for moving SW for reuse
- Industries
  - aggregate,
  - concrete,
  - asphalt
- Focus use of industrial materials recycling
- Recycled SW for use in construction of concrete block
  - How to store it!
- Memorial for 1812
  - bronze bass relief
  - old propellers connection
- pervious
- Rubber Sidewalk
- Municipal solid waste bins- county
- What about recycling for businesses
- Scrap tires for bike trial/ walking/ running Rubbermatt made from recycled tires
  - 2 places in Balt. Ave. using them
  - University Parkway/
  - Pratt street examples
- Cistern System for Ernest Maier
  - He now uses potable from WSSC any way for him to use stormwater?
- WSSC Service
- Embankments?-Probably not
- Steep slopes by school?
- Bladensburg
  - Used tire sales- Sam Moki

- Tire processors and outlet
- Scrap recycling- crush cars- Joe Smite
- Shingles
- Eco industrial park
- Community fork lift
- take building pieces and resell
- arch salvage restorer
- BLDC

Local Material Providers (5 mi.)

- Agg Industries
  - Concrete
  - Asphalt
  - Aggregate
- DC Materials
  - Conc mix
- Earnst Maier
  - Concrete products
  - Pervious pavers
  - Water user

Community Fork Lift

- Major tire processors
- Shingle
- Green processing business
- Scrap metal processing

UMD

- Eco industrial park
- Leveraging tie current waste/buyproduct intensity
- Eco Industrial center of the Metroplex-Investor industries

III. Green Jobs

- Local Jobs
  - Tax-base
  - Skills
  - Take to other communities
- Involve youth
  - Lower crime rate
  - Helping build community
  - Identifies goals, puts them on a track
- Connects with apprentice program
  - Union program
- Works with businesses to hire these students
- If project is long enough- apprentice can trade from apprentice to licensed
- Bladensburg as a signature project
- United communities against poverty
  - Student pay for community college
  - Opportunity for different pathways
- Training around accountability
- Work ready- understand accountability
- Zoning and policy changing landscape of jobs
- Wellness and health of employees
- Incubator, attract jobs
- How do incentives change?
- Active community engagement
- Government role
  - Policy
  - Departments
  - Enforcement
- Citizen engagement leads to enforcement
- Who is responsible
  - Port town youth council
  - Sustainable business program
  - Union apprentice program
  - City and county laws and policies
- Community work force agreements (federal waivers?)
  - Local labor
  - Weed out non local
  - Establishes higher level
  - Lowest bid isn't always best
- Community outreach for local labor
- Enforcement of laws for bidding
  - Youth to work
  - Local labor
  - Sustainable transformation of local businesses
  - Government responsibility/compliance

Protect Jobs = Community Jobs

- Thoughtfully involve youth
  - Early access
  - Break cycle
  - Stakeholders
- Port Town Jobs
  - For youth age 14-18 program
- Pipline to career path by early assessment of interests and abilities
- GS/GJ project can galvanize existing job programs to next level
  - Higher range of opportunities
- Opportunity to earn credentials at different

levels
- Federal Funding
  - Community collages to develop accreditation program
- Green Job training
  - Integrated approach
- Changing landscape of jobs within green street project
  - move toward sustainable green job businesses
- Look at policies, codes regulations
- Set priorities for greening existing jobs, future opportunities then move to creating new "green" business/jobs
- Establishing incubators/ Eco industrial park
- Demand new businesses be green

Government Role

- Compliance assistance and citizen engagement and education, self monitoring
- Signature project opportunity to link to local schools on environmental literacy
- Engage principals and administrators
- Maintain cultivate linkages among existing programs to ensure future opportunities to \ work together, share
- Community workforce agreements, ability to include parameters
  - Local jobs, green etc, for RFP/bids

V. Financing

Before we determine how to pay, what do we need to know?

- Who is responsible?
  - State road but local jurisdiction
  - Whose on the hook
  - Important institutional question
- What exactly are we financing? Design?
- What is the appropriate role for private sector investment?
- How can the environmental gains be translated into market?
- What is the communities capacity to implement this effort?
- How can this be related to other community priorities and those of surrounding communities?
- What dedicated revenue streams are possible?

V. Renewable Energy

Don't forget conservation of energy, every gallon of water evap/infiltrated is energy saved in pumping
Energy Conservation/ beautification
Save land for future city hall to be used for future green development for now put out an RFP to have someone build a new green city hall and rent it to the city.

Basics

Provide the basics for energy savings
Route for alternative transportation
Where are the trees?
LED lights/ update
Pumping stormwater costs money link to larger efforts
NREL, National Renewable Energy Lab will come out and check existing roof area to provide solar cost/ benefit.

Out of the Box

Strategies for fleet vehicles
Carbon offset credit to fund walk-ability and bike-ability
Coordinate all parties into power purchase agreement coordinated town effort to link rooftops
Bladensburg solar initiative
Lock in energy prices
Solar/Green roof partnership

Energy generating pavement
Challenge programs "eg kilowatt crackdown"
Capture the energy of cars-motion