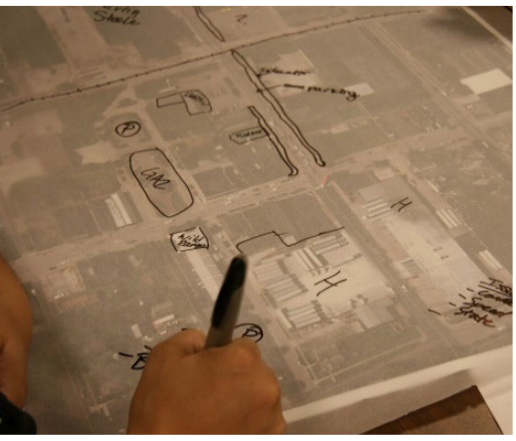
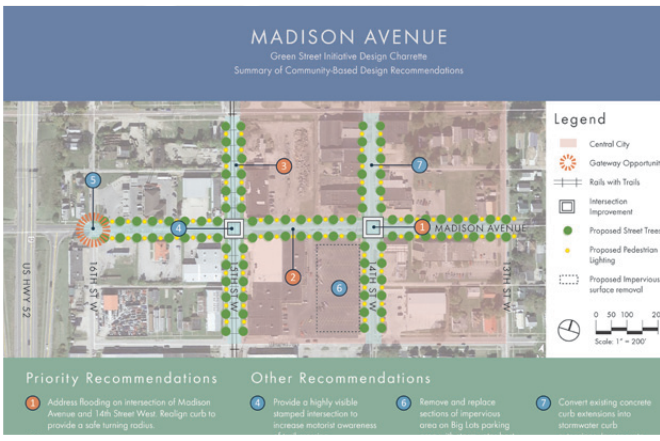
EPA United States Environmental Protection Agency

June 2018

HUNTINGTON GREEN STREET CHARRETTE

Integrating Green Practices into City Planning





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Thanks to our Planning Team and Participants:

Sherry Wilkins, Director | Huntington Stormwater Utility

Breanna Shell, Planning Director | Huntington City Planning

Chris Chiles, Executive Director | Region 2 Planning & Development Council and KYOVA Interstate Planning Commission

Kathy Elliott | Region 2 Planning & Development Council and KYOVA Interstate Planning Commission

Bethany Wild | KYOVA Interstate Planning Commission

Joe Trimboli | U.S. Army Corps of Engineers Huntington District

Michelle Price-Fay, Associate Director | U.S. Environmental Protection Agency, Region III, Water Protection Division

Ken Hendrickson, Green Infrastructure Lead | U.S. Environmental Protection Agency, Region III, Water Protection Division

Samantha Rachko | U.S. Environmental Protection Agency, Region III, Water Protection Division

Daniel Taylor | U.S. Environmental Protection Agency, Region III, Water Protection Division

Diana Saintignon | U.S. Environmental Protection Agency, Region III, Water Protection Division

Jada Goodwin | U.S. Environmental Protection Agency, Region III, Water Protection Division

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Front and Back Cover Photos:

Top row: Example green street with street trees, stormwater bump-out, and bike lane. Image from US EPA Region III WPD G3 Program

Bottom row, left to right: Charrette meeting in West Huntington; Walkability Map; Madison Avenue concept design rendering.

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Foreword

Public health and environmental impacts affect people most significantly where they live; at the community level. Many of the EPA's programs focus on providing support to communities, especially in environmentally overburdened, underserved, and economically distressed areas, which have the greatest needs.

Communities across the United States are facing a variety of challenges, from outdated infrastructure, to water quality protection, to the need to increase community resilience and mitigate the impacts of flooding and other hazards. These communities are looking for multi-purpose solutions to these challenges. Green infrastructure, including the development of green streets, is one approach to improve water quality and address flooding challenges. Green infrastructure yields many benefits, including improved water quality, reduced flooding, infrastructure cost savings, and healthier communities. While green infrastructure alone may not fully address these issues, it adds capacity, flexibility and resilience to other infrastructure systems and provides multiple community benefits.

This document provides an overview of the Huntington Green Street Charrette that was held in Huntington, West Virginia, on July 19, 2017. The charrette was a collaborative effort between federal and local partners. This document is intended to help those partners and stakeholders in Huntington to continue moving forward as they integrate green practices into city planning. It will serve as a resource to others interested in greening their community and creating green streets.

Introduction

In the spring of 2017, the EPA Region III Water Protection Division - Office of State and Watershed Partnerships (OSWP), Huntington City Planning Office, Huntington Stormwater Utility (HSU), the West Virginia Region 2 Planning & Development Council, and local stakeholders began planning for a green street charrette to be held in Huntington, West Virginia. During the charrette planning discussions a portion of the City, known as West Huntington, emerged as an area that could benefit from green streets. The team identified three street corridors that had the potential for green street development.

The Huntington Green Street Charrette was held on July 19, 2017. The purpose of this charrette was to:

- Assemble local stakeholders to discuss the selected corridors and capture thoughts and feedback
- Identify challenges and opportunities
- Develop conceptual design ideas
- Prioritize the order of green street development

This guide provides an overview of the Huntington Green Street Charrette and captures stakeholder feedback on each corridor. It is intended to help organize further discussion, planning, and action toward advancing green streets in Huntington, West Virginia.

What is a Charrette?

A charrette is defined as an intensive, multi-disciplinary workshop with the aim of developing a design or vision for a project or planning activity. Charrette participants work together to find design solutions that will address the issues that stakeholders have identified as priorities, resulting in a clear, detailed, realistic vision for future development.

Selecting a Charrette Location

The area of West Huntington was selected as the focus of this charrette based on its recent revitalization efforts, its history of localized flooding, its need to manage flooding with additional stormwater management practices, and its geographical location in the City. West Huntington is located in a strategic position between multiple city amenities such as the Paul Ambrose Tail for Health (PATH), Levee Trail and Memorial Park Trail. West Huntington is home to historic Central City, a regional antiques district that serves as the neighborhood main street. Central City is home to the Wild Ramp, the City's only local food market and seasonal tailgate farmers market. West Huntington is also an important area for connecting bicycle routes between residential areas, commercial areas, and Marshall University.

This area of Huntington has been the focus of previous planning efforts including *Plan 2025 West Huntington*, a Smart Growth America Technical Assistance grant and the *Central City Study* by the American Institute of Architects (AIA) West Virginia Livable Communities Committee. In addition, since 2014, residents, business owners and community groups, in partnership with the City of Huntington and Huntington Police Department, have met to reduce crime and begin community revitalization efforts with the group River-to-Rail Initiative. Additional information on these programs can be found in Appendix A of this report. Owing to these previous planning and redevelopment efforts, there is a well-established group of local stakeholders who are aware of area needs and invested in seeing positive change. This stakeholder group was critical to the success of the charrette.

Green Streets improve stormwater management, walkability, aesthetics, and community economics by incorporating vegetation, soil, and engineered systems to slow, filter, and cleanse stormwater runoff from streets and sidewalks. Green streets also improve pedestrian safety and navigation through better design.

Green Streets and Green Infrastructure

Stormwater Runoff

Stormwater runoff is one of the largest sources of water pollution in urban and suburban areas and presents many environmental, social and economic challenges to communities across the nation. Rainwater that runs off impervious surfaces, such as roadways, rooftops and parking lots, collects pollutants like oil and grease, animal waste, metals, trash, sediment and nutrients. Ultimately, the contaminated stormwater runoff is discharged into local waterbodies, directly impacting local water quality.

Along with pollution concerns, impervious surfaces may lead to increased flooding. More frequent and intense rain events in highly impervious areas can overwhelm stormwater collection systems, leading to recurrent localized flooding. Flooding can have significant economic impacts on communities due to environmental degradation, loss of property, and damage to critical infrastructure such as utilities, roads, and bridges. Flooding of streets can also impact transportation networks, cutting off access to critical services and hindering movement of emergency vehicles.

Stormwater Collection Systems

In urban areas, stormwater runoff is directed into Municipal Separate Storm Sewer Systems (MS4s) and/or Combined Sewer Systems (CSS). MS4s are designed or used to collect or convey stormwater (e.g., storm drains, pipes, ditches). These systems often discharge untreated stormwater into local water bodies. A CSS collects rainwater runoff, domestic sewage and industrial wastewater into one pipe. Under normal conditions, a CSS transports all of the wastewater it collects to a sewage treatment plant for treatment before discharging to a water body. However, the volume of wastewater can sometimes exceed the capacity of the CSS or treatment plant (e.g., during heavy rainfall events or snowmelt). When this occurs, untreated stormwater and wastewater discharges directly to nearby streams, rivers, and other water bodies.

A green infrastructure approach to stormwater management and flood risk reduction seeks to capture rainwater as close to where it falls as possible and let that water soak back into the ground. Green infrastructure integrates multiple smaller practices throughout the watershed, encourages the preservation of existing green space, increases tree canopy cover, works to restore degraded natural areas, and adds green space where possible. All of this is done with consideration of traditional piped stormwater systems. Therefore, green infrastructure elements reduce the volume of runoff that streams and piped systems need to carry.

In March of 2018, EPA Region III released the "Storm Smart Cities Guide for Integrating Green Infrastructure in Local Hazard Mitigation Plans." The document was developed in collaboration with local, state, and federal partners and explores how Huntington could incorporate green infrastructure into its Local Hazard Mitigation Plans. Developing a green street network is one approach that Huntington and other cities might use to reduce localized flooding and improve local water quality.

Huntington was also the focus of an US Army Corps of Engineers (USACE) and EPA collaborative effort to model green infrastructure locations using a geographic information systems (GIS). The model is available on the Watershed Resources Registry (WRR) for West Virginia. The WRR is an interactive, online mapping tool that prioritizes areas for preservation and restoration of wetlands, riparian zones, terrestrial areas, and stormwater management control across entire states. Additional information about the WRR can be found in Appendix C.

What is a Green Street?

A green street is a stormwater management approach that incorporates vegetation (e.g., perennials, shrubs, trees), soil, and engineered systems (e.g., permeable pavements) to slow, filter and cleanse stormwater runoff from impervious surfaces (streets, sidewalks). Green streets are designed to capture rainwater at its source; where rain falls. Conversely, a traditional street is designed to direct stormwater runoff from impervious surfaces into storm sewer systems (e.g., gutters, drains, pipes) that discharge directly into surface waters, rivers, and streams.

Implementing a green street approach and incorporating green infrastructure practices help manage stormwater where it falls and keeps it from entering stormwater collection systems. Green street practices can address the environmental and human health concerns associated with stormwater runoff from impervious surfaces by:

- Reducing the discharge of pollutants into waterways
- Mitigating the effects of flooding
- Preventing stream bank erosion
- Increasing stream stability and ecological health

Anatomy of a Green Street

Streets comprise a significant percentage of publicly-owned land in most communities. Streets provide connections across a community and often become centers of activity. They offer a unique opportunity to incorporate elements of green infrastructure that will not only protect the environment, but can improve community health and prosperity. Green streets can also help improve safety for all users, including pedestrians, bicyclists, and motorists.

Green streets incorporate a wide variety of design elements such as street trees, permeable pavements, bioretention, and swales. Successful application of green techniques will encourage soil and vegetation contact and infiltration and retention of stormwater. Although the design and appearance of green streets will vary, the functional goals are the same:

- Reduce localized flooding
- Provide source control of stormwater to limit the transport of pollutants to stormwater conveyance and collection systems
- Restore predevelopment hydrology to the extent possible
- Create roadways that help protect the environment and local water quality
- Improve walkability and safety for all users
- Improve aesthetics and revitalize the street corridor

Figure 1 provides details of green street elements.

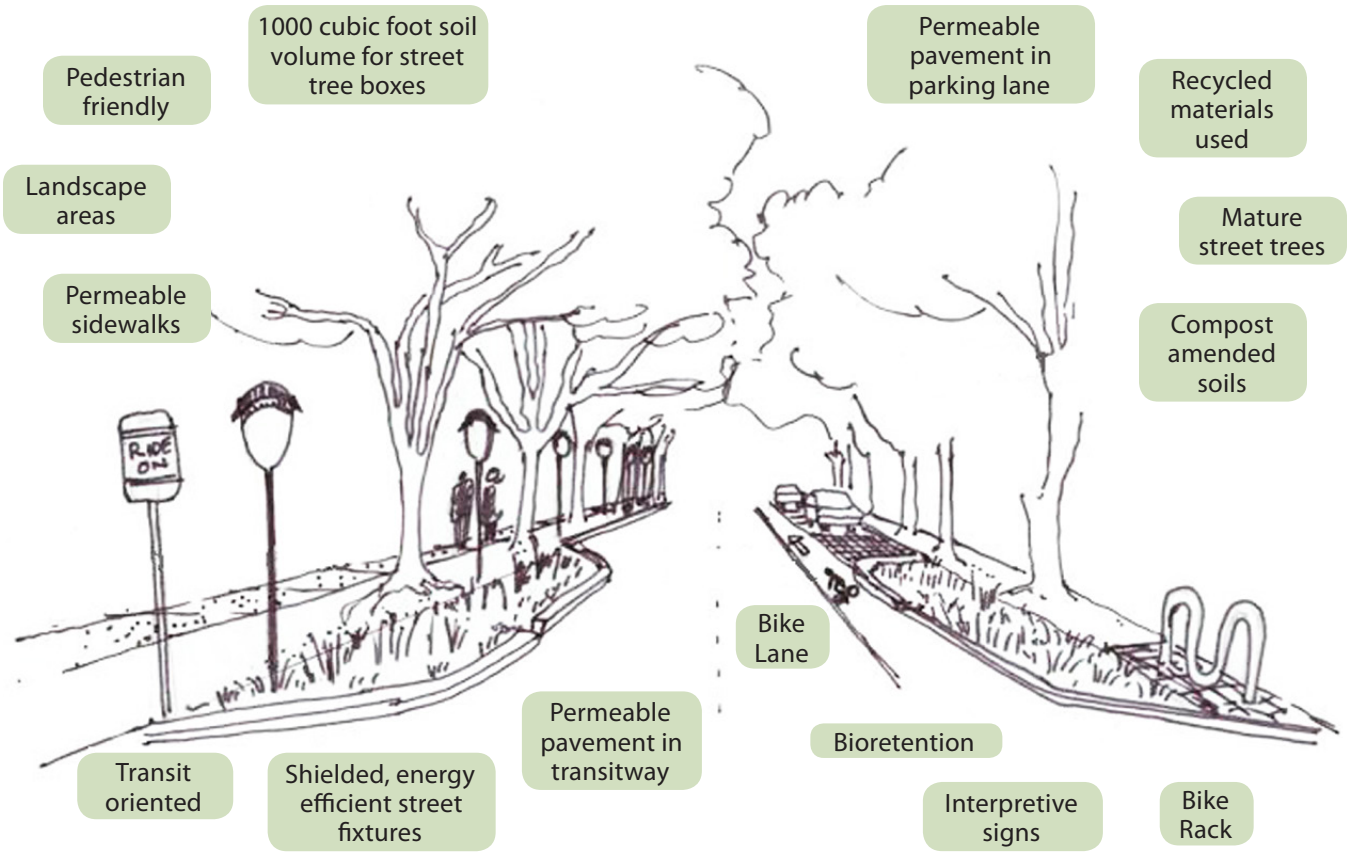


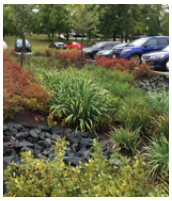
Figure 1: Anatomy of a Green Street.

Downspout Disconnect – This simple practice reroutes rooftop drainage pipes from draining rainwater into the storm sewer to draining it into rain barrels, cisterns, or permeable areas. It can be used to store stormwater and/or allow stormwater to infiltrate into the soil.

Rainwater Harvesting – Rainwater harvesting systems collect and store rainfall for later use. When designed appropriately, they slow and reduce runoff and provide a source of water. This practice is particularly valuable in arid regions, where it could reduce demands on increasingly limited water supplies.

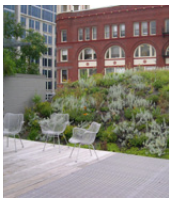
Rain Gardens – Rain gardens are versatile features that can be installed in almost any unpaved space. Also, known as bioretention, or micro-bioretention cells, these shallow, vegetated basins collect and absorb runoff from rooftops, sidewalks, and streets. This practice mimics natural hydrology by infiltrating, evaporating, and transpiring stormwater runoff.

Planter Boxes – Planter boxes are urban rain gardens with vertical walls and either open or closed bottoms. They collect and absorb runoff from roofs, sidewalks, parking lots, and streets and are ideal for space-limited school sites in dense urban areas.



Bioswales – Bioswales are vegetated, mulched, or xeriscaped channels that provide stormwater treatment and retention as it moves from one place to another. Vegetated swales slow, infiltrate, and filter stormwater flows. As linear features, they are particularly well suited to being placed along streets and parking lots.

Permeable Pavements – Permeable pavements infiltrate, treat, and/or store rainwater where it falls. They can be made of pervious concrete, porous asphalt, or permeable interlocking pavers. This practice could be particularly cost effective where land values are high and flooding or icing is a problem.



Green Roofs – Green roofs are covered with growing media and vegetation that enable rainfall infiltration and evapotranspiration of stored water. They are particularly cost-effective in dense urban areas where land values and stormwater management costs are likely to be high.

Urban Tree Canopy – Trees reduce and slow stormwater by intercepting precipitation in their leaves and branches. Many cities have set tree canopy goals to restore some of the benefits of trees that were lost when the areas were developed. Homeowners, businesses, and community groups can participate in planting and maintaining trees throughout the urban environment.

Images courtesy the Low Impact Development Center

Figure 2: Examples of Green Infrastructure Practices.

Background

History of Stormwater in Huntington

The Huntington Stormwater Utility (HSU) was formed by the Huntington City Council in June 2014. There were several reasons for the formation of the HSU:

- As a response to decades of nuisance flooding during moderate to heavy rainfall
- To support the implementation of the MS4 regulatory program and holding the MS4 permit
- To operate and manage the floodwall/levee system that protects the City of Huntington from the Ohio River when flooding. HSU was the first in the state to include a floodwall/ levee system
- To inspect, clean and repair storm lines and catch basins

HSU has a process in place to review, approve, and inspect stormwater management facilities that utilize green infrastructure on-site. HSU also requires developers to manage the first one inch of rainfall on-site. Currently, most of the green infrastructure in the City is on private property and consists of bioretention cells and porous pavements.

Since 2013, HSU requires stormwater management for development or redevelopment of property that encompasses 5,000 square feet or more, and that has one of the following characteristics:

- Land that currently has an existing structure, such as buildings or houses
- Land that is currently covered with an impervious surface, such as a parking lot or roof
- Land that is currently degraded and is covered with sand, gravel, stones, or other non-vegetative covering

If the project is less than 5,000 square feet, but part of a larger, common plan of development that is 5,000 square feet or greater, it also meets the criteria of redevelopment. HSU requires a maintenance agreement for every project that must be recorded at the County Courthouse. Additionally, stormwater must be managed on site with no discharge to the sewer system (MS4 permit requirement). This is accomplished by utilizing green infrastructure practices.

Why West Huntington?

West Huntington has been undergoing a transformation in recent years. This transformation centers around 14th Street West in the Old Central City Business District. The Business District features locally-owned shops, public gathering spaces and larger commercial and industrial businesses. This diversity in property use and the proximity to river, rail and road transportation systems are key assets of West Huntington. The Old Central City area emerged as an area of interest because it is close to natural resources and the growth of Huntington's railroad. This area has a rich history and culture of craft making that many places in Appalachia (Eastern United States from the southern tier of New York to northern Alabama, Mississippi and Georgia) share. Early settlers handcrafted everything from fine glassware and art frames, to bung stoppers and beer on 14th Street West.

To capture this rich history and culture, while creating a new future for West Huntington, the City launched the River-to-Rail Initiative in 2014. The mission of the River-to-Rail Initiative is to improve the quality of life in West Huntington by engaging a diverse group of community residents, businesses, stakeholders and government agencies to create and implement a shared vision for community and economic development. This multi-stakeholder collaboration strategy enables each partner; non-profits, government agencies, business organizations and individuals to contribute within their sector and area of expertise. The vision of the River-to-Rail Initiative is that West Huntington becomes a welcoming gateway to the City of Huntington. The River-to-Rail Initiative envisions a thriving, safe, walkable, family-friendly community where residents enjoy a high quality of life.

West Huntington is connected from the east to the downtown core of the City of Huntington and Marshall University. It is also connected to the north and south by the US-52 connector highway. These factors enable West Huntington to be the central location for interstate travel from Ohio, Kentucky and the eastern parts of West Virginia. Transportation networks in West Huntington are diverse and all transportation modes are necessary for development to occur and be sustainable.

West Huntington's proximity to other locations in the city, regional access, and historical attractions makes this area ideal for community and economic development opportunities. The River-to-Rail Initiative has capitalized on this by hosting several community conversations about the future of development, including visits from Smart Growth America, Strong Towns, and Huntington's local branch of the West Virginia AIA Livable Communities Program. The program assisted in creating targeted zoning and design guidelines and proposed connections to sections of the PATH and the downtown area. Most recently, the River-to-Rail Initiative and their partners applied for a designation within the West Virginia development office to become an Organization, Training, Revitalization and Capacity (ON TRAC) community. More information is provided in Appendix A.

For the above reasons and more, West Huntington is a prime location to pilot how green streets and green infrastructure can be a tool for the community, economic development and rebirth of the neighborhood.

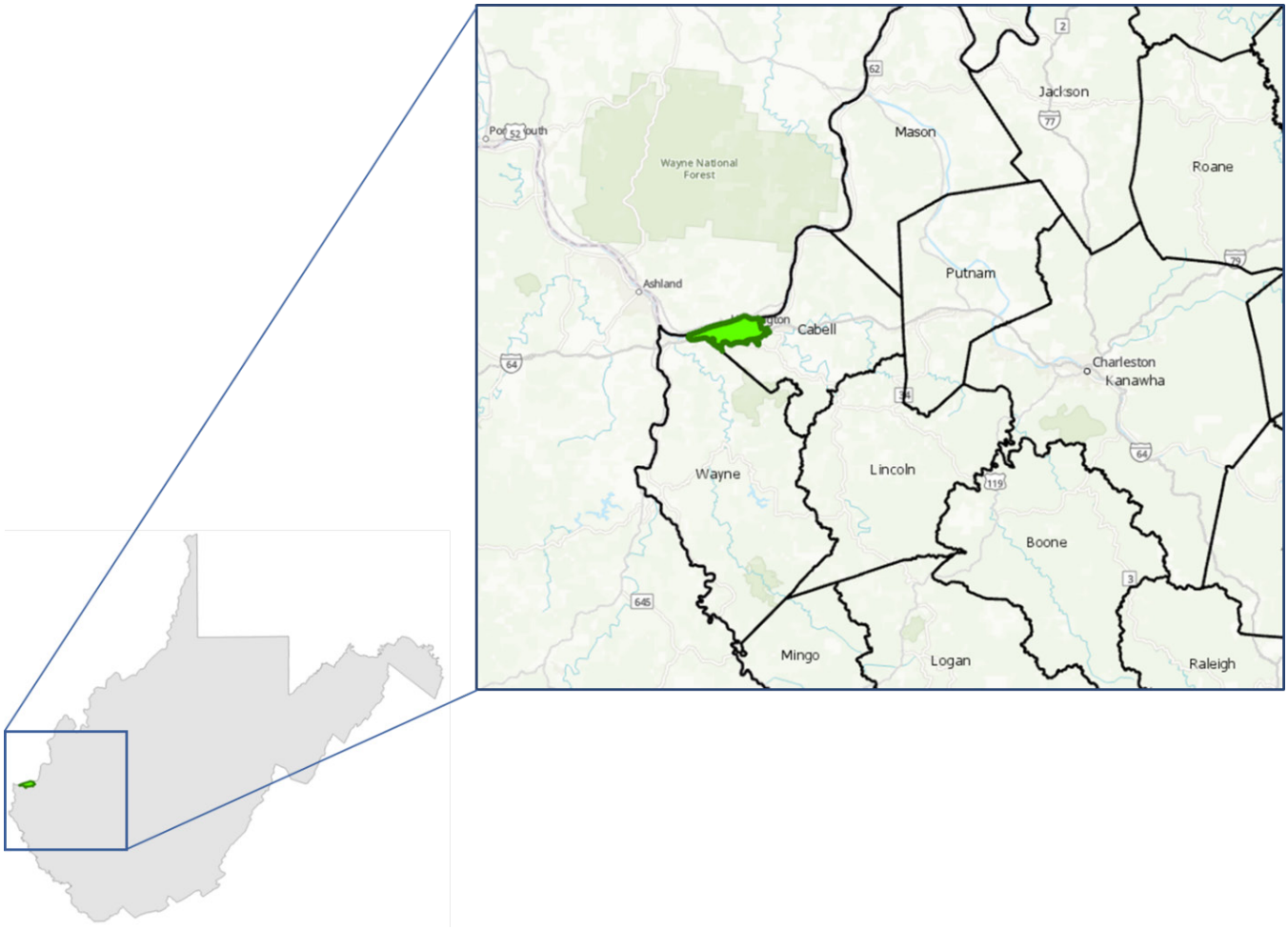


Figure 3: Location of Huntington in West Virginia.

Charrette Overview

There were three main goals for the Huntington charrette. The first was to develop a shared understanding of green infrastructure and green street solutions. The second goal was to identify potential green street corridors and get stakeholder input on opportunities and challenges within those corridors. The third goal was to discuss conceptual green street design ideas that might improve those corridors. This included site design ideas that could also serve as a model for other areas in Huntington.

Charrette Planning

Planning for the charrette was a collaborative effort between the Huntington City Planning Office, HSU, the West Virginia Region 2 Planning and Development Council, and EPA Region III Water Protection Division - Office of State and Watershed Partnerships. Prior to the charrette the planning team worked to prepare educational and reference information. This material provided an overview of typical green street practices and included different scenarios in which these practices might be used. The information was intended to be used as both a primer in advance of the charrette and a design reference during the charrette. Invitations to the charrette were sent to a list of stakeholders who had participated in previous city planning activities in West Huntington.

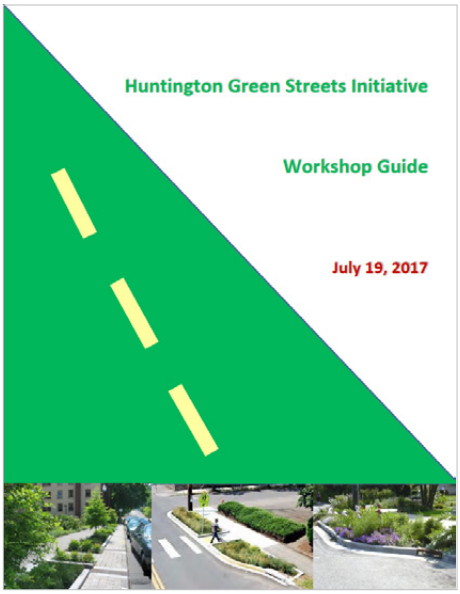


Figure 4: Stakeholders were provided reference material in advance of the Charrette.

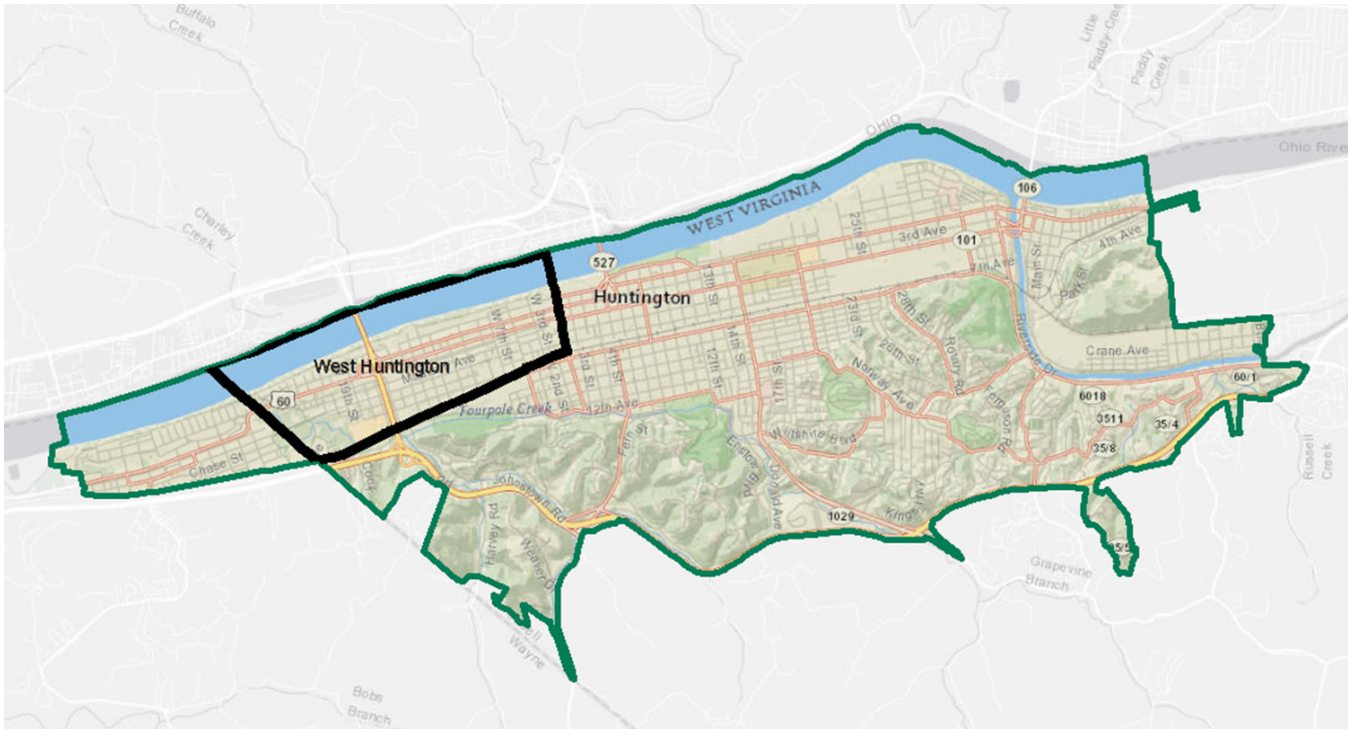


Figure 5: Map Showing the West Huntington Portion of Huntington, WV.

Charrette Setting and Participants

The charrette in Huntington was held at the West Virginia Electric Supply, a local business well-known by most residents in Huntington. The electric supply company provided a classroom-sized meeting space for the event.

There were approximately 20 participants representing a variety of experience levels and backgrounds. City planners, members of federal and local government, members of the planning and development council, staff from a local university, local business owners, local residents and concerned citizens all came together to share their unique perspectives. The charrette lasted approximately seven hours and it included a variety of facilitated sessions, lunch, and a walking tour of each street corridor. The charrette agenda and references are included in Appendix B.

On the day of the charrette, the program began with participant introductions. The participants expressed why they were interested in seeing green streets in Huntington. Presentations provided background of West Huntington and a review of green streets and green infrastructure. Presenters covered common green infrastructure practices followed by a review of green streets to ensure participants had a shared understanding of these ideas to set the story for charrette discussions.

Next, the participants discussed three potential green street corridors in West Huntington. These corridors included Madison Avenue, Virginia Avenue, and Adams Avenue. After a brief review of the corridors, the participants took a walking tour of each corridor. The corridor walk-through allowed the participants to discuss challenges and opportunities as they considered each street.

After the site tours, participants engaged in a brainstorming session. They divided into two teams and were given supplies to map out and draw designs. The supplies included aerial photos of the site, tape, easels, flip charts, markers, pencils, drawing paper, post-its, and dot stickers. Teams were given 90 minutes to discuss design ideas and locations that they felt were the best fit for green infrastructure implementation in West Huntington. The teams were encouraged to be creative but practical, with a consideration of the characteristics and limitations of the area. Once complete, each team had 10 minutes to present their ideas to all participants focusing on the reasoning behind their design and on any concerns they foresee with their design.

Figure 6: Series of photos of the charrette process.

Potential Green Street Corridors

The site tour consisted of three corridors selected by the planning team and stakeholders as the focus areas of this charrette:

- **Virginia Avenue**—Virginia Avenue between 13th Street West and 14th Street West
- **Madison Avenue**—Madison Avenue between US 52 and 14th Street West
- **Adams Avenue**—Adams Avenue between US 52 and 14th Street West

Wayfinding is the ability to understand where you are within a community and how quickly and easily you can determine where you want to go. Communities improve wayfinding by using signage (for both pedestrians and motorists), kiosks, and streetscape design.

Each corridor presented opportunities and challenges identified and discussed by charrette participants and stakeholders. The following sections describe each corridor and outline the main concerns, needs, and opportunities captured during the charrette stakeholder discussions.

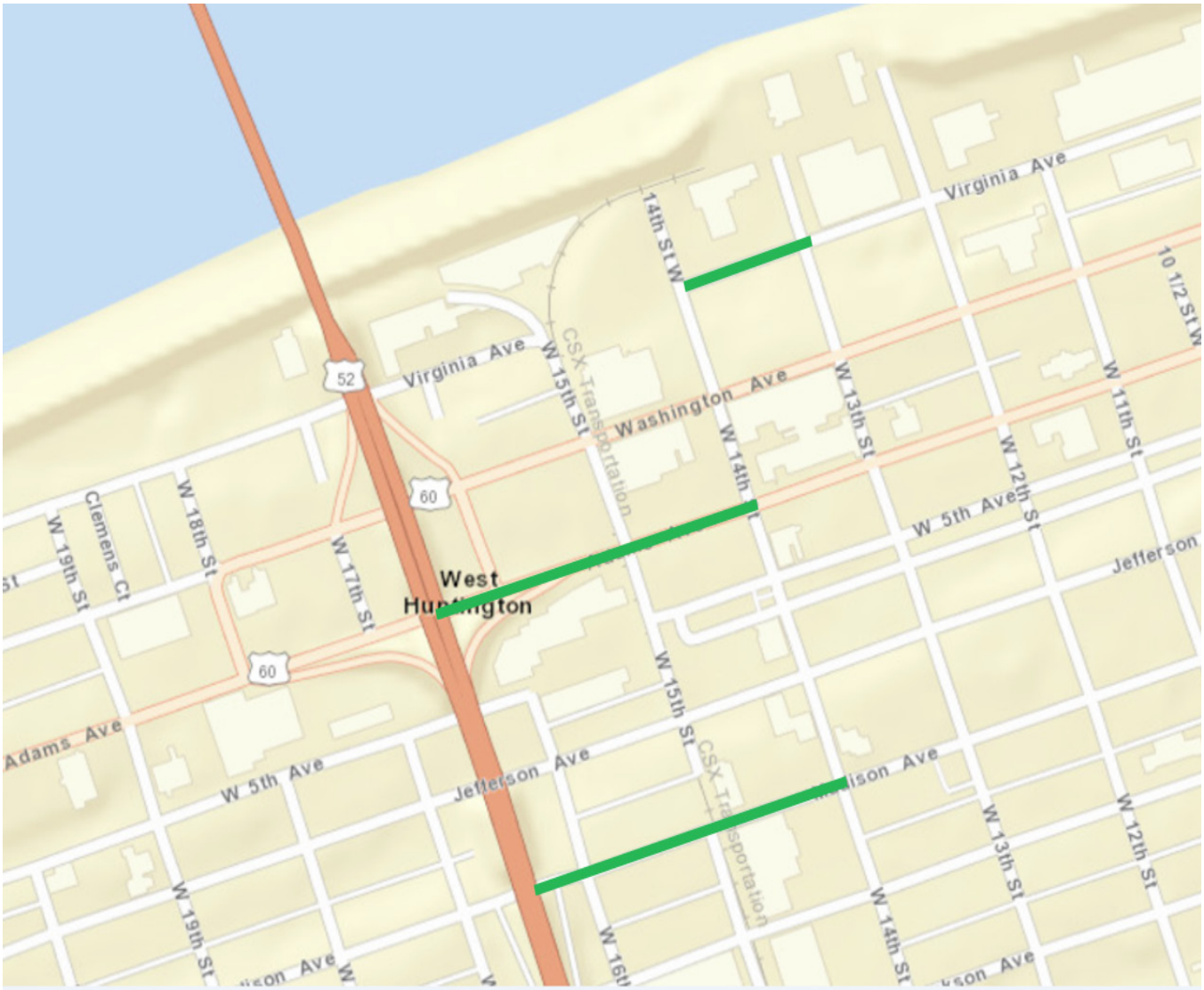


Figure 7: Portion of West Huntington depicting potential green street corridors on Adams Ave., Madison Ave., and Virginia Ave. in green.

Virginia Avenue

The Virginia Avenue corridor is an unimproved right-of-way with limited infrastructure including stormwater run-off management surrounded by the more industrial area of this neighborhood. Although it primarily services the nearby industries exclusively, residents have expressed that this could be an important connection between downtown and Central City/14th Street West commercial district, as it is the final block of Virginia Avenue that needs to be paved. In addition, this area has been thought to be a potential location where the PATH could connect between the Northern Levee trail and Southern Memorial Park trail for residents and visitors. The PATH generally follows along the Huntington flood wall and levee system.

Concerns

- Currently, there are minimal stormwater drainage systems, leading runoff to flow into adjacent properties
- This road is unpaved with numerous pot-holes and is subject to heavy truck traffic
- There are no stop signs or traffic lights present
- Due to lack of lighting, there are safety and security issues surrounding Virginia Avenue
- Illicit activities, such as vandalism, are frequent near Virginia Avenue
- The local chemical/petroleum facility has increased safety and security requirements that may not be compatible with frequent pedestrian use
- Excess undergrowth on the PATH by Virginia Avenue blocks visibility to the river and creates safety concerns
- Limited signage and trail connections to the PATH lead to difficult navigation

Needs

- Implement wayfinding signs to lead to the park trail
- Improve the lighting, security and surveillance of Virginia Avenue
- Add green space and a bike path along Virginia Avenue to connect the PATH with other bicycle and pedestrian routes
- Remove understory brush and invasive species on the PATH to provide visibility towards the river

Opportunities

- There is a potential connection to Memorial Park via 14th Street West
- To increase green space, bioswales or rain garden can be implemented along the roadway

Figure 8: Walk through of Virginia Avenue.

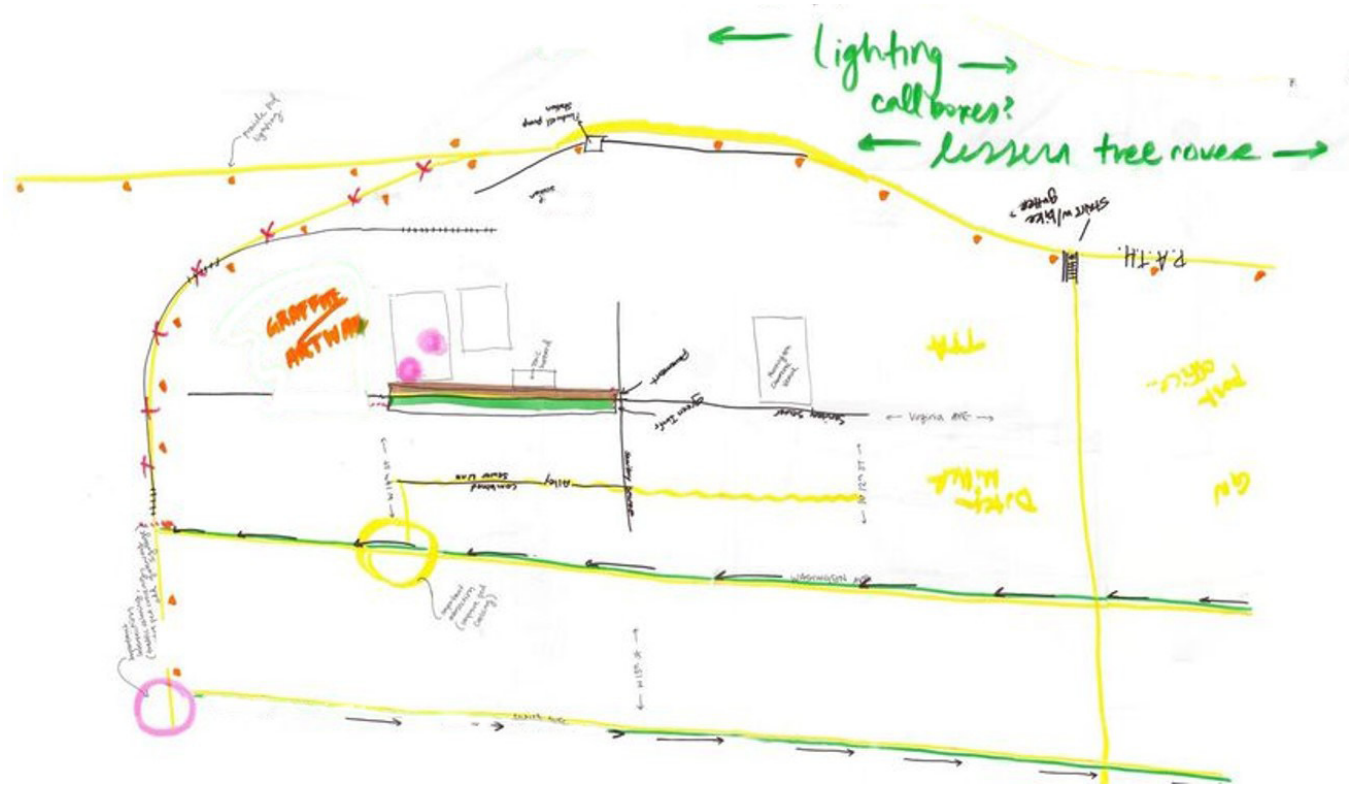


Figure 9: Map of Virginia Avenue corridor with comments by stakeholders.

Figure 10: Virginia Avenue between 13th Street West and 14th Street West.

Madison Avenue

Madison Avenue handles two-way local traffic, with two wide travel lanes and turn lanes at intersections. Maintenance is under the jurisdiction of the City of Huntington. Madison Avenue serves as an important two-way local traffic commuter connection from US Rt. 52 to Central City and the 14th Street West commercial district to downtown. This street also provides a gateway to the southern entrance of 14th Street West and Central City Commercial District. The land use on this stretch of Madison Avenue varies widely between the interstate and 14th Street West. With a few exceptions, properties are underutilized.

Concerns

- Madison Avenue is subject to traffic due to the high-volume commuter connections and because the corridor is narrow in areas
- Localized flooding issues occur frequently at the northeast intersection of 14th Street West and Madison Avenue near the West Tenampa Restaurant
- The gas and fire station on Madison Avenue are in poor condition

Needs

- Improve the bus stops, pedestrian lighting, and signage in the area
- Better aesthetics and defined entrances to businesses
- Realign intersection of 15th Street West and Madison Avenue to make vehicular turns easier
- Implement flood management practices at the intersection of 14th Street West and Madison Avenue
- Redevelop the gas and fire station along Madison Avenue

Opportunities

- A potential to acquire property and revitalize the area along Jefferson Avenue and 15th Street West
- Bike paths and green space can be installed by narrowing existing wide travel lanes
- Provide a green strip with street trees along Big Lots' commercial area
- Remove a portion of impervious area on Big Lots' parking lot
- Provide alternative transit on 15th Street West for bicycles and pedestrians
- Redevelop and renovate the gas and fire stations on Madison Avenue
- Because this area has commuter traffic and access to downtown, a hotel would benefit the City

Figure 11: Walk through at the corner of Madison Avenue and W. 14th.

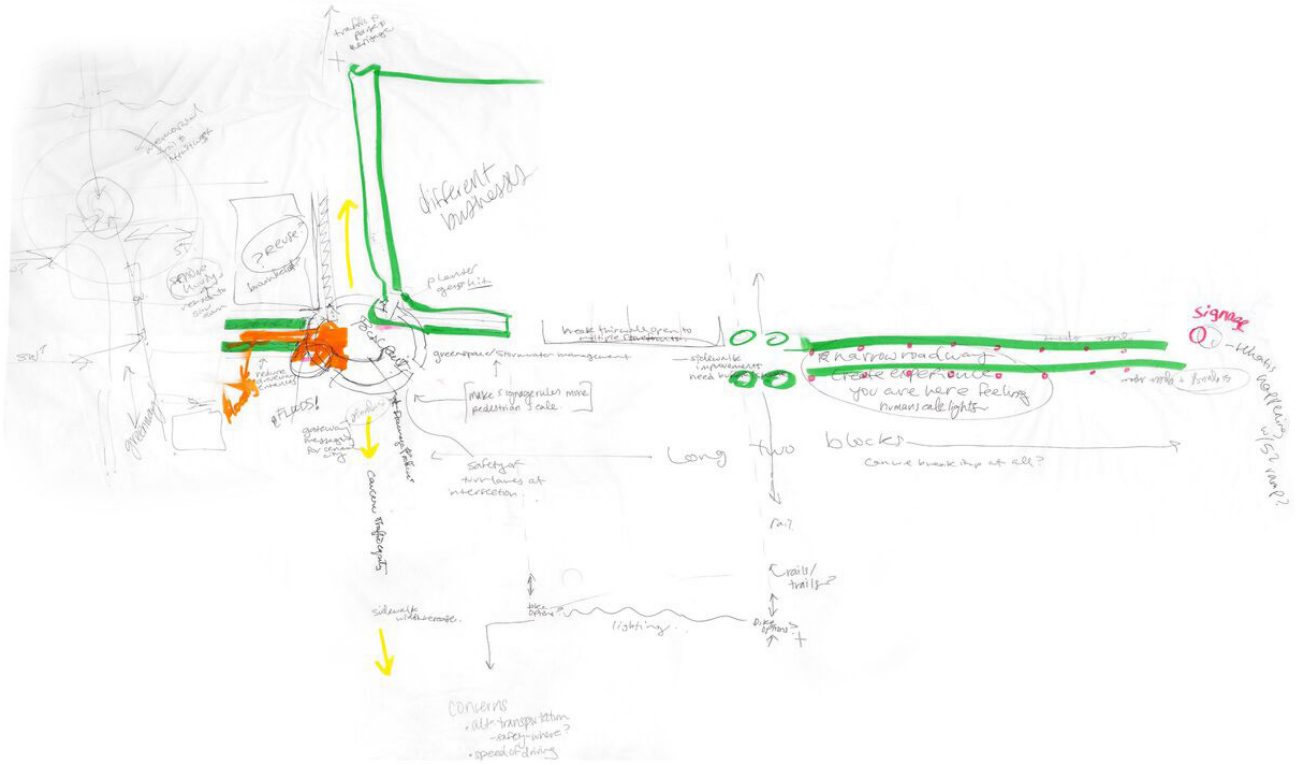


Figure 12: Map of Madison Avenue corridor with comments by stakeholders.

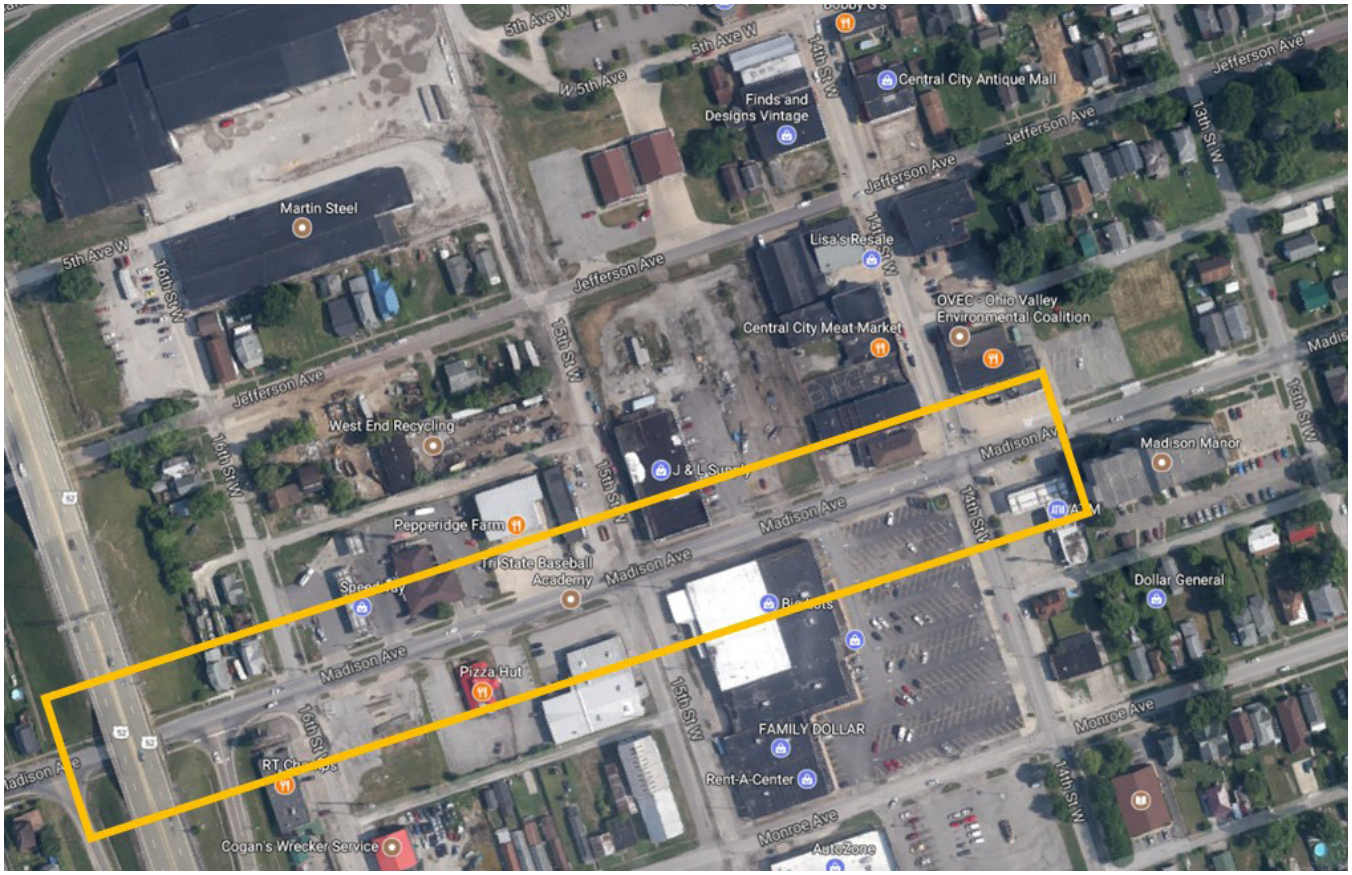


Figure 13: Madison Avenue between US 52 and 14th Street West.

Adams Avenue

Adams Avenue is a one-way, eastward traffic route with two wide travel lanes and on-street parking. Washington Avenue is a one-way westward bound traffic route north of Adams Avenue. On Adams Avenue, parking, construction, maintenance and regulation must work with the West Virginia Department of Highways (WVDOH) since this route is part of US Rt. 60. Adams Avenue also serves as an important commuter connection from US Rt. 52 to Central City and the 14th Street West commercial district and eastward to downtown. Adams Avenue is an important gateway from the northern entrance to 14th Street West and the Central City Commercial District. It is often the first impression visitors to the street have upon entering this commercial district. The land-uses on these two blocks vary widely and include under-utilized industrial properties, vacant land, and some commercial areas.

Concerns

- Adams Avenue lacks green space, signage, and lighting
- Due to the one-way road, illegal traffic maneuvers occur
- Significant speeding of automobiles makes crossing the street a pedestrian safety issue
- Adjacent to Adams Avenue, there are deteriorated houses that decrease the aesthetics of the area

Needs

- Augment the sidewalks with green space, including a tree canopy
- Improve the aesthetics of 14th Street West to encourage tourist and pedestrians to enter
- Improve pedestrian lighting and bus stops

Opportunities

- Improve intersection crossing at 15th Street West and 14th Street West to increase public safety
- Adams Avenue has excess street parking that can be replaced with green space
- Traffic calming could be achieved if the exit ramp to US Highway 52 is improved
- Provide a welcome signage at gateway that reads "Welcome to Central City, Huntington, WV"

Figure 14: Walk through of Adams Avenue between US 52 and 14th Street West.

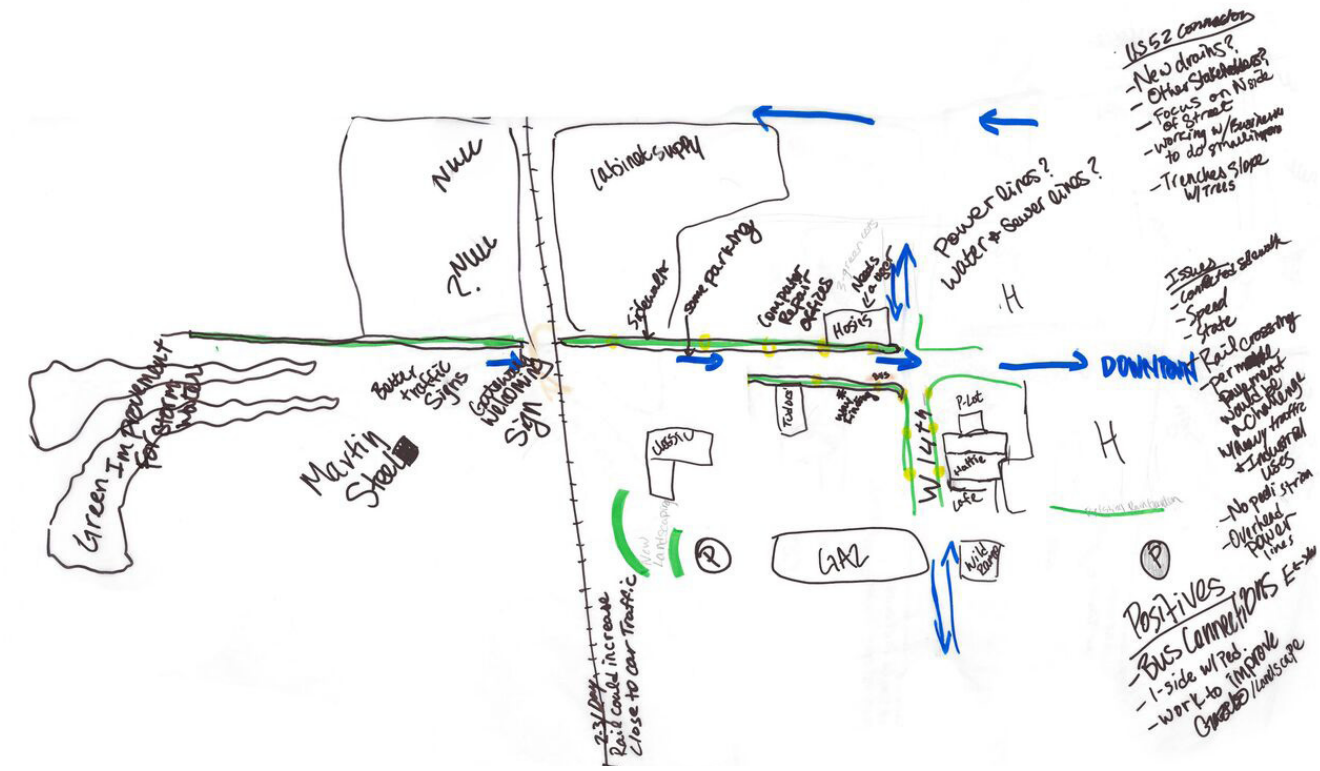


Figure 15: Map of Adams Avenue corridor with comments by stakeholders.

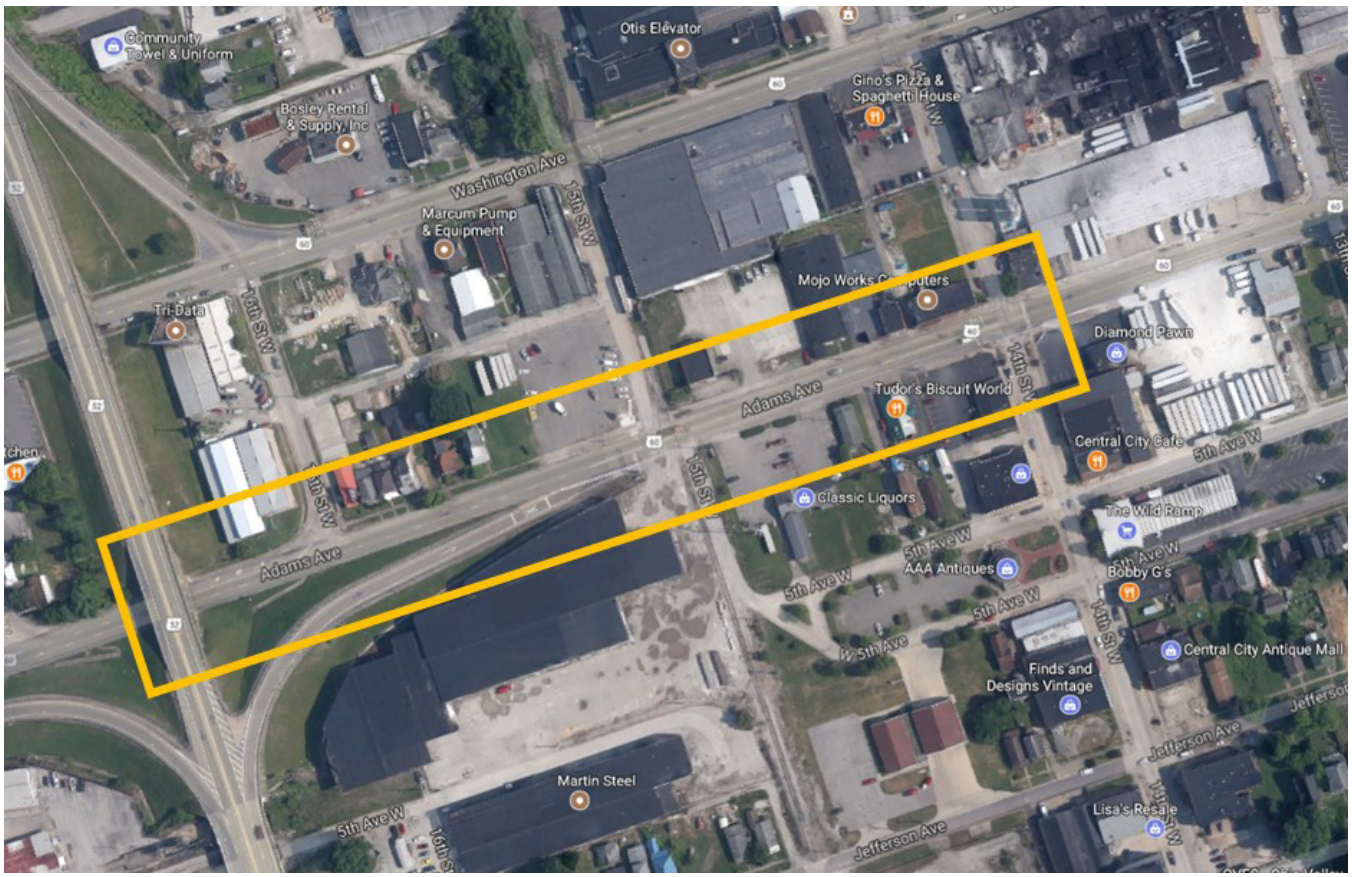


Figure 16: Adams Avenue between US 52 and 14th Street West.

Charrette Outcomes

Master Plan and Recommendations

During the Huntington Green Street Charrette, the participants discussed the need for a master plan that included multiple green street corridors in West Huntington that could be combined to form a green street network. This green street network could:

- Help improve water quality
- Reduce flooding
- Facilitate better pedestrian and bicycle connections in this area of the City
- Build on economic revitalization efforts already underway

Master plans help communicate the planning or design vision for an area and show how elements in the plan are related. For instance, a green street master plan might include multiple corridors that make up a green street network. A master plan can also provide suggestions for project phasing. For a green street master plan, this might mean identifying the order in which street sections could be completed. The master plan helps provide context and guides long-term decisions.

Master plans are also helpful when pursuing project funding and may be a requirement of certain funding sources. Green street projects are rarely fully funded as one project under one funding source. They are broken down into smaller projects or phases that better align with available funds, budgets and timelines. Plans should be viewed as dynamic; allowing cities, or other sponsors, to respond to the changing needs of the project, new funding sources or changes in the areas.

While a fully-developed master plan was not an outcome of the charrette, ***Figure 17*** shows the community-based design recommendations including potential green street corridors. ***Figure 17*** serves as the starting point for further discussion, planning, and pilot projects that will make this green street network a reality.

Participants identified the following priorities to be included in a master plan.

Madison Avenue Priorities

- Address flooding on intersection of Madison Avenue and 14th Street West
- Improve streetscape, incorporate a green strip and pedestrian lighting
- Provide alternative transit options on 15th Street West for bikes and pedestrians and close the road to cars

Adams Avenue Priorities

- Improve the north side of Adams Avenue by incorporating greenery, removing on-street parking, and providing pedestrian-scale lighting
- Provide pedestrian-scale lighting along Adams Avenue and 14th Street West
- Provide gateway welcome signage to slow down traffic, enhance community identity, and connect the community to the history of the area
- Include "Huntington" on the signage – currently the sign only says "Central City"

General West Huntington Priorities

- Provide connections between the West Huntington potential green street corridors and the PATH
- Improve wayfinding for pedestrians, cyclists, and motorists in West Huntington through the use of signage and design
- Improve the design at the Madison Avenue and Adams Avenue gateways to West Huntington to better communicate arrival to the community and to enhance its character

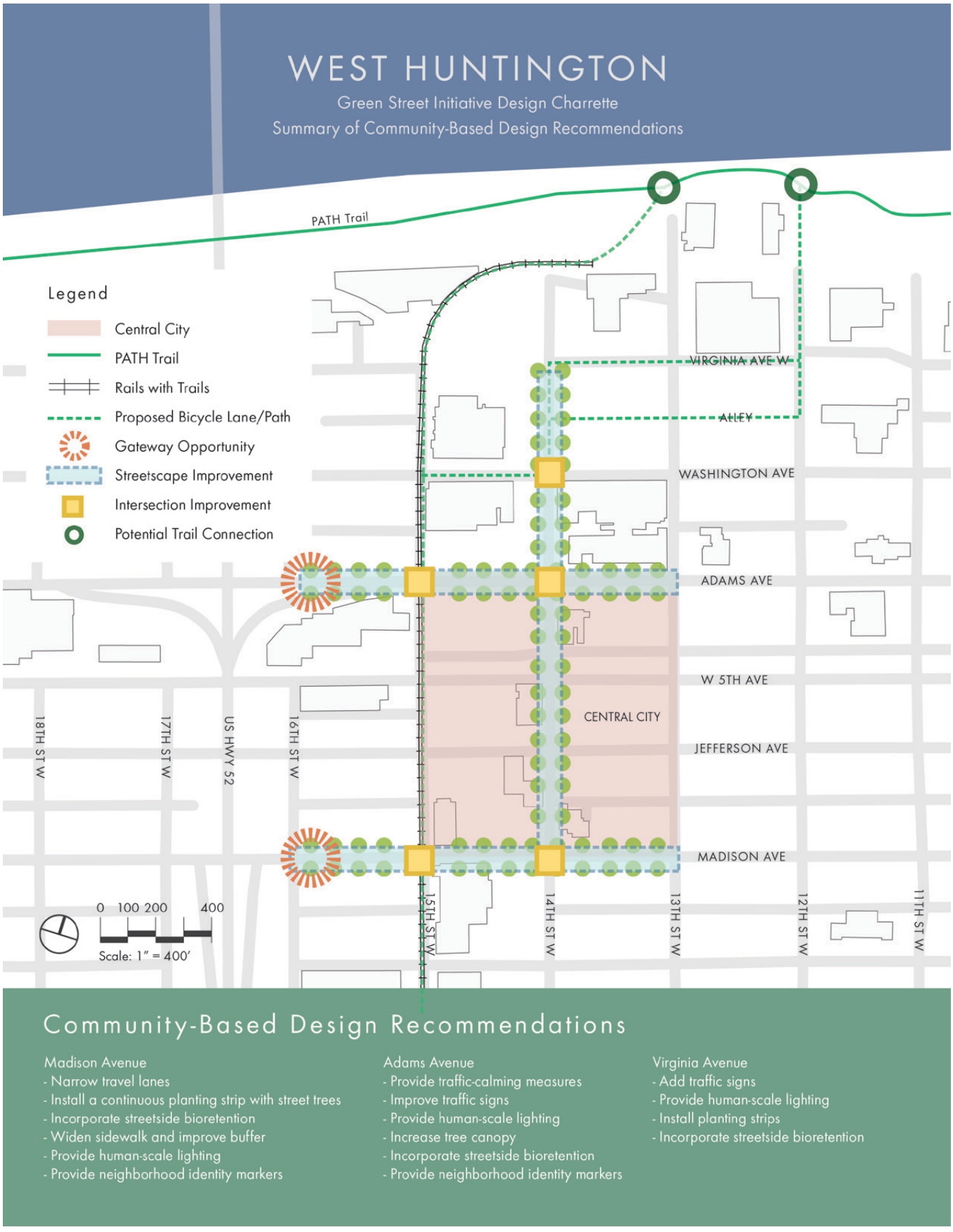


Figure 17: West Huntington Green Street Charrette Community Design Recommendations .

Madison Avenue Conceptual Design

As the discussion groups reported out on their findings, most participants agreed that Madison Avenue has the greatest potential for a green street. Charrette participants also agreed that Virginia Avenue appeared to be the least feasible corridor for developing a green street due to planned redevelopment in the area, heavy truck traffic, security and safety concerns at the adjacent lubricant production facility, and low visibility compared to other corridors. Additional planning and discussion is necessary to determine the ideal connection to access the river trail.

As part of the charrette, participants were asked to prioritize which corridor could serve as the pilot green street for West Huntington. Participants selected Madison Avenue to be the focus of additional discussion and planning. Based on charrette discussions, a basic conceptual design was developed for Madison Avenue. ***Figure 18*** illustrates the Madison Avenue concept design recommendations made by the charrette participants.

Figure 18: Madison Avenue concept design and design recommendations.

Madison Avenue Green Street Design Recommendations

Numbered recommendations correspond to ***Figure 18***.

1. **Address flooding at the intersection of Madison Avenue and 14th Street West.**

   Road flooding can create safety concerns and become a barrier to traffic flow. Green infrastructure and green street practices can be used along Madison Avenue to help absorb and store excess stormwater runoff and reduce localized flooding. The first step in this process is to identify the sources of runoff and install green infrastructure as close to the source as possible. The flooding along Madison Avenue may ultimately include a mix of sources, including runoff from local road surfaces and parking lots.

2. **Improve the streetscape along Madison Avenue by incorporating green infrastructure, better aesthetics, and improved pedestrian-scale lighting.**

   Green street designs incorporate a variety of techniques to improve stormwater management, walkability, wayfinding and the safety of all users. Wayfinding includes signage for both pedestrians and motorists, but can also include kiosks and other design elements that can help users to quickly determine where they are and where is the direction they need to go to reach their destination. ***Figure 19*** provides examples of wayfinding signage.

Walkability is a measure of how easy it is for a person to walk safely through an area and how much that area encourages walking through design and aesthetics.

Figure 19: Examples of wayfinding signs; wayfinding includes signs, kiosks, and other design elements that make it easier for pedestrians, cyclists and motorists to know where they are in the community and navigate to where they want to go.
Images by Eric Fischer. https://www.flickr.com/photos/walkingsf/40252843981 , https://www.flickr.com/photos/walkingsf/18604595758, https://www.flickr.com/photos/walkingsf/39017978635

Design can also be used as a visual or spatial cue to help users tell where they are within a community. Green streets can use design cues to help communicate to users that they are in a particular area of the community. Green infrastructure, lighting and green street design elements can all be used to improve walkability and wayfinding.

Along with improving stormwater management, charrette participants noted that Madison Avenue should include better wayfinding elements and better design to improve walkability. Green infrastructure elements such as street trees, stormwater planters and green strips (or raingardens) not only help absorb and store stormwater, they help to define pedestrian areas and improve aesthetics. Pedestrian-scale lighting, or lighting that is intended for pedestrians rather than motorists, will also help improve the Madison Avenue corridor. Pedestrian-scale lighting is generally lower in height and spaced closer together than street lights intended for motorists. Pedestrian-scale lighting is connected to both wayfinding and walkability because it allows the pedestrian to feel safe and identify the route they wish to walk. ***Figure 20*** shows how a green street with green infrastructure elements and pedestrian-scale lighting can be combined to improve the aesthetics and scale for pedestrian users.

3. Consider eliminating motorized vehicular traffic on a section of 15th Street West.

Charrette participants discussed the possibility of creating a pedestrian mall on a section of 15th Street West. This is a common practice used in cities. Pedestrian malls become an oasis for walking, dining, shopping and gathering. They can also still be used as routes for cyclists through proper design. 15th Street West is a unique area because it contains a rail corridor, but is often underutilized by motorists according to charrette participants. Eliminating motorized vehicle traffic on a section of 15th Street West could open opportunities for a pedestrian mall and rails-with-trails or rails-to-trails connection.

Figure 20: Example green street with street trees, stormwater bump-out, and bike lane.
Image from US EPA Region III WPD G3 Program

4. Improve pedestrian and cyclist safety at intersections through the use of signage and stamped intersection crossings.

The safety of pedestrians and cyclists was one issue of concern discussed during the charrette. Green street designs can improve the safety of all users. Intersections are the most likely areas for pedestrians and cyclists to be at risk from motorized vehicles. Traffic signals and signage, along with marked pedestrian crossings, are all ways to increase pedestrian safety. Many cities are turning to stamped pedestrian crosswalks or even raised pedestrian crossings to signify to traffic that pedestrians may be crossing. Stamped crossings use a change in pattern and color to signify a crossing to motorists. Patterns are stamped into the asphalt or concrete road surface and then painted for additional contrast. Stamped patterns could mimic the look of individual pavers (for a more traditional look), or be in different artistic patterns that embrace the culture of the area.

Raised pedestrian crossings (also known as Woonerf) are crossing areas that are raised a few inches from the road surface to create a visual and physical indicator that pedestrians have priority. These are essentially a wide speed hump with pedestrian crossing across the top. While raised pedestrian crossings may not be feasible on Madison Avenue, stamped and painted crosswalks would help to indicate pedestrian crossing areas. Pedestrian crossing signage would also help in improving pedestrian safety.

Green streets can take a variety of approaches for pedestrian and cyclist safety. ***Figure 21*** shows an example of green street sections and demonstrates different approaches to incorporating green street elements. This figure also demonstrates two different approaches to incorporating bicycle traffic. The top section shows separate bicycle lanes. The bottom section shows bicyclists using the same lanes as motorized traffic, but includes large on-pavement printing to indicate shared lanes.

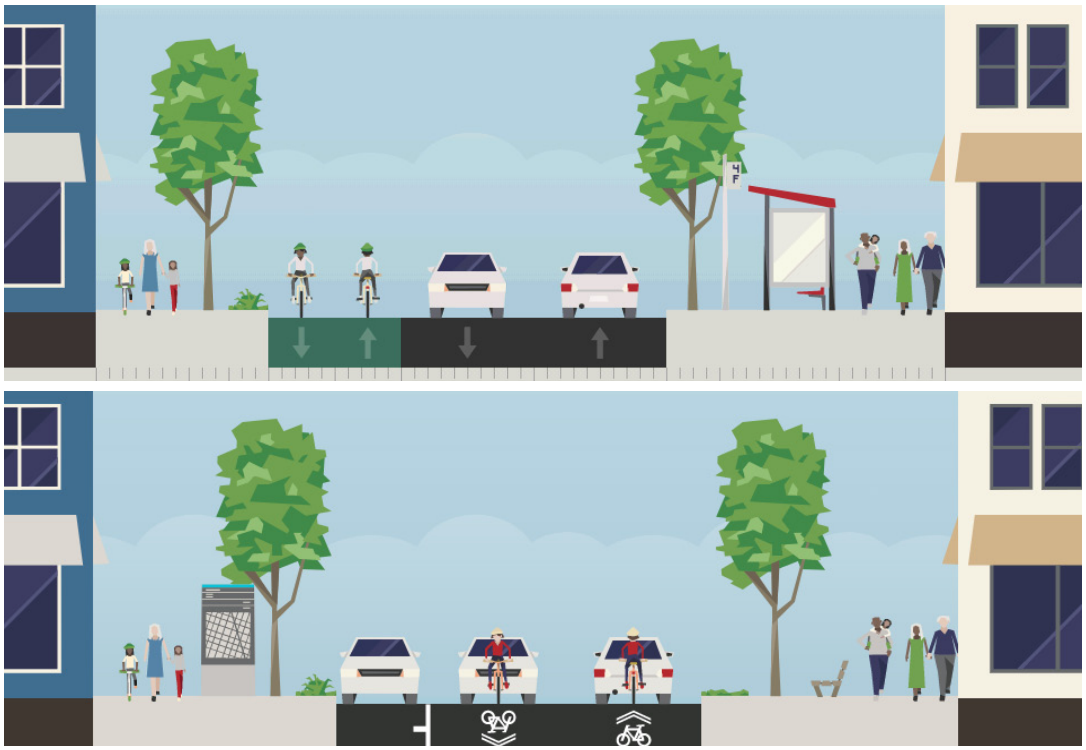


Figure 21: Different options for green street elements such as street trees, bus stops, benches, wayfinding signs, and green infrastructure; the images also compare separate bike lanes vs lane marking and bicycle travel with motor vehicle traffic.

5. Improve welcome signage and designs at gateways to the community, such as the intersection of Madison Avenue and 16th Street West.

Community gateways are important areas for wayfinding and for communicating the culture and identity of the community. Gateways mark a point of entry. Just like the gateway to a courtyard, yard, or garden, the gateways to a community can communicate a great deal about the character of that community.

During the charrette, participants noted that the West Huntington area has multiple entry points that could benefit from more thoughtful and purposeful gateway designs. The exit ramp from US Highway 52 and the intersection of Madison Avenue and 16th Street West were two areas that charrette participants identified as important gateways.

6. Reduce large impervious surfaces and incorporate green infrastructure stormwater BMPs (Best Management Practices) and community amenities.

As previously mentioned, large impervious areas can generate significant volumes of stormwater runoff, which can cause flooding and negatively impact water quality. Large areas of impervious surface, especially those that are dark in color (such as asphalt), can also raise the temperature around them. This is known as the urban heat island effect. These dark surfaces absorb more heat from the sun and then radiate that heat back into the community.

Charrette participants expressed a concern that large impervious surfaces were contributing to localized flooding. These surfaces were also perceived as very uninviting and offering little contribution to the community. These areas, such as the parking area near Big Lots, could be modified to incorporate green infrastructure. Thoughtful designs that incorporated green infrastructure could help reduce localized flooding and add community amenity space while still offering adequate parking for retail areas.

7. Retrofit concrete curb extensions to incorporate green infrastructure stormwater BMPs. Incorporate rain gardens or stormwater planters along 14th Street West.

One green infrastructure practice that many green streets use is stormwater bump-outs or curb extensions. These BMPs extend the curb out into the parking zone in strategic areas to capture stormwater. ***Figure 22*** shows example stormwater bump-outs. They are essentially rain gardens in a bumped-out curb area. These BMPs can help reduce stormwater runoff while maintaining on-street parking. Stormwater bump-outs can also be used at intersections to increase pedestrian safety by reducing the crossing distance and maintaining visibility. Narrowing of the crossing also serves as a cue for motor vehicles to reduce speeds.

Charrette participants noted that these BMPs may work well in some areas of West Huntington. 14th Street West is an important connector in the local pedestrian bicycle network. This corridor also has some key local businesses that are part of the identity of the area. Green infrastructure BMPs could be used to help unify the green street design of 14th Street West and visually connect it to Adams and Madison Avenue.

Figure 22: Stormwater bump-outs also known as curb extensions are a BMP used to capture stormwater from the street. Image from Philadelphia Green Streets Design Manual. http://www.phillywatersheds.org/what_were_doing/gsdm.

Next Steps

The West Huntington Green Street Charrette was intended to build on momentum in this area and explore the potential of green streets. The charrette was just the start of this continuing conversation about green streets. The following outlines the next steps that may be considered in this process:

Green Street / Bicycle and Pedestrian Network Next Steps

- Hold additional stakeholder meetings for stakeholders not present at the charrette
- Identify and prioritize additional corridors and connections
- Continue demonstration and pilot project efforts to build community support
- Discuss construction schedules with Huntington City Departments to see if green street elements can be included as part of regular road and infrastructure maintenance
- Consider conducting a feasibility study to develop a green street network
- Pursue pilot and demonstration opportunities
- Assemble information into a more complete Master Plan
- View the Master Plan as a living document and make adjustments in response to changes in the community

Pilot Project – Next Steps

- Hold additional stakeholder meetings for stakeholders not present at the charrette
- Expand upon the community-based design recommendations to develop an additional conceptual design drawing for Madison Avenue
- Use concept designs to pursue engineering design and cost estimates for construction
- Discuss Operation and Maintenance (O&M) plans for green infrastructure and other green street elements with partners and the City
- Develop communications and outreach plan for the project
- Pursue funding opportunities for pilot project construction (grants, etc.)
- Release Request for Proposals (RFP) for construction of pilot green streets based on engineering design and cost estimates
- Develop a contract for construction
- Provide outreach to the community to explain the construction schedule and the impacts it may have on traffic, parking and pedestrian access
- Hold a groundbreaking ceremony before construction to build additional community excitement and press around the event
- Host an unveiling ceremony after construction to thank all volunteers involved and to introduce the pilot project to the media and citizens
- Complete O&M on a regular basis to maintain the functionality of the green street elements

Progress and Activities Since the Huntington Green Street Charrette

Since the completion of the Green Streets Charrette in West Huntington, the River-to-Rail Initiative and partners have several ongoing projects that complemented this effort including:

1. Master planning is underway for the Central City Gazebo. This includes physical improvements in infrastructure and design. This work is ongoing with a local landscape architect. Initial planning concepts have been developed.
2. Huntington applied for funds from the Metropolitan Planning Organization (MPO) to consider PATH connections and streetscape improvements along 14th Street West between Memorial Park trail and Levee trail.
3. Community events have been planned for a demonstration project of the potential recommendations of green streets in West

Huntington in the late Spring/Summer 2018. The Sustainability Fair/Tour de PATH bike ride occurred May 19, 2018. There are plans to complete Build a Better Block Tactical Urbanism event during the summer of 2018. An exact date for this event has yet to be determined.

4. Huntington was recently accepted into the WV Development Office program to be an ON TRAC community. This will provide the River-to-Rail Committee with technical assistance on the National Main Street America "four points approach" (social, physical, political and economic) and other design and technical assistance.
5. Huntington applied for the National Endowment for the Arts (NEA) Our Town grant for a regional wayfinding and community development plan for the West Huntington region. An application decision is pending.

Conclusion

This document has provided an overview of the West Huntington Green Street Charrette and the potential green street corridors identified by partners and local stakeholders. It highlights the charrette participants' discussions about the concerns, needs and opportunities of each potential green street corridor as well as potential design ideas.

The document outlines those design ideas and provides a list of potential next steps that stakeholders could follow. Stakeholders realized that additional planning and design work was necessary to make their green streets vision a reality. This document represents a significant step in that direction. Stakeholders can use this document as foundation for further planning, design and pilot projects.

Appendix A: Planning and Development Efforts in Huntington, West Virginia

PATH

http://www.paulambrosetrailforhealth.org/

The Paul Ambrose Trail for Health (PATH) is a growing, 26-mile bicycle and pedestrian trail system providing free, healthy recreational and alternative transportation opportunities for the City of Huntington and surrounding areas. Through grants, sponsorships, and individual contributions, over $4 million has been raised to support the construction and maintenance of PATH.

PATH is a vital part of Huntington's continued efforts toward the redevelopment and growth of the City, because it:

- Serves as a central walking, cycling and meeting place that has shown to revive vulnerable areas throughout the City
- Connects businesses, schools and communities as a means of alternative transportation in Huntington
- Enhances mixed development and redevelopment strategies with greater accessibility to green space
- Contributes to the growth of municipal revenue as a result of increased property values

ON TRAC

http://www.wvcommerce.org/people/communityresources/communityrevitalization/ontrac/default.aspx

The West Virginia ON TRAC (Organization, Training, Revitalization and Capacity) program was created by Main Street, West Virginia and endorsed by Governor Joe Manchin to assist West Virginia communities in their efforts to boost economic and community growth. The goals of the program are to evaluate, educate and assist communities in these efforts and to prepare them for more advanced technical services through the Main Street program.

Communities selected as ON TRAC participants will receive the following during the two-year participation period:

- Participation in the mentoring program
- An assessment of strengths and weaknesses
- Access to an online library of databases and resources, such as e-clips, videos and articles
- Attendance to training workshops
- Action-planning services
- Telephone consultation
- Scholarship and grant information
- Technical design visit(s)
- Training on the National Trust for Historic Preservation's Main Street Four-Point Approach®, which includes organization, promotion, design and economic restructuring

River-to-Rail Initiative

http://www.cityofhuntington.com/assets/pdf/document-center/River%20to%20Rail%202013%20Report.pdf

The River-to-Rail Initiative is a multi-disciplinary approach to improve a stagnant and crime-plagued area of Huntington's West End. The targeted area stretches from the Ohio River to the rail line along Van Buren Avenue between 8th Street West and 17th Street West.

One of the primary directives of the River-to-Rail Initiative is using a community-driven approach to rejuvenate the Old Central City commercial district on 14th Street West. Community members believe this area is ripe for commercial growth because of its proximity to Interstate 64.

The River-to-Rail area holds vast potential with its flat land, a long-established commercial district, easy access to Interstate 64 and vacant homes, buildings and warehouses that could be put back to productive use.

Smart Growth America

https://smartgrowthamerica.org/

Smart Growth America is an approach to development that encourages a mix of building types and uses, diverse housing and transportation options, development within existing neighborhoods, and community engagement.

Smart Growth is about helping every town and city become a more economically prosperous, socially equitable, and environmentally sustainable place to live. In 2014, Huntington won a free technical assistance workshop from Smart Growth America to help the City achieve goals for housing, businesses, and it's downtown.

Strong Towns

https://www.strongtowns.org/mission

Strong Towns is a national media organization that challenges everyone to fundamentally rethink how cities are built. There are no universal answers to the complex problems that America's cities, towns and neighborhoods face. Strong Towns seeks to discover rational ways to respond to these challenges. A Strong Towns approach:

- Relies on small, incremental investments instead of large, transformative projects
- Emphasizes resiliency of result over efficiency of execution
- Is designed to adapt to feedback
- Is inspired by bottom-up action and not top-down systems
- Seeks to conduct as much of life as possible at a personal scale
- Accounts for its revenues, expenses, assets and long-term liabilities

West Virginia AIA Livable Communities Program

http://aiawv.org/livablecommunities/

The West Virginia chapter of American Institute of Architects (AIA) Committee for Livable Communities is comprised of architectural design professionals with a mission to create better living through design. They work with planners, developers, officials, and communities to help improve the quality of life in West Virginia. The Committee provides assistance for:

- Presentations on the principles of livable communities, including a special presentation on the health benefits of livable design
- Design assistance with community revitalization; providing unique solutions, design expertise and graphic skills to convey the ideas that are developed
- Innovative solutions to planning and zoning issues
- Review and development of existing planning and zoning ordinances
- Advocacy of issues such as sustainability, healthy communities, safety, adaptive re-use, historic preservation, green field preservation, etc.
- Illustrations of how livable community design can be a profitable investment

Appendix B: Charrette Agenda and References

Agenda

Time	Topic
8:30-9:00am	Registration
9:00-9:15am	Welcome and Introductions • Overview of the day
9:15-10:30am	Why Are We Here? • Program background • Site characteristics
10:30-10:45am	Break
10:45–11:15am	Green Street/Green Infrastructure Practices
11:15am -11:45am	Site Walk Through (rain or shine)
11:45-12:45pm	Lunch (Central City Café)
1:00-2:30pm	Brainstorming Session
2:30-2:45pm	Break
2:45-4:15pm	Design Presentations and Discussion
4:15-4:45pm	Closing Remarks & Next Steps

Green Street Design Element Options

	Downtown Walkable Commercial	Main Street Commercial	High-Density Residential	Medium-Density Residential Street	Low-Density Residential Street	Signature Intersections
Permeable Pavement						
Porous Asphalt	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑
Pervious Concrete	☒ ☑ ☑ ☑	☑ ☑ ☑ ☑	☒ ☑ ☑ ☑	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑
Interlocking Pavement	☒ ☒ ☑ ☑	☑ ☑ ☑ ☑	☒ ☑ ☑ ☑	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑
Streetscape Bioretention						
Streetside Rain Garden	☑	☑	☑	☑	☑	☑
Stormwater Curb Extension	☑	☑	☑	☑	☑	☑
Planter Box	☑	☑	☑	☑	☑	☑
Tree Box Filter	☑	☑	☑	☑	☑	☑
Bioswale	☑	☑	☑	☑	☑	☑
Alternative Compliance						
Street Tree	☑	☑	☑	☑	☑	☑
Impervious Surface Removal	☑	☑	☑	☑	☑	☑

TABLE 4-2. SUITABILITY MATRIX

Table 4-2 identifies which green street elements are most appropriate for retrofits occurring within the street types described here.

Legend

- Travel lanes
- Bicycle/parking lanes
- Sidewalks
- Amenity zones/medians
- ☑ Appropriate for most applications
- ☑ Appropriate for some applications
- ☒ Not recommended

When integrating green infrastructure into urban areas, consider potential constraints: pedestrian, bike, and vehicle use; parking needs; utilities; and maintenance needs.

Green Street Design Element Options

Design Element	Benefits	Constraints/Considerations	Maintenance
Street Trees	• One of the most economical low impact development features • Requires only a small footprint and can therefore fit within a constrained site. • Can accommodate steep topographic changes.	• Require space, proper soil, drainage, and irrigation in order to thrive • Limited stormwater management capacity.	• Routine landscape maintenance
Open soil planting areas	• Adds trees to the streetscape • Soil may be existing, new, or amended. • Can fit between existing street furnishings such as signs, benches, hydrants and lights.	• Each planting area must contain the appropriate soil volume to hold the specified number of trees	• Proper watering is critical for the first two to three growing seasons. • Routine landscape maintenance
Closed, engineered systems	• Provides sufficient support for foot or automobile use on paved surfaces above while providing a large area of uncompacted soils below ground for root growth, stormwater storage, and the breakdown of pollutants	• Ensure the appropriate soil volume requirements are met	• Proper watering is critical for the first two to three growing seasons. • Routine landscape maintenance
Streetscape Bioretention	• Versatile stormwater treatment systems that capture runoff from impervious surfaces during small storm events and allow it to infiltrate through the soil media • Provides water quality improvements • Flexible to adjust design for utility and other conflicts	• A range of shapes, sizes, and layouts can be used to adapt bioretention features to street configurations, grades, soil conditions, and space availability.	• Depends on design (see below)
Rain gardens	• Small footprint allows rain gardens to easily fit into the urban landscape	• Most applicable for residential yards and other small-scale applications.	• Depends on design. • Typically: Routine landscape maintenance; inspect for erosion; remove and replace dead stock
Stormwater planters	• On-site retrofit option for treating rooftop runoff. • Can be placed either above the ground or at grade in landscaping areas between buildings and roadways. • Can be designed to allow water to fully seep into the ground (i.e., infiltration planters) or as flow-through planters	• May be necessary to provide structural support such as a retaining wall or an impermeable liner on the bioretention facility's road or building side	• Depends on design. • Typically: Routine landscape maintenance; inspect for erosion; remove and replace dead stock; ensure underdrain properly working
Stormwater curb extensions (bump-outs)	• Water filters through the planting soil, improving water quality. • Provides a physical buffer between pedestrians and the street. • Does not require encroachment into sidewalk area. • Encourages slower vehicle speeds by physically and visually narrowing the street. • Reduces pedestrian crossing distances when used at intersections. • Provides an area within the right-of-way for smaller plantings in addition to street trees.	• Must consider existing on-street parking conditions, street width, and vehicle turning radii. • Alteration of existing curb line will directly impact existing street drainage patterns and bump-out design must ensure existing street drainage is not negatively impacted. • Vegetation must accommodate adequate sight distances at intersections.	• Routine landscape maintenance, such as trimming, watering during droughts, weed and litter removal, etc. • Routine cleaning of inlets and pipes is required.
Bioswales	• Configured as linear channels that have a longitudinal slope of 1 to 5 percent to help convey stormwater	• Longitudinal slope does not allow the system to provide as much retention storage as in other bioretention systems smaller surface area per drainage	• Depends on design. • Typically: Routine landscape maintenance; inspect for erosion; remove and replace dead stock
Tree box filters	• Effective at controlling runoff • Runoff collected irrigates trees	• Presence of overhead • Wires must be accounted for with tree placement and species selection.	• Depends on design. • Typically: Routine landscape maintenance; inspect for erosion; ensure underdrain properly working

Design Element	Benefits	Constraints/Considerations	Maintenance
Tree trench	• Ability to store a large volume of stormwater • Impact to existing sidewalk width, use, and surface features is similar to that of typical street tree planting because sidewalk surface is restored to grade.	• Because flow is directed to the subsurface of the system, special attention should be paid to pretreatment.	• Routine landscape maintenance of street trees. • Routine cleaning of inlets and pipes is required.
Permeable Pavement	• Provides stormwater management while maintaining paved and other hardscape surfaces. • Can be implemented in lieu of traditional pavement replacement projects.	• Design must consider traffic loading and volume conditions. • Designs may not allow stormwater to drain onto permeable pavements from other areas. • Most frequently cited maintenance problem is surface clogging caused by organic matter and sediment	• Periodic clean out or vacuuming of surface is required. • Ensure that no sediment builds up on the pavement. Remove sources of sediment such as erodible soils in nearby landscaped areas.
Porous asphalt	• Successfully used for right-of-way applications such as on-street parking, low-volume neighborhood streets, alleys, and trail surfacing open structure • Allows water to drain through and is a "cooler" pavement choice	• Similar in color and appearance to conventional asphalt. • With proper maintenance, can last up to 20 years.	• Periodic street sweeping will remove accumulated sediment and help prevent clogging. • Ensure that surrounding land areas remain stabilized.
Pervious concrete	• Creates void spaces large enough to allow water to drain through. • Can be installed on residential streets, paths and walkways; light duty and commercial parking areas; and transit and pedestrian areas.	• Pervious concrete is not recommended in areas where large vehicles travel. Heavy loads can deform or crack the pavement in these systems. • Properly maintained, may have a life span of up to 30 years.	• Periodic street sweeping will remove accumulated sediment and help prevent clogging. • Ensure that surrounding land areas remain stabilized.
Interlocking permeable pavers	• Provide charm and character to both residential and urban streetscapes. • Have been successfully implemented in walkways, plazas, alleyways, and parking areas for larger projects.	• Pavers must be placed by hand or machine on an even surface. • If properly maintained, typical lifespan of up to 30 years. • Interlocking pavers should not be used in bike lanes.	• Periodic street sweeping will remove accumulated sediment and help prevent clogging. • Ensure that surrounding land areas remain stabilized.
Other			
Green Gutters	• Provides a physical buffer between pedestrians and the street when an elevated street side curb is used. • Does not require encroachment into sidewalk area. • Provides an area within the right-of-way for smaller plantings.	• Must consider existing on-street parking conditions and street width. • Landscape materials must accommodate direct impact of gutter flow velocity. • Placement should occur outside of bike lanes. • May not be appropriate in high volume pedestrian areas.	• Routine landscape maintenance
Stormwater Drainage Wells	• Small footprint with potentially large storage volume. • Potential option where other BMPs are not applicable.	• Must account for minimum allowable separation between the bottom of the stormwater drainage well and: seasonal high ground water, the top of bedrock, and building foundations • Design sizing may be based on methods other than static storage of the runoff volume.	• Designed such that stormwater introduced to the drainage well has already passed through a system that provides a high level of pretreatment, thus the wells themselves require relatively little maintenance. However, maintenance of the upstream pretreatment system, which varies, will be required.

Appendix C: Additional Resources

EPA G3 Website

https://www.epa.gov/G3

The G3 Initiative supports the use of green streets to bring a community's "Green Vision" to life and provides the tools and resources needed to develop a green vision, design-build, and operate and maintain green infrastructure stormwater management practices.

Paul Ambrose Trail for Health (PATH), KYOVA Report

http://www.kyovaipc.org/2015_05_18_%20WV_Bike_Ped_Assessment_Final_Report.pdf

EPA Municipal Handbook, Green Streets

https://www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_green_streets_0.pdf

Green Streets Design Manual Philadelphia Water Department

http://www.phillywatersheds.org/what_were_doing/gsdm

The Green Streets Design Manual outlines what types of green stormwater infrastructure practices are appropriate on various street typologies, provides standardized design details, and lays out the necessary design review and construction inspection processes. While this manual was developed for Philadelphia, other cities can benefit from reading through this guide.

EPA National Stormwater Calculator

https://www.epa.gov/water-research/national-stormwater-calculator

A desktop application that estimates the annual amount of rainwater and frequency of runoff from a specific site anywhere in the United States (including Puerto Rico). Estimates are based on local soil conditions, land cover, and historical rainfall records.

Storm Smart Cities

https://www.epa.gov/G3/storm-smart-cities-integrating-green-infrastructure-local-hazard-mitigation-plans

Watershed Resources Registry

https://watershedresourcesregistry.org/

This is an interactive online mapping tool that prioritizes areas for preservation and restoration of wetlands, riparian zones, terrestrial areas, and stormwater management control across an entire state. The tool is helpful for a wide variety of purposes but is especially useful for developers, natural resource planners, transportation planners, and others who are required to avoid impacting natural areas or to provide mitigation for any unavoidable impact.

Georgetown Climate Center Green Infrastructure Toolkit

http://www.georgetownclimate.org/adaptation/toolkits/green-infrastructure-toolkit/introduction.html

This resource analyzes common trends in the approaches various cities are taking to planning, implementing, and funding green infrastructure to manage stormwater. The toolkit is intended to aid local governments nationwide in comparing best practices across cities, drawing lessons from different approaches, and crafting similar policies for their own jurisdictions.

H_2O Capture National Resources Defense Council Green Infrastructure Benefits Calculator

http://www.adaptationclearinghouse.org/resources/h2o-capture-nrdc-green-infrastructure-benefits-calculator.html

H_2O Capture is a green infrastructure benefits "calculator" that can estimate the benefits of a new project. It quickly presents benefits in a concrete numerical fashion meant to be a tool in deciding the feasibility of projects.

West Virginia Stormwater Management and Design Guidance Manual

http://www.dep.wv.gov/WWE/Programs/stormwater/MS4/Pages/StormwaterManagementDesignandGuidanceManual.aspx

This manual contains stormwater management practices that utilize the runoff reduction method, which is a method that takes advantage of infiltration, harvesting and evapotranspiration of rainfall on-site.

List of Acronyms

AIA	American Institute of Architects
BMPs	Best Management Practices
CSS	Combined Sewer System
EPA	Environmental Protection Agency
G3	Green Streets, Green Jobs, Green Towns
GIS	Geographic Information System
HSU	Huntington Stormwater Utility
MPO	Metropolitan Planning Organization
MS4	Municipal Separate Storm Sewer System
NEA	National Endowment for the Arts
ON TRAC	Organization, Training, Revitalization and Capacity
O&M	Operations and Maintenance
OSWP	Office of State Watershed Partnerships
PATH	Paul Ambrose Trail for Health
RFP	Request for Proposals
USACE	United States Army Corps of Engineers
WRR	Watershed Resources Registry
WV	West Virginia
WVDOH	West Virginia Department of Highways

United States Environmental Protection Agency