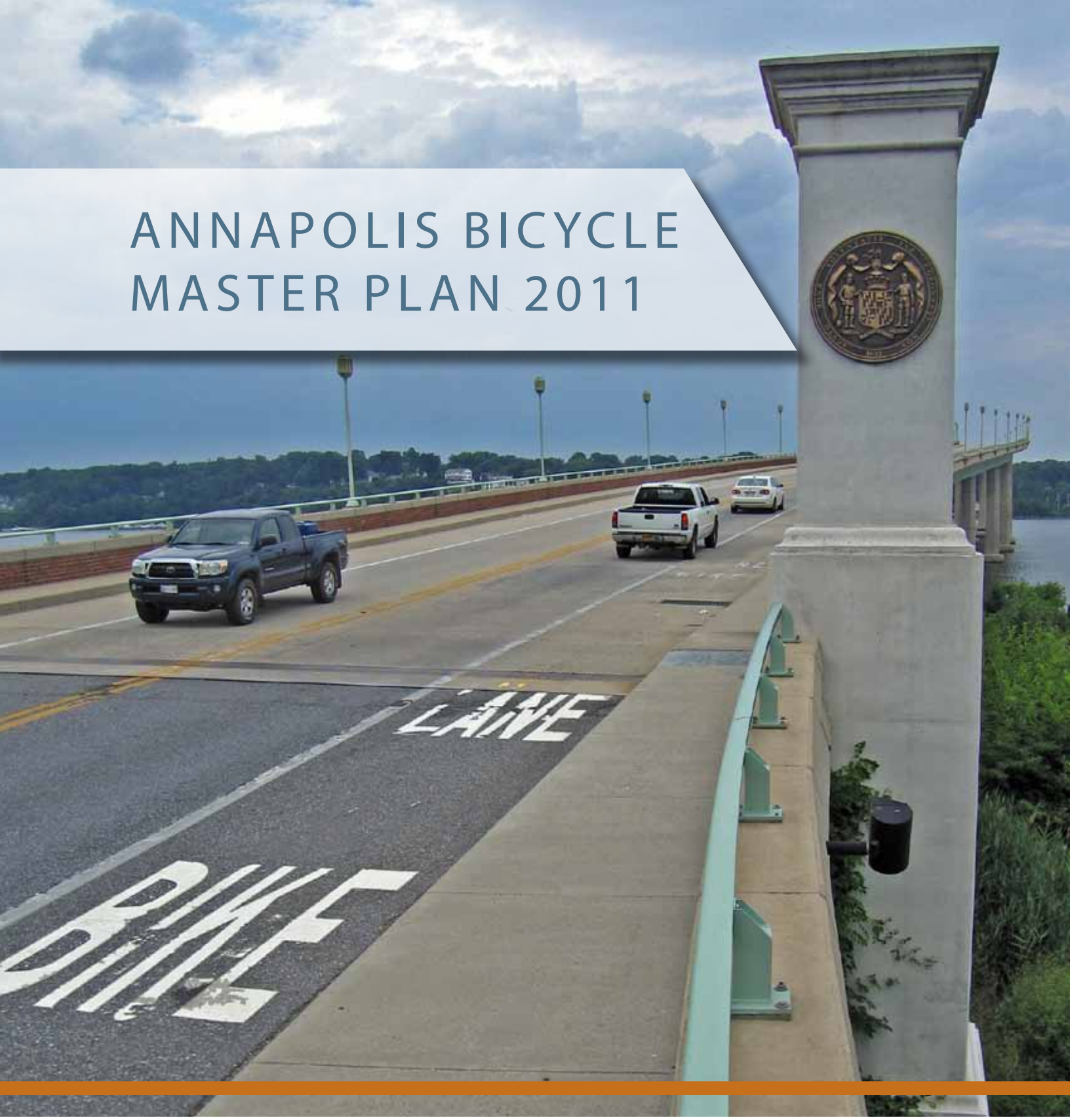
ANNAPOLIS BICYCLE MASTER PLAN 2011



THE CITY OF ANNAPOLIS MARYLAND

ACKNOWLEDGEMENTS

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1. INTRODUCTION

"Life is like riding a bicycle. To keep your balance you must keep moving."
- Albert Einstein

MASTER PLAN VISION AND GOALS

Annapolis' compact network of streets were laid out about 350 years ago and the scale and mixture of land uses make the City ideal for walking and bicycling for both transportation and recreation. Annapolis boasts a renowned active outdoor culture oriented to its connection to the Chesapeake Bay. The setting of gentle hills, ample water views and moderate climate bicycling feasible and enjoyable nearly year round. An active bicycling community and a wealth of destinations within easy biking distance from any location in town prime Annapolis to be "a premier community for safe and reliable bicycle transportation" as envisioned in the City's Comprehensive Plan.


Annapolis city dock

The City has set a goal to earn a Bronze Level Bicycle Friendly Community award, administered by the League of American Bicyclists, by 2012 and to earn a Silver-level Community by 2016. The first step towards earning this award is the completion of this Plan and implementation of its short-term recommendations. Furthermore, the support of bicycling in Annapolis can help achieve numerous broader livability and development goals outlined in the 2009 Comprehensive Plan. The impetus for this Plan came from the Annapolis Bicycle Committee's 2008 report which recognized that the City needed a blueprint for advancing Bicycle Network. The report set ideas into motion with its vision statement:

> *"… it shall be the policy of the City of Annapolis to invite, welcome and encourage more bicycling by planning, developing and continually improving safe and accessible streets through programs like Safe Routes to School and off-road networks and amenities such as bicycle storage, signage, education, enforcement and maps."*

To achieve this vision, the following goals guide the development of the Annapolis Bicycle Master Plan.

This Plan will establish:

1. a lasting bicycle transportation program integrated with Anne Arundel County and the State of Maryland
2. ongoing programs for bicycle safety, education, and encouragement
3. a convenient and attractive network of on-street and off-street bicycle routes for all abilities, ages and skill levels
4. connections to other modes of transportation
5. a financial plan for construction, maintenance, and programming

Specific actions recommended to achieve the goals of this Plan are summarized below and detailed in the following chapters: Institutionalizing Bicycling, Bicycle Programs, Bicycle Network, and Implementation Strategy.

POLICY, PROGRAM, & INFRASTRUCTURE RECOMMENDATIONS

Dedicate Funding

- Identify dedicated funding sources to implement and maintain the bicycle programs and infrastructure identified in this Plan. Potential funding sources include a percentage of parking revenues, a percentage of the overall City transportation budget, and bonding to bundle and implement multiple small bicycle improvement projects across the City at one time.

Staffing & Operations

- One full-time, permanent staff position as the City's point person for bicycle and pedestrian coordination and project implementation.
- Regular training for staff on current bicycle facility design best practices.
- To enable responsive maintenance and ongoing implementation, move traffic operations and maintenance duties to the Department of Transportation, including funds and equipment necessary to perform in-house installation and rehabilitation of pavement markings.

Integrate Plan recommendations into land development review and capital project scoping

- The trails and facilities identified on the Bicycle Network - Recommended Facilities map should be required as conditions of approval through the development review process when applicable.
- The city code should be updated to clarify the quantities and design characteristics for bicycle parking.
- Include Plan recommendations when scoping for all City capital improvement projects.

Expand and Enhance the Existing Bike Annapolis Website

The City's bicycle information website is helpful and functions as a clearinghouse for several important bicycling-related resources. The following actions are recommended to expand and enhance the existing Bike Annapolis website:

- Register a web address that is easy to advertise, i.e. www.bikeannapolis.gov
- Update the bicycle route map and make it viewable by smartphones
- Add a link to the City's online "report a problem" webpage
- Add a calendar showing bicycle events
- Cross-post bicycle-related volunteer opportunities
- Cross-post bicycle-related activities and programs of other City departments

The City should expand the Coexist Give/Get program. The program's goals and approach create an opportunity to comprehensively strengthen and package the City's roadway safety programs and should also extend to include pedestrians in their messages. Actions that would create an enhanced Coexist program include:

- Create a brand for the Coexist Program
- Provide Bicycle education for all law enforcement officers
- Expand the Police bicycle fleet
- Progressive/Educational ticketing
- Support distracted driving campaigns
- Crossing stings to reinforce compliance with crosswalk markings
- Linking biking to health/recreation programs

The City can also play a role in facilitating, organizing, or cross publicizing efforts where other private or public entities in the community will take the lead.

- Market the City as an "Active Vacation" destination
- Expand the reach of the Safe Routes to School Program

- Provide youth bicycle safety education program/bicycle rodeos
- Advertise adult and university student safety classes
- Facilitate and promote group rides
- Encourage friends of the trails programs
- Explore bringing a bike share program to the City

The recommended Bicycle Network was informed by the Plan's goal of establishing a convenient and attractive network of on-street and off-street bicycle routes for all abilities, ages and skill levels. Based on this guiding principle, as well as stakeholder input, the recommendation is to develop a set of core routes that parallel but avoid major vehicle thoroughfares where possible. The routes connect Annapolis' neighborhoods and destinations, enhanced by strategic Connector Paths, targeted intersection and crossing improvements, and a comprehensive wayfinding signage system.

The primary routes and connections established by the recommended Bicycle Network are:

- Poplar Trail: City Dock to the Annapolis Mall
- Spa Creek Trail: neighborhood and trail route connecting City Dock to Parole Town Center
- West Annapolis/Hilltop/Bay Ridge Loop
- Forest Trail: a separated trail along the entire southern edge of Forest Drive

IMPLEMENTATION STRATEGY

The Plan identifies phases of infrastructure projects to be implemented based on prioritization factors including safety, connectivity, cost, complexity of implementation, and community support.

Phase One (0-2 Years) - The Phase One Plan recommendations seek to make the maximum impact with a relatively small investment in the next two years. The first element is to enact the ongoing Policy and Program recommendations. Also recommended is to begin installing bicycle parking in high need locations, perhaps as a part of ongoing city-wide bus shelter rehabilitation. Finally, the 6.9 miles of early implementation Bicycle Network facility projects can be created almost exclusively with just paint and signage.

Phase Two (3-5 Years) - The Phase 2 Plan recommendations seek to continue implementing the Policy, Program, and bicycle parking recommendations. Building on the ongoing Bicycle Network expansions completed in Phase

One, Phase Two will create an updated bicycle map and destination-oriented wayfinding system to educate bicyclists about the established Bicycle Network and their improved route options. The Phase Two Bicycle Network facility projects are a set of 4.0 miles of capital projects. These projects will require more time and resources to design and implement than the Phase One facilities, however they make essential connections in the Bicycle Network as shown in the Network Phases Map.

Phase Three (6+ Years) - The Phase Three recommendations are capital projects that complete the Bicycle Network. Many of these recommended facilities will require new construction or roadway reconfiguration, which will be completed as development or larger capital roadway reconstruction projects occur. An update of this Plan shall also be undertaken in Phase Three to track progress and re-evaluate priorities.

The Implementation Costs Table identifies funding targets for the next five years to implement the Plan recommendations through Phases One and Two.

Phase One & Two Implementation Costs Table						
	Years					
	1	**2**	**3**	**4**	**5**	**6+**
Facility Construction	$50,000	$50,000	$360,000	$360,000	$360,000	$100,000
Design/Planning (50%)	$25,000	$25,500	$180,000	$180,000	$180,000	$50,000
Bike Parking	$10,000	$10,000	$10,000	$10,000	$5,000	$5,000
Co-Exist Programs/ Materials	$5,000	$5,000	$2,000	$2,000	$2,000	$2,000
Maintenance			$5,000	$10,000	$10,000	$15,000
Wayfinding Plan/ Installation				$60,000	$60,000	
Bike Map Redesign/ Printing				$40,000		
Plan Update						$50,000
	$90,000	$90,000	$560,000	$670,000	$620,000	$230,000

5-year total	**$2,030,000**
10% contingency	**$210,000**
	$2,240,000

MASTER PLAN PROCESS

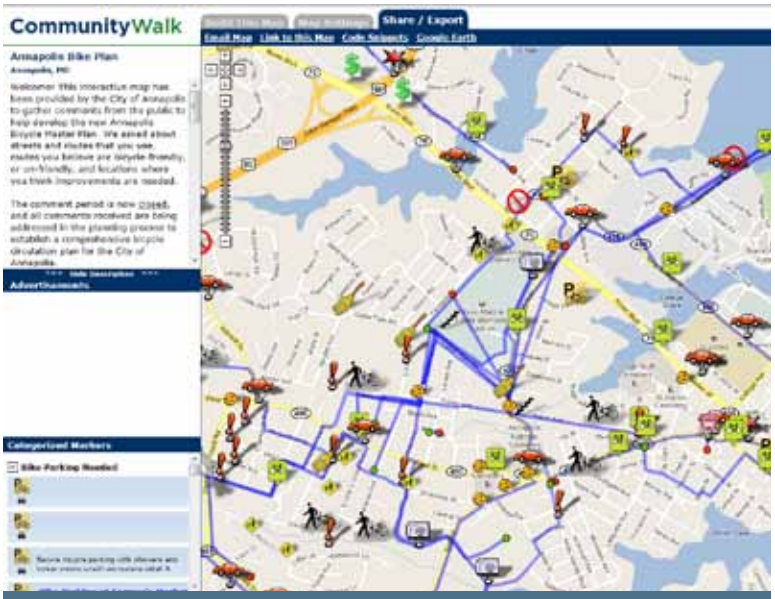
This Plan is the result of a collaborative process involving City staff, a steering committee comprised of City, County and State agency staff, and the general public. The public had several opportunities to provide comment and ideas for the Plan as detailed below.

Steering Committee

At the helm of the Plan development process was a steering committee made up of representatives from many of the City's agencies and departments involved in bicycle issues. A variety of community perspectives were included on the steering committee as provided by representatives from the Annapolis Regional Transportation Management Association and the City of Annapolis Transportation Board. Representatives from Anne Arundel County and SHA were involved to ensure continuity with planning efforts in neighboring jurisdictions. The team set the vision and goals for the Plan, reviewed the field analysis and public comment results, and helped craft and confirm the policy, Bicycle Network and program recommendations.

Online-Interactive Map

An online interactive map was created for the purpose of capturing geographically specific locations where biking conditions are comfortable and where they need improvement, informal connections, desirable routes, roadways of concern, maintenance issues, challenging intersections, etc. This approach allows us to supplement conventional public outreach efforts that frequently address only a small geographic area. The map was publicized on the City's website and other channels such as bike advocacy listservs and newsletters. The map was made available from May 1, 2011 through June 13, 2011. Over 800 people viewed the map and more than 300 points and 40 paths were recorded.



Community Walk online interactive map

The functionality of the map allowed participants to click on a location, assign the point a category, and describe bicycling conditions at the location. The map also allowed people to map routes that they take, and describe

the conditions along the way. Participants could also comment on each other's points and comments. All of the points, lines and comments were downloaded and exported to an external database. The points reflected input on locations across the City and into some of the neighboring communities just outside the City limit. Many routes and difficult intersections identified by participants were evaluated as a part of fieldwork efforts. The most common comments placed on the map were areas in need of bike parking and areas where traffic is uncomfortable for bicyclists. The most common routes identified were "good side-streets" suggesting that there are ways for bicyclists to navigate Annapolis while avoiding the major arterials, which can be uncomfortable for bicyclists. All of the comments were reviewed and considered as part of the existing conditions analysis and development of recommendations. This database will be provided to the City for future use.

Public Workshops

The public was invited to two workshops at the City Dock Market House on May 26, 2011 to learn about and comment on the Plan. The public stakeholder workshops were an opportunity for the community to share their bicycling experiences, opinions and advice and also have a chance to learn about the planning process. Existing conditions information and maps were presented on a series of maps and boards, as well as a brief presentation and preliminary recommendations for bicycle programs. The workshops were conducted in an interactive format in which participants were encouraged to mark up maps indicating such items as the destinations they wish to access by bicycle, the routes they prefer to use for recreation and transportation, the streets they avoid, and where bicycle parking or other amenities are needed. The information gathered through this outreach was used to identify specific deficiencies, such as problem intersection crossings and challenging roads that merit field investigation. Participants were also asked to vote for the proposed support programs that were most appealing. Self-addressed comment forms were also provided for people to add suggestions to the public record and either submit later or give to people who were unable to attend the meeting.

Field Analysis

Field investigation of existing bikeway facilities (both on-road as well as off-road) and an analysis of gaps in the existing network led to the creation of the recommended Bicycle Network. The criteria used to evaluate and screen the routes for inclusion in the draft network included: suitability for bicycling without improvement; potential to be improved; destinations served (parks, schools, shopping, library, City Dock); public interest in the route; contribution

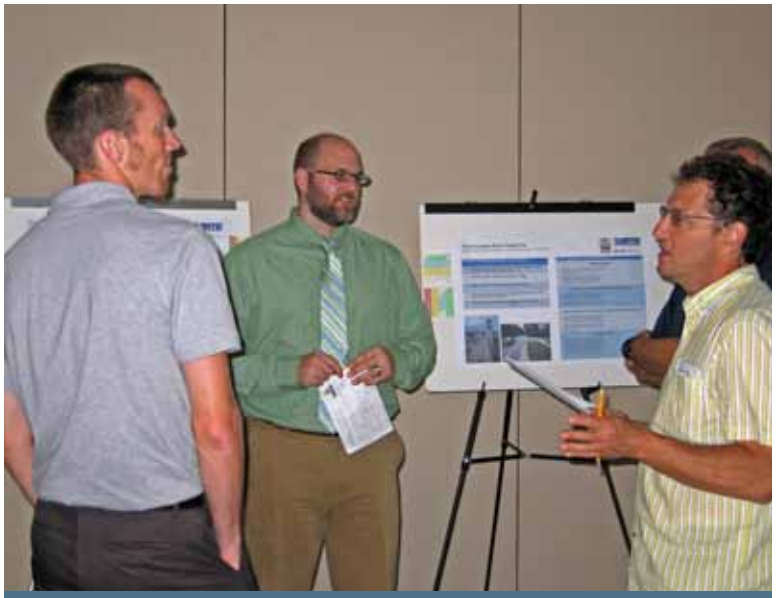
to overall connectivity; coverage of the City; connections to transit; and other factors. The field work identified critical on-road network gaps that may be solved by improving existing off-road connections, or building new connections as well as roadway segments requiring follow up analysis and design.

Stakeholder Interviews

Stakeholder interviews were held with organizations that have an interest or relationship to bicycling in Annapolis, including: State Highway Administration, Anne Arundel County, and City of Annapolis Department of Public Works. These meetings allowed an opportunity to review preliminary recommendations with key stakeholders in detail and identify opportunities for improving and expanding bicycling and bicycle safety in Annapolis, as well as identifying constraints.

Public Open House

A traditional open house public meeting was held to review the draft plan content and recommendations at Pip Moyer Recreation Center on July 20, 2011. A presentation, handouts, and maps introduced the recommended policies, programs, and bicycle route network. An open question session followed the presentation and attendees were invited to fill out comment forms and mark up the maps with their concerns and suggestions. Several key themes emerged from the open house including: a desire for immediate action to implement the Plan recommendations, concern over bicyclists riding on sidewalks, the need for continued coordination with property owners and the public through project implementation, and overall importance of King George Street to the Bicycle Network.



Annapolis Bike Plan Public Open House

2. INSTITUTIONALIZING BICYCLING

Bicycle Programs - Master Plan Goals

1. *A lasting bicycle transportation program integrated with Anne Arundel County and the State of Maryland*

THE CASE FOR BICYCLING

There are many benefits to be gained from supporting bicycling in Annapolis, including improvements in health and fitness, safer and more vibrant communities, economic development and tourism, and a balanced and fiscally-sound transportation system. Bicycling provides intangible benefits for both the individual and the City as a whole, whether they are riding for recreation or necessity. As cities across the country grow, being able to bike from one place to another safely and conveniently can help define the quality of a person's experience in the community. Cyclists in Annapolis enjoy a generally mild climate and gentle landscape, which makes bicycling a viable year-round transportation and recreation option.

Support Annapolis' Existing Bicycle Community

Annapolis is fortunate to have an enthusiastic and large cycling community. In Annapolis, the increasing popularity of recreational bicycling is unmistakable as more bicyclists are seen on the streets each year. The City has several cycling clubs and groups that promote bicycling in and around the City and organize group rides. While many of the groups are oriented to recreational riding, their members' presence on the roads and trails increases awareness of all cyclists.

Mayor Josh Cohen at Market House for Bike-to-Work Day 2010

In addition to recreational riders, there are a growing number of residents that cycle for transportation out of either choice or necessity. For young people, walking and bicycling afford a sense of independence, and for seniors, walking and biking are effective means to stay active both physically and socially.

According to the 2000 U.S. Census, approximately 22 percent of the Annapolis population is under the age of 18 and just over 12 percent of the population is 65 years or older. These are two largely non-driving segments of the population that directly benefit from improvements to the non-motorized transportation network. Additionally, 2000 U.S. Census data reveals that 15.8 percent of commuters do not own a car and rely on walking, biking and transit.

Economic Development and Job Creation

Bicycling can help bring tourist dollars into the city. Active vacations and recreational tourism are one of the fastest growing sectors of the tourism industry, and Annapolis offers exceptional recreational riding opportunities. Bicycling also allows tourists to travel quickly to sites around Annapolis and enables the city to better tap into the buying power of the 4 million tourists who often limit their visit to the downtown[1]. It is in the City's interest to maximize the economic benefits from ongoing investments in expanding the Poplar Trail and Spa Creek Trail as links in the East Coast Greenway, a route drawing bicyclists traveling between Florida and Maine. According to a 1998 study, recreational tourism on the Great Allegheny Passage trail in Maryland and Pennsylvania generated in excess of $14 million a year, even though the trail was only partially completed at that time[2]. A 2004 study of the Northern Central Rail Trail (a 21-mile unpaved trail in Maryland) found that annual revenues from the purchase of hard goods, soft goods and accommodations by trail users were approximately $10.3 million. A destination off-road trail network could be established in Waterworks Park with similar benefits.

In addition to tourism impacts, studies have shown that proximity to greenways and trails can have a positive effect on property values. A study by the Center for Urban Policy and the Environment focusing on the Indianapolis, Indiana housing market found that "proximity to greenways generally has positive, statistically significant effects on property values and that, when summed across the City, these effects may be in the millions of dollars."[3]Additionally, in a 2002 survey of recent home buyers sponsored by the National Association of Realtors and the National Association of Home Builders, trails ranked as the second most important community amenity out of a list of 18 choices.[4]

1 Figured taken from City of Annapolis website, http://www.ci.annapolis.md.us/Visitors/Welcome.aspx accessed on 07-07-11.
2 Stephen Farber, An Economic Impact Study for the Allegheny Trail Alliance, University of Pittsburgh and Pennsylvania Economic League, Inc., January 1999, i-ii.
3 Greg Lindsey, Public Choices and Property Values: Evidence from Greenways in Indianapolis, Center for Urban Policy and the Environment, December 2003, 1.
4 Consumer's Survey on Smart Choices for Home Buyers, National Association of Realtors and the National Association of Home Builders, April 2002.

Implementing bicycle infrastructure projects such as bike lanes and bike boulevards has a positive effect on local job creation. It is likely that any infrastructure project will foster local jobs, but it appears that bicycle and pedestrian projects may be even more beneficial to the local economy. Based on a study conducted by the University of Massachusetts-Amherst, bicycle and pedestrian infrastructure projects create more jobs than road repairs and resurfacing.[5] The study evaluated data on infrastructure projects completed in Baltimore, Maryland. The conclusion was that because bicycle and pedestrian projects can be more labor-intensive, more of the money is spent on labor than on materials. As explained by the author,

> *"In this case study we find that investments in bicycle and pedestrian infrastructure create the most employment for a given level of expenditure. While road construction projects create approximately 7 jobs per $1 million spending, pedestrian projects create over 11 jobs for the same level of spending, and bicycle projects create up to 14 jobs."*

Finally, companies today are very location mobile, and many large employers are recognizing that their ability to recruit top employees depends significantly on local culture and amenities. With modest investments in bicycle infrastructure and programs, Annapolis can turn its Bicycle Network, programs, and community into a primary selling point for prospective companies and employees.

Maximizing Investments & Use of Limited Resources

Bicycling can often be the fastest and most convenient mode of travel for trips less than a few miles, especially when considering the cost and scarce availability of vehicle parking. Due to the compact form of Annapolis, retrofitting existing roads to accommodate bicycles can be a desirable way to maximize the carrying capacity of roadways without expanding pavement and other impervious surfaces. The retrofit of selected roadways to include bicycle facilities can also help neighborhoods achieve broader traffic calming goals in working towards a balanced transportation system for all modes. As the number of bicyclists increases, motorists will become more accustomed to driving alongside them, and inexperienced bicyclists will have good examples to emulate.

Bicycles, like any vehicle, increase the efficiency and speed at which the

5 Heidi-Garret Peltier, Estimating the Employment Impacts of Pedestrian, Bicycle and Road Infrastructure. Political Economy Research Institute University of Massachusetts Amherst . December 2010

traveler is moving. Targeting the provision of safe and convenient bicycle facilities to provide access to transit stops can increase the service radius beyond the typical catchment area for transit users. Transportation planners generally estimate that people will opt to bicycle up to three miles for their trips; possibly less, if the trips include a leg on public transit. This is a significant potential for bicycling as transportation in Annapolis given that vast majority of destinations within the City are at most 3 miles apart. Even if the transit rider will only bike up to one mile to the closest transit stop, it can increase the ridership for that transit stop significantly. Providing bike parking at transit stops and equipping buses to carry bikes can further increase the affinity between the two modes.

Bicycle facility improvements are significantly less expensive for the City to both construct and maintain than the equivalent for cars. The cost to purchase and install one bicycle rack is between $150-300 as compared to a car parking space which is approximately $2,220 for a surface lot space and $12,500 for a space in a garage.[6] As a vehicle, the bicycle is very efficient in its use of public space. For example, there is space for approximately 10 to 12 bicycle parking spaces in one automobile parking space.[7]

Parking accommodations for bikes rather than cars allows for for landscaping and other aesthetics in key destinations. Many bicycle routes can be shared with cars by implementing inexpensive strategies such adding pavement markings, installing signs, or permitting bicyclists to use shoulders already present on the road. Additionally, as people substitute car trips with bike trips, there are fewer cars on the road which can lead to less congestion and less wear and tear on the roads, and translates to less roadway surface and pavement markings maintenance responsibilities for the City.

Bike to Work Day 2010

Requiring only a fraction of the cost that it takes to own and operate a motor vehicle, bicycling is an affordable mode of transportation. The American Automobile Association estimates that the average American spends nearly $8,000 per year to own and operate an automobile, while bicyclists typically spend less

6 Cost estimates taken from Pedestrian and Bicycle Information Center http://www.bicyclinginfo.org/engineering/parking.cfm) accessed online on 06-29-11.

7 Pedestrian and Bicycle Information Center, "Bicycle Parking: Costs," Available online: www.bicyclinginfo.org/de/park_costs.cfm.

than $200 per year.[8] As the bicycle is a much simpler machine, it is more likely that repairs and maintenance for bicycles can be performed by the owner rather than a mechanic, saving time and money for the owner. When bicycling trips are combined with public transit, travel can be just as convenient as operating a personal vehicle, at a significantly lower cost.

Health Benefits

Active transportation modes such as biking and walking increase physical activity, which has numerous health benefits. Regular moderate physical activity improves heart and lung functionality. Recent health studies have shown up to a 50% reduction in Type 2 diabetes among people who engage in moderate physical activity – such as bicycling to work - on a regular basis Bicycling on a regular basis[9] can improve endurance, strength and flexibility.

Bicycling is especially part of a healthy routine for children. When children walk and bike to school they are able to expend energy before entering the classroom, making it easier to focus and learn. Studies have shown that there is a positive relationship between physical fitness and academic achievement for children.[10] Children who ride in chaperoned "bike trains" practice safe bicycling maneuvers and decision-making skills in a safe environment. Teaching children a new skill that they can use throughout their lifetime helps build confidence and a sense of self-worth. Children today are especially vulnerable to conditions associated with obesity. Physical education classroom time and after school athletics are suffering cuts due to budget constraints and the lack of exercise is taking its toll. According to a recent study, "Too Fat to Fight" researchers found that 25 percent of America's youth are ineligible to serve in the United States Military due to obesity related conditions.[11]

Environmental Benefits

Bicycling instead of driving a car can help to improve the environment by reducing greenhouse gases that contribute to global warming, and reducing the amount of pollution in our air and water. There are no by-products or pollution associated with bicycling. Retrofitting bicycle facilities to existing roads can increase the carrying capacity of the transportation system with negligible

8 As estimated by the League of American Bicyclists

9 Journal of the American Medical Association, October 1999, based on a study by the Harvard School of Public Health.

10 Chomitz, Virginia R., Slining, Meghan M., McGowan, Robert T., Mitchell, Suzanne E., Dawson, Glen F. and Hacker, Karen A. "Is There a Relationship Between Physical Fitness and Academic Achievement? Positive Results From Public School Children in Northeastern United States." Journal of School Health. 79 (2009): 30-37.

11 Mission Readiness "Too Fat to Fight: A Brief On Georgia": 2011. http://www.missionreadiness.org/GAReport.pdf Accessed online 07-06-11.

increases in impervious surfaces and stormwater runoff. This is important for cities such as Annapolis where water quality is an important community value.

OTHER PLANS AND STUDIES

A primary goal of this Plan is to establish bicycle links between the City of Annapolis and the surrounding communities and neighborhoods in Anne Arundel County. In addition, many of the recommendations in this Plan will be completed in consultation and coordination with the Maryland Department of Transportation (DOT), State Highway Administration (SHA), and Department of Natural Resources (DNR) who have the responsibility of managing and maintaining many of the primary thoroughfares and statewide trails that pass through Annapolis. The following is an outline of the existing plans and initiatives of these partner agencies and departments with relevance to and support for the City of Annapolis Bicycle Master Plan.

2009 Annapolis Comprehensive Plan

The 2009 Annapolis Comprehensive Plan articulates a vision for the city's next decade and beyond, identifying issues important to the city and its citizens, and formulating goals and recommendations to address those issues. The Transportation recommendations of the Comprehensive Plan include specific support for investment in bicycle infrastructure and programs with statements such as: "*Principle 4. Transportation investment and operating priorities in Annapolis must shift to transit, pedestrians and bicycles first, automobile second*." The Plan proposes using automobile parking revenue to fund bicycle and other non-motorized infrastructure improvements, as well as the reconfiguration of "main streets" into Complete Streets that serve the full needs of the community and establish "a world-class network of bicycling facilities and routes ".

This City of Annapolis Bicycle Master Plan will be incorporated as a part of the Annapolis Comprehensive Plan.

2008 Bicycle Transportation Committee Final Report

In early 2008, the Annapolis Bicycle Transportation Committee (ABTC) was convened to assess the city's Bicycle Network and amenities and recommend improvements. The ABTC's Nov. 2008 Report proposed short- and long-term solutions to improving Annapolis bicycle facilities and assessed critical missing links in the network. To guide future City decisions in regards to bicycle facilities, the ABTC proposed the Vision Statement that was then adopted in the City's 2009 Comprehensive Plan and here in this Bicycle Master Plan.

2011 Bicycle, Automotive and Pedestrian Safety Evaluation

This study looked at multimodal improvements in the area surrounding City Dock, including the reconfiguration of Market Space, Dock Street, St. Mary's Street, Main Street, and Memorial Circle. A key recommendation of this Plan is to create a bollard-protected, two-directional cycle track along the north side of Main Street in place of the current parking lane.

Bike to Work Day 2010

2004 City of Annapolis - Parks, Recreation and Open Space Master Plan

"The Plan recommends connecting more parts of the City to the trails/pathway system, formalizing the connection between the Poplar Trail and Spa Creek Trail, an important missing link in the current system, and expanding the wayfinding sign program."

2003 Anne Arundel County - Annapolis Neck Small Area Plan

A key recommendation of the Small Area Plan supports the development of the Bicycle Network detailed in this Bicycle Master Plan: *"Create an integrated City-County network of pathways that link neighborhoods, parks, schools, stream valleys, waterways, and activity centers on the Annapolis Neck with one another and with regional and national trails. Pathways should serve both transportation and recreational needs."*

2003 Anne Arundel County - Pedestrian and Bicycle Master Plan

The Anne Arundel County Pedestrian and Bicycle Master Plan provides recommendations for specific actions, responsibilities, policies and procedures for future bicycle and pedestrian projects. The County is in the initial steps of updating the Pedestrian and Bicycle Master Plan, which will directly affect the Annapolis Bicycle Master Plan by providing the framework to continue and enhance recommendations across jurisdictional boundaries.

2009 Maryland Trails: Strategic Implementation Plan - A Greener Way to Grow

The TSIP is Maryland's coordinated approach to plan a connected statewide shared-use trail network that serves the needs of all Marylanders. The purpose of the TSIP is: to communicate a vision for trail development in Maryland; to provide policy direction for partner agencies and local governments; and to outline

a coordinated and strategic approach for closing gaps in the existing system of trails, for improving existing trails and supporting eco- and heritage tourism opportunities, and for ensuring smart planning for future trail development."

2002 MDOT Twenty Year Bicycle and Pedestrian Access Master Plan

"The MDOT Bicycle and Pedestrian Access Master Plan is a comprehensive guide to developing, improving, and maintaining bicycle and pedestrian travel in Maryland over a twenty-year period. The Plan largely addresses the conditions for biking and walking along State highways. Yet, it also serves as guidance and a call to action to other State and local agencies that oversee local, federal and related systems that can foster better bicycle and pedestrian travel in Maryland."

POLICY RECOMMENDATIONS

Dedicate Funding

Identify dedicated funding sources to implement and maintain the bicycle programs and infrastructure identified in this Plan. Potential funding sources include a percentage of parking revenues, a percentage of the overall City transportation budget, and bonding to bundle and implement multiple small bicycle improvement projects across the City at one time.

Staffing & Operations

The City of Annapolis should continue to employ one full time staff dedicated to non-automobile planning and coordination to implement and monitor programs, carry out development review, manage capital projects identified in this Plan, provide a point of contact for public and agency communication, track Plan achievements and prepare content for annual Comprehensive Plan reports

For consistency it will be important that all staff members involved in project evaluation and implementation have access to and a basic understanding of current practices and standards. This can be accomplished with City support for regular educational opportunities for appropriate City staff and partners related to bicycle planning and facility design on current bicycle facility design best practices. The 2009 edition to the Manual for Uniform Control Devices (MUTCD) has added new approved facilities which are included in this Plan. The updated AASHTO guide includes guidance and best practices information on where and when those facilities should be implemented. City staff should be aware of the changes made to these resources, and should be kept up to date on other revisions to manuals and design guidelines. A list of relevant resources are included as an Appendix.

To enable responsive maintenance and ongoing implementation, the City should move traffic operations and maintenance duties to the Department of Transportation, including funds and equipment necessary to perform in-house installation and rehabilitation of pavement markings.

Integration of Plan recommendations with land development and capital projects

Incorporating this Bicycle Master Plan into the Transportation chapter of the Comprehensive Plan will establish these recommendations as official city policy. Land development and redevelopment projects should be required to routinely address the recommendations of this Plan as it would any other part of the Comprehensive Plan. The trails and facilities identified on the Bicycle Network - Recommended Facilities map should be required as conditions of approval through the development review process when applicable.

The City Code should be modified to guide development and redevelopment projects to supply appropriately designed, located and spaced bicycle parking facilities in a sufficient quantity for the surrounding land uses. *Bicycle Parking Guidelines, 2nd Edition (2010)* prepared by the Association of Pedestrian and Bicycle Professionals provides detailed guidance on the current state of practice for bicycle parking regulations, and should be adopted as the official guidance document for City of Annapolis bicycle policy. In particular, the following modifications to the existing City Code relevant to bicycle parking are recommended:

- De-couple bicycle parking requirements from vehicle parking requirements and develop independent requirements for each land use, including bicycle parking requirements for multi-family housing.
- Develop site plan guidance graphics to demonstrate appropriate placement, spacing, and acceptable rack designs.

Finally, the bicycle facility recommendations in this Plan cannot all be created as standalone projects and therefore need to be included as an integral element of capital improvement project scoping including resurfacing, restriping, reconstruction, and routine maintenance. In addition to roadway capital projects, the recommendations of this Plan should be included in the project scoping of all new or renovated City facilities including administration buildings, school campuses, community centers, transit facilities, and parking garages.

3. PROGRAMS FOR SAFETY, EDUCATION, AND ENCOURAGEMENT

Bicycle Programs - Master Plan Goals

2. Ongoing promotion and enhancement of bicycle safety.

Annapolis' bicycle culture is visibly emerging. This is supported by the City's commitment to improving bicycling conditions as well as the cooperation of groups and people who actively promote the interest of bicyclists. This Plan aims to build upon the foundation already present in Annapolis.

Infrastructure is only part of the solution to making a place more bike-friendly. A comprehensive bicycle plan must also address non-infrastructure elements such as unsafe behaviors, lack of safe bicycling skills or awareness, and overall disinterest in biking. This Plan takes a comprehensive approach when addressing bicycling challenges. This section documents existing programs and identifies recommendations for revised and additional programs that uphold the vision and goals set forth for the Plan.

EXISTING CITY ADMINISTERED PROGRAMS AND ACTIVITIES

The City of Annapolis has initiated several efforts to promote bicycling for both recreation and travel. Included below is a list of efforts currently in progress.

Bike Annapolis/City Bicycle Webpage and Program

The City hosts and maintains an online reference that provides easy access to bicycle laws, safety tips, maps of trails and other components of the Bicycle Network, as well as programs that encourage people to bike more often. This page is included as part of the City's site under the Transportation Department section. As the City's bike program grows, so does the content on the website.

Coexist Give/Get Program

The basis for the Coexist program is to encourage cooperation and respect amongst bicyclists and motorists. Road safety conditions improve when everyone clearly understands their rights and responsibilities. To spread the message, City of Annapolis police officers hand out information to motorists detailing activities that endanger cyclists, and pass out multi-lingual educational flyers to educate cyclists. The first event for the program

occurred on Wednesday May 19th, 2010 at the intersection of Bay Ridge Avenue and Madison Street/Eastport Shopping Center. Over 700 flyers were handed out to motorists and cyclists.

Bike on Bus Program

All Annapolis transit buses are equipped with bicycle racks. Passengers may place bicycles in the racks for no additional cost.

Free Wheelin' short-term bike rentals

Youth bicycle rodeos reach safe cycling skills

Free Wheelin' Bike Program

The City of Annapolis provides bikes for short-term bicycle rentals (either half or full days between the hours of 9 a.m. and 8 p.m.) at a low cost. Rentals are charged $5.00. The bicycles are distributed by the Harbor Master at the City Dock. An added benefit to using these bicycles is all Free Wheelin' customers may ride any Annapolis transit bus for free.

Revolution Kids

Revolution Kids is a model joint-agency program. Administered by the Recreation and Parks Department (with support from Box of Rain Foundation, the Annapolis Transportation Department and the Annapolis Police Department), children meet with skilled professionals and volunteers to fix donated bicycles. Students who are able to make safe, operational bikes are allowed to keep the bikes, and are awarded graduation certificates.

Bicycle Rodeos

The Safe Routes to School Instructor from the Annapolis Police Department, certified by the League of American Bicyclists provides bicycle safety education to schools around the City. The instructor begins each rodeo with

an explanation of bicycle skill expectations for students. Various stations are set up to give students the opportunity to practice a variety of specific bike handling skills for operating a bike safely and legally on the street. Bicycle rodeos are provided during the school day, and at events upon request.

Police Bicycle Fleet

An effective way to engage bicyclists and model safe bicycling maneuvers is put police officers on bicycles. Since 1994 Annapolis has instituted bicycle mounted officers who patrol the downtown area. These officers have increased mobility and are more accessible to pedestrians and bicyclists. Police on bicycles also tend to have a more thorough understanding of the rights and responsibilities of all users as they receive specialized training on bicycle safety skills and laws. An added benefit to using bicycles instead of cars is that officers on bicycles travel at slower speeds and are more engaged with their surroundings.

City Complete Streets Policy

The Annapolis Comprehensive Plan was adopted on October 5, 2009 by City Council Resolution R-32-09. *Chapter 4: Transportation, Policy 8* functions as the City's Complete Streets policy. Specifically it states that "The City will invest in system-wide improvement to convert main streets and avenues into "complete streets"—that is, streets which serve the full needs of the community." Elements 8.1-8.5 provide guidance on how existing streets can be retrofitted and how new development will impact the bike network. Element 8.2 lists specific, key street improvements that when implemented will strengthen the bike network.

RECOMMENDATIONS FOR CITY-ADMINISTERED PROGRAMS AND ACTIVITIES

The City is already pursuing many programs and activities that benefit bicyclists. It is for this reason that most of the recommendations for the city-administered programs and activities add suggestions to improve existing programs.

Achieve Bronze Level Bicycle Friendly Community Status

The City is eligible for Bronze-level Bicycle Friendly Community recognition as determined by the League of American Bicyclists (LAB). Upon completion of this Plan, the City should submit its application to the LAB. The City has set a goal to earn Bronze Level recognition and to continue to improve thereafter and earn a Silver-level Community by 2016.

Cities across the nation are applying for Bicycle Friendly Community status recognize accomplishments related to bicycling and guide discussions about local challenges and opportunities for bicycling. The award criteria help to prioritize efforts and strategies to improve existing conditions. Community leaders recognize that the tiered structure of the award (bronze, silver, gold, and platinum) helps to establish milestones for future progress. Once awarded, the LAB provides feedback on how to advance to the next level, making it easier for communities to organize next steps for Plan implementation. Finally, the national recognition publicly announces that the Community is committed to enhancing bicycling conditions. As of 2011 there are only 180 formally recognized bicycle friendly communities across the country and only one other community in Maryland (Baltimore). Earning this prestigious award would put the City of Annapolis in the company of the few, strong, active-transportation-oriented communities such as Portland, Oregon; Minneapolis, Minnesota; and Washington, DC.

Expand the Existing Bike Annapolis Website

The City's bicycle information website is helpful and functions as a clearinghouse for several important bicycling-related resources. However, there are some short-term improvements that would benefit the bicycling community.

Register an additional web address that is easier to advertise

The City's bicycle webpage is not placed in an intuitive location. Most people will not think to look in the transportation department section of the City's website, where it currently is located. It is more likely that people will look for it on the front page or under parks and recreation. This recommendation is not to move the website, but to register web addresses that are easier to remember, and to link/forward those web addresses to its current address. For example, it is easier to remember www.bikeannapolis.gov[1] and can easily be included in flyers, emails, postcards, etc. Update the bike route map.

The current map on the website clearly shows existing on and off-road bike facilities. The map should also include informal on-road bike routes that are well connected and comfortable to use as a bicyclist. Helping novice bicyclists understand key connections will help them start to bike more often. See the detailed wayfinding recommendations in this Plan for further guidance on establishing a bicycle route system. This map should be designed in a format that is also viewable by people using smartphones as these are growing in popularity as navigational tools.

1 As of June 21, 2011 this web address is unregistered and available.

Add a calendar showing bicycle events

Posting events on a monthly calendar would help people learn about upcoming events. The City partners with other departments, agencies and interest groups that have bicycling events. These events should be publicized on the website in a format that is accessible and easy to read.

Bike Annapolis Website

Add a link to the City's Online "report a problem" webpage

Annapolis has instituted a mechanism for the public to report problems with City infrastructure. Once comments are submitted on the electronic form, a City staff person is notified and has the tools needed to investigate the concern. This webpage is prominently displayed on the front page of the City's website under citizen services. However, once a person navigates to the Bicycle webpage, the link disappears. If people visit the City's Bicycle page via a bookmark, or via an outside link, thereby bypassing the front page, they will have no clear way to access the Report a Problem page. Placing a link on the Bicycle webpage will help people find the link quickly, while their concern is on their mind.

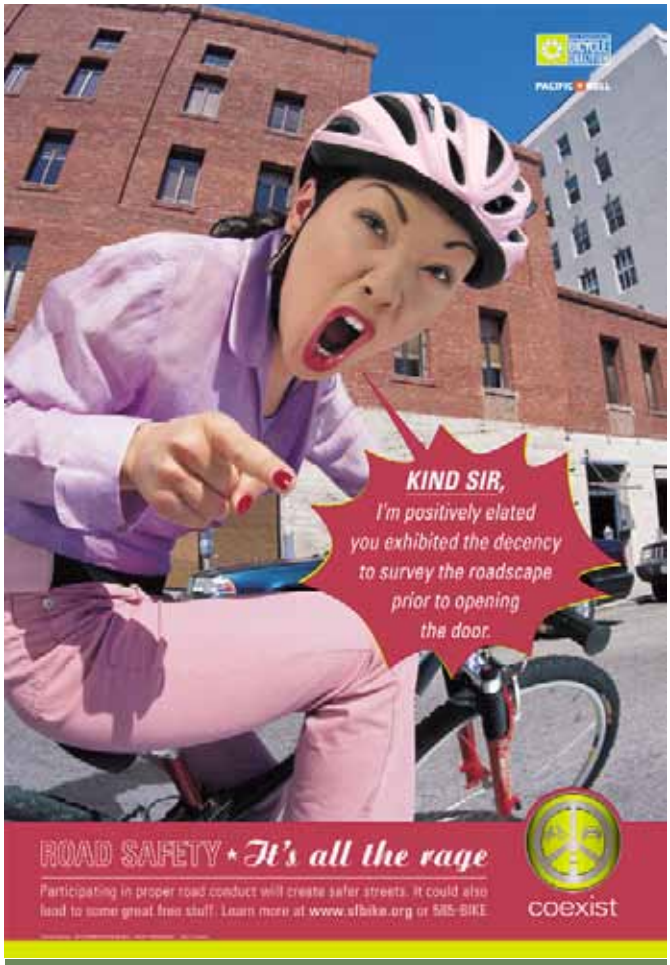
Cross-post bicycle-related volunteer opportunities

Cities can always use help from volunteers. Whether the job is to help distribute flyers or to report debris on a trail, there are simple jobs that enthusiastic citizens can perform. The City advertises volunteer opportunities on its webpage, but it can be difficult to find. It would be helpful if any volunteer opportunities related to bicycling were to be cross-posted on the City's bicycle web page. The bicycle web page audience is interested in bicycling and may be willing to volunteer time to improve conditions.

Cross-post bicycle-related activities and programs

The transportation department is not the sole City agency in support of bicycling. The City's Parks and Recreation, Police and Health departments all have programs that either address bicycling directly

or have complimentary objectives. When people visit the City's bicycle website, it is likely that many assume that all of the bicycle-related activities are present. Currently that is not the case. Bicycle-transportation activities, laws and resources are included but recreation and health related activities are not. Cross posting the efforts of other City agencies and departments will make for a more convenient experience for the web user, and will promote cooperation and joint development across City administration.



Example Coexist Flyer from San Francisco (www.sfbike.org/coexist)

Expand the Coexist Give/Get Program

The Coexist program was started by the City to educate drivers and bicyclists of their rights and responsibilities. The tone is cooperative, emphasizing that both modes need to be aware and respectful of each other on the road. The program's goals and approach create an opportunity to comprehensively strengthen and package the City's roadway safety programs and should also extend to include pedestrians in their messages. Below are additional activities that should be marketed under the umbrella of an energized Coexist program.

Create a brand for the Coexist Program

The City's bike program needs its own identity. Creating brands that can be applied on all new materials will help spread awareness and maintain a consistent message. The brand should be apparent on all activities and products that are associated with the program.

Provide Bicycle education for law enforcement officers

This activity is already in progress under the CoExist Program/Police Fleet umbrella. However, bicycle legislation enforcement training should be given the same attention that vehicular legislation receives. It is important for all officers to fully grasp the rights and responsibilities for all modes.

Expand the Police bicycle fleet

The Annapolis Police bicycle fleet generally patrols the downtown area. Expanding the fleet's rounds to neighborhoods, schools and trails will have the benefit of increasing accessibility to pedestrian bicyclists and will also model safe bicycling behavior. Increasing the presence of bicyclists will help motorists learn how to safely maneuver around bikes. Increased enforcement of laws for motorists and bicyclists in neighborhoods is needed throughout the City.

Progressive/Educational ticketing

It is likely that drivers are unaware of bicycle safety legislation. Many people do not know that Maryland recently passed a law requiring cars to give bicyclists a three-foot buffer when passing or riding alongside them. Similarly, there is a need to clarify and publicize that it is illegal and inappropriate to ride bicycles on sidewalks in the downtown historic district where there is a large numbers of pedestrians. While it is everyone's responsibility to be educated on current laws, it is more effective to educate drivers and bicyclists before issuing citations. With progressive ticketing, officers offer educational materials, and then warnings before issuing citations and fines. Offering this grace period allows drivers time to adjust to new laws. This approach can also be applied to bicycle enforcement.

Annapolis Poilce bicycle officers patrolling Main Street

Support distracted driving campaigns

Drivers that are not fully paying attention to the road and other vehicles create unsafe conditions for all modes. Bicyclists are especially vulnerable as they are often hidden in driver's blind spots. Enforcing Maryland State laws that prohibit hands-on cell phone use while driving will emphasize the City's commitment to ensure safety for all modes.

Schools can also participate by conducting pledges for parents promising that they will not use their cell phones while driving,

especially in school zones. The City can also adopt a policy that increase fines specifically for those caught using hands-on cell phone devices while driving in school zones.

Crossing stings

Crossing stings are an effective way to enforce Maryland State law that requires all vehicles to stop for pedestrians in crosswalks. Plain clothes police officers attempt to cross the street when cars are approaching. If cars do not stop in the appropriate time and distance, the drivers are issued educational materials and warnings, which may lead to tickets for repeat offenders. While bicyclists do not usually use crosswalks, it does improve safety for all modes as they are reminded to watch out for non-motorized traffic. It should be noted the crosswalks are used by bicyclists when crossing trail/road intersections.

Linking biking to health/recreation programs

The City should cross-promote the Plan's goals through partnerships between the Recreation and Parks, Transportation, and Public Works Departments. This includes giving higher priorities to bicycling infrastructure that connect to trails and parks as well as opening Waterworks Park to mountain bicyclists.

EXISTING COMMUNITY & PARTNERSHIP ACTIVITIES

Fortunately for the City, there are groups, clubs and individuals dedicated to improving bicycling conditions in Annapolis. Often these groups partner with the City to expand their reach. The combine efforts of these groups sustain the bike culture.

Annapolis Regional Transportation Association (ARTMA)

Founded in 1992 as a 501 (c6), ARTMA is a member organization which receives funding from the Maryland Transit Administration and Anne Arundel County and is managed by a volunteer board of directors. Its goal to promote transportation options across all modes makes it an effective partner for the City and this Plan. Specifically, ARTMA is working with the City to strategize ways to improve and encourage trips combining biking and transit choices.

Safe Routes to School

The two goals of the Federal Safe Routes to School program are 1) to encourage students to walk and bike to school and 2) to create safe, accessible walking and biking routes to school for children of all abilities.

The City of Annapolis has a successful Safe Routes to School program. Two schools have received Safe Routes to School grants for their programs in 2011, and four schools have received grant awards since 2007. Most recently, Mills-Parole Elementary school received funds for sidewalks and bike racks. Annapolis West Elementary school received funding for non-infrastructure program support and resources.

The Chesapeake Children's Museum secured a Safe Routes to School grant to create an exhibit that promotes walking and biking to school. The main feature of the exhibit is a foot-controlled video game designed by Julia Griffey of Animocation that gives students a safe and fun way to practice walking safety skills.

Employee commuting incentive programs

The City of Annapolis has included information on the federal Employee Commuting Incentive Program on its bicycle transportation website. It explains that as a result of The Bicycle Commuter Act (2009) employers may now reimburse their employees up to $20 per month ($240 per year) tax-free for "reasonable" expenses related to one's bike commute.

Triathlons/Races

Since 2009, Annapolis has hosted the finish line for Race Across America. In its 30th year, this is one of the longest distance bicycle races in North America at 3,000 miles. Over one million dollars is raised each year for charities and non-profits by its racers. Local races have included triathlons at City Dock as well as adventure races and the popular Annapolis Bay Country Century.

Children have the opportunity to compete and improve their bicycling skills in the Truxton Youth Triathlon which has been held annually since 2006. This year the race was co-sponsored by the Annapolis Recreation and Parks Department (ARPD) and *Chesapeake Family* magazine. It attracted 230 children ranging from age 7-17 to compete in the swimming, biking and running event. The Youth Triathlon is part of a much larger event known as the TRI-iT festival, which encourages children to learn and practice a variety sports and recreation activities.

Bike to Work Day

Bike to Work Day is sponsored in partnership between the City, Baltimore Metropolitan Council (BMC), ARTMA, numerous local businesses, and the League of American Bicyclists each May. The purpose of the event is to

encourage people to try substituting their bike for their car for one day with the hope that the day's experience could inspire more regular bike commuting. The event includes a pit stop at City Dock for bicyclists and bicycling advocates to meet and discuss local bicycling conditions. In 2010, over 200 participants met at the pit stop. In 2011, the pit stop attracted a record-breaking 250 bicyclists.

Annapolis Bicycle Club/Annapolis Bike Racing Team

The Annapolis Bicycle Club (ABC) and the Annapolis Bike Racing Team (ABRT) are two groups committed to promoting safe and fun bicycling in the City. The Annapolis Bicycle Club organizes group recreational rides for members. Riding in groups helps build confidence for road riding and helps reinforce safe bicycling skills and maneuvers. ABRT has also been active in promoting bicycle safety and has conducted numerous safety clinics at area schools and for youth groups.

RECOMMENDATIONS FOR PARTNERSHIP PROGRAMS AND RESOURCES

Other departments, agencies and interest groups contribute to the success of the Bicycle Master Plan. Recommended below are opportunities where the City can play a role in facilitating, organizing, or cross publicizing efforts, but other entities will take the lead.

Market the City as an "Active Vacation" Destination

Annapolis already has a thriving outdoor-activity culture with water sports and leisure. Promoting more active transportation on land can be equally successful. Promoting Annapolis as an active vacation destination will increase the number of bicyclists and promote awareness for all modes. Promoting cycling as a tourist activity also gives greater weight to bicycle infrastructure projects. Potential bicycling destinations that could be marketed in Annapolis include the East Coast Greenway route as well as a future system of off-road trails in Waterworks Park.

Expand the Reach of the Safe Routes to School Program

Bicycle and pedestrian safety are skill sets that will benefit the children through their entire lives. Children are being driven more often than the children a generation past, and are given fewer opportunities to practice safe biking and walking skills with their parents. Ensuring consistent, certified instruction for all children of Annapolis will help to improve safety for the City's next generations. To support pedestrian education, Anne Arundel County Public Schools should adopt the NHTSA Pedestrian Safety Curriculum as part of the school physical education annual curriculum.

Provide youth bicycle safety education program/bicycle rodeos

Continue to partner with the City police department to offer regularly scheduled bicycle rodeos at elementary schools. If possible, expand the number of events to coincide with other City-sponsored events such as the annual TRI-iT festival or the Safe Cycling event. Health fairs and safety events should be seen as opportunities to promote safe cycling clinics for children, families and adults.

Advertise adult and university student safety classes

Many adults are unaware of how to properly fit and wear a helmet, signal turns to vehicular traffic and other safe road riding skills. The City should promote adult bicycle clinics offered by the League of American Bicyclists and the Annapolis Bicycle Racing Club on the bicycle calendar of events. The City bicycle web page can also provide links to those groups that provide publicly accessible clinics and workshops.

Additionally the City could provide classroom space for bicycle safety workshops. Groups and clubs regularly offer clinics and workshops but have difficulty finding spaces that can provide both classroom space, and areas to practice maneuvers. Several civic buildings have meeting rooms and parking lots that can be used for instruction. These spaces are usually unused during weekend and evening hours. Providing these spaces for free would increase the frequency that clinics and workshops are offered.

Facilitate and Promote group rides

Whether for recreation or commuting purposes, riding in groups gives novice cyclists confidence to ride both on and off-road, and introduces new and convenient routes for everyday rides. The rides can cover vast areas and provide tours of the City, or they can help people identify comfortable and convenient routes to work. The best rides are those that start and end in the same location but explore new routes and destinations, giving people a new awareness of the Bicycle Network. Group rides have the added benefit of creating a strong bicycle presence on the roads.

Bike to Work Day group ride in Annapolis

Students can also benefit from group rides. The Safe Routes to School movement encourages young cyclists to bike to school in groups with adult chaperones. These rides increase the students' confidence in their bicycling skills and establish healthy habits for life. Bicycle trains have been especially effective for high-school aged students, providing a cheaper alternative to driving.

While the actual rides may be led by volunteers from local bicycling organizations, the City's role in this strategy can be to provide resources and materials on planned group rides by including events on the bicycle calendar page and including a list of future rides on the announcement pages. The City can also link to other groups that produce how-to materials for organizing group rides or bicycle trains to school.

Encourage friends of the trails programs

Finding money and other resources for trail maintenance can be difficult for municipalities. Recruiting and training volunteers to help keep the trails free of debris and monitored for emergencies can help ease the strain on tight budgets. Friends of the Trails program can also help to provide eyes on the trails and report issues that cannot be solved by volunteers on the site such as dumping, fallen trees, or damaged bridges.

Explore bringing a bike share program to the City

There is already a low-cost rental option which is administered by the City (Free Wheelin'). Unfortunately the bike rental period is seasonal and ends in the early evening, precluding summer night time bicycle access. Additionally the program is only convenient for those working or living at City Dock. With only one station all trips must start and end at this location. The City should continue to explore partnerships to create a bike share program that would make bikes available at all hours and at stations located throughout the City. Ideal future locations would be near employment centers, retail and parking garages.

Washington DC Capital Bikeshare station

4. BICYCLE NETWORK

This chapter details existing bicycle routes, envisions a recommended network of bicycle routes, and provides detailed guidance on the facilities required to complete the envisioned network and achieve the goals of this Plan.

Bicycle Network - Master Plan Goals

3. *a convenient and attractive network of on-street and off-street bicycle routes for all abilities, ages and skill levels*
4. *connections to other modes of transportation*

EXISTING BICYCLE NETWORK AND FACILITIES

The existing network of on-street bicycle facilities in Annapolis is very limited and disconnected, consisting primarily of isolated segments of bike lanes. There are approximately 3.3 miles of bike lanes and bike-friendly shoulders along streets within City limits, including Hilltop Lane, Edgewood Road, Moreland Parkway, Melvin Avenue, the one-way segment of Bay Ridge Drive, and Childs Point Road. Several areas of pavement markings have become visibly worn, including shared lane markings along a portion of Admiral Drive and bike lanes on Tyler Avenue. Shared lane markings were installed on a portion of Bay Ridge Avenue during the completion of this plan, however careful consideration needs to be given to their placement in relation to curb choke points, on-street parking, and vehicle turn lanes. Finally, 'Bicycle Route' signage can be seen along various state-maintained roadways through town. However, the signs are not tied to specific destinations and are apparently not part of a comprehensive route system.

Poplar Trail crossing at Glen Avenue

The existing network of off-street bicycle facilities is similarly discontinuous, but provides the initial links in what will be an exemplary regional trail

network, connecting neighborhoods and forming the core of Annapolis's future Bicycle Network. The existing trail segments include the Poplar Trail following the alignment of the abandoned W,B, & A railroad, portions of the Spa Creek Trail on each side of Spa Road, a loop trail around the Navy-Marine Corps Memorial Stadium, and a closed network of trails through Quiet Waters Park. In 2000, the White House Millennium Council under President Bill Clinton invited every state to nominate trails for designation as a Millennium Legacy Trail. The City established the Colonial Annapolis Maritime Trail route on pathways and sidewalks through town as part of the Maryland Millennium Legacy Trail, including scattered signage located along the trail route.

Several routes of national significance pass through the core of Annapolis including the East Coast Greenway (Florida to Maine) and American Discovery Trail (Delaware to California). The envisioned East Coast Greenway route in and out of town includes the existing B & A Trail, which begins on the east/north side of the Severn River and continues to BWI Airport, and the planned W, B & A "South Shore" Trail, which will follow the south/west side of the Severn River connecting Annapolis to the Odenton area.

Bicyclists can be readily observed in Annapolis riding for both recreation and necessity. Recreational bicyclists were generally observed to ride confidently with vehicle traffic and are often bound for longer loop rides that branch out into Anne Arundel County. Leaving or entering the City of Annapolis by bicycle requires crossing the ring of automobile-oriented arterial roadways that surround the historic core of Annapolis, including: Roscoe Rowe Boulevard (MD Highway 70), US Highway 50/301, Solomons Island Road (MD Highway 2), and Aris T Allen Boulevard/ Forest Drive (MD Highway 665). Bicyclists of necessity can be seen in all parts of Annapolis, weaving routes through neighborhoods and often on sidewalks to access commercial and employment destinations.

Existing barriers to neighborhood connections include this gate on Victor Parkway

Numerous bicycle routes, spot locations, and issues of concern were identified through the interactive online map, Public Workshops, and Open House. The issues of concern included: bicycling conditions along the major thoroughfares, connections to destinations in Anne Arundel County, access to the Naval Academy campus which has been closed to bicyclists since shortly after September 11th, 2001 due to security concerns, and the availability of bike parking.

Several overlapping desired paths of travel were identified in multiple contexts with common sections of difficult connections, including:

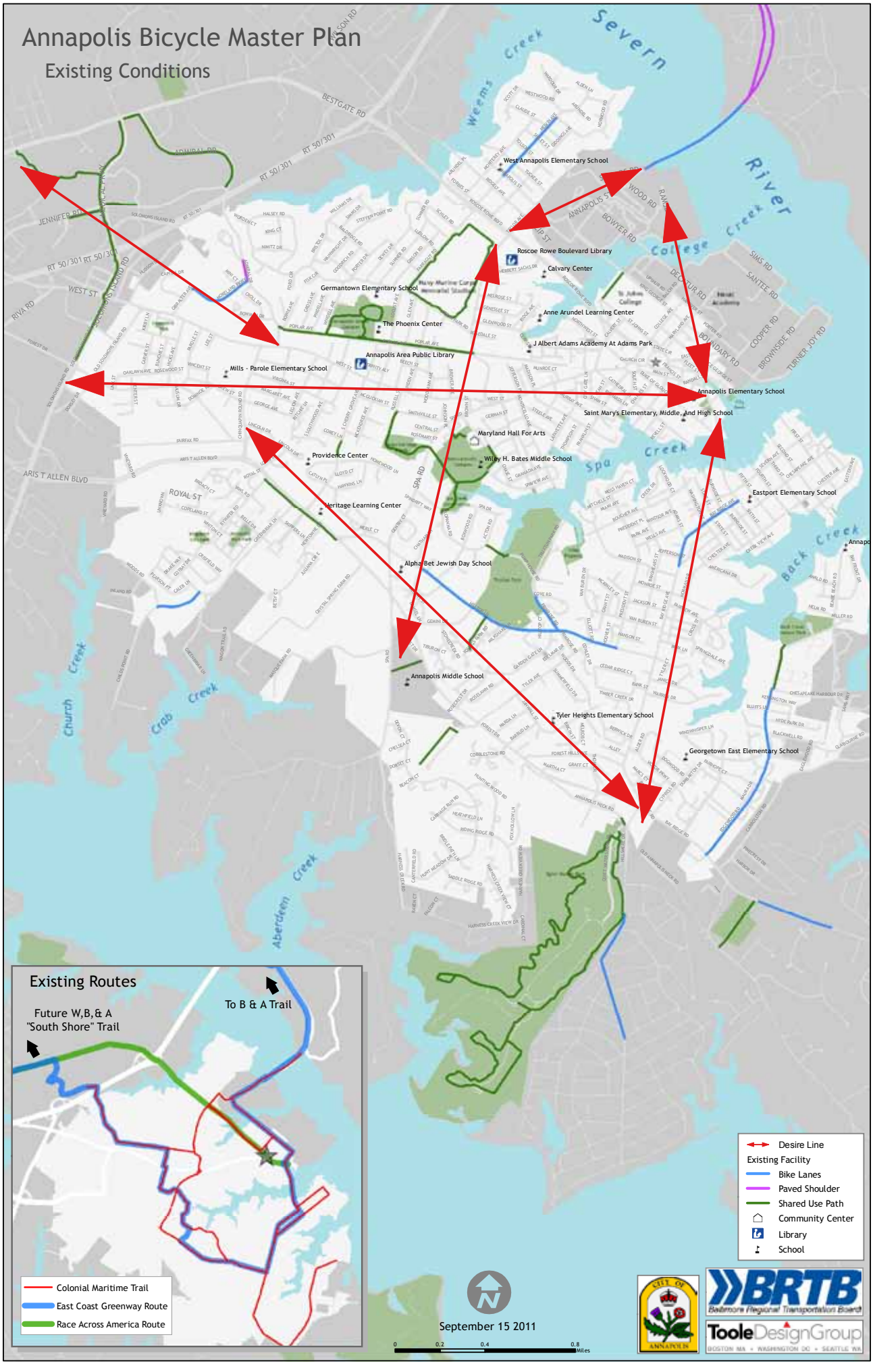
- City Dock and Eastport to Parole Town Center - following the West Street & Forest Drive corridors
- Eastport to West Street Arts District via City Dock, including the surface of the Spa Creek Bridge on Compromise Street
- West Annapolis connections, notably King George Street, Taylor Avenue, and the connection between those two streets and the Naval Academy Bridge.

RECOMMENDED BICYCLE NETWORK

The recommended Bicycle Network was informed by the Plan's goal of establishing a convenient and attractive network of on-street and off-street bicycle routes for all abilities, ages and skill levels. Based on this guiding principle, as well as stakeholder input, the recommendation is to develop a set of core routes that parallel but avoid major vehicle thoroughfares where possible. The routes connect Annapolis' neighborhoods and destinations, enhanced by strategic connector paths, targeted intersection and crossing improvements, and a comprehensive wayfinding signage system.

The core routes and primary connections established by the recommended Bicycle Network are:

- Poplar Trail: City Dock to the Annapolis Mall
  - extend the existing trail route west to Gibraltar Avenue as well as northwest along Admiral Drive and across US 50/301 to the Annapolis Mall and eventually the South Shore Trail
  - extend the existing trail east along the Loew's service road into the West Street Arts District, including a connection through the Loew's parking lot to Washington Street
  - Connect the West Street Arts District to the City Dock and across the Spa Creek Bridge via on-street facilities following Cathedral Street, Franklin Street and Duke of Gloucester Street; as well as cycle track along Church Circle, Main Street and Compromise Street
- Spa Creek Trail: neighborhood and trail route connecting City Dock to


Annapolis Bicycle Master Plan
Existing Conditions
Severn River
Weems Creek
College Creek
Spa Creek
Back Creek
Church Creek
Crab Creek
Aberdeen Creek
BESTGATE RD
RT 50/301
WEST ST
ARIS T ALLEN BLVD
ROYAL ST
SPA RD
BOWYER RD
ANNAPOLIS ST
WOOD RD
West Annapolis Elementary School
Roscoe Rowe Boulevard Library
Calvary Center
Germantown Elementary School
The Phoenix Center
Anne Arundel Learning Center
J Albert Adams Academy At Adams Park
Annapolis Area Public Library
Mills - Parole Elementary School
Annapolis Elementary School
Saint Mary's Elementary, Middle, And High School
Maryland Hall For Arts
Providence Center
Wiley H. Bates Middle School
Heritage Learning Center
Eastport Elementary School
Alpha Bet Jewish Day School
Annapolis Middle School
Tyler Heights Elementary School
Georgetown East Elementary School
Existing Routes
Future W,B,& A "South Shore" Trail
To B & A Trail
Colonial Maritime Trail
East Coast Greenway Route
Race Across America Route
Desire Line
Existing Facility
Bike Lanes
Paved Shoulder
Shared Use Path
Community Center
Library
School
September 15 2011
0 0.2 0.4 0.8 Miles
BRTB
Baltimore Regional Transportation Board
Toole Design Group
BOSTON MA • WASHINGTON DC • SEATTLE WA

Parole Town Center
  - neighborhood and recreation loop around the water
  - primary missing link is a trail connection from the end of Ritchie Court to Cherry Grove Avenue
  - establish neighborhood gateway along Forest Drive between Solomons Island Road (MD-2) and Link Street
  - formalize the dirt trail connecting Truxton Park at the end of Primrose Road to Eastport at Windsor Avenue
- West Annapolis/Hilltop/Bay Ridge Loop
  - connect the City Dock to West Annapolis and the Naval Academy Bridge
  - connect the City Dock to Eastport and Hillsmere/Quiet Waters Park beyond
  - connect both West Annapolis and Eastport to the Spa Creek Trail, Poplar Trail, and routes and destinations on the west side
- Forest Trail: a separated trail along the entire southern edge of Forest Drive

It should be noted that while the network concept seeks to establish core routes as the guiding vision and to inform the implementation strategy detailed in this Plan, dedicated bicycle facilities are still required for many additional roadway segments and locations to complete a full Bicycle Network for Annapolis. Furthermore, the core routes and connections as presented are not intended to substitute for providing bicycle accommodations on all other roadways as development and capital projects arise, whether the locations are specifically addressed in this Plan or not.

The Bicycle Facility Recommendations map indicates the full network of specific facilities that are recommended as desired and achievable based on stakeholder comment and technical analysis. These routes and facilities recommendations are location-specific and are based on a range of factors including:

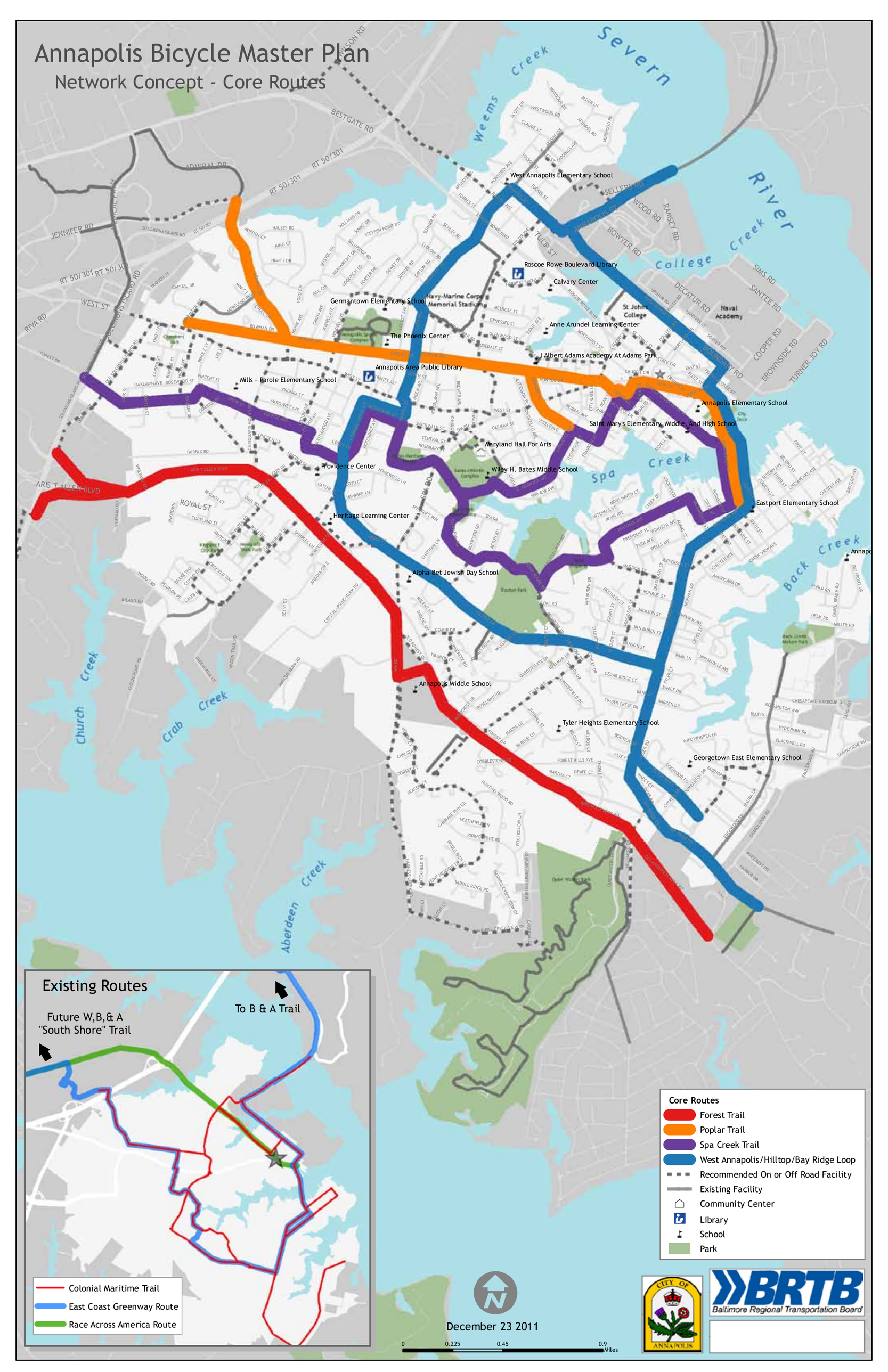
- Addresses an existing safety issue or barrier
- Contributes to a city-wide network of connected facilities
  - Connects to destinations (including employment, recreation, transit, and residential attractors)
  - Completes the Bicycle Network by overcoming a barrier or filling a gap
  - Importance of the connection for the regional Bicycle Network
- Implementability
  - cost and complexity of implementation
  - existing roadway lane widths and surrounding land uses
  - potential to partner with existing maintenance or capital

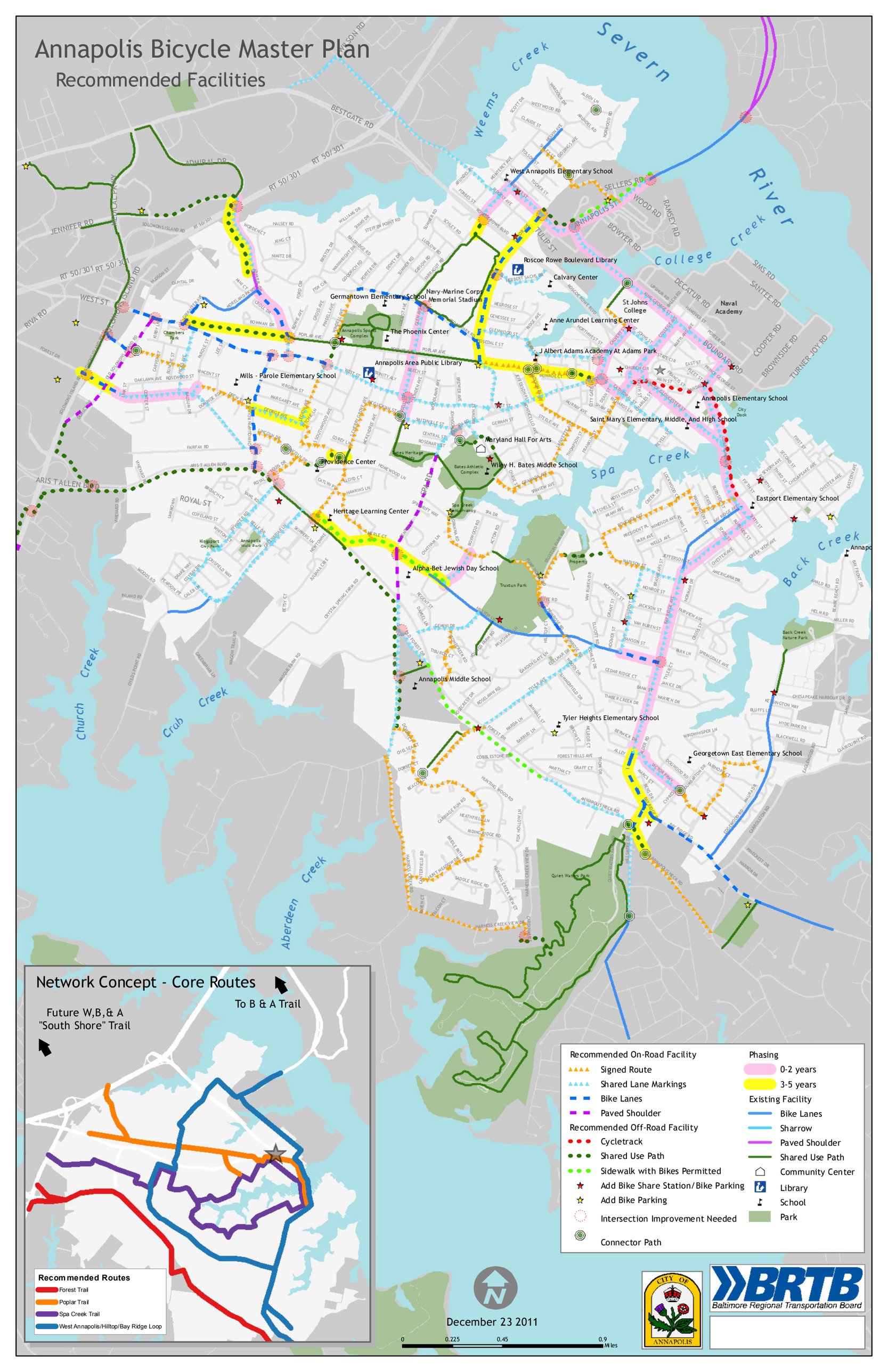
improvement project
    - impact on vehicle capacity
- Community support

In addition to the existing shared use paths and 3.3 miles of bicycle lanes and paved shoulders in Annapolis, this Plan recommends the following facilities to create the Bicycle Network.

Recommended Bicycle Network Overview	
Facilities	Length (miles)
Bike Lanes	4.7
Paved Shoulder	1.2
Shared Lane Markings	15.3
Signed Route	9.1
Cycle Track	0.8
Shared Use Path	3.5
Sidewalk Bikes Permitted	1.5
Grand Total	**36.1**

Finally, a system of off-road trails should be established in Waterworks Park. Such a trail system will require preparation of a separate master plan and is not detailed in this Plan's Implementation Chapter.


Annapolis Bicycle Master Plan
Network Concept - Core Routes
Severn River
Weems Creek
College Creek
Spa Creek
Back Creek
Church Creek
Crab Creek
Aberdeen Creek
West Annapolis Elementary School
Roscoe Rowe Boulevard Library
Calvary Center
Navy-Marine Corps Memorial Stadium
Germantown Elementary School
St. John's College
Naval Academy
Anne Arundel Learning Center
The Phoenix Center
J Albert Adams Academy At Adams Park
Annapolis Area Public Library
Mills - Parole Elementary School
Annapolis Elementary School
Saint Mary's Elementary, Middle, And High School
Maryland Hall For Arts
Providence Center
Wiley H. Bates Middle School
Eastport Elementary School
Heritage Learning Center
Alpha Bet Jewish Day School
Annapolis Middle School
Tyler Heights Elementary School
Georgetown East Elementary School
Existing Routes
Future W,B,& A "South Shore" Trail
To B & A Trail
Colonial Maritime Trail
East Coast Greenway Route
Race Across America Route
Core Routes
Forest Trail
Poplar Trail
Spa Creek Trail
West Annapolis/Hilltop/Bay Ridge Loop
Recommended On or Off Road Facility
Existing Facility
Community Center
Library
School
Park
December 23 2011
0 0.225 0.45 0.9 Miles
CITY OF ANNAPOLIS
BRTB Baltimore Regional Transportation Board


Annapolis Bicycle Master Plan
Recommended Facilities
Severn River
Weems Creek
College Creek
Spa Creek
Back Creek
Church Creek
Crab Creek
Aberdeen Creek
West Annapolis Elementary School
Roscoe Rowe Boulevard Library
Calvary Center
Navy-Marine Corps Memorial Stadium
Germantown Elementary School
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Annapolis Middle School
Tyler Heights Elementary School
Georgetown East Elementary School
Quiet Waters Park
Truxtun Park
Back Creek Nature Park
Network Concept - Core Routes
Future W,B,& A "South Shore" Trail
To B & A Trail
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Forest Trail
Poplar Trail
Spa Creek Trail
West Annapolis/Hilltop/Bay Ridge Loop
Recommended On-Road Facility
Signed Route
Shared Lane Markings
Bike Lanes
Paved Shoulder
Recommended Off-Road Facility
Cycletrack
Shared Use Path
Sidewalk with Bikes Permitted
Add Bike Share Station/Bike Parking
Add Bike Parking
Intersection Improvement Needed
Connector Path
Phasing
0-2 years
3-5 years
Existing Facility
Bike Lanes
Sharrow
Paved Shoulder
Shared Use Path
Community Center
Library
School
Park
December 23 2011
0 0.225 0.45 0.9 Miles
CITY OF ANNAPOLIS
BRTB
Baltimore Regional Transportation Board

FACILITY DESCRIPTIONS & DESIGN GUIDANCE

This Plan lays out a network of functional, safe and accessible bicycle facilities and routes throughout Annapolis. It is critical that facilities and design solutions are appropriately designed for the type of user and existing space. This section provides detail and general guidance on design solutions to accompany the location-specific facility recommendations for improving bicycling conditions. Facility design guidance references are included as an Appendix. The following section includes brief descriptions and selected design guidance relevant to Annapolis for each of the facility types recommended as a part of the Plan.

Off-Street Bicycle Facilities

There are many advantages to providing off-street bicycle facilities. These routes are completely separated from motorized traffic and are generally preferred by families and inexperienced cyclists. Additionally, off-road facilities such as shared use paths allow bicycles to make connections or shortcuts that cars cannot. Such a perk creates an incentive to travel by bike.

Shared Use Paths

Shared use paths provide a high-quality walking and bicycling experience that follows independent alignments (such as a stream, greenway trail or rail-trail) and are physically separated from vehicle traffic. These paths should be 10-14 feet wide for bi-directional traffic and should be paved. The alignment and design of shared use paths should be coordinated with the Recreation and Parks Department to achieve both the transportation and recreation potentials for the paths.

Poplar Trail Shared Use Path

On high-speed roadways, there may be a need for shared-use paths on parallel routes in addition to bicycle lanes or shoulders. Shared-use paths should not be used to preclude on-road bicycling, but rather to supplement a system of on-road bicycle facilities for less experienced bicyclists. Shared-use paths also provide essential facilities and connections for pedestrians where they may not already exist.

Widening sidewalks in selected locations can make important bicycle connections

Sidewalks with Bikes Permitted

When sidewalks create direct connections to popular destinations, and road conditions are uncomfortable for bicyclists or there is not sufficient right of way to create dedicated facilities for each mode, it can be helpful to allow and encourage bicycles to use the same facilities as pedestrians in designated sections. Signs or pavement markings should clearly communicate when and where bicyclists are permitted to ride on sidewalks. There may be locations with high pedestrian volumes or narrow sidewalks where bicyclists are encouraged/required to dismount and walk their bicycles. Adding width and upgrades to existing sidewalks to expand the Bicycle Network is a low-cost, efficient way to accommodate bicyclists and improve safety for all modes.

Sidewalks where bikes are permitted (and encouraged!) should be designed as cycle tracks in locations intended to make short connections that will be used by both pedestrians and cyclists. Locations where bicycle routes cross major roads with a jog are particular candidate locations to direct cyclists to use the sidewalk to avoid difficult crossings and reach signalized crossing locations. These locations include:

- Along the north side of West Street, between Glen Avenue and Russell Street
- Along the north side of Forest Drive between Louis Drive and Bywater Road

Sidewalks with bikes permitted

Several longer stretches are also recommended where the design of sidewalks with bikes are permitted will resemble a shared use path. The placement directly adjacent to major vehicle roadways, large number of driveway curb cuts and higher pedestrian volumes are the reason to distinguish these sections from other

recommended shared use paths. Paths constructed directly adjacent and parallel to roadways require special design consideration for each driveway and road crossing. Careful access management is required to minimize these conflicts. These locations include:

- Along the south side of Forest Drive between Annapolis Middle School and Annapolis Neck Road
- Along the north side of Hilltop Lane between Cherry Grove Avenue and Boxwood Road
- Along the north side of Annapolis Street between Taylor Avenue and the Naval Academy Bridge

Cycle tracks

Cycle tracks are one- or two-directional bicycle lanes that keep pedestrians, motorized vehicles and bicyclists separated with physical buffers including bollards, curbs, vegetation or parked cars. These bicycle-specific pathways are intended for urban locations where separation of modes is desired. These high profile facilities can become prominent features of urban spaces and require detailed urban design to achieve aesthetic goals and mitigate conflict locations. The locations proposed for Annapolis form one continuous two-directional facility through the historic core including the following segments:

Cycle track

- Along the south side of Memorial Circle between Franklin Street and Main Street
- Along the north side of Main Street between Memorial Circle and City Dock
- Along the east side of Compromise Street between City Dock and Eastport

A benefit of providing a bi-directional facility is that it can expand the Bicycle Network by providing access to roads that are otherwise one-way for vehicles. Creating this physically separated facility and bi-directional shortcuts for bikes expands the Bicycle Network and creates inviting bicycling conditions for various levels of experience.

On-Street Bicycle Facilities

By designating select streets as part of a Bicycle Network, special attention can be focused on maximizing their potential to serve bicycle travel. It is important to note, that except for highways where bicycle use is specifically prohibited, all streets can and will be legally used by bicyclists. By designating a specific Bicycle Network, the City identifies where enhancement, over and above the baseline level of care, should be provided.

Signed Routes

Signed routes are the least expensive option for expanding the Bicycle Network. Signed routes are a treatment that can be considered for roads in Annapolis that may not warrant a dedicated facility, but make important network connections. Roads that should be considered for shared roadways typically are one lane in each direction and feature low traffic volumes and speeds. These streets can also be further optimized for bicycle traffic by the inclusion of traffic calming discouraging cut-through motor vehicle traffic. Another name used for these types of streets is 'bicycle boulevards.'

Signed Routes

Supportive signs indicating that bicycles are permitted to take the full lane or "Share the Road" signs that remind motorists to share the road with bicyclists can be helpful reminders for both drivers and bicyclists. Signs should be used judiciously, as too many signs can cause visual clutter and lead to non-compliance. Note that the "Share the Road" sign is a warning and should not be used for directional signing of a bicycle route.

Mapping routes and creating a comprehensive wayfinding sign system show bicyclists comfortable options for travel and recreation. It is intended that each of the roadways identified as Signed Routes will be included in the comprehensive wayfinding network and signage system recommended in this Plan.

Shared Lane Markings

Shared lane markings (often referred to as "sharrows") are a design option for locations where roadways are too narrow for dedicated bicycle lanes yet bicycle access and guidance is desired and cyclists should be encouraged to use the full traffic lane. The placement of the pavement marking is important as the marking reminds cars to watch for bicyclists in the roadway and shows bicyclists where to ride safely outside the "door zone" of parked cars or other hazards. Shared lane markings are particularly suited to Annapolis' network of narrow lanes where a wider street is neither feasible nor desired.

Shared Lane Markings

Shared lane markings have the following benefits:

- Provide a visible cue to bicyclists and motorists that bicycles are expected and welcomed on the roadway
- Indicate the most appropriate location to ride on the roadway with respect to moving traffic and parked cars
- Can be used on roadways where there is not enough space for standard width bicycle lanes
- Connect gaps between other bicycle facilities, such as a narrow section of roadway between road segments with bicycle lanes
- Complement wayfinding and point out difficult sections on signed routes
- Reduce wrong-way bicycling
- Increase the distance between bicyclists and passing cars

The shared lane pavement marking should be placed:

- A minimum of 11 feet from the face of the curb when used adjacent to a parking lane;
- A minimum of 4 feet from the face of curb or roadway edge when not used adjacent to a parking lane; and
- Immediately following intersections and spaced at intervals up to 250 feet thereafter.

The shared lane pavement marking should not be placed in bicycle lanes or roadways with speed limits posted above 35 mph. Sharrows should also not be used as the primary means of wayfinding or identifying routes if guidance on appropriate lane position is not warranted.

Existing bike lane on Melvin Avenue

Bike Lanes

Bike lanes are the most widely known on-road bicycle facility. Bicycle lanes are portions of the roadway that have been designated for the preferential or exclusive use of bicyclists through striping, signage and other pavement markings. The primary design consideration for bicycle lanes is to provide sufficient width and configuration to place bicyclists out of the dangerous "door zone" of parked cars. The other primary design consideration for bike lanes is the routing of bicyclists through intersections and turn lanes.

Five foot bicycle lanes are typical, but wider lanes (i.e. 6 feet) are often used on roadways with high motor vehicle traffic volumes. Bicyclists still have the right to use the travel lanes on streets with bicycle lanes to make left turns or avoid obstacles, such as open car doors. It is important to note that many cars can park in lanes that are striped at 7 feet or wider, which can raise unintended enforcement issues. Parking should be prohibited in bicycle lanes and this restriction should be enforced through signage and ticketing if necessary.

While segments of the following roadways may have recommendations for different retrofit facilities or bypass routes in this Plan's Bicycle Network, bike lanes should be considered for future major reconstruction of the city's vehicular thoroughfares, including: Roscoe Rowe Boulevard, West Street, Spa Road, Taylor Avenue, Annapolis Street, Chinquapin Round Road, Bay Ridge Road, Solomon Island Road.

Paved Shoulders

Paved shoulders function in a similar way to bike lanes, where bicyclists are encouraged to ride outside the solid, white line, to the right of moving traffic.

The provision of shoulders on roadways has benefits to all roadway users by increasing the comfort of bicyclists by providing greater lateral separation from automobiles, providing additional clear zone and recovery areas for all vehicles, and providing additional buffer or space for pedestrians in areas where sidewalks may not exist. Maintenance to keep shoulder areas free of debris is required to maintain bicycle compatibility. Rumble strips are discouraged in locations where bicyclists are expected to use the shoulder. If they must be installed, they should be designed to minimize impact on bicyclists.

Paved shoulder

Additional shoulder width may be desirable on roadways with high motor vehicle traffic volumes, high vehicular speeds, or a high percentage of trucks, buses, and recreational vehicles. It is important to note that at intersections, additional symbols, signage, arrows, or short sections of bike lanes may be needed to provide direction to bicyclists and reduce potential conflicts between bicyclists and turning cars. When reconstructing these roadways in Annapolis, curb, gutter, bike lanes, and sidewalks should be considered.

CONNECTING THE NETWORK

Connectivity is an important element of a successful bike network. Because bike trips are relatively short, it is important to provide direct and efficient routes for people to use. As facilities are constructed across Annapolis and the Bicycle Network takes shape, it is critical that transitions between facilities are implemented properly.

Connectors Paths

Connector paths are a great way to increase connectivity with little pavement or construction. Connector paths expand the network for non-motorized users by creating short connecting trail segments between sections of the roadway grid that are currently closed to all traffic. These connections provide the key benefit of shortening travel distances and times, which greatly increases the possibility

of choosing to walk or bike for short trips. These short connections can also help bicyclists bypass high volume or difficult roadway sections.

Existing connector path on Cherry Grove Avenue

Generally, the existing connector paths in Annapolis are off-road connections between dead end streets or breaks in fences, many of which already receive regular bicycle and pedestrian use though existing informally or being unpaved. In many cases, connector paths are on or directly adjacent to private properties. In modern planning, connector paths are planned for in developments with cul de sacs to connect neighborhoods for bicyclists and pedestrians, but not automobile traffic. Regardless of how the connector paths are established, they will be well-used and appreciated by bicyclists of all skill levels.

Many such connector paths have already been established throughout Annapolis as detailed below. These connector paths have become valued community and neighborhood amenities, and provide important links in the connected Bicycle Network for Annapolis. While many existing connections have been implemented through the development process, retrofitting existing areas often requires the establishment of access easements or the purchase of right of way. These connections should be viewed as potential longer-term improvements to address any concerns that may arise from current property owners.

Missing Connector Path opportunities that are essential to completing the envisioned Bicycle Network include:

- Various connections to the Poplar Trail, including:
  - Following the rail bed between Gibralter Avenue and Admiral Drive
  - Windell Avenue from West Street
  - Madison Place from West Street
  - Ridout Street from Clay Street
  - ascend retaining wall in Loew's parking lot with trail connection to Washington Street
- Ritchie Court, connected east to Cherry Grove Avenue (segment of Spa Creek Trail)

- Holeclaw Street, connected west to Old Solomon's Island Road
- St. Johns College campus along the south bank of College Creek at King George Street
- Quiet Waters Park trail system across Hillsmere Drive at Hickory Lane
- Existing Connector Paths that need to be enhanced and formalized include:
  - McGuckian Street, connected east to Russell Street
  - Victor Parkway, between Cypress Road and Georgetown Road (remove gate)
  - Annapolis Neck Road, connected across Quiet Waters Road and Hillsmere Drive
  - Nicholson Street, connected to the Bates Athletic Complex
  - Shiley Street to Monroe Road, between Giddings Avenue and Badger Road
  - Lincoln Drive, between Chinquapin Round Road and Louis Drive

Intersection & Crossing Improvements

In general, there are two types of intersections to consider for bicyclists in Annapolis: signalized and un-signalized. Signalized intersections can present major barriers to bicyclists when dedicated bicycle facilities are sacrificed for vehicle turning lanes or signal actuation equipment is not calibrated to recognize bicycles. Therefore, it is essential to continue bicycle facilities through intersections and provide the transitions between facilities as they change. Detailed design is needed so that proper facility transitions are included in each intersection. Pedestrian crossing features such as crosswalks, countdown pedestrian signal heads, and push buttons are also recommended, as they can be especially useful for bicyclists that are more comfortable navigating the intersection as a pedestrian.

Intersection Improvements

Un-signalized intersections and mid-block crossings can also be intimidating for both pedestrians and bicyclists. Factors that influence the crossing's real or perceived safety include width of the road, presence of a median refuge, speed of traffic, and tendency for vehicles to yield.

Several measures can be used to improve safety at un-signalized crossings, ranging from high-visibility crosswalk striping and signage to higher-level treatments such as textured crosswalks, curb extensions ("bumpouts"), median refuge islands (curbed or uncurbed), in-road lighting, overhead lighting, High Intensity Activated Crosswalks (HAWKs) and Rectangular Rapid Flashing Beacons (RRFBs). In-road lighting, HAWKS and RRFBs are typically pedestrian-actuated, and help to increase the visibility of bicyclists and pedestrians to oncoming motorists. Curb extensions and median refuge islands improve crossing conditions by shortening the crossing length, increasing visibility, and acting as a traffic calming feature. Median refuge islands should be sized to accommodate a full bicycle length waiting in the median.

Intersections and crossings that need detailed design considerations to accommodate bicycles include:

- Admiral Drive at US 50/301 underpass and Poplar Trail
- Various crossings of Solomons Island Road/MD-2, including at:
  - West Street
  - Somerville Road
  - Forest Drive
  - Aris T Allen Boulevard off-ramps
- Various crossings of West Street, including at:
  - Gibralter Avenue
  - Chinquapin Round Road
  - Admiral Drive
  - Legion Avenue/Windell Avenue
  - Russell Street/Glen Avenue
  - Washington Street
  - Calvert Street/Cathedral Street
- Various crossings of Forest Drive, including at:
  - under the Aris T Allen Blvd bridge over Church Creek
  - Chinquapin Round Road/Fairfax Road
  - Louis Drive/Bywater Road
  - Cherry Grove Avenue
  - Spa Road
  - Bay Ridge Avenue/Hillsmere Drive
- Hilltop Lane, at Spa Road
- Spa Road, at Smithville Street/Nicholson Street
- Tyler Avenue, at Bay Ridge Avenue
- Cedar Park Road, at Glen Avenue
- Rowe Boulevard, at Farragut Road

- Rowe Boulevard, at Taylor Avenue
- Annapolis Street/Taylor Avenue
- Annapolis Street/King George Street

Bicycles on Bridges

The City of Annapolis spans many creeks that lead into the Chesapeake Bay, with the Severn and South Rivers defining the Annapolis Neck. Two bridges in particular are key links the City's bicycle network: Spa Creek Bridge at Compromise Street and the Naval Academy Bridge. The Spa Creek Bridge connects the densely populated City Dock and Eastport neighborhoods. It is also a key access point connecting the many marinas used by residents and visitors. Concerns have been raised about the metal deck surface of the bridge being slippery for bicyclists and SHA is evaluating a special friction treatment to improve traction. The Naval Academy Bridge is Annapolis' connection across the Severn River and the B&A Trail beyond. The bridge itself currently has wide bicycle lanes that abruptly end when entering town.

Wide bike lanes on Naval Academy Bridge end abruptly entering town

Federal law, makes the following statements with respect to bridges: *"In any case where a highway bridge deck is being replaced or rehabilitated with Federal financial participation, and bicyclists are permitted on facilities at or near each end of such bridge, and the safe accommodation of bicyclists can be provided at reasonable cost as part of such replacement or rehabilitation, then such bridge shall be so replaced or rehabilitated as to provide such safe accommodations." (23 U.S.C. Section 217)*

Bridges can be retrofitted to better accommodate bicyclists and pedestrians. There are a variety of ways of accomplishing this:

- Reducing the width and/or number of travel lanes to create more space for bicycles and/or pedestrians. For example, a narrow sidewalk can be widened to provide for a more comfortable pedestrian environment, while maintaining adequate shoulder width for bicycling.
- Adding a new or parallel bicycle and pedestrian structure to the existing bridge structure. In some cases, bridge footings may have been

constructed in anticipation of a future roadway widening, or it may otherwise be possible to add an additional structure for pedestrians and bicyclists. Bridge retrofit solutions require detailed structural analysis to determine if the bridge can accommodate the additional weight of new facilities without compromising its structural integrity.

- Some bridges may provide grade-separated crossing opportunities. In particular, the existing Aris T Allen Boulevard bridge over Church Creek may provide an opportunity for the proposed Forest Trail to cross the roadway without requiring any at-grade crossings or new structures.

NETWORK SUPPORT FACILITIES

The value of the Bicycle Network is greatly enhanced by a set of user features that supports bicycling door-to-door. An informational wayfinding system, end-trip facilities such as bike parking, and streamlined connections to transit can be the deciding factor in creating a truly world class bicycle community.

Wayfinding

A comprehensive set of bicycle route wayfinding signs should be developed to connect destinations in Annapolis and indicate to bicyclists that particular advantages exist to using certain routes compared with alternatives. Signs can also effectively market bicycling as a transportation choice by reminding motorists of the alternative and alerting them to potential time savings by using a bicycle. An option is the include average travel time to destinations in place of or in addition to distance. The bicycle route signs, as described below, should be created as a part of a comprehensive wayfinding system for the larger region and oriented to key destinations.

Key Routes could include:	Colonial Annapolis Maritime Trail, East Coast Greenway, Poplar Trail, Spa Trail, Spa Creek Loop, Forest Drive Trail
Key Regional Destinations could include:	Sandy Point State Park, Thomas Point Park, Baltimore & Annapolis (B & A) Trail, South Shore (W,B & A) Trail, Waterworks Park, Harry S. Truman Park-and-Ride, Annapolis High School, Riva, Edgewater/ Londontowne, Crofton/Bowie, Arnold/ Severna Park
Key Local Destinations could include:	City Dock, St. John's College, Naval Academy, West Annapolis, West Street Arts District, Navy-Marine Corps Memorial Stadium & Trail, Annapolis Library, Children's Museum, Eastport, Hillsmere/ Quiet Waters Park, Back Creek Nature Park, Annapolis Middle School, Annapolis Marketplace/Annapolis Walk/Archstone, Westfield Mall, Parole Towne Center, Harbour Center, City Hall, Pip Moyer Recreation Center

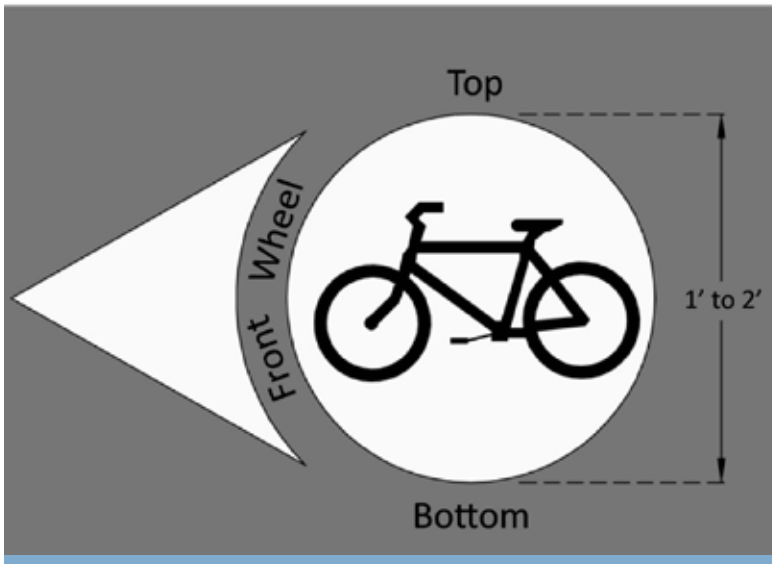
Example of MUTCD wayfinding signs for bicycle facilities

D4-3

D1-2a

D11-1c

D1-2c



Bicycle Dot

An optional treatment for signed bicycle routes is custom pavement markings to enhance wayfinding. The "bike dot" used in Seattle is a good example.

End-Trip Facilities

What bicyclists find at their destination can be just as important as facilities they rode on for their trip. End trip facilities include parking facilities, showers/ changing rooms, and places to secure their additional gear. Including these facilities at strategic places will make biking all the more convenient and appealing. The Recommended Facilities map indicates proposed locations for enhanced or additional bicycle parking facilities. In addition, several of these locations have been further noted as valuable locations for stations in a future Bike Share system.

Bicycle Parking

Bike parking is important at destinations such as town centers, historic sites, transit stations and park-and-ride lots. It is also important to provide bike parking near entrances to business, schools, and libraries and at employment centers. Secure, well-lit bicycle parking located close to building entrances and transit entry points can make bicycling more attractive. It also reduces the risk of bicycle damage or theft.

Bike parking can be provided in the form of bike racks, or more secure facilities such as bike lockers. Bike racks are relatively low cost, have a small footprint, and can be customized to match or enhance local aesthetics. Bike lockers provide added protection from theft and weather by providing an enclosed storage space. Bike rack design and site location are discussed in detail in the Bicycle Parking Guidelines, developed by the Association of Pedestrian and Bicycle Professionals (available on the resources page at www.apbp.org).

Covered U Racks

It is important to consider the parking needs before installing any facility. For short-term trips, meaning less than 8 hours parked, bike racks are effective solutions that are inexpensive. Due to their versatility, level of security and small footprint, inverted U racks are preferred. Covering the bike racks offers an added benefit to bicyclists, which can often be achieved with strategic placement such as under an existing storefront awning or eave.

Long-term bicycle parking needs additional security. Cages and lockers are more difficult to break and tamper. These can be designed specifically for a location or purchased prefabricated, and should be installed at places where people will spend the day, or even overnight. Ideal locations would be at employment centers, transit hubs and parking garages such as Hillman Garage, Gotts Court Garage, Knighton Garage and Park Place.

Bike Lockers

No matter what the parking facility type is, it is important that the location be secure and convenient. All facilities should be installed within plain sight of a building. This increases surveillance and also shows bicyclists

where they can find available parking. Placing the parking as close to the building entrance as possible is also important. Just as drivers do not like to walk long distances from their parking spaces, bicyclists prefer to park near their destinations. If bicycle parking cannot be located in a place that is immediately apparent to users, conspicuous signage should be installed guiding bicyclists to the parking facilities.

Showers, Changing rooms, & Secure Storage Facilities

People choose to travel by bike because it is fun and a good source of exercise. To make their trips more comfortable, bicyclists often choose to wear athletic clothing and work up a sweat, while their plain clothes are stowed in a backpack, basket or pannier. If their final destination does not have a place where they can clean up and change, they may opt to drive instead. One method employers use to encourage bicycle commuting is installing showers and locker rooms in their buildings. Some establishments have partnered with nearby gyms to allow their employees and customers access to the showering facilities, at a reduced or subsidized cost. Annapolis can show its support by installing showers and changing rooms in their civic buildings for employees to use.

Bicyclists often have additional gear that needs to be stored safely when they arrive at their destination. This can include helmets, lights, bells, baskets/panniers, etc. Usually these items are vulnerable even if the bike is secured to a rack. To ease the concerns of the bicyclist, it can be helpful to offer lockers or other secure locations for them to store their gear. One low-cost alternative is allowing customers to store their gear behind a store counter, or with a coat check. If bicyclists know that their gear is safe, it makes the choice to bike an easier one.

Bike on front of bus

Integrating Bicycling and Transit

Depending on where they live, there are people who can make nearly all of their trips by bike. However, it is more likely that there are everyday trips located just outside the comfort of a bike ride. To incorporate bike travel for those trips longer than a few miles, public transit can be an attractive solution. All Annapolis transit buses

are equipped with bicycle racks, and bicyclists can use these racks for no additional cost.

Another way to combine bicycle and transit trips is to provide secure parking facilities at transit and shuttle hubs such as bus depots and parking garages. People can choose to bike to the hub, and then take transit for the rest of the way. Alternatively, people can choose to leave a bike waiting at the transit hub and bike the rest of the way after the bus ride. This type of "trip chaining" can be very attractive to the many Annapolis residents who commute to and from Washington or Baltimore every day using the MTA commuter buses. It can also complete the picture for visitors looking to park once and explore town via bicycle or the Annapolis Circulator bus service that connects the various tourist destinations, state offices, and parking garages located along West Street.

Bike Share

Another way to encourage commuters to bike the "last mile" is to provide both bicycle parking as well as bikes to borrow or rent at or near the transit stations. This way, the commuter can access the transit stop, and have a bike available to complete the leg of their trip without needing to leave a personal bicycle unattended. As a starting point, the City currently provides bike rentals for a small fee through Free Wheelin' Program located at City Dock. Bike Share rental membership programs, such as Capital BikeShare of Washington, D.C. can be very convenient for commuters. Generally the programs require an annual membership fee, which is often less than the cost of a new bike. The membership includes access to bikes at stations throughout the city, without the hassle of maintaining or storing a personal bike. Some of the bike rental stations even provide free use of showers and locker rooms, if the commuters prefer to freshen up.

5. IMPLEMENTATION STRATEGY

This chapter details the strategy and steps required to implement the Plan's recommended Bicycle Network and Programs.

IMPLEMENTATION PHASING

This 36.1 miles of facilities recommended in this Plan are intended to be implemented over the following decade. The total estimated cost to implement the entire Bicycle Network recommended in this Plan will be approximately $3.6 million. The Plan identifies two phases of projects to be implemented over the next five years to strategically realize miles 10.9 miles of core routes of the Bicycle Network envisioned in this Plan, costing just under $1.2 million. The following section provides details on the phases of projects recommended to implement the Bicycle Network.

The Steering Committee established for this project should continue to meet semi-annually to track progress of Plan implementation, including annually updating this project listing to reflect completed projects and identifying additional projects based on opportunities that arise and the goals of this Plan. Formal review of this Plan should be conducted in 4 to 6 years, at which time an assessment of Phase One & Two implementation can be made. Additionally, Phase Two and Three activities can be reviewed for continued relevance and be reprioritized as appropriate. By this time, new needs are likely to have emerged, and new strategies and initiatives can be formulated and adopted.

Construction cost estimates were developed for the individual recommendations by identifying pay items and establishing rough quantities by the length of recommended facilities. Unit costs are based on 2011 dollars and were assigned based on historical cost data from state departments of transportation and other sources (see Appendix.) Rough costs have been assigned to some general categories such as grading, utility impacts, drainage, etc., however these costs can vary widely depending on the exact details and nature of the work. The overall estimates are intended to be general and used for planning purposes. Construction costs will vary based on the ultimate project scope (i.e. potential combination of projects) and economic conditions at the time of construction.

As discussed in the Facility Design Guidance section in the Bicycle Network Chapter, detailed design is needed for each recommended facility and location. Please note that the individual facility cost estimates do not include additional required project planning, engineering analysis and design, easement or Right-of-Way acquisition, or the cost for ongoing maintenance. Generalized estimates of these additional costs to implement the Phase One and Two recommendations are included in the Implementation Cost Table.

Recommended Facilities by Phase	Length (miles)	Approximate Cost
Near Term		
Bike Lanes	0.5	$26,000
Shared Lane Markings	6.4	$69,000
	6.9	$95,000
Medium Term		
Bike Lanes	1.4	$334,000
Shared Lane Markings	0.3	$3,000
Signed Route	0.5	$2,000
Shared Used Path	1.1	$557,000
Sidewalk with Bikes Permitted	0.7	$186,000
	4.0	$1,082,000
Long Term		
Bike Lanes	2.8	$343,000
Paved Shoulder	1.2	$253,000
Shared Lane Markings	8.6	$92,000
Signed Route	8.6	$24,000
Cycle Track	0.8	$661,000
Shared Use Path	2.4	$899,000
Sidewalk with Bikes Permitted	0.8	$160,000
	25.2	$2,432,000
Grand Total	**36.1**	**$3,609,000**

The Network Phases Map identifies the stages of the evolving Bicycle Network as each phase of projects is implemented. It emphasizes how much of the Bicycle Network can be completed with the cost-effective Phase One recommendations and the connectivity importance of the Phase 2 recommendations. The Implementation Costs Overview Table identifies funding targets for the next five years to implement the Plan recommendations through Phases One and Two.

Phase One (Years 0-2)

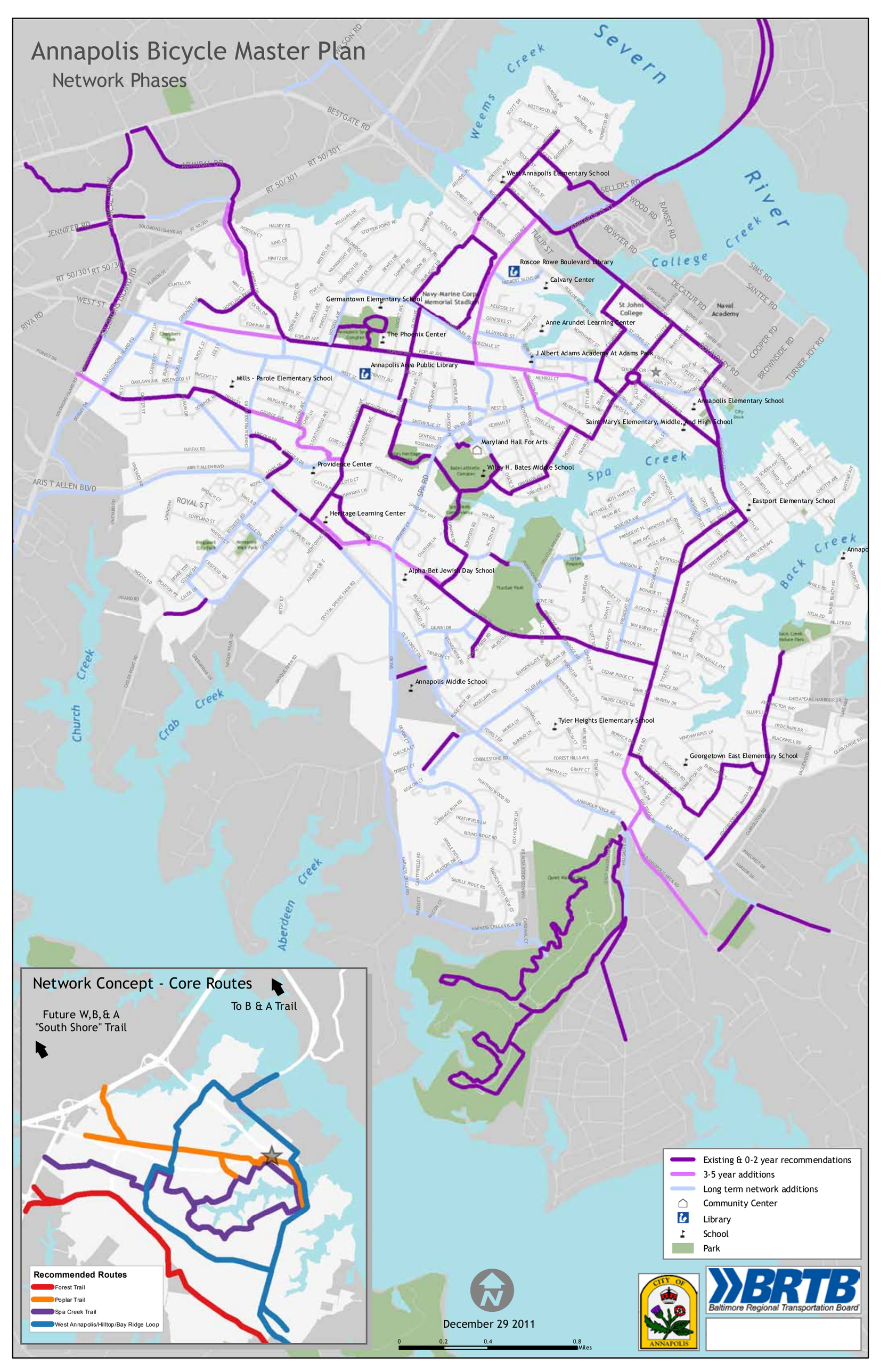
The Phase One Plan recommendations seek to make the maximum impact with a relatively small investment in the next two years. The first element is to enact the Policy and Program recommendations. Also recommended is to begin installing bicycle parking in high need locations, perhaps as a part of ongoing bus shelter rehabilitation. Finally, the early implementation Bicycle Network facility projects identified below can be created almost exclusively requiring paint and signage.

Existing Connections that need to be enhanced and formalized in Phase One include:

- McGuckian Street, connected east to Russell Street
- Victor Parkway, between Cypress Road and Georgetown Road (remove gate)

Intersections and crossings that need detailed design considerations to accommodate bicycles in Phase One include:

- Various crossings of West Street, including at:
  - Russell Street/Glen Avenue
  - Calvert Street/Cathedral Street
- Various crossings of Forest Drive, including at:
  - Cherry Grove Avenue
- Tyler Avenue, at Bay Ridge Avenue
- Cedar Park Road, at Glen Avenue
- Annapolis Street/Taylor Avenue
- Annapolis Street/King George Street
- Admiral Drive, at Poplar Trail
- Bay Ridge Avenue, at Adams Avenue
- Bay Ridge Avenue, at Washington Street
- Bay Ridge Avenue, at Fairview Avenue


Annapolis Bicycle Master Plan
Network Phases
Severn River
Weems Creek
College Creek
Spa Creek
Back Creek
Church Creek
Crab Creek
Aberdeen Creek
West Annapolis Elementary School
Roscoe Rowe Boulevard Library
Calvary Center
Navy-Marine Corps Memorial Stadium
Germantown Elementary School
St Johns College
Naval Academy
Anne Arundel Learning Center
The Phoenix Center
J Albert Adams Academy At Adams Park
Annapolis Area Public Library
Mills - Parole Elementary School
Annapolis Elementary School
Saint Mary's Elementary, Middle, and High School
Maryland Hall For Arts
Providence Center
Wiley H. Bates Middle School
Eastport Elementary School
Heritage Learning Center
Alpha-Bet Jewish Day School
Annapolis Middle School
Tyler Heights Elementary School
Georgetown East Elementary School
Network Concept - Core Routes
Future W,B,& A "South Shore" Trail
To B & A Trail
Recommended Routes
Forest Trail
Poplar Trail
Spa Creek Trail
West Annapolis/Hilltop/Bay Ridge Loop
Existing & 0-2 year recommendations
3-5 year additions
Long term network additions
Community Center
Library
School
Park
December 29 2011
0 0.2 0.4 0.8 Miles
CITY OF ANNAPOLIS
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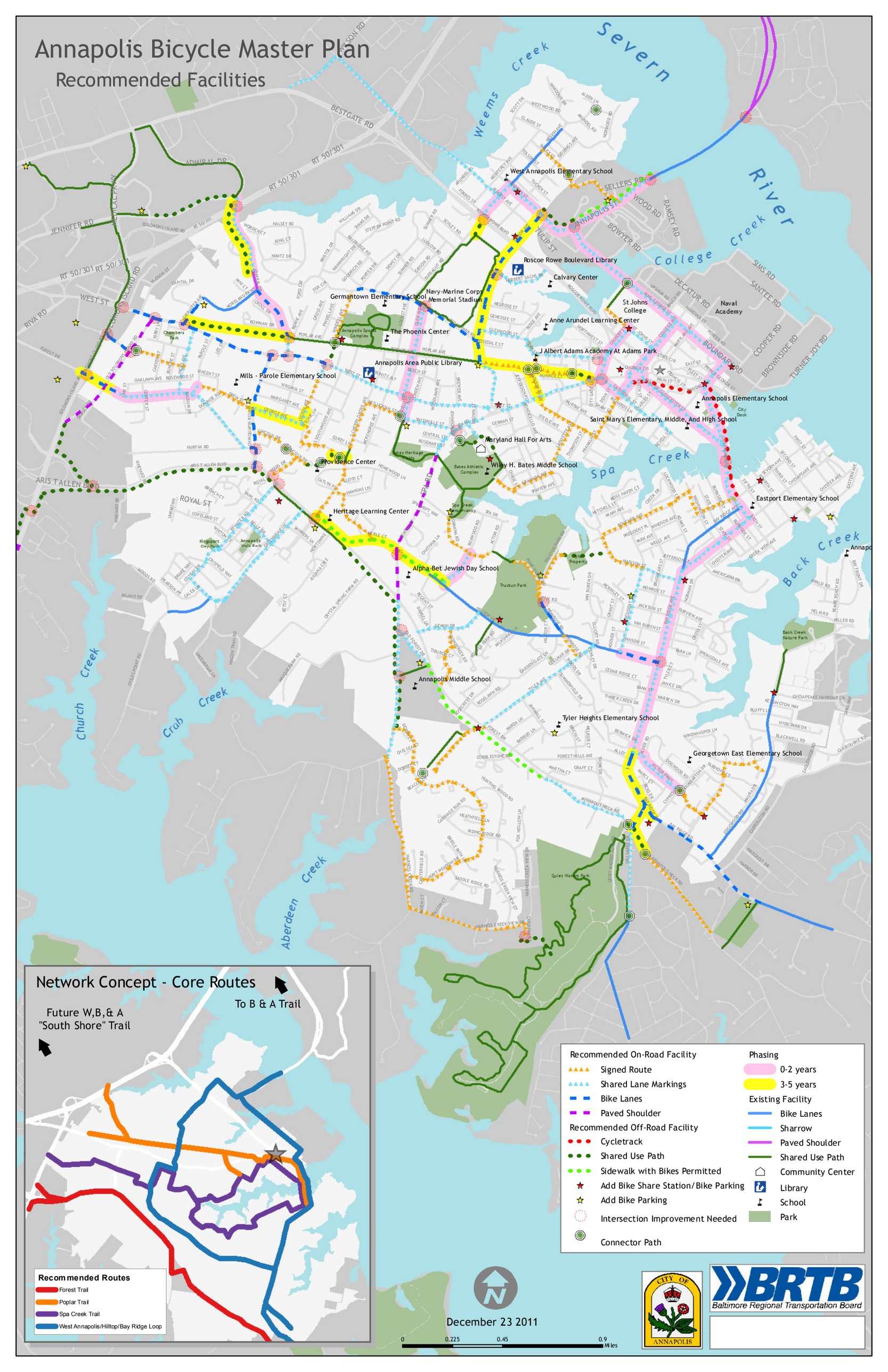
Annapolis Bicycle Master Plan
Recommended Facilities
Severn River
Weems Creek
College Creek
Spa Creek
Back Creek
Church Creek
Crab Creek
Aberdeen Creek
West Annapolis Elementary School
Roscoe Rowe Boulevard Library
Calvary Center
Navy-Marine Corps Memorial Stadium
Germantown Elementary School
The Phoenix Center
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Heritage Learning Center
Alpha Bet Jewish Day School
Annapolis Middle School
Tyler Heights Elementary School
Georgetown East Elementary School
Quiet Waters Park
Truxtun Park
Back Creek Nature Park
Network Concept - Core Routes
Future W,B,& A "South Shore" Trail
To B & A Trail
Recommended Routes
Forest Trail
Poplar Trail
Spa Creek Trail
West Annapolis/Hilltop/Bay Ridge Loop
Recommended On-Road Facility
Signed Route
Shared Lane Markings
Bike Lanes
Paved Shoulder
Recommended Off-Road Facility
Cycletrack
Shared Use Path
Sidewalk with Bikes Permitted
Add Bike Share Station/Bike Parking
Add Bike Parking
Intersection Improvement Needed
Connector Path
Phasing
0-2 years
3-5 years
Existing Facility
Bike Lanes
Sharrow
Paved Shoulder
Shared Use Path
Community Center
Library
School
Park
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0 0.225 0.45 0.9 Miles
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Phase 1 (0-2 Year) Projects			
Project	Length (miles)	Approximate Cost	Extent
Bike Lanes			
Admiral Drive	0.3.	$15,000	Poplar Avenue to Moreland Parkway (remove parking)
Tyler Avenue	0.2	$11,000	President Street to Bay Ridge Avenue
	0.5	$26,000	
Shared Lane Markings			
Admiral Drive	0.3	$4,000	Jennifer Road to Captains Circle
Melvin Avenue/ Annapolis Street	0.8	$7,000	Ridgley Avenue to Naval Academy Bridge
Compromise Street/Randall Street/ King George Street	1.1	$13,000	Spa Creek Bridge to Annapolis Street
Duke of Gloucester Street	0.5	$5,000	Church Circle to Compromise Street
College Avenue/ Church Circle/ Franklin Street	0.6	$6,000	Cathedral Street to King George Street
Victor Parkway/ Bay Ridge Avenue/ Chesapeake Avenue/ Sixth Street	1.6	$17,000	Cypress Road to Severn Avenue
Boxwood Road	0.2	$2,000	Hilltop Lane to Silopanna Road
Calvert Street/Cathedral Street	0.4	$4,000	St. Johns Street to Franklin Street
Forest Drive/ Parole Street	0.4	$5,000	Drew Street to Old Solomons Island Road
Russell Street/ Glen Avenue	0.5	$6,000	Spa Creek Trail to Cedar Park Road
	6.4	$69,000	
Grand Total	6.9	$95,000	

Phase Two (Years 3-5)

The Phase 2 Plan recommendations seek to continue implementing the Policy, Program, and bicycle parking recommendations. Building on the Bicycle Network expansions completed in Phase One, Phase Two will create an updated bicycle map and destination-oriented wayfinding system to educate bicyclists about the established Bicycle Network and their improved route options.

The Bicycle Network facility projects identified below are a set of 4.0 miles of capital projects. These projects will require more time and resources to design and implement than the Phase One facilities, however they make essential connections in the Bicycle Network as shown in the Network Phases Map.

Phase 2 (3-5 Year) Projects			
Project	Length (miles)	Approximate Cost	Extent
Bike Lanes			
Bay Ridge Avenue	0.5	$31,000	Victor Pkwy. to Bay Ridge Rd. and Quiet Waters Farm Rd.
Taylor Avenue	0.7	$257,000	Annapolis Street to Poplar Avenue
Forest Drive	0.2	$25,000	Solomons Island to Link Street
	14	$334,000	
Shared Lane Markings			
George Ave./ Legion Ave.	0.3	$3,000	Chinquapin Round Road to Margaret Avenue
	0.3	$3,000	
Signed Route			
Extend Poplar Trail	0.4	$2,000	Taylor Avenue to Loew's parking lot
Madison Place	0.1	-	West Street to Poplar Trail
	0.5	$2,000	
Shared Use Path			
Stadium Trail Connector	0.1	$24,000	Melvin Avenue to the Stadium Trail
Poplar Trail Segment	0.1	$134,000	Loew's parking lot to Washington St. (includ. $100,000 towards a required structure, actual cost may vary)
Poplar Trail Segment	0.5	$170,000	Admiral Drive to Gibraltar Avenue
Poplar Trail Segment	0.2	$58,000	From just past Moreland Parkway to Jennifer Road
Spa Creek Trail Segment	0.1	$128,000	Connects Ritchie Ct. to Cherry Grove Ave. (includ. estimated $100,000 for bridge, actual cost may vary)
Forrest Trail Segment	0.1	$43,000	Connects Hillsmere Road to Annapolis Neck Road
	1.1	$557,000	
Sidewalk with Bikes Permitted			
Forest Dr./ Hilltop Ln.	0.7	$186,000	Cherry Grove Avenue to Boxwood Road
	0.7	$186,000	
Facilities Total	**4.0**	**$1,082000**	
Wayfinding Plan			
Design/Planning		$60,000	
Installation	50	$60,000	
		$120,000	
Bike Map			
Redesign		$10,000	
Printing		$30,000	
		$40,000	
Phase 2 Grand Total		**$1,242,000**	

Missing connections that are essential to completing Phase 2 of the envisioned Bicycle Network include:

- Connections to the east end of the Poplar Trail, including at:
  - Madison Place, from West Street
  - Washington Street, by ascending the retaining wall in Loew's parking lot and a trail connection
- Ritchie Court, connected east to Cherry Grove Avenue (segment of Spa Creek Trail)

Existing Connections that need to be enhanced and formalized in Phase 2 include:

- Annapolis Neck Road, connected across Quiet Waters Road and Hillsmere Drive

Intersections and crossings that need detailed design considerations to accommodate bicycles in Phase 2 include:

- US 50/301, at the Admiral Drive underpass
- Solomons Island Road/MD-2, at Forest Drive
- West Street, at Washington Street
- Forest Drive, at Bay Ridge Avenue/Hillsmere Drive
- Hilltop Lane, at Spa Road
- Rowe Boulevard, at Farragut Road
- Rowe Boulevard, at Taylor Avenue

Phase Three (Years 6+)

The Phase Three recommendations are capital projects the complete the Bicycle Network. Many of these recommended facilities will require new construction or roadway reconfiguration, which will be completed as development or larger capital roadway reconstruction projects occur.

Larger capital projects should be initiated in this phase, including:

- Compromise Street and Main Street Cycle Tracks
- Forest Drive Trail segments (Bywater Road to MD State Highway 2 including Church Creek bridge and Aris T. Allen Boulevard underpass, Hilltop Lane to Annapolis Middle School, Annapolis Middle School to Old Annapolis Neck Road)
- Spa Creek Trail segments (Compromise Street to Shipwright Street, Vytar Property connection from Primrose Road to Madison Street, Bates Heritage Fields to Lincoln Drive)

Bicycle facilities can also be created through larger roadway Complete Streets reconstruction projects in this phase, including:

- Taylor Avenue/Annapolis Street from the Poplar Trail to the Naval Academy Bridge,

- Old Annapolis Neck Road improvements and connection to Forest Drive Trail
- Finally, a full update of the Annapolis Bicycle Master Plan should be undertaken in Phase Three, including:
- Tracking the progress made in Phases One and Two
- Re-evaluate of priority projects and resetting the implementation timeline
- Re-evaluate of annual budget allocation for programs, maintenance, etc.
- Further development and refinement of program activities

Phase One & Two Implementation Costs Table						
	Years					
	1	2	3	4	5	6+
Facility Construction	$50,000	$50,000	$360,000	$360,000	$360,000	$100,000
Design/Planning (50%)	$25,000	$25,500	$180,000	$180,000	$180,000	$50,000
Bike Parking	$10,000	$10,000	$10,000	$10,000	$5,000	$5,000
Co-Exist Programs/ Materials	$5,000	$5,000	$2,000	$2,000	$2,000	$2,000
Maintenance			$5,000	$10,000	$10,000	$15,000
Wayfinding Plan/ Installation				$60,000	$60,000	
Bike Map Redesign/ Printing				$40,000		
Plan Update						$50,000
	$90,000	$90,000	$560,000	$670,000	$620,000	$230,000

5-year total	**$2,030,000**
10% contingency	**$210,000**
	$2,240,000

OPPORTUNITIES TO IMPLEMENT FACILITIES

The Bicycle Network chapter identifies a variety of bicycle facility types. The Bicycle Facility Recommendations map indicates the facilities that are recommended as desired and achievable based on stakeholder comment and technical analysis. These recommendations are location-specific and are based on existing roadway and lane widths, surrounding land uses, and other factors.

Much of the on-street network will be achieved through routine road resurfacing. Other improvements will be made as part of major road rehabilitation projects, new road construction, routine traffic management and maintenance projects, major land developments, and standalone bicycle facility projects. The following sections provide some guidance on specific actions required to implement the recommended network of bicycle facilities.

Actions by Facility Type for All Phases

Project	Length (miles)	Approximate Cost
Bike Lanes		
Add Striping	1.5	$89,000
Pave Existing Shoulder	0.7	$353,000
Road Diet	2.4	$261,000
	4.7	$703,000
Paved Shoulder		
Lane Diet	0.5	$45,000
Pave Existing Shoulder	0.4	$165,000
Road Diet	0.2	$23,000
Widen Shoulder	0.1	$20,000
	12	$253,000
Shared Lane Markings		
Add Markings	15.0	$164,000
	15.3	$164,000
Signed Route		
Add Signs	9.1	$26,000
	9.1	$26,000
Cycle Track		
Study/Construct	0.8	$661,000
	0.8	$661,000
Shared Use Path		
Study/Construct	3.5	$1,356,000
	3.5	$1,356,000
Sidewalk with Bikes Permitted		
Study/Widen	1.5	$346,000
	1.5	$346,000
Grand Total	**36.1**	**$3,609,000**

New Facilities

The creation of the completely new bicycle facilities identified in Phases One and Two of this Plan as standalone projects will require identifying funding sources for bicycle facility improvements and maintenance including: adding pavement markings, striping, signage, widened shoulders or sidewalks, or shared use paths. A dedicated funding source should be sought to implement the recommendations of this Plan.

Rehabilitation & Reconstruction

Less than 3% of the land area within the City of Annapolis is categorized as vacant, and much of that is distributed in numerous parcels of less than one acre. As such, there will be few entirely new developed areas and roadways constructed. The City's Comprehensive Plan has established the vision of concentrating the future growth of Annapolis in the form of infill, particularly in three Opportunity Areas: West Annapolis, Bay Ridge, Forest Drive, and Outer West Street. These are areas of town that were originally constructed exclusively for automobile access, but are no longer on the periphery of town. The periodic reconstruction of existing roadways can provide the opportunity to reconfigure the allocation of public roadway space as land redevelopment occurs and density is strategically increased.

There are two primary means of expanding the range of uses within limited roadway corridor rights-of-way that can be accomplished through either re-striping or reconstruction: Lane Diets and Road Diets.

Lane Diets

A bicycle lane can often be added to existing pavement by narrowing an existing vehicle travel lane when there is sufficient width, which is called a lane diet. In some cases, milling existing paint and restriping lanes may not be necessary; rather bike lanes can be striped inside the rightmost lane to divide it into vehicle and bicycle lanes. Narrowing the travel lanes for cars has the added benefit of slowing down traffic, making conditions safer for all users.

Road Diets

Road diets are the reallocation of roadway space to multiple uses through the removal of through vehicle lanes. Roadway capacity is considered when examining the number and type of vehicular travel lanes. If a reduction in the number of travel lanes is desired, a traffic analysis should be performed to determine if that "road diet" option is

feasible. Roadways with higher vehicular speed and volumes are less comfortable for cyclists, and are therefore in more need of dedicated bicycle facilities. Excess capacity can also result in higher traffic speeds. Some roads may benefit from the fewer travel lanes or conversion of travel lanes to turning lanes.

MAINTENANCE

Many bicycle facilities exist solely as pavement markings. Therefore, it is essential that they are repaired and maintained through wear and tear, or they can effectively cease to exist.

Complete Streets principles can be applied to existing streets and facilities as well as new ones. As streets are slated for regular maintenance, small, low-cost improvements can be made to benefit bicyclists. Some examples of low-cost bicycle improvements that can be integrated into routine roadway maintenance include:

- Removing drainage grates the pose dangers for bicyclists. Drainage covers with slats orientated parallel to the street create hazards for bicyclists when their wheels are caught in the slats. Replacing these covers with those that have design patterns will not catch bicycle wheels (cross hatching, circular openings) would be relatively inexpensive, yet effective.
- Resurfacing & restriping the road for vehicles also helps bicycle travel. When resurfacing roads it will be important to resurface the entire surface area, including shoulders were bicyclists are likely to ride. Resurfacing and restriping also opens the possibility for lane diets or road diets, as previously discussed
- Annual trimming of vegetation that overhangs shared use paths and sidewalks on City properties, including reminders to residents to do the same on private property.
- Sweeping the roads is a critical operation for bicycle route maintenance. Debris such as trash, gravel and salt crystals left over from the winter season reduces traction on the roads and can puncture bicycle tires. Regular street sweeping, especially for high traffic roads can help improve the safety and comfort of bicyclists.

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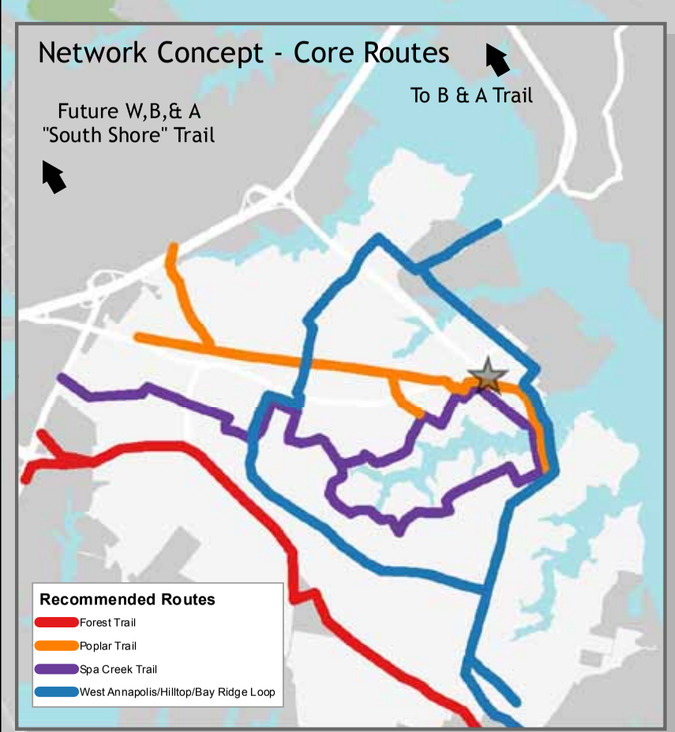
Annapolis Bicycle Master Plan

Recommended Actions



- Add Bike Share Station/Bike Parking
- Add Bike Parking
- Intersection Improvement Needed
- Connector Path

Recommended On-Road Action

- Add Markings
- Add Signs
- Add Striping
- Lane Diet
- Pave Existing Shoulder
- Road Diet
- Widen Shoulder

Recommended Off Road Action

- Study/Construct
- Study/Widen
- Community Center
- Library
- School
- Park

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0 0.225 0.45 0.9 Miles

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FUNDING OPPORTUNITIES

Local

A policy recommendation of this Plan is to identify dedicated funding the implement the recommendations of this plan from sources such as a percentage of parking revenues, a percentage of the overall City transportation budget, and bonding to bundle and implement multiple small bicycle improvement projects across the City at one time. In addition to directly funding physical improvements, local funding is needed to provide:

- Funds for matching grant opportunities
- Ongoing maintenance of trails, pavement markings, signage, and parking facilities.
- ongoing support for programs, events, and educational materials

State/Federal[1]

The State of Maryland has several funding programs that support the construction and maintenance of bicycle and walking facilities. Although many are funded with federal dollars, all of the programs included below are administered by state agencies and departments.

- *Highway User Revenues (HURs)* are collected by the state and are distributed to localities. These revenues are usually spent on vehicular transportation projects such as roadways and bridges. They can also be spent on the construction and maintenance of footpaths, bridle paths or horse paths, as well as bicycle trails (Article 66B Title 2 Department of Transportation Subtitle 4 Highway User Revenues 8-409).

- *Neighborhood Conservation/Urban Reconstruction Program* began in 1996 to assist in the revitalization of neighborhoods through roadway improvements to state highways and urban state highways. Three phases of funding are available: 1) concept development, 2) design, and 3) construction. Some of the eligible projects funded by this program include: adding or upgrading drainage, curb and gutter construction/ reconstruction, conventional sidewalks, bus shelters and transit station access improvements, landscaping and specialized signage. The State committed an $8 million annual budget to this program, which was expected to triple by the year 2000. Projects on state highways in State Designated Neighborhoods or on the state's urban highway system can

1 All descriptions were taken from the Baltimore Regional Bicycle, Pedestrian and Greenways Transportation Plan, July 2001. http://www.baltometro.org/BRTP2001/BikePedGreenPlan.pdf accessed on 07-07-11.

receive 100% of the project's cost. Counties or municipalities can send concept development or design proposals to SHA District Engineer's anytime during the year. Construction projects, however, are accepted semi-annually (spring and fall). The proposal will then be submitted to the Chief Engineer's Office for review and selection.

- *Bicycle Retrofit Program* was initiated by the State Highway Administration in 2000. The purpose of the program is to fund minimal on-road improvements on state highways that would benefit bicycling. Eligible improvements include projects that can be completed quickly and without the need for permits or right-of-way. One million dollars is allocated annually to the Bicycle Retrofit Program. Individuals and local jurisdictions can submit project requests to SHA's Bicycle and Pedestrian Coordinator on an on-going basis.

- *Transportation Enhancement Program* is administered by SHA and uses Federal appropriations (Federal Surface Transportation Program funds) to fund transportation-related community amenities. Less than $8 million is left through 2003 for the Transportation Enhancement Program. Projects such as bicycle and pedestrian facilities and education programs, acquisition of scenic easements and preservation of abandoned railways are examples of projects funded each year; approximately 70% of the program funds have gone toward bicycle and pedestrian education programs and trail projects. Up to 50% of each project's cost is eligible for funding the other 50% must be matched by the project sponsor. Funds are awarded to new projects semi-annually, in the summer and fall. The average award is between $350,000 – $400,000, however, it varies depending on the project.

- *National Recreational Trails Program* administered by SHA, matches federal funds up to 50% with local funds to implement trail projects. Eligible activities include trail construction, reconstruction, maintenance, restoration, and easement or property acquisition. Currently $760,000 is available to SHA from the Federal Highway Administration; the amount of money varies each year. The average project cost is around $30,000. Projects are proposed by local governments, other state agencies, counties or municipal governments. Applications should be submitted to SHA's Office of Environmental Design. In order for non-governmental agencies such as a non-profit agency, a community group, or individual to apply for program funds, co-sponsorship from

an appropriate local governmental agency is required. Applications are distributed in September for a mid-November deadline. Typically, funds are awarded in January or February of each year.

- *Maryland Scenic Byways Program* can provide communities with the framework and funding to create a community-based Corridor Management Plan (CMP) along State Designated Scenic Byways. A CMP serves as a guide to promote, preserve, and develop a scenic byway that addresses issues such as tourism development, roadway safety, preservation of natural features and historic structures. The State must first designate a scenic byway in order for CMP projects to be considered. Once a CMP has been developed, project sponsors may apply for additional funding for a number of projects such as safety improvements, construction of pedestrian and bicycle facilities, and governments, private non-profit agencies, or community groups with appropriate governmental agency co-sponsorship can apply for CMP funds. $25 million dollars is available nationwide for scenic byways programs, some states receive as much as $1 million or more each year, depending on the need. Maryland has received on average $500,000 in federal funds each year; however, this amount may increase because the Maryland Scenic Byways Program Maryland has recently designated 31 State Scenic Byways. Southern Maryland has two designations, the Calvert Maritime Tour in Calvert County and the Religious Freedom Tour that runs through Charles and St. Mary's Counties. This program is unique in that SHA can award up to 80% of the project's cost and sponsors are only required to match expenses by 20 percent. The deadline for applying for Scenic Byways funds is June 1. Applications are available online at www.byways.org and should be submitted to the State Scenic Byways Coordinator. The State Scenic Byways Advisory Committee reviews and approves potential projects.

- *Highway Safety Grant Program (Section 402)* is administered by the Maryland Highway Safety Office (MHSO), a division of SHA. Federal 402 funds are used for pedestrian and bicycle public information and education programs. Funds are distributed to states annually from the National Highway Traffic Safety Administration (NHTSA) according to a formula based on population and road mileage. Maryland receives 402 funds each year. Local jurisdictions submit Expressions of Interest (EOI) to the MHSO in March and commitment letters announcing the approval of the proposed projects are distributed in June. Funds are

generally awarded sometime after October 1st each year. Government agencies or government-sponsored entities are eligible to apply for 402 Grant funds. Every county in the state and the City of Baltimore is assigned a Community Traffic Safety Program Coordinator who organizes local Task Forces to identify and prioritize traffic safety issues and develop appropriate countermeasures. Agencies are encouraged to work with their local Task Force to determine the feasibility and eligibility of proposed projects prior to submitting a 402 Grant.

- *Program Open Space (POS)* primary focus is to acquire outdoor recreation and open space areas for public use. POS is administered by Maryland's Department of Natural Resources (DNR) and is funded through the **state real estate transfer tax**. The money set aside for this program is divided equally between local and state projects. Half of the money is used by the state for direct land acquisitions, while the other half is granted to local governments. Using a population-based formula, every July 1, each county in the state and the City of Baltimore is apportioned a specific amount of the money for Program Open Space. In order to receive these funds, counties are required to create Land Preservation and Recreation Plan that outlines acquisition and development goals, of which bicycle and pedestrian facilities may be included. POS provides 100% funding for local land acquisition and will contribute 75% for development costs for county and city parks and recreation areas. As much as 90% of development costs can be funded if Land and Preservation and Recreation Plan goals are met.

- *Rural Legacy Program* was enacted by the 1997 General Assembly as part of Governor Parris N. Glendening's Smart Growth and Neighborhood Conservation Initiative. The program encourages local governments and private land trusts to identify Rural Legacy areas and to competitively apply for funds to protect the state's most valuable agricultural, forestry, natural, and cultural resources or create new ones. A combination of Maryland Program Open Space dollars and general obligation bonds from the state's capital budget subsidize the Rural Legacy Program. During the first five years of the Rural Legacy Program between $110 and $128 million will be committed to preserving from 50,000 to 75,000 acres of Maryland's farms, forests, and open spaces. While the focus of this initiative is not specifically for bicycle and pedestrian facilities and programs, they can be proposed as an adjunct or compliment to eligible projects, and may be used to help acquire greenway lands.

Applications may be made by local governments or organizations endorsed by local government to the Rural Legacy Board. The Rural Legacy Board, in turn, makes final recommendations to the Governor and the Board of Public Works. The Board of Public Works approves the grants for Rural Legacy funding.

- *The Sustainable Communities Act of 2010* (HB 475) strengthens reinvestment and revitalization in Maryland's older communities by reinventing an existing rehabilitation tax credit and extending the life of the credit through 2014, simplifying the framework for designated target areas in the Community Legacy (CL) and Neighborhood BusinessWorks (NBW) program by creating "Sustainable Communities", establishing a new transportation focus on older communities, and enhancing the role of the Smart Growth Subcabinet (SGSC) in the revitalization of communities.

- *Community Parks and Playgrounds Program* also established during the state's 2001 legislative session, is administered by the Department of Natural Resources (DNR). The program will provide funding to restore and create parks and playgrounds in communities all across the State. While this initiative is not specifically written to fund bicycle and pedestrian facilities, such plans could be proposed as enhancements to existing parks. This program has been funded at $11 million for fiscal year 2002.

- *The Smart Growth Transit Program (SGTP)* is an initiative to encourage community revitalization and to create incentives for development or redevelopment in areas close to MARC, metro, light rail, and bus stations and services. More specifically, these funds are used on behalf of transit-oriented developments that have an appropriate combination of commercial and residential land uses, sufficient density to support public transit usage, and that support community master planning in designated revitalization/growth areas. Improvements to improve bicycling and walking infrastructure are among the projects eligible for SGTP funds. SGTP includes four programs, the Transit Station Development Incentive Program, Neighborhood Conservation, Access 2000 Pedestrian Improvements and the Transit Enhancement Program. Funding is approximately $6 million per year.

There is a wide range of federal dollars that can be used for state and local bicycling and walking facilities. The most common include2:

2 Source: Federal Highway Administration, Bicycle and Pedestrian Provisions of the Federal-aid

- Funds through federal land agencies such as the National Forest Service, National Park Service or Bureau of Land Management. These funds are primarily for trails and must be on federal lands.
- Community Development Block Grants through HUD, the Department of Housing and Urban Development provides funds for community-based projects. Examples of the types of projects they fund are:
  - Commercial district streetscape improvements
  - Sidewalk improvements
  - Safe routes to school
  - Neighborhood-based bicycling and walking facilities that improve local transportation options or help revitalize neighborhoods3

- **The National Highway System Program provides funding for improvements to rural and urban roads that are part of the National Highway System, including the Interstate System and designated connections to major intermodal terminals. Under certain circumstances, NHS funds may also be used to fund transit improvements in NHS corridors.** These funds may be used to construct bicycle transportation facilities and pedestrian walkway on land adjacent to any highway on the National Highway System

- **Surface Transportation Program provides flexible funding that may be used by States and localities for projects on any Federal-aid highway, including the NHS, bridge projects on any public road, transit capital projects, and intracity and intercity bus terminals and facilities.** These funds may be used for either the construction of bicycle transportation facilities and pedestrian walkways, or non-construction projects such as maps, brochures, and public service announcements related to safe bicycle use and walking.
  - Ten percent of each State's annual Surface Transportation Program funds is set aside for Transportation
  - Enhancement Activities, which include facilities for pedestrians and bicycles, safety and educational activities for pedestrians and bicyclists, and the preservation of abandoned railway corridors
  - Ten percent of each State's annual Surface Transportation Program funds is set aside for the Hazard Elimination and Railway-Highway Crossing Programs, which addresses bicycle and pedestrian safety at hazardous locations.

Program, http://www.fhwa.dot.gov/environment/bikeped/bp-broch.htm

3 Pedestrian and Bicycle Information Center,http://bicyclinginfo.org/funding/sources-government.cfm accessed on 07-07-11.

- The Federal share is generally 80 percent, subject to the sliding scale adjustment. When the funds are used for Interstate projects to add high occupancy vehicle or auxiliary lanes, but not other lanes, the Federal share may be 90 percent, also subject to the sliding scale adjustment. Certain safety improvements listed in 23 USC 120(c) have a Federal share of 100 percent.[4]
- Funds from the **Congestion Mitigation and Air Quality Improvement Program** may be used to construct bicycle facilities, pedestrian walkways, or non-construction projects such as maps, brochures, and public service announcements related to safe bicycle use.
- Funds from the **Recreational Trails Program** may be used for all kinds of trail projects. Of the funds apportioned to States, 30% must be used for motorized trail uses, 30% for non-motorized trail uses, and 40% for combination trail uses.
- **National Scenic Byways Program** funds may be used for construction of a bicycle and pedestrian facility along scenic byways.
- **Job Access and Reverse Commute Grants** are available to support bicycle-related services and other projects that are designed to transport welfare recipients and eligible low-income individual to and from employment.
- **High Priority Projects and Designated Transportation Enhancement Activities** include numerous bicycle, pedestrian, trail, and traffic calming projects in communities.
- **Urbanized Area Formula Grants, Capital Investment Grants and Loans, and Formula Program for Other than Urbanized Area** transit funds may be used for improving bicycle and pedestrian access to transit facilities and vehicles
- The **Transit Enhancement Activity Program** sets aside 1% of Urbanized Area Formula Grant funds specifically for pedestrian access and walkway sand bicycle access, including bicycle storage facilities and installing equipment for transporting bicycles on mass transportation vehicles.

4 Information taken from Federal Highway Administration's SAFETEA-LU Fact Sheet. http://www.fhwa.dot.gov/safetealu/factsheets/stp.htm Accessed online on 07-06-11.

APPENDIX

FACILITY DESIGN GUIDANCE REFERENCES

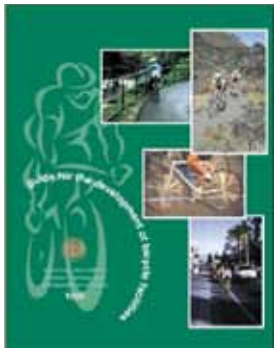
A goal of the Annapolis Bicycle Master Plan is to provide functional, safe and accessible multi-modal connections throughout the city. It is critical that facilities and design solutions are chosen that are appropriate for the type of user and existing space. This appendix provides detail and general guidance on design solutions to accompany this Plan's specific recommendations for improving bicycling conditions in Annapolis.

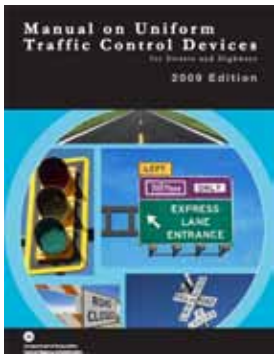
All pedestrian and bicycle facilities should be designed to meet current State and Federal design guidance and standards, as defined by MDOT, the American Association of State Highway Transportation Officials (AASHTO), the Americans with Disabilities Act, and the Manual on Uniform Traffic Control Devices (MUTCD). If the national standards are revised in the future, the updated standards should be followed.

The following publications should be referenced for greater detail on the design of bicycle facilities:

- ***Guide to the Development of Bicycle Facilities.*** The American Association of State Highway Transportation Officials (AASHTO), Updated in 1999. Available from AASHTO at www.aashto.org/bookstore/abs.html.
- ***Manual on Uniform Traffic Control Devices (MUTCD)***. Published by the U. S. Department of Transportation, Washington, DC, 2001. The manual is available at http://mutcd.fhwa.dot.gov.
- ***Americans with Disabilities Act Accessibility Guidelines (ADAAG).*** U.S. Department of Justice, United States Access Board. Guidelines are available at http://www.access-board.gov/adaag/html/adaag.htm.
- ***Designing Sidewalks and Trails for Access: Part Two - Best Practices Design Guide***. Published by U.S. Department of Transportation, Washington, DC, 2001
- ***Maryland SHA Pedestrian and Bicycle Design Guidelines.*** Published by MDOT, 2003. The guide is available at http://www.roads.maryland.gov/Index.aspx?PageId=25.
- ***Maryland Manual on Uniform Traffic Control Devices (MD MUTCD).*** Published by MDOT, 2006 and updated with revisions from the Federal MUTCD in 2009. The guide is available at http://www.sha.state.md.us/Index.aspx?PageId=835.

- Bicycle Parking Guidelines, 2nd Edition (2010). The Association of Pedestrian and Bicycle Professionals (APBP). http://www.apbp.org





COST ESTIMATE TABLES

Construction cost estimates were developed for the individual recommendations by identifying pay items and establishing rough quantities by the length of recommended facilities. Unit costs are based on 2011 dollars and were assigned based on historical cost data from state departments of transportation and other sources (see Appendix.) Rough costs have been assigned to some general categories such as grading, utility impacts, drainage, etc., however these costs can vary widely depending on the exact details and nature of the work. The overall estimates are intended to be general and used for planning purposes. Construction costs will vary based on the ultimate project scope (i.e. potential combination of projects) and economic conditions at the time of construction.

As discussed in the Facility Design Guidance section in the Bicycle Network Chapter, detailed design is needed for each recommended facility and location. Please note that the individual facility cost estimates do not include additional required project planning, engineering analysis and design, easement or Right-of-Way acquisition, or the cost for ongoing maintenance. Generalized estimates of these additional costs to implement the Phase One and Two recommendations are included in the Implementation Cost Table.

	Length (miles)	Approximate Cost
Bike Lanes		
ADMIRAL DR	0.3	$ 15,000
BAY RIDGE AVE	0.5	$ 17,000
BAY RIDGE RD	0.4	$ 31,000
CEDAR PARK RD	0.6	$ 67,000
CHINQUAPIN ROUND RD	0.5	$ 36,000
FAIRFAX RD	0.1	$ 5,000
FOREST DR	0.2	$ 18,000
GIBRALTER AVE	0.1	$ 9,000
HILLSMERE DR	0.1	$ 9,000
PRIMROSE RD	0.2	$ 86,000
SOMERVILLE RD	0.1	$ 8,000
TAYLOR AVE	0.7	$ 287,000
TYLER AVE	0.2	$ 11,000
WEST ST	0.9	$ 100,000
	4.7	$ 699,000
Paved Shoulder		
OLD SOLOMONS ISLAND RD	0.5	$ 117,000
SPA RD	0.7	$ 136,000
	1.2	$ 253,000
Shared Lane Markings		
ADMIRAL DR	0.4	$ 4,000.00
ANNAPOLIS NECK RD	0.4	$ 4,000.00
ANNAPOLIS ST	0.3	$ 3,000.00
BAY RIDGE AVE	0.8	$ 9,000.00
BELLE DR	0.2	$ 2,000.00
BOXWOOD RD	0.2	$ 2,000.00
BYWATER RD	0.4	$ 4,000.00
CALVERT ST	0.3	$ 3,000.00
CATHEDRAL ST	0.3	$ 3,000.00
CHESAPEAKE AVE	0.4	$ 4,000.00
CHURCH CIRCLE	0.2	$ 2,000.00
CLAY ST	0.4	$ 4,000.00
COLLEGE AVE	0.3	$ 3,000.00
COMPROMISE ST	0.2	$ 2,000.00
CONDUIT ST	0.0	$ -
COYBAY DR	0.2	$ 3,000.00
DUKE OF GLOUCESTER	0.5	$ 5,000.00
FOREST DR	0.7	$ 7,000.00
FRANKLIN ST	0.1	$ 1,000.00
GEMINI DR	0.3	$ 3,000.00
GEORGE AVE	0.2	$ 2,000.00
GLEN AVE	0.4	$ 4,000.00
GLENWOOD ST	0.2	$ 2,000.00
GREENBRIAR LN	0.5	$ 6,000.00
GREENFIELD ST	0.1	$ 1,000.00
HERBERT SACHS DR	0.3	$ 3,000.00
HICKS AVE	0.3	$ 3,000.00
KING GEORGE ST	0.8	$ 9,000.00
LEGION AVE	0.1	$ 2,000.00
MADISON ST	0.2	$ 2,000.00
MARKET ST	0.0	$ -
MELVIN AVE	0.2	$ 2,000.00
NICHOLSON ST	0.0	$ -
OLD FOREST DR	0.2	$ 2,000.00
PAROLE ST	0.0	$ 1,000.00
PILOT HOUSE DR	0.3	$ 3,000.00
PRESIDENT ST	0.4	$ 4,000.00
RANDALL ST	0.1	$ 2,000.00
RIDGELY AVE	0.3	$ 3,000.00
RUSSELL ST	0.1	$ 1,000.00
SHIPWRIGHT ST	0.2	$ 2,000.00
SIXTH ST	0.1	$ 1,000.00
SMITHVILLE ST	0.2	$ 3,000.00
SPA RD	0.5	$ 5,000.00
ST JOHNS ST	0.1	$ 2,000.00
TAYLOR AVE	0.2	$ 2,000.00
TYLER AVE	0.6	$ 7,000.00
UNION ST	0.1	$ -
VICTOR PKWY	0.3	$ 3,000.00
WEST ST	1.2	$ 13,000.00
(blank)	0.4	$ 4,000.00
	15.3	$ 164,000.00

Signed Route			
BADGER RD	0.0	$	-
BLOOMSBURY SQ	0.1	$	-
BOUCHER AVE	0.4	$	1,000
DREW ST	0.3	$	1,000
FRANKLIN ST	0.2	$	1,000
GEORGE AVE	0.0	$	-
GEORGETOWN RD	0.3	$	1,000
GRANADA AVE	0.2	$	1,000
HARNESS CREEK VIEW DR	0.2	$	1,000
HAWKINS LN	0.1	$	-
HOLECLOW ST	0.2	$	1,000
HUNT MEADOW DR	1.2	$	3,000
LAFAYETTE AVE	0.2	$	1,000
LEGION AVE	0.1	$	-
LINCOLN DR	0.2	$	1,000
LOUIS DR	0.1	$	-
LOWES HOTEL ACCESS	0.4	$	1,000
MADISON PL	0.1	$	-
MADISON ST	0.3	$	1,000
MCGUCKIAN ST	0.1	$	-
MERRYMAN RD	0.3	$	1,000
MONTICELLO AVE	0.0	$	-
PRIMROSE RD	0.5	$	1,000
PUMP HOUSE RD	0.2	$	-
RIDOUT ST	0.1	$	-
RITCHIE LN	0.1	$	-
RITCHIE ST	0.1	$	-
S CHERRY GROVE AVE	0.5	$	1,000
SEVERN AVE	0.2	$	-
SHILEY ST	0.2	$	-
SILOPANNA RD	0.3	$	1,000
SOUTHGATE AVE	0.3	$	1,000
SPAVIEW AVE	0.1	$	-
ST JOHNS ST	0.1	$	-
STONECREEK RD	0.1	$	-
TYLER AVE	0.4	$	1,000
VICTOR PKWY	0.1	$	-
WASHINGTON ST	0.1	$	-
WINDELL AVE	0.2	$	1,000
WINDWHISPER LN	0.1	$	-
YACHTSMAN WAY	0.1	$	-
YOUNGS FARM RD	0.2	$	1,000
	9.1	$	26,000
Grand Total	**30.3**	**$**	**1,142,000**

Annapolis Bicycle Master Plan - Facility Base Costs (per mile)
July 1, 2011

1 **Signed Route (Add Signs)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment		
New Sign	EA	10	$220.00	$2,200	Assume 1 Sign every 500 feet, each direction		
Lump Sum Items							
	LS	1.00		$0			
			Subtotal	**$2,200**		**$0.42**	
			25% Contingency	$550		**2 Lanes**	
			Total Estimated Cost	**$2,800**	←	**$0.53**	**Per Foot**

2 **Shared Lane Markings (Add Markings)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment		
Thermoplastic Pavement Marking Symbol	EA	20	$300.00	$6,000	Assume 1 Symbol every 250 feet per side of the road		
New Sign	EA	10	$220.00	$2,200	Assume 1 Sign every 500 feet		
Lump Sum Items							
Maintenance of Traffic (5%)	LS	1.00	$410.00	$410			
			Subtotal	**$8,610**		**$1.63**	
25% Contingency				$2,153		**2 Lanes**	
Total Estimated Cost				**$10,800**	←	**$2.05**	**Per Foot**

3 **Bike Lanes (Add Striping)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment		
Thermoplastic Pavement Marking (6")	LF	20000	$1.50	$30,000	Assume 4 lines entire length		
Thermoplastic Pavement Marking Symbol	EA	40	$300.00	$12,000	Assume 1 Symbol every 250 feet each side of road		
24" Thermoplastic Pavement Marking	LF	200	$6.00	$1,200	Assume 1 High Vis crossing every 2500 feet		
New Sign	EA	10	$220.00	$2,200	Assume 1 Sign every 500 feet each side of road		
Lump Sum Items							
Maintenance of Traffic (5%)	LS	1.00	$2,270.00	$2,270			
			Subtotal	**$47,670**		**$9.03**	
			25% Contingency	$11,918		**2 Lanes**	
			Total Estimated Cost	**$59,600**	←	**$11.29**	**Per Foot**

4 **Bike Lanes (Road Diet)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment		
Thermoplastic Pavement Marking (6")	LF	20000	$1.50	$30,000	Assume 4 lines entire length		
Thermoplastic Pavement Marking Symbol	EA	40	$300.00	$12,000	Assume 1 Symbol every 250 feet each side of road (bike lane)		
24" Thermoplastic Pavement Marking	LF	200	$6.00	$1,200	Assume 1 High Vis crossing every 2500 feet		
New Sign	EA	10	$220.00	$2,200	Assume 1 Sign every 500 feet		
Eradication	LF	15000	$2.00	$30,000	Assume 3 lines entire length (2 center yellow, 1 50% skip yellow)		
Thermoplastic Pavement Marking Symbol	EA	20	$300.00	$6,000	Assume 1 symbol every 250 feet (Left-Turn arrows)		
Lump Sum Items							
Maintenance of Traffic (5%)	LS	1.00	$4,070.00	$4,070			
			Subtotal	**$85,470**		**$16.19**	
			25% Contingency	$21,368		**2 Lanes**	
			Total Estimated Cost	**$106,900**	←	**$20.25**	**Per Foot**

5 **Bike Lanes (Pave Existing Shoudlers - 4' each side, includes lane diet)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Earthwork, Excavation, Grading	CY	3000	$15.00	$45,000	Assume 8 feet width and 2 feet depth
Aggregate Base Course for Pavement	CY	1600	$50.00	$80,000	Assume 8 feet width and 1 feet depth
Asphalt Surface Course	TON	400	$60.00	$24,000	Assume 8 feet width and 0.125 feet depth, 13.3 CF in a TON
Asphalt Base Course	TON	1600	$60.00	$96,000	Assume 8 feet width and 0.5 feet depth, 13.3 CF in a TON
Eradication	LF	10000	$2.00	$20,000	Assume 2 lines entire length (2 white edge lines)
Thermoplastic Pavement Marking (6")	LF	10000	$1.50	$15,000	Assume 2 lines entire length
Thermoplastic Pavement Marking Symbol	EA	40	$300.00	$12,000	Assume 1 Symbol every 250 feet each side of road (bike lane)
24" Thermoplastic Pavement Marking	LF	200	$6.00	$1,200	Assume 1 High Vis crossing every 2500 feet
New Sign	EA	10	$220.00	$2,200	Assume 1 Sign every 500 feet
Lump Sum Items					
Landscaping (5%)	LS	1.00	$14,000.00	$14,000	
Drainage and E&S (10%)	LS	1.00	$28,000.00	$28,000	
Maintenance of Traffic (5%)	LS	1.00	$14,000.00	$14,000	
Utility Adjustments (10%)	LS	1.00	$28,000.00	$28,000	
			Subtotal	**$379,400**	
25% Contingency				$94,850	
Total Estimated Cost				**$474,300**	←

$71.86

2 Shoulders
$89.83 **Per Foot**

6 **Paved Shoulders (Lane Diet)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Thermoplastic Pavement Marking (6")	LF	20000	$1.50	$30,000	Assume 4 lines entire length (2 white edge, 2 center yellow)
Thermoplastic Pavement Marking Symbol	EA	40	$300.00	$12,000	Assume 1 Symbol every 250 feet each side of road
24" Thermoplastic Pavement Marking	LF	200	$6.00	$1,200	Assume 1 High Vis crossing every 2500 feet
New Sign	EA	10	$220.00	$2,200	Assume 1 Sign every 500 feet
Eradication	LF	15000	$2.00	$30,000	Assume 3 lines entire length (mixed edge and center lines)
Lump Sum Items					
Maintenance of Traffic (5%)	LS	1.00	$3,770.00	$3,770	
			Subtotal	**$79,170**	
			25% Contingency	$19,793	
			Total Estimated Cost	**$99,000**	←

$14.99

2 Shoulders
$18.75 **Per Foot**

7 **Paved Shoulders (Road Diet)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Thermoplastic Pavement Marking (6")	LF	20000	$1.50	$30,000	Assume 4 lines entire length
Thermoplastic Pavement Marking Symbol	EA	40	$300.00	$12,000	Assume 1 Symbol every 250 feet each side of road (bike lane)
24" Thermoplastic Pavement Marking	LF	200	$6.00	$1,200	Assume 1 High Vis crossing every 2500 feet
New Sign	EA	10	$220.00	$2,200	Assume 1 Sign every 500 feet
Eradication	LF	13300	$2.00	$26,600	Assume 2.66 lines entire length (2 center yellow, 2x 0.33 skip dash white)
Thermoplastic Pavement Marking Symbol	EA	20	$300.00	$6,000	Assume 1 symbol every 250 feet (Left-Turn arrows)
Lump Sum Items					
Maintenance of Traffic (5%)	LS	1.00	$3,900.00	$3,900	
			Subtotal	**$81,900**	
			25% Contingency	$20,475	
			Total Estimated Cost	**$102,400**	←

$15.51

2 Shoulders
$19.39 **Per Foot**

8 **Paved Shoulders (Widen Shoulder - 2' each side)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment
Earthwork, Excavation, Grading	CY	1500	$15.00	$22,500	Assume 4 feet width and 2 feet depth
Aggregate Base Course for Pavement	CY	800	$50.00	$40,000	Assume 4 feet width and 1 feet depth
Asphalt Surface Course	TON	200	$60.00	$12,000	Assume 4 feet width and 0.125 feet depth, 13.3 CF in a TON
Asphalt Base Course	TON	800	$60.00	$48,000	Assume 4 feet width and 0.5 feet depth, 13.3 CF in a TON
Lump Sum Items					
Landscaping (5%)	LS	1.00	$6,125.00	$6,125	
Drainage and E&S (10%)	LS	1.00	$12,250.00	$12,250	
Maintenance of Traffic (5%)	LS	1.00	$6,125.00	$6,125	
Utility Adjustments (10%)	LS	1.00	$12,250.00	$12,250	
			Subtotal	**$159,250**	
25% Contingency				$39,813	
Total Estimated Cost				**$199,100**	←

$30.16

2 Shoulders
$37.71 **Per Foot**

10 **Sidewalk with Bikes Permitted (Study/Widen - 4' asphalt)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment		
Earthwork, Excavation, Grading	CY	1500	$15.00	$22,500	Assume 4 feet width and 2 feet depth		
Aggregate Base Course for Pavement	CY	800	$50.00	$40,000	Assume 4 feet width and 1 feet depth		
Asphalt Surface Course	TON	200	$60.00	$12,000	Assume 4 feet width and 0.125 feet depth, 13.3 CF in a TON		
Asphalt Base Course	TON	800	$60.00	$48,000	Assume 4 feet width and 0.5 feet depth, 13.3 CF in a TON		
Lump Sum Items							
Landscaping (5%)	LS	1.00	$6,125.00	$6,125			
Drainage and E&S (10%)	LS	1.00	$12,250.00	$12,250			
Maintenance of Traffic (5%)	LS	1.00	$6,125.00	$6,125			
Utility Adjustments (10%)	LS	1.00	$12,250.00	$12,250			
			Subtotal	**$159,250**		**$30.16**	
25% Contingency				$39,813		**2 Lanes**	
Total Estimated Cost				**$199,100**	←	**$37.71**	**Per Foot**

11 **Shared Use Path (Study/Construct - 10' asphalt)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment		
Earthwork, Excavation, Grading	CY	6500	$15.00	$97,500	Assume 16 feet width and 2 feet depth		
Aggregate Base Course for Pavement	CY	1000	$50.00	$50,000	Assume 10 feet width and 1 feet depth		
Asphalt Surface Course	TON	250	$60.00	$15,000	Assume 10 feet width and 0.125 feet depth, 13.3 CF in a TON		
Asphalt Base Course	TON	1000	$60.00	$60,000	Assume 10 feet width and 0.5 feet depth, 13.3 CF in a TON		
Lump Sum Items							
Landscaping (5%)	LS	1.00	$11,125.00	$11,125			
Drainage and E&S (10%)	LS	1.00	$22,250.00	$22,250	Note: Does not include enhanced features such as: waysides,		
Maintenance of Traffic (5%)	LS	1.00	$11,125.00	$11,125	signals, crosswalks, signs, lighting, structures, etc.		
Utility Adjustments (10%)	LS	1.00	$22,250.00	$22,250			
			Subtotal	**$289,250**		**$54.78**	
25% Contingency				$72,313		**2 Lanes**	
Total Estimated Cost				**$361,600**	←	**$68.48**	**Per Foot**

12 **Cycletrack (Study/Construct - 10' asphalt w/ curb & gutter)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment		
Earthwork, Excavation, Grading	CY	6500	$15.00	$97,500	Assume 16 feet width and 2 feet depth		
Aggregate Base Course for Pavement	CY	1000	$50.00	$50,000	Assume 10 feet width and 1 feet depth		
Asphalt Surface Course	TON	250	$60.00	$15,000	Assume 10 feet width and 0.125 feet depth, 13.3 CF in a TON		
Asphalt Base Course	TON	1000	$60.00	$60,000	Assume 10 feet width and 0.5 feet depth, 13.3 CF in a TON		
Curb & Gutter	LF	5280	$50.00	$264,000			
Thermoplastic Pavement Marking (6")	LF	2500	$1.50	$3,750	Assume 0.5 line entire length		
Thermoplastic Pavement Marking Symbol	EA	20	$300.00	$6,000	Assume 1 symbol every 250 feet (bike lanes)		
New Sign	EA	10	$220.00	$2,200	Assume 1 Sign every 500 feet each side of Cycletrack		
Lump Sum Items							
Landscaping (5%)	LS	1.00	$24,813.00	$24,813			
Drainage and E&S (10%)	LS	1.00	$49,625.00	$49,625			
Maintenance of Traffic (5%)	LS	1.00	$24,813.00	$24,813			
Utility Adjustments (10%)	LS	1.00	$49,625.00	$49,625			
			Subtotal	**$647,326**		**$122.60**	
25% Contingency				$161,832		**2 Lanes**	
Total Estimated Cost				**$809,200**	←	**$153.26**	**Per Foot**

9 **Paved Shoulders (Pave Existing Shoudlers - 4' each side)**

Item	Unit	Quantity	2011 Unit Cost	Total Cost	Comment		
Earthwork, Excavation, Grading	CY	3000	$15.00	$45,000	Assume 8 feet width and 2 feet depth		
Aggregate Base Course for Pavement	CY	1600	$50.00	$80,000	Assume 8 feet width and 1 feet depth		
Asphalt Surface Course	TON	400	$60.00	$24,000	Assume 8 feet width and 0.125 feet depth, 13.3 CF in a TON		
Asphalt Base Course	TON	1600	$60.00	$96,000	Assume 8 feet width and 0.5 feet depth, 13.3 CF in a TON		
Thermoplastic Pavement Marking (6")	LF	10000	$1.50	$15,000	Assume 2 lines entire length		
Lump Sum Items							
Landscaping (5%)	LS	1.00	$13,000.00	$13,000			
Drainage and E&S (10%)	LS	1.00	$26,000.00	$26,000			
Maintenance of Traffic (5%)	LS	1.00	$13,000.00	$13,000			
Utility Adjustments (10%)	LS	1.00	$26,000.00	$26,000			
			Subtotal	**$338,000**		**$64.02**	
25% Contingency				$84,500		**2 Shoulders**	
Total Estimated Cost				**$422,500**	←	**$80.02**	**Per Foot**