

andropogon
landscape architecture
ecological planning + design

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LETTERS OF SUPPORT



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
NORTH ATLANTIC DIVISION, US ARMY CORPS OF ENGINEERS
FORT HAMILTON MILITARY COMMUNITY
BROOKLYN, NEW YORK 11252-6700

It is an honor for me to announce the completion of the Chesapeake and Delaware Canal Trail Concept Plan. I want to congratulate the federal and non-federal sponsors, the Delaware Department of Natural Resources and Environmental Control, the Delaware Department of Transportation, New Castle County, project partners in Maryland and Delaware, and the public for having a vision and working together to bring this project closer to reality.

I also want to offer a special thanks to our Congressional members, Representatives Mike Castle and Wayne Gilchrest, for their leadership and continued support.

Through sound engineering and architectural design, the Chesapeake and Delaware Canal Recreation Study Working Group has developed a "Trail Concept Plan" that includes a multi-purpose trail stretching from Delaware City to Chesapeake City.

The make-up of the Working Group, encompassing local, state and federal agencies and organizations exemplifies the power of partners teaming and is just the right thing to do!

The C&D Canal and the men and women who operate and maintain it have a long history. In addition, as a major commercial waterway between Delaware and Maryland it is a vital asset to the region. As shown by this study and the outpouring of positive public comments, the C&D Canal has the potential to become a recreational area that serves local, state and regional visitors, providing them with opportunities to participate in many and varied forms of compatible recreational and educational activities.

I am proud of the tremendous effort displayed by everyone and look forward to going to construction on a project that will connect the states of Delaware and Maryland and make a valuable contribution in the region.

Sincerely,

WILLIAM T. GRISOLI
Brigadier General, U.S. Army
Division Engineer

MICHAEL N. CASTLE
DELAWARE, AT-LARGE

COMMITTEES:
FINANCIAL SERVICES
EDUCATION AND THE WORKFORCE

CHAIRMAN:
SUBCOMMITTEE ON EDUCATION REFORM

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www.house.gov/castle/

February 28, 2006

It gives me great pleasure to announce the completion of the "Chesapeake and Delaware Canal Trail Concept Plan." Similar to what has been achieved over the last three decades along the banks of the Cape Cod Canal, this Trail Concept Plan outlines how best to implement enhancements to a multi-purpose trail along both the north and south sides of the Chesapeake and Delaware Canal (C&D Canal). While this is a long-term project, I am confident that we are well on our way to creating a multi-purpose trail connecting Delaware City and Chesapeake City.

Over a year ago my office partnered with the U.S. Army Corps of Engineers, the Delaware Department of Natural Resources and Environmental Control, the Delaware Department of Transportation, New Castle County, and state and local agencies in Delaware and Maryland in forming the C&D Canal Recreation Study Working Group. This group has coordinated with federal, state, county and local agencies, stakeholders, and citizens to better understand how the Canal is presently used and how its use is envisioned in the future.

The "Chesapeake and Delaware Canal Trail Concept Plan" is the culmination of our findings and provides a practical road map for implementation. As you will see in the coming pages, the conceptual design outlines a multi-purpose trail that will accommodate a mix of walking, biking and horseback riding (among other activities) with trail markers, restroom facilities, improved fishing piers, controlled access points, and parking areas. The plan importantly incorporates all activities currently taking place at the Canal, including hunting, fishing, dog-training, and horseback riding, as well as preservation of the Canal's wetlands, wildlife, and natural infrastructure.

The need for preserving open space is paramount, particularly in areas with growing populations, like Delaware City. I hope you will take the time to understand our vision for enhancing recreation along the C&D Canal and the potential benefit to the surrounding communities in Delaware and Maryland. I look forward to working with the Army Corps and the project partners in turning the Trail Concept Plan into reality.

Michael N. Castle
Member of Congress

WAYNE T. GILCREST
1st District, Maryland

COMMITTEE ON TRANSPORTATION
AND INFRASTRUCTURE
COAST GUARD AND
MARITIME TRANSPORTATION
WATER RESOURCES
COMMITTEE ON SCIENCE



Congress of the United States
House of Representatives

COMMITTEE ON RESOURCES
CHAIRMAN, FISHERIES AND OCEANS
FORESTS AND FOREST HEALTH

CHAIRMAN, CHESAPEAKE BAY
WATERSHED TASK FORCE

March 6, 2006

Brigadier General William Grisoli
Commander
U.S. Army Corps of Engineers - North Atlantic Division
302 General Lee Ave
Brooklyn, NY 11252

Dear General Grisoli;

I am writing to express my full support for the Chesapeake and Delaware Canal Trail Concept Plan. This plan partners the US Army Corps of Engineers with state agencies and cities from both Maryland and Delaware. I will assist these collaborative efforts and the vision they have created for the future of tourism along the banks of the historic Chesapeake and Delaware Canal.

I am excited for the recreational opportunities that this project will provide to residents and visitors to the Canal area. It is important to protect and support areas in this Mid-Atlantic Region that are already attractive locations for outdoor enthusiasts. Park patrons will continue to enjoy hunting, fishing and dog-training as well as new adventures on the proposed walking, biking and blading trails.

The C & D Canal project will creatively combine these recreational activities with the conservation of natural areas and wildlife habitat. I applaud Congressman Castle's efforts to utilize this scenic stretch of lands as a place where people can safely enjoy activities along our region's beautiful waterways.

Sincerely,

Wayne T. Gilcrest
Member of Congress

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CHRISTOPHER A. COONS
COUNTY EXECUTIVE



87 READS WAY
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February 7, 2006

William T. Grisoli
Brigadier General, USA
U.S. Army Corps of Engineers
North Atlantic Division
Fort Hamilton Military Community
General Lee Avenue
Brooklyn, NY 11262-6700

Dear General Grisoli:

New Castle County is pleased to be working with our federal, state and local government partners in the development of a new vision for the Chesapeake and Delaware Canal that is encompassed in the Multi-Use Trail Plan proposal.

My administration is committed to creating a more livable and healthier community for all New Castle County residents. The C & D Canal is a significant resource that will be more broadly appreciated and enjoyed as a result of the efforts to undertake the Multi-Use Trail Plan. It is an important step towards meeting the rising demand for healthy, outdoor activities in a rapidly growing region and builds upon our own efforts to develop both on and off-road trail systems, linking the natural, historic, and cultural assets countywide, making them accessible to everyone.

I applaud the Army Corps of Engineers for their interest and involvement in this important initiative for the people of New Castle County and the surrounding areas.

Sincerely,

Christopher A. Coons
County Executive

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Rob Bernstine, Mayor
Jack Ritter, Vice Mayor
Council
Bill Kiessling
Ron Francis
Joe Lewis
Bill Miners

January 27, 2006

The Honorable Michael N. Castle
1233 Longworth Building
Washington, DC 20515

Dear Congressman Castle:

The Town of Chesapeake City supports the objective of the C. & D. Canal Recreation Study Group's directive to study the feasibility of recreational enhancements along the banks of the Canal.

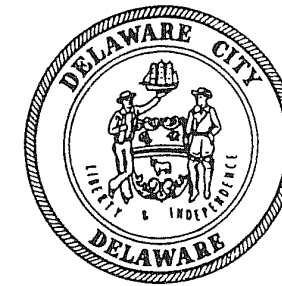
We believe that the population growth in the immediate vicinity of the Canal in both Delaware and Maryland in recent years underscores the need for nearby recreational access. Chesapeake City looks forward to the day when the report by the Canal Study Group is put into actual working use and the development of safe recreational areas along the Canal are available to all. The Canal roads are a natural for bicycling, walking, rollerblading, horse riding and fishing.

We look forward to working in partnership with the State of Delaware to improve and enhance the greenway linking our two states.

Sincerely

Mayor and Council
Town of Chesapeake City

"A Historic Past"



"A Bright Future"

CITY OF DELAWARE CITY
407 Clinton Street - P.O. Box 4159
Delaware City, Delaware 19706
302-834-4573

January 27, 2006

On behalf of the Mayor & Council and residents of Delaware City, I am extremely pleased to congratulate the United States Army Corps of Engineers and their partners on the completion of the Chesapeake and Delaware Canal Trail Concept Plan. We hope the plan can be brought to fruition in the near future.

Delaware City has been an active participant on the C&D Canal Recreation Study Working Group and is excited by prospect of a multi-purpose trail that will link Delaware City and our historic sister city, Chesapeake City, Maryland. It is a dream that we have pursued for many years.

Delaware City was founded as the eastern terminus of the original canal when it opened in the 1820's and our history is closely intertwined with that of the C&D Canal. Thus, it is with great anticipation that we look forward to the enhancement and preservation of the natural and recreational resources that the Canal area offers. This plan is a perfect fit with Delaware City's future as a recreation and tourism destination.

Special thanks must go to our Congressman Mike Castle and to Congressman Wayne Gilchrest of Maryland for their leadership in advancing this study and the vision behind it. Without their efforts, this would still be just a dream. The Working Group, made up of local, state, and federal agencies and organizations, has done a tremendous job with this plan. It balances the preservation of the Canal's natural resources with improved public access and respects current users of the canal lands while expanding the recreational opportunities available to residents of this area and the region.

We in Delaware City are proud to be associated with the Chesapeake and Delaware Canal Trail Concept Plan and look forward to working with the Corps and our other partners to implement the plan as soon as possible.

Cordelia W. Bennett
Cordelia W. Bennett
Mayor
City of Delaware City, Delaware



Robert L. Ehrlich, Jr., Governor
 Michael S. Steele, Lt. Governor
 C. Ronald Franks, Secretary

February 1, 2006

William T. Grisoli
 Brigadier General – U.S. Army Corps of Engineers
 North Atlantic Division – Fort Hamilton Military Community
 General Lee Avenue
 Brooklyn, New York 11262-6700

RE: Chesapeake & Delaware Canal Recreation Study

Dear General Grisoli:

On behalf of the Maryland Department of Natural Resources (DNR) and the Maryland Greenways and Water Trails Program I would like to express support for the Army Corps' efforts to provide additional recreational opportunities along the Chesapeake and Delaware Canal through the establishment of a recreational greenway.

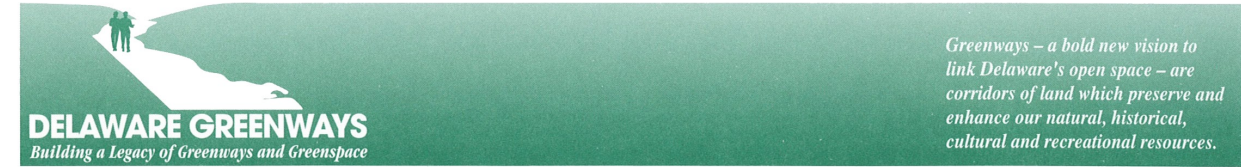
The State of Maryland has recognized the C&D Canal as a potential/planned greenway corridor linking the Chesapeake Bay to Delaware Bay, in the *Maryland Atlas of Greenways, Water Trails and Green Infrastructure*, since 1992. We believe that this project will provide tremendous recreational opportunities to the surrounding community, contribute to our own expanding network of trails, and serve as a strategic, interstate link between Maryland and Delaware.

In addition, we were pleased to participate on the study team and applaud the cooperative partnerships between states, agencies and other entities, which have developed as a result of this effort. We offer our enthusiastic support for the creation of this important, interstate recreational greenway and hope that a commitment to implementation will emerge in the near future.

Sincerely,

Lisa A. Cutierrez, Director
 Greenways and Blueways Services

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January 27, 2006

William T. Grisoli
 Brigadier General - U.S. Army Corps of Engineers
 North Atlantic Division - Fort Hamilton Military Community
 General Lee Avenue
 Brooklyn, New York 11262-6700

RE: Chesapeake & Delaware Canal Recreation Study

Dear General Grisoli:

On behalf of Delaware Greenways, I enthusiastically submit this letter in support of your continuing efforts to enhance and improve recreational opportunities along the Chesapeake & Delaware Canal.

While many people now regularly enjoy the area's diverse recreational offerings that include hiking, mountain biking, fishing, horseback riding, bird watching, boating, dog training, and hunting, I believe the canal holds tremendous potential to serve an even broader group of users and become a regional attraction for recreational enthusiasts of all types.

The Army Corps of Engineers along with Congressmen Castle and Gilchrest have shown great foresight by recognizing the need to improve accessibility to the canal and its thousands of acres now. Soon communities surrounding the canal will see a great influx of new residents all looking for an attractive location to walk, bicycle, picnic, and spend time together as a family. With modest improvements, the Chesapeake & Delaware Canal area will offer new and existing residents a place where they can enjoy a small piece of nature in an increasingly urbanized region.

We believe this venture is the most significant outdoor recreation and greenway project in the state, and I am excited at the prospect of the Corps expanding their duties and partnerships with other agencies to further serve residents of Maryland and Delaware.

Sincerely,

Delaware Greenways
 Brad Killian
 Director of Projects and Planning

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Council on
**Greenways
& TRAILS**

February 7, 2006

The Honorable Michael N. Castle
1233 Longworth Building
Washington, DC 20515

Dear Congressman Castle:

On behalf of the Council on Greenways & Trails, I am writing to express support for the creation of a trail system and associated amenities identified in the Chesapeake and Delaware Canal Trail Concept Plan. We congratulate the United States Army Corps of Engineers and their partners on the completion of the Plan, which, when implemented, will provide linear outdoor recreation facilities for hiking, bicycling and horseback riding.

The Council first identified the potential for trail development in the C&D Canal in 1992 in Delaware's Greenway and Trail Plan, and then again in the 1999 Greenway and Trail Atlas. Construction of this trail will fulfill the public's identified need for hiking, bicycling and other linear recreational activities that are documented in the 2003-2008 State Comprehensive Outdoor Recreation Plan.

We envision that trail facilities along the Chesapeake and Delaware Canal waterway will become well used by local residents and will draw visitors from within the region for recreation pursuits. The Council is dedicated to the creation of pedestrian and bicycle facilities that serve both alternative transportation and recreation needs, and the creation of trails for the enjoyment of equestrians.

The Council has been a partner in the development of the Chesapeake and Delaware Trail Concept Plan and we look forward to working with the Corps and our other partners to implement this Plan.

Sincerely,


Paul Morrill
Chairman
Council on Greenways & Trails

Governor Appointed Citizens and Advisory to the
Department of Natural Resources & Environmental Control



STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

OFFICE OF THE
SECRETARY

89 KINGS HIGHWAY
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February 27, 2006

William T. Grisoli
Brigadier General – U.S. Army Corps of Engineers
North Atlantic Division – Fort Hamilton Military Community
General Lee Avenue
Brooklyn, New York 11262-6700

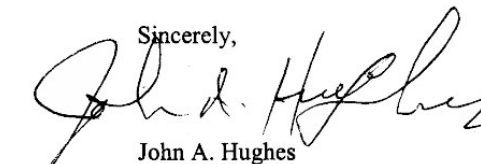
Dear General Grisoli:

On behalf of the Delaware Department of Natural Resources and Environmental Control (DNREC), I would like to express support for both the Army Corps' and Congressman Castle's efforts to provide additional recreational opportunities along the Chesapeake and Delaware Canal (Canal). The completion of the "Chesapeake and Delaware Canal Trail Concept Plan" represents a milestone in the joint vision our agencies have to provide increased recreational opportunities, walking, biking and horseback riding (among other activities), through the establishment of a formalized trail along this historic water body. I am particularly pleased by the plan's consideration and incorporation of the existing recreational activities currently taking place on the Canal, including hunting, fishing and dog training, as well as its intent to protect the existing wildlife and preserve their associated habitats.

As you are undoubtedly familiar, the DNREC and the Army Corps have a long and successful relationship in preserving this area and providing recreational opportunities while accommodating the maritime navigational needs of the region. Delaware's Divisions of Fish and Wildlife and Parks and Recreation have successfully maintained long-term lease agreements between our agencies, some lasting over 62 years, providing for increased recreational opportunities on the Canal.

Implementation of a new multi-use trail will provide valuable connections to both Lums Pond and Fort DuPont State Parks and to the historic towns of Delaware City and St. Georges. I am delighted that our agencies, as well as the numerous other state, federal and local agencies who are partnering with us, are making strides to increase recreational opportunities, especially in an area of Delaware whose population has grown so rapidly. We look forward to continuing this work with the Corps and our partners in implementing this noteworthy plan.

Sincerely,


John A. Hughes
Secretary

pc: Congressman Michael N. Castle

Delaware's Good Nature depends on you!

EXECUTIVE SUMMARY



ST. GEORGES BRIDGE, 4-LANE US-13. LOOKING NORTHBOUND, TAKEN AUGUST 1997, BY DELDOT, PROVIDED BY BRIAN A. DORESTE OF DELAWARE. PHOTO IMAGE CROPPED BY SCOTT KOZEL. THE C & D CANAL SPLITS IN TWO THE TOWN OF ST. GEORGES, DELAWARE.

THE CHESAPEAKE & DELAWARE CANAL TRAIL CONCEPT PLAN

In 2005 the U.S. Army Corps of Engineers (Corps) received initial funding to conduct a study of the Chesapeake & Delaware (C & D) Canal's recreational potential and a project team (Working Group) was created to manage the study. A significant focus of the study was to develop an appropriate vision for a multi-use trail system along the C & D Canal that would enhance the recreational opportunities for the local and the regional community.

The Working Group explored the possibility of a phased implementation that would conclude in multi-use paths along the north and south banks of the Canal along with parking lots, restroom facilities, education kiosks, and other enhancements of current recreation activities such as fishing and boating.

Andropogon Associates, Ltd. was invited to assist the Working Group in gathering information, site investigations, public workshops and to develop plan recommendations. The planning process for the C & D Canal also explores the difficult questions: How can the demand for recreational resources actually be acted upon? What are the most feasible and realistic solutions?

A key goal was to develop a trail plan with recommendations for restoring, renewing and integrating the richness already present along the Canal lands. As the State of Delaware is experiencing double digit development, places for recreation, especially as varied and wide as those offered at the C & D Canal, are becoming private and corporate land. The demand is high for quality recreational experiences in the region overall, especially for hiking and biking. The C & D Canal and approximately 7,700 acres of adjacent public land are owned and operated by the Corps and connect Delaware and Maryland by water and land.

Recreation is not new to the Canal or to other Corps Canals and facilities. However, at present recreational facility development along the C & D Canal is not an authorized project. Stemming from Congressman Michael Castle's leadership and vision for developing recreational opportunities in Delaware for the local, state and regional citizens, the Corps' Cape Cod Canal was used as inspiration and model for the C & D concept design effort. The following Trail Concept Plan is a result of an intense and thoughtful effort by the Working Group and the public to formalize this idea and make this plan a reality.

CURRENT STATUS

The C & D Canal has a long history and is one of the only two commercially viable sea-level Canals in the United States. As it takes on an additional role as a recreation destination, it will continue to be a focal point and serve the region well.

The landforms along the Canal are man-made, fashioned from the massive quantities of dredge materials excavated to create the Canal. Over the years, various strategies have been developed to address the problem of re-vegetating these regarded areas. In partnership with environmental agencies, fish and game agencies, and soil conservation services in both Delaware and Maryland, the Army Corp has focused on improving soil conditions and vegetation restoration strategies for the sites. The result has been a mosaic of successional habitat areas of open meadow areas, interspersed with wood lots and man-made ponds.

As the plant community habitat diversity has increased, so has the diversity of wildlife and hence the importance of the Canal lands for hunting, bird-watching, hiking, horseback-riding and dog training. The Canal lands are considered to be the most heavily used wildlife area in the state of Delaware due to its proximity to the most populated part of the state.

The land along the C&D Canal has been refashioned in a series of terraces or tiers with miles of existing unpaved service roads constructed by the Army Corps to help service and maintain the viability of the Canal. In order to gain full access along its banks, the roads were constructed along its entire length, except for areas inaccessible by natural waterways. It is estimated that there are over 100 miles of service roads throughout the public lands.

The service roads along the first tier on the north and south side of the Canal are the main focus of this study for the development of a multi-use recreational trail. Local residents and a growing number of regional users already utilize the roads for hiking, cycling and equestrian activity. Development of numerous trail heads and connections are possible for these service roads, as well as relatively flat, unvegetated land for the development of trail amenities such as comfort stations and parking areas.

KEY RECOMMENDATIONS

The primary objective of the proposed improvements is to encourage additional recreational activity along the Canal while keeping existing activities and fostering its responsible use. The primary goal of management is to confine the impacts of the trail to the trail corridor. The strategies to accomplish this are both physical and programmatic.

TRAIL FEATURES

The proposed trail features include trailheads, signage, maps, comfort stations, benches, fishing piers and parking areas. The concept plan outlines a total of 29.2 miles of multi-use trail on both sides of the Canal along the first tier of service road.

- Trailheads are the welcoming entrances to the trail. This is where visitor information about use, destinations and amenities is available. Controlled access of vehicles to trail may also be necessary at some trailheads. Two different materials are proposed for the trail surface:
 - 1.) Paved multi-use trail to provide access for the widest diversity of users and accommodate the most intense use. Paved trails provide all-weather access.
 - 2.) Unpaved (compacted stone fines) two lane multi-use portions of the trail where the environmental conditions require.
- Comfort Stations are an important amenity and should be located where adequate surveillance is present.
- Parking areas have been identified on both sides of the Canal lands at over a dozen sites. The concept is to develop and improve already cleared and relatively flat land adjacent to trailhead areas.
- The existing fishing piers will be restored as an amenity along the Canal.

LANDSCAPE RESTORATION GUIDELINES

The development of the multi-use trail will result in opportunities to improve the ecological aesthetic of the area immediately adjacent to the trail and its amenities; raise awareness of regional native plant species; and increase the biodiversity of the Canal lands. The “restoration” of the landscape will be incremental, just as it has been throughout the history of Canal lands, by managing the process of ecological succession.

This plan outlines several typical conditions for the proposed trail and amenities and suggests a set of Landscape Design and Management Principles as outlined below:

- Consider undertaking extensive soil reworking and massive planting efforts only where the landscape is in collapse, overwhelmed by non-native invasive species, or extensively eroded.

- Specify native plant species. Wherever possible contract grown plant material from local seed. Utilize native plant species that may be missing from the area where they are appropriate.
- Do not displace or modify any relatively healthy natural system.
- Minimize disturbance to any natural area.
- Do not compromise natural and cultural resources such as geological formations or stream corridors by activities that threaten their character and preservation.
- Protect and expand remaining wetlands wherever possible. Reestablish natural drainage patterns and hydrologic regimes where they have been disturbed.
- Establish missing links and provide connectivity, such as forest edges where possible.

PUBLIC PARTICIPATION

An important component of the study process has been community involvement. Current users value the access to the natural environments that the trail system allows. Throughout the study, participants emphasized the relationship between access to the Canal lands, recreational activity and quality of life.

While public support for the project is very high, concerns were expressed about trail development. They included:

- The area is currently heavily used by hunters and dog training activities. How will these activities co-exist and be kept separated?
- As more recreational activity is encouraged along the Canal, how will the rules be enforced?
- Why does the multi-use trail need to be paved? Why can't the roads remain the way they are now?
- Will access for motorized vehicles be limited?
- Will equestrians continue to have access to the trails that they presently enjoy along the Canal?

The Trail Concept Plan addresses these concerns through the plan recommendations, trail alignment and design guidelines. Despite the complex nature of trail development in general, and the Canal lands in particular, the proposed guidelines for managing the proposed trail system are fairly simple:

- Confine the impacts of the trail to the boundaries of the trail.
- Accommodate mixed uses. All non-motorized users deserve access to the trail system. The goal is to provide balanced access. Involve users in the effort to upgrade the standard of care. Informed trail users are responsible trail users.
- Implement infrastructure improvements that are adequate for the level of proposed use. Accommodate responsible use of the trail without compromising environmental quality.
- Effectively promote courtesy and compliance with rules of the trail.

INTRODUCTION

PROJECT GOAL

The goal of the C & D Canal Trail Concept Plan is to work with Federal, State and local agencies in Delaware and Maryland and other interested partners to investigate potential future recreational usage of the C & D Canal and compile a final report with recommendations for the betterment of recreational opportunities available to the citizens of Delaware and Maryland. These recreational uses included hunting, fishing, bicycling, birdwatching, hiking, walking, horseback riding and other popular forms of outdoor recreation.

Demand for these and other uses will only increase as the population continues to expand around the Canal. To enhance existing recreation along the Canal and consider new uses, planning for the future at this time is very important.

The starting point for the C & D Trail Concept Plan came from comments provided to the State of Delaware for its Statewide Comprehensive Outdoor Recreation Plan 2003-2008. This Plan outlines outdoor recreation preferences and recommends facility development that will meet the public needs. The State of Delaware identifies the potential for a trail within the C & D lands in its 1999 Greenway and Trails Atlas. The State of Maryland has listed the C & D Canal as a potential recreational greenway in its Statewide Greenways Atlas since 1992. The Working Group is recommending that a multi-use trail for walkers, joggers and bikers serve as the main element in all plans to enhance recreation along the Canal.

The C & D Canal has a long history and is one of the only two commercially viable sea-level Canals in the United States. Forty percent of all ship traffic in and out of the Port of Baltimore travels through the Canal. As it takes on an additional role, it will continue to be a focal point and serve the region well.

A key component of the study process is public involvement. The C & D Canal Recreation Study Working Group has made every effort to enlist support and work closely with its stakeholders in this regional effort.

The planning process for the C & D Canal explores the difficult questions. How can the demand for recreational resources actually be implemented? What are the most feasible and realistic solutions?

NEED FOR PLAN

Section 22 of the Water Resources Development Act ("WRDA") of 1974 (Public Law 93-251), as amended, authorizes the Secretary of the Army, acting through the Chief of Engineers, to assist the States in the preparation of comprehensive plans for the development, utilization and conservation of water and related resources of drainage basins, watersheds or ecosystems located within the boundaries of such State.

The State of Delaware has reviewed their comprehensive water plans and identified the need for planning assistance from the Corps. The Corps technical expertise in water and related land resource management has supplemented a Working Group of State, county and private partners in Delaware and Maryland on this effort. In addition, the State of Delaware (the non-federal sponsor), through the support of the three partners (Department of Natural Resources and Environmental Control, Department of Transportation, and New Castle County), has contributed to one-half (1/2) the cost of developing the C & D Recreation Trail Concept Plan.

The multi-use trail concept evolved from the original idea of Congressman Michael Castle and a consortium of supporters. In addition, support for this trail came through extensive positive public input during the community outreach phase of this study. A future goal of the C & D Canal Recreation Study is to complete a Master Recreation Plan for all properties of the C & D Canal.

WORKING GROUP

The partners in the C & D Canal Recreation Study Working Group are the U.S. Army Corps of Engineers; U.S. Congressman Michael N. Castle; U.S. Congressman Wayne Gilchrest; Delaware Department of Natural Resources and Environmental Control; Delaware Department of Transportation; Maryland Department of Natural Resources; New Castle County, DE; Cecil County, MD; Delaware Greenways, Inc.; Delaware City; Chesapeake City and St. Georges.



CHESAPEAKE CITY BRIDGE - MARYLAND



C&D CANAL - CHESAPEAKE CITY BRIDGE - (LOOKING EAST)



SUMMIT BRIDGE - DELAWARE



CARGO SHIP PASSING UNDER RR BRIDGE



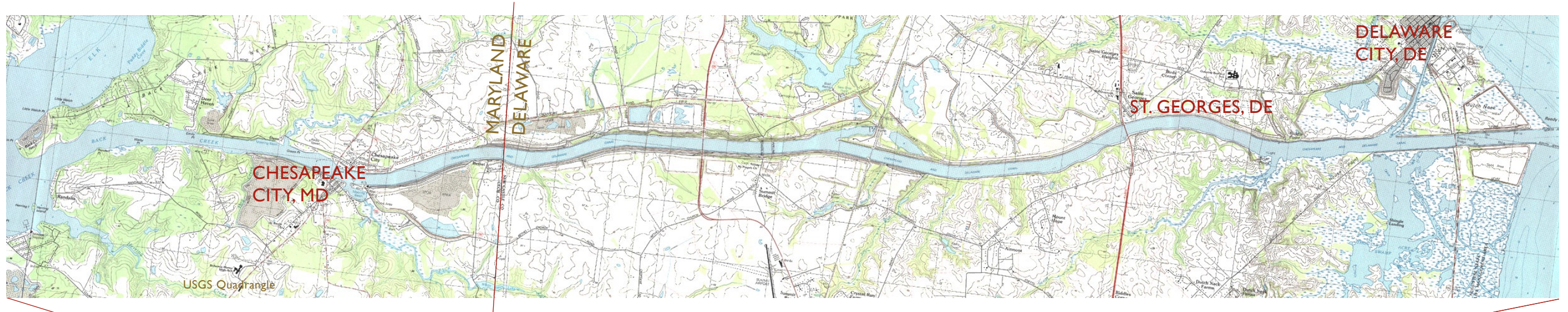
S.R. I BRIDGE - ST. GEORGES, DELAWARE

CONTEXT MAP

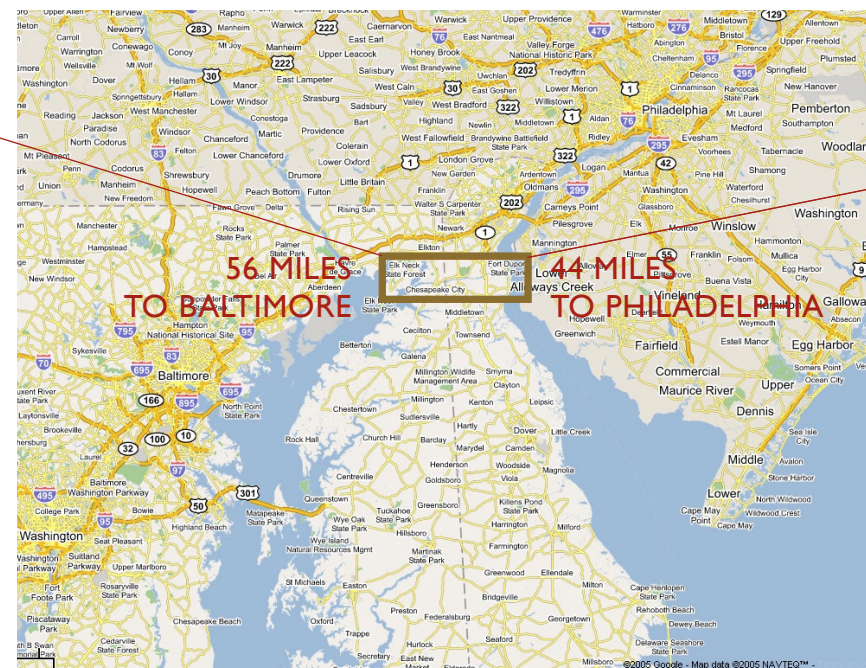
LOCATION AND REGIONAL CONTEXT

The C & D Canal is a working waterway, wide and deep enough to handle ocean-going ships. The Canal is one of the busiest in the world, with over 25,000 vessels a year passing through its waters. The waterway extends west from the Delaware River at Reedy Point, Delaware, to the junction of Back Creek and Elk River at the Chesapeake Bay.

The 14-mile Canal cuts across the narrow neck of the Delmarva Peninsula where it has become a natural and cultural boundary between upper and lower Delmarva.



S.R. I BRIDGE AND ST. GEORGES BRIDGE (LOOKING NORTH)



REGIONAL CONTEXT MAP



BRIDGE OVER OLD BRANCH CANAL - DEL. CITY



REEDY POINT BRIDGE AND DELAWARE RIVER

C & D HISTORY - TIMELINE - 1661-1910

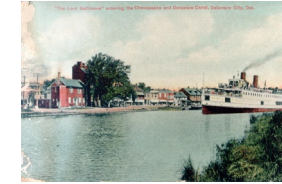


A MAPMAKER'S DREAM - 1661

In the mid-1600s, Augustin Herman, a Dutch envoy and mapmaker, proposed that a waterway be built to connect the Delaware River and Chesapeake Bay. The canal would reduce the water routes between Baltimore and Philadelphia by nearly 300 miles.



In **1829**, Chesapeake and Delaware Canal "open for business". The nearly \$2.5 million construction cost made it one of the most expensive canal projects of its time.



Throughout the **1900's** the canal's use continued to change with the New Castle and Frenchtown Railroad being its only major competitor. Steam power brought larger and deeper-draft vessels that could not pass through the restricting locks. By 1900 the decline in canal traffic and great cost of operation and repairs brought a downward trend in canal profits.

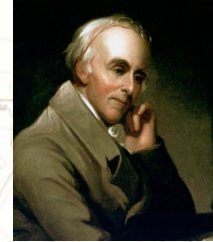
A steam operated pump was purchased in **1837** to raise water from Back Creek and in **1852** a steam engine and large waterwheel were installed in the pumphouse in Chesapeake City. Measuring 39 feet in diameter and 10 feet wide, the iron and wood had 12 troughs. By **1854** a second steam engine was in use. The two 150-horsepower engines consumed 8 tons of coal daily while lifting 170 tons of water per minute in the canal. They remained operational through the mid-**1920s**.



C&D OPERATIONS - 1829 to 1919

The Chesapeake Bay and Delaware River were now connected by a navigation channel measuring nearly 14 miles long, 10 feet deep, 66 feet wide at the waterline and 36 feet wide along the channel bottom. Locks to pass vessels through the waterway's various level were constructed at Delaware City and St. Georges, and two at Chesapeake City. Teams of mules and horses towed freight and passenger barges, schooners and sloops through the canal. Cargoes included lumber, grain, farm products, fish, cotton, coal, iron and whiskey.

President Theodore Roosevelt appoints commission in **1906** to report on the feasibility of converting the canal to a "free and open waterway".



In **1788** the issue of constructing the canal was raised again by regional business leaders, including noted Philadelphians Benjamin Franklin and Benjamin Rush.

Surveys of possible water routes across the Delaware/Maryland Peninsula were made, but canal would not become reality for decades.



In **1802**, following actions by the legislatures of Maryland, Delaware and Pennsylvania, the Chesapeake and Delaware Canal Company was incorporated.

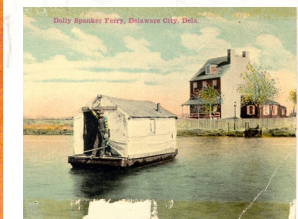
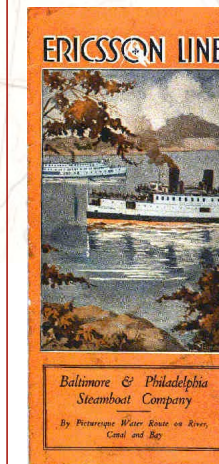
In **1804** construction on the canal began including 14 locks to connect the Christina River in Delaware with the Elk River at Welch Point, MD. But the project was halted two years later for lack of funds.



In **1823** and **1824**, the U.S. Army Corps of Engineers provided two senior commissioned officers to assist in determining the canal route. The engineer officers and two civilian engineers recommended a new route with four locks, extending from Newbold's Landing Harbor (now Delaware City), westward to the Back Creek branch of the Elk River. Canal Construction resumed in April 1824. The swampy marshlands along the canal's planned route proved a great impediment to progress as some 2,600 workers continuously battled slides along the soft slopes of the "ditch" being cut.

A VISION IS REALIZED - 1822

The canal company was reorganized in 1822, and new surveys determined that more than \$2 million in capital was needed to resume construction. Eventually the Commonwealth of Pennsylvania purchased \$100,000 in stock, the State of Maryland \$50,000 and Delaware \$25,000. The federal government's investment was \$450,000 with the remainder subscribed to the public.



Packet lines were eventually established to move freight. One such enterprise - the Ericsson Line - operated between Baltimore and Philadelphia, and continued to carry passengers and freight through the canal into the **1940s**. The cargo tonnage peaked in 1872 with more than 1.3 million tons transiting the canal.

C & D HISTORY - TIMELINE - 1911-2005



UNCLE SAM BUYS A CANAL 1919

In 1919 the canal was purchased by the Federal government for \$2.5 million and designated the "Intra-coastal Waterway Delaware River to Chesapeake Bay, Delaware and Maryland". Included were six bridges, plus a railroad span owned by the Pennsylvania Railroad. They were replaced during the 1920s by four vertical lift spans and a new railroad bridge.



CANAL WIDENED AND DEEPEMED - 1935-1938

In 1933, the Philadelphia District Corp's of Engineers took over operation of the canal. Between 1935 and 1938 the channel was again deepened to 27 feet deep and widened to 250 feet - at a cost of nearly \$13 million. The project was expanded to include a federal navigation channel 27 feet deep and 400 feet wide some 26 miles in the Upper Chesapeake Bay, from the Elk River to Poole's Island.



CONGRESS AUTHORIZES EXPANSION - 1954

In 1954, Congress authorized further expansion of the channel to 450 feet wide and 35 feet deep. These improvements began in the 1960s and were completed in the mid-1970s. New bridges to accommodate highway traffic crossing the canal also became necessary as deepening and widening progressed. Two mechanical lift bridges at St. Georges and Chesapeake City, toppled by ship collisions, were replaced in the 1940s with high-level highway spans.



C&D ATTRACTIONS
The Chesapeake and Delaware Canal is listed on the National Register of Historic Places and is designated as a National Historic Civil Engineering and Mechanical Engineering landmark. The canal is unique as the sole major commercial navigation waterway in the United States built during the early 1800s still in use. The Corps also maintains the Canal Museum in Chesapeake City which provides visitors with a glimpse of the canal's early days. The waterwheel and pumping engines remain in the original pumphouse. These steam engines are the oldest of their type in America still on their original foundations.

PENNS. RAILROAD LIFT BRIDGE CONSTRUCTED - 1966

In 1966 a new railroad lift bridge was completed by the Corps and turned over to the Pennsylvania Railroad to carry freight across the canal. The railroad and Summit spans were recognized by the American Institute of Steel Construction as the most beautiful bridges of their types in the years they were completed.



SEA LEVEL CANAL COMPLETED - 1927

Responsibility for operating, maintaining and improving the waterway was assigned to the Corps of Engineer's Wilmington, DE District. By 1927 the eastern entrance at Delaware City had been relocated several miles south at Reedy Point, DE. All locks (except the one at Delaware City) were removed and the waterway was converted to a sea-level operation 12 feet deep and 90 feet wide. These improvements cost \$10 million. Two stone jetties at the new eastern entrance were completed in 1926.

The "new" canal opened in May 1927 with great celebration, yet plans were underway for further expansion as the sizes of ships and amounts of cargo continued to increase.



In 1968, Reedy Point Bridge was constructed.

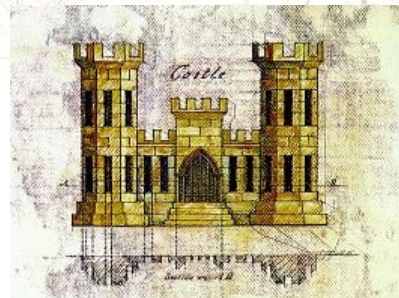


In 1996, S.R. 1 Bridge was constructed. Also, the district accepted into the museum inventory a full-sized replica of the 30 foot Bethel Bridge Lighthouse. And, a Corps feasibility study to investigate improvements for the canal and the Baltimore connecting navigation channels of Tolchester, Brewerton Eastern Extension and Swan Point with the signing of the Chief of Engineers' report.

C & D AND RECREATION 2003-2008

The starting point for the C&D Canal Recreation Study came from comments provided to the State of Delaware for its Statewide Comprehensive Outdoor Recreation Plan 2003-2008. The State of Delaware Green and Trail Atlas identified a potential trail linking Delaware City and Chesapeake City within the C & D Canal Lands. (1999) The State of Maryland has listed the C & D Canal as a potential recreational greenway in its Statewide Greenways Atlas since 1992.

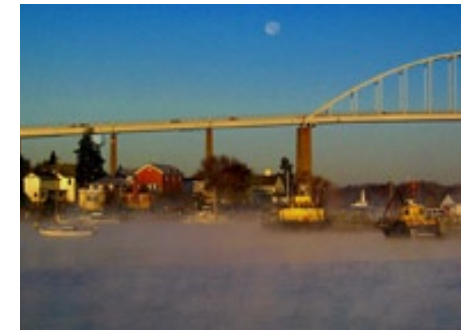
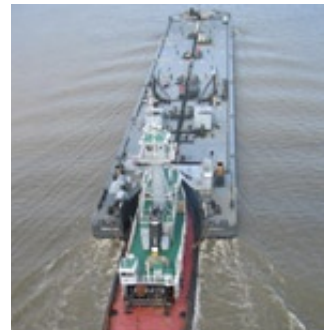
In 1960, Summit Bridge was constructed.



WATERWAY OPERATION TODAY

Today's Canal is a modern sea-level, electronically controlled commercial waterway, carrying 40 percent of all ship traffic in and out of the Port of Baltimore.

Since 1933 the Corps Philadelphia District has managed Canal and highway bridge operations from a two-story white frame building on the Canal's southern bank at Chesapeake City, MD. Cargo ships of all sizes, tankers, container-carrying vessels, barges accompanied by tugboats, and countless recreational boats create a steady flow of traffic. Through state-of-the-art fiber optic and microwave links, dispatchers use closed circuit television and radio systems to monitor and safely move commercial traffic through the waterway.



Navigating ocean-going vessels require extensive maritime skills, with strong currents or bad weather conditions adding risks. A U.S. Coast Guard certified pilot is required for vessels engaged in foreign trade transiting the Canal, the Delaware River and Bay, and Chesapeake Bay. Many shipping firms use pilots from the Delaware River and Bay or Maryland Pilots' associations.

Typically a Delaware River and Bay pilot boards a ship as it passes Lewes, Delaware, entering the Delaware Bay, and guides the vessel up the bay and into the Canal at Chesapeake City. A Maryland pilot then takes over and continues the ship's transit into the Chesapeake Bay to Baltimore or Annapolis, Maryland. The procedure is reversed for eastbound ships. At Chesapeake City a "changing of the pilots" takes place, while the pilot launch maneuvers alongside a vessel as it continues its journey without stopping. The pilots use the ship's gangway, Jacob's Ladder or port entrance to climb aboard or leave the vessel.



THE FUTURE

The Canal is significantly important to the ports of the Delaware River, Baltimore, and others along the northern Atlantic trade routes. Millions of tons of cargo are transported through it annually by container and other bulk-carrying and general cargo vessels.

A Corps feasibility study to investigate improvements for the Canal, and the Baltimore connecting navigation channels of Tolchester, Brewerton Eastern Extension and Swan Point was completed in December 1996 with the signing of the Chief of Engineers' report. The study, co-sponsored by the Maryland Department of Transportation (MDOT), investigated deepening of the channel to 40 feet from its current 35 foot depth, plus additional navigation improvements and environmental initiatives.

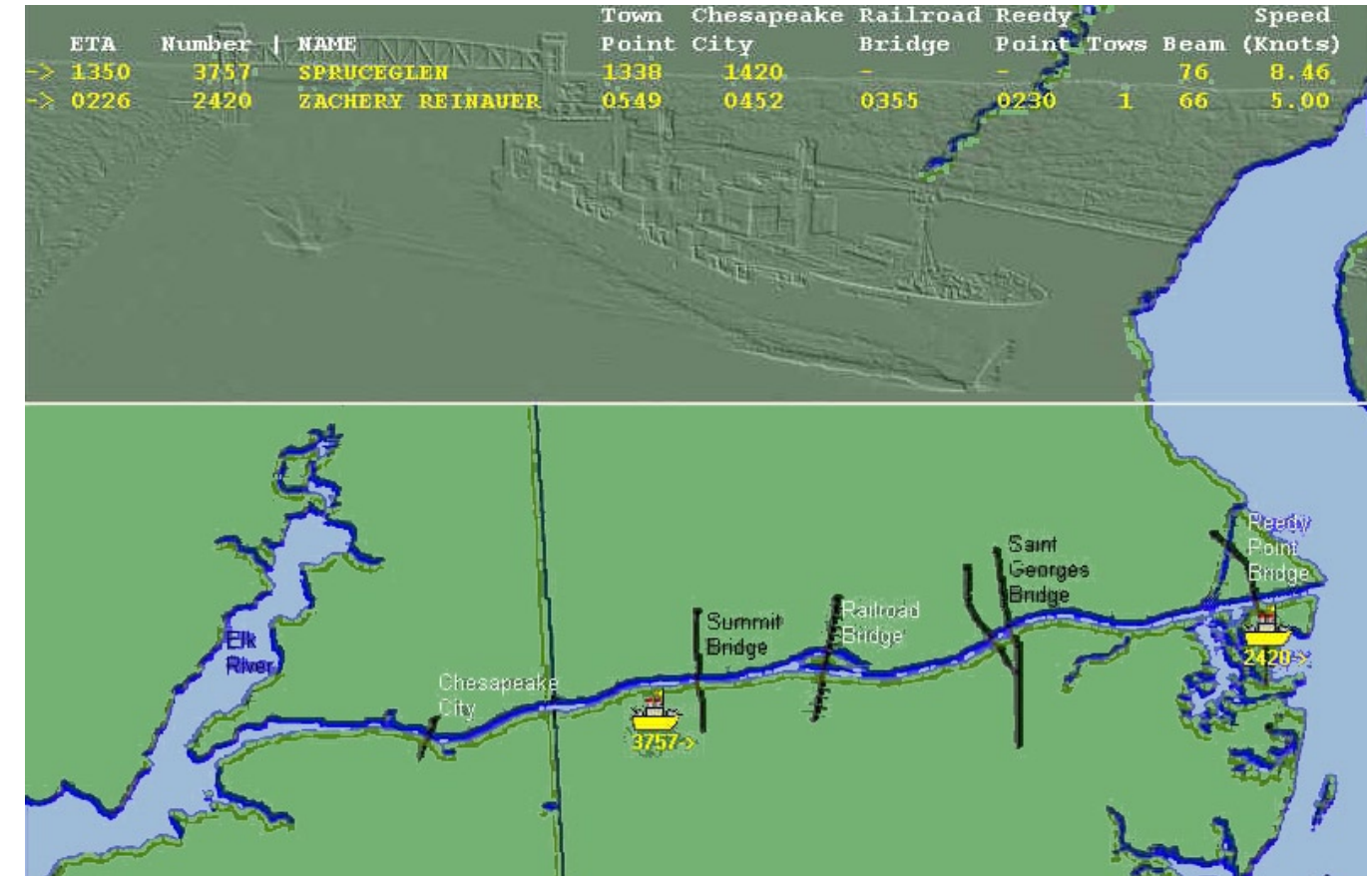
Through the efforts of Federal, State and Local agencies, all aspects of Canal improvements recommended at the conclusion of the study were analyzed for environmental, cultural, economic and engineering concerns. The Chief's report concluded the plan was sound from an engineering aspect, but certain economic and environmental concerns needed to be resolved before the design of a project could be initiated.

These issues were addressed as the project continued through the Preconstruction Engineering and Design phase, which was cost-shared with the Maryland Port Administration. In January 2001 the study was suspended due to a downturn in container ships calling on the Port of Baltimore and the unlikelihood that there would be Federal interest in proceeding with the C & D Canal project at that time.

WATERWAY OPERATION TODAY

The public can also track waterway traffic via the internet. Vist the USACE website <https://candd.nap.usace.army.mil/> and you can obtain a daily report along with a map graphic (shown at right) to determine traffic frequency.

Date	Time Cleared	Canal ETA	Vessel Name	Owner/Operator	Type	Length	Beam	Pilot	Ship Dir	Tide Dir	Town Point	Ches City	Railroad Bridge	Reedy Point	Light/Loaded
C&D Canal Vessel Log for December 2005															
20051201	2028	2228	ELIZABETH MCALLISTER	MCALLISTER BROS	A3	102	29	PARKIN	W	E	58	21	2348	2301	LOADED
20051201	2028	2228	COLUMBIA HOUSTON	COLOMBIA	A4	310	70	PARKIN	W	E	58	21	2348	2301	LOADED
20051201	2218	18	CAPT RUSSIE	VANIE LINE	A3	53	32	HANSON	E	E	28	126	214	311	LIGHT
20051201	2218	18	DOUBLE SKIN 15	VANIE LINE	A5	260	50	HANSON	E	E	28	126	214	311	LIGHT
20051201	9	209	CHARLES HUGHES	HUGHES BROTHERS	A3	106	30	DOVE	W	E	509	400	304	153	LOADED
20051201	9	209	VB 36	VANIE BROS	A5	240	50	DOVE	W	E	509	400	304	153	LOADED
20051201	116	316	PATRIOT	VANIE BROS	A3	105	35	STARK	E	E	320	358	429	509	LIGHT
20051201	116	316	DOUBLE SKIN 52	VANIE BROS	A5	362.5	62	STARK	E	E	320	358	429	509	LIGHT
20051201	109	309	LORETTE MORAN	MORAN TOWING	A3	66.5	26	GIBSON	W	E	552	452	359	255	LOADED
20051201	109	309	M 3103	MORAN TOWING	A4	265	48	GIBSON	W	E	552	452	359	255	LOADED
20051201	1115	1315	GE 4	CONTINENTALTRAIN	A3	70	25	PARKS	W	E	1515	1438	1404	1323	LOADED
20051201	1115	1315	VB 18	VANIE BROS	A5	242	43	PARKS	W	E	1515	1438	1404	1323	LOADED
20051201	1430	1630	LORETTE MORAN	MORAN TOWING	A3	66.5	26	GIBSON	E	E	1622	1658	1725	1801	LIGHT
20051201	1622	1832	SPAR RUBY	NORWAY	F1	584.6	75.7	R B STEELE A POTTER	E	E	1822	1856	1926	2008	LOADED
20051201	1619	1819	COLUMBIA	C P TOWING	A3	82	24	FURLOUGH	E	E	1824	1901	1933	2016	LOADED
20051201	1619	1819	DLF 1800	C P TOWING	A5	220	40	FURLOUGH	E	E	1824	1901	1933	2016	LOADED
20051201	1804	2004	ATLANTIC SERVICE	LEEYAC MARINE	A3	105	32	MELLON	W	E	2206	2104	2009	1850	LOADED
20051201	1804	2004	ENERGY 8001	LEEYAC MARINE	A5	350	78	MELLON	W	E	2206	2104	2009	1850	LOADED
20051201	1701	1901	CORAL SEA	KC TRAN	A3	111	32	PAPPA	W	E	2213	2109	2016	1906	LOADED
20051201	1701	1901	DBL 78	KC TRAN	A5	370	67	PAPPA	W	E	2213	2109	2016	1906	LOADED
20051201	1856	2056	ELIZABETH MCALLISTER	MCALLISTER BROS	A3	102	29	PARKIN	E	E	2051	2120	2145	2225	LOADED
20051201	1856	2056	COLUMBIA HOUSTON	COLOMBIA	A4	310	70	PARKIN	E	E	2051	2120	2145	2225	LOADED
20051201	1741	1941	ISLAND PILOT	SEVEN CORP	A3	65	26	DELFAUS	W	E	2346	2253	2156	2030	LOADED
20051201	1741	1941	SJ 180	STEPHEN TOW	A4	260	52	DELFAUS	W	E	2346	2253	2156	2030	LOADED
20051202	2135	2335	PURPLE HAYS	HAYES TOWING	A3	115	32	HUTCHINSON	E	E	2337	12	42	124	LIGHT
20051202	2137	2337	GOLD COAST	DANNI TOWING	A3	86	26	DANIELS	W	E	155	120	42	2351	LIGHT
20051202	2137	2337	VB 27	VANIE BROS	A5	248	50	DANIELS	W	E	155	120	42	2351	LIGHT
20051202	125	325	CHIEF	S C LOVELAND	A3	80	30	WOOTEN	E	E	315	348	420	500	LIGHT
20051202	125	325	ASC 300	ALLIED TOW	A5	300	55	WOOTEN	E	E	315	348	420	500	LIGHT
20051202	136	336	FALCON	EKLOF MARINE	A3	74	25	HOLLOWELL	E	E	327	404	450	542	LOADED
20051202	136	336	ATC 1800	ALLIED TOW	A5	430	80	HOLLOWELL	E	E	327	404	450	542	LOADED
20051202	135	335	LORETTE MORAN	MORAN TOWING	A3	66.5	26	GIBSON	W	E	640	535	435	320	LOADED
20051202	135	335	M 3103	MORAN TOWING	A4	265	48	GIBSON	W	E	640	535	435	320	LOADED
20051202	532	715	DON JUAN	SWEDEN	F1	653.2	105	R B SHEAE A DAVIS	W	E	829	843	805	721	LOADED
20051202	734	834	CHARLES HUGHES	HUGHES BROTHERS	A3	106	30	DOVE	E	E	826	1002	1033	1118	LIGHT



LOGS COURTESY OF USACE - CHESAPEAKE CITY FIELD OFFICE WEBSITE

IMAGE COURTESY OF USACE - CHESAPEAKE CITY FIELD OFFICE WEBSITE



RESOURCE INVENTORY

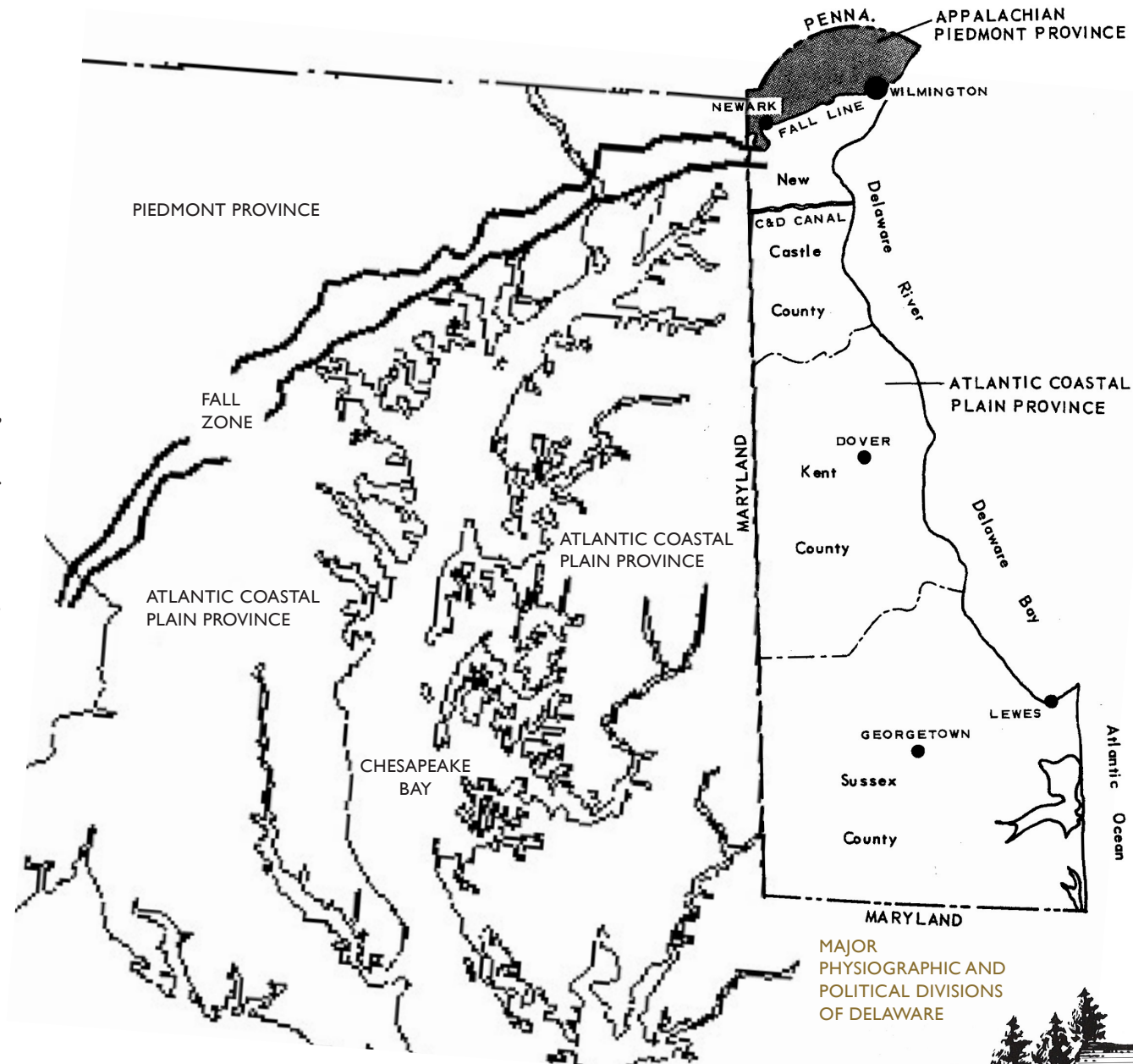
THE LANDFORMS

The Canal lands lies entirely in the Atlantic Coastal Plain Coastal Plain physiographic province. The natural landforms of this province are characterized by generally low surface features and shallow stream valleys with well-developed flood plains. The landforms along the Canal no longer reflect the typical physiographic features of the Coastal Plain, but resemble more the steep slopes and rolling hills of the Piedmont to the north.

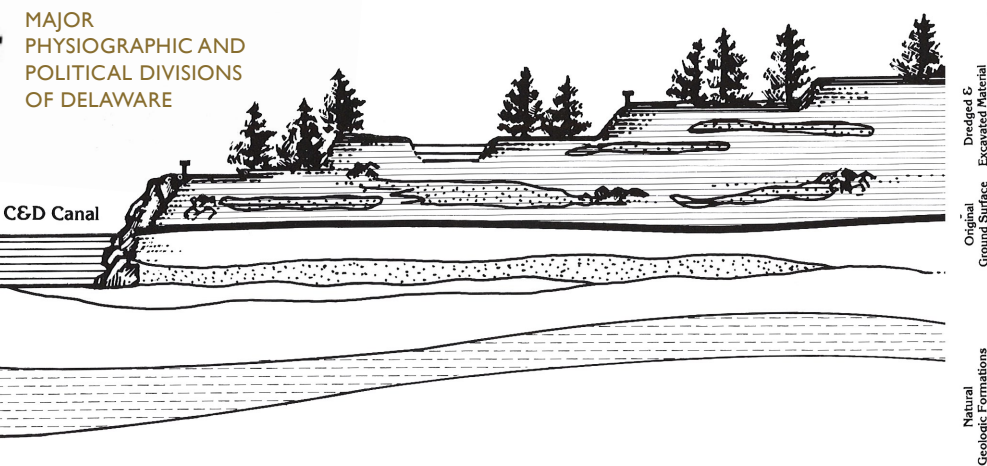
Over time, as the Canal was built, improved and maintained, massive amounts of material have been deposited along the banks. This has created the landforms that exist today. It is reported that there are areas where the deposits are 50 to 60 feet deep. "In the period from 1920 to the early 1970s, approximately 100 million cubic yards of dredged material was placed in diked disposal areas on these embankments." (Design Memorandum No. 28, ACOE, September 1977.) Today existing disposal areas range from over 1,488 acres in Delaware to 765 acres in Maryland. Average elevations from north to south range from 120' to 0' at the Canal edge. From east to west, the elevations range from 5' at the eastern tip Delaware City to 5' at Chesapeake City.

Various strategies have been developed over time to address the problem of re-vegetating these large areas of dredge material. Lack of vegetated cover was imperative to reduce erosion, to improve the structural integrity of the disposal areas and to provide wildlife habitat. In partnership with environmental agencies, fish and wildlife agencies, and soil conservation services in both Delaware and Maryland, the Army Corps has focused on improving soil conditions and vegetation restoration strategies for the sites. The result has been a mosaic of successional habitat areas of open meadow areas, interspersed with wood lots and man-made ponds.

As habitat diversity increased, so did the diversity of wildlife, and hence, the importance of the Canal lands for hunting, bird-watching, hiking, horseback-riding and dog training. The Canal lands are considered to be the most heavily used wildlife area in the State of Delaware due to its location to the most populated part of the state. Game species hunted includes white-tailed deer, mourning dove, cottontail rabbit, squirrel, waterfowl and bobwhite quail. Land cover adjacent to the Canal lands is mostly farm and woodland. However, adjacent residential housing is increasing at a rapid rate with high growth trends projected for the area through 2025.



MAJOR PHYSIOGRAPHIC DIVISIONS OF MARYLAND



GENERALIZED CROSS-SECTION OF THE C&D CANAL ILLUSTRATING THE COMPLEX MAKEUP OF THE DREDGED AND EXCAVATED MATERIAL DEPOSITED OVER THE ORIGINAL GROUND SURFACE

HYDROLOGY

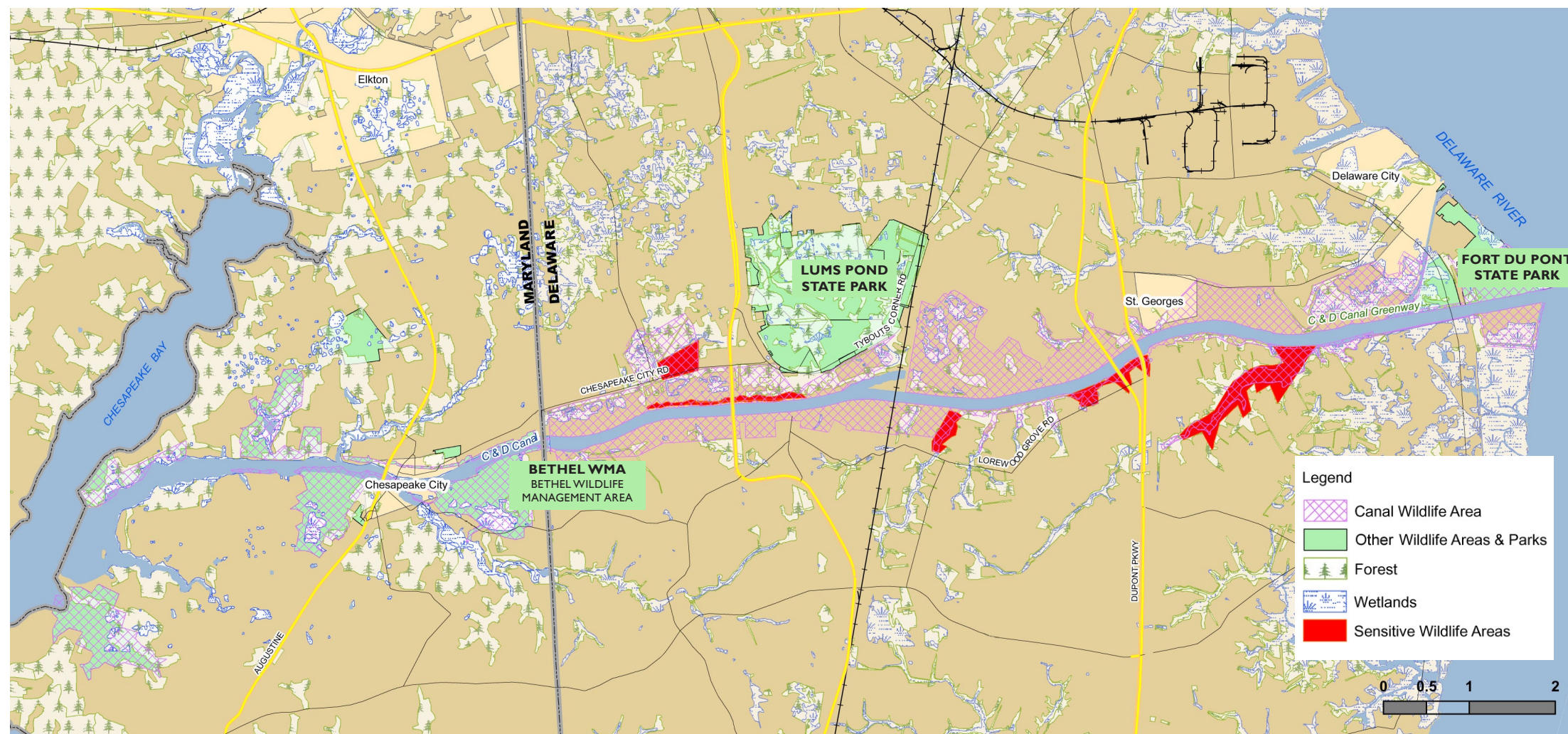
The 1920's modification to the Canal that deepened and widened the waterway also allowed the fresh water from the Delaware River to mix with the brackish tidal flow of the Elk River. The tide of the Canal is also a result of the tides of the waterbodies at its ends. "...the Delaware River tide at the east end (Reedy Point), and that of the Chesapeake Bay at the west end (Elk River). The mean range of the tide varies from 5.5 feet near the east end to 2.6 feet at Chesapeake City, Maryland, and 2.2 feet in Elk River at Court House Point, Maryland. The normal high water elevations gradually decrease from 6.0 feet at the east end to 4.7 feet at the west end. The normal low water elevations change from .05 feet at the east end to 2.2 feet at the west end. When related to the same ocean tides, the tide at the west end of the Canal arrives 10.5 hours later than the tide at the east end. This is due to the longer distance and time of travel up the Chesapeake Bay." (Design Memorandum No. 28, ACOE, September 1977.) The water of the Canal is similar to calm open bay conditions. Large ships can produce waves 1' to 2' high.

FISH AND WILDLIFE

The C & D Canal is a good location to view migratory ducks and geese. Because the waterway is continuously traversed by both commercial and recreational vessels of all sizes, the waters are too turbid to permit the growth of aquatic grasses in the Canal's main stem. Some of the tributaries, particularly those sheltered from the wakes of large vessels, have recently seen the emergence of various forms of pondweed, which to migrating ducks and geese is an important food source. (Source: Maryland's Top Public-land Goose Hunting, Diamond)

BETHEL WILDLIFE MANAGEMENT AREA

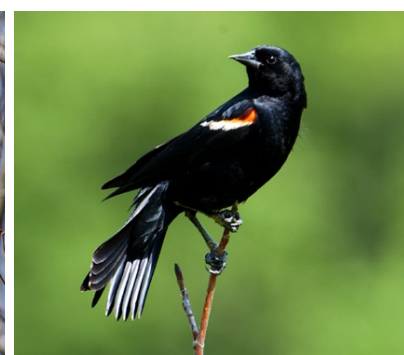
Measuring just over 400 acres, Bethel Wildlife Management Area is situated directly on the shores of the C & D Canal. The Canal's shoreline here consists mainly of dredging spoils that create a near-vertical shoreline, which is not conducive to waterfowl hunting. However, the stretch along state Route 286 consists mainly of lowland swamps that provide good pass-shooting for hunters seeking ducks and geese. Only four sites are available here, but according to local wildlife managers, Bethel is among their most popular locations for waterfowl hunting.



Flora and Fauna images courtesy FEODOR PITCAIRN from his book "Dreaming of the Wild"



TURKEY VULTURE



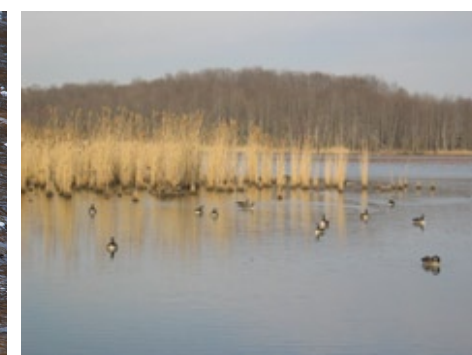
RED WINGED BLACKBIRD



WHITE TAILED DEER



MALLARD DUCKS



WATERFOWL HABITAT



BOX TURTLE



SCOTT RUN



JOY RUN TIER 3 SERVICE ROAD



DEEP CUT



GUTHRIE RUN



OLD BRANCH CANAL - DELAWARE CITY



SOUTH CANAL EDGE AT BETHEL



BETHEL DRAINAGE DITCH



ST. GEORGES NORTH GATED ACCESS

VEGETATION AND HABITAT

The early successional habitats that have developed on the Canal lands include: Thickets, shrub lands, hedgerows, and woodlots. In the broad sense, the vegetation of these habitats includes a variety of both native and non-native species. A few narrow wooded ravines exist, which support young deciduous species on moderate slopes. Small freshwater streams can be found in these ravines that flow to the Canal. Occasionally these ravines lack a wooded canopy and support a scrub/shrub wetland plant community. At lower elevations, areas can also be dominated by Phragmites marshes which lower the habitat value of a site. Only two sites support a contiguous block of mature forest - Emily Point and Summit East.

The Environmental Resources Report (December, 1994) ranked the environmental resource value of 13 dredge material areas (see page 28) in the following descending order:

- EMILY POINT - one of two sites with large areas of mature forest greater than 100 acres, important for forest interior dwelling birds. Maple-gum-poplar and Oak-hickory-beech are the most common forest types. "Most of the site has not been disturbed...Vegetative communities and their resulting animal communities are well developed...permanent ponds in the center of the site provide an additional habitat component."
- SUMMIT EAST - one of two sites with large areas of mature forest types greater than 100 acres, important for forest interior dwelling birds. "...it is recommended that this site be left alone due to its increasingly rare size of habitat and the species which are using it."
- DELAWARE CITY - particular value to migratory waterfowl and proximity to Pea Patch Island, a nesting site for wading birds. A 93-acre large open water area is a nesting area for many bird species including mallards, black duck and teal.
- UPPER SUMMIT - currently a designated dog training and dog trial area. "This site has the potential to being valuable to a number of wildlife....Freshwater marsh areas in Delaware are the among the least common type found....The large area of grassland is a habitat that is becoming increasingly rare in the Mid-Atlantic region as fewer farmers maintain pastureland or grow hay. Many of the grassland neotropical birds, such as the eastern meadowlark, dickcissel, and savannah sparrow, are experiencing even greater population declines than the forest dwellers (Smith et.al, 1992) Unfortunately, the regular mowing of the upland grassland prevents successful breeding by grassland species."
- GOOSE POINT - A third of this site is wetland habitat and open water, with an upland area dominated by grassland. "The large area of freshwater marsh surrounding scattered ponds forming a good interspersion of cover types, plus the extensive area of grassland and meadow give this area a moderate to high potential for wildlife use."
- SCHOOL HOUSE ROAD - mixed juxtaposition of woods and fields, with low diversity of plant species. Considered to have a low to moderate value for wildlife.
- BIDDLES POINT - low habitat diversity due to dense stands of scrub-shrub or phragmites and many non-native species.
- ST. GEORGES - largely field and early successional forest of low structural complexity.



BETHEL NATURAL AREA



BETHEL DITCH



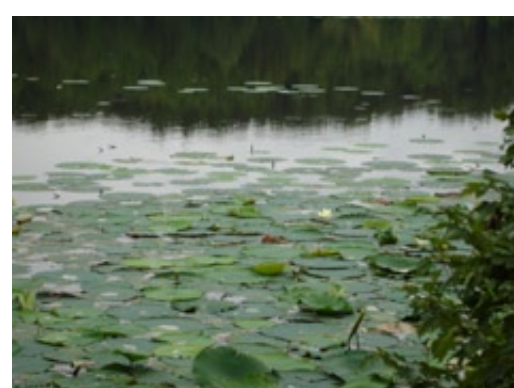
BETHEL DISPOSAL SITE



BETHEL DISPOSAL SITE



BETHEL NATURAL AREA



BETHEL NATURAL AREA



REEDY POINT NORTH - FORT DUPONT



REEDY POINT NORTH

- LOWER SUMMIT - The only known site of diffuse juncus, *Juncus diffusissimus* (Delaware Natural Heritage Inventory - S1 state rank species of concern). Also a dog training area, this site has a low to moderate habitat value due to frequent presence of people and dogs and plant species diversity.
- BETHEL - "This area is dominated by large blocks of low value habitat such as phragmites and bare ground. While habitat interspersions are fairly good with scattered stands of forest ... the overall habitat and wildlife value is low."
- CHESAPEAKE CITY - "This site is covered by low value, early successional habitats that provide little structural complexity... Much of the site is covered with monotypic stands of phragmites. The wildlife value is low."
- REEDY POINT SOUTH - Fifty-one percent of the site is dominated by phragmites with patches of shrubs and woody species resulting in low habitat value.
- REEDY POINT NORTH - "Overall wildlife use of the site is considered low as there is limited diversity and the majority of vegetated habitat is covered by plant species with low wildlife value."

CANAL ECOLOGY

This resources of the C & D Canal have been well documented in past studies such as Habitat Assessment of C & D Canal Upland Disposal Areas for the C & D Canal Deepening Feasibility Study, December 1994, prepared by Environmental Resources, Inc. This report builds upon the work of previous studies to insure that the development of the C & D Canal as a recreation resource considers the program and facility needs as well as environmental issues in an integrated fashion.

The natural environs of the C & D Canal Wildlife Area lie within a fragmented landscape, consisting of a mosaic of early successional habitat types, which are an artifact of the creation of the Canal. Early successional upland habitats include: thickets, grass-lands, shrub-lands, hedgerows, and woodlots. In the broad sense, the vegetation of these habitats includes a variety of both native and non-native broad-leaf herbs, grasses, sedges, vines, and deciduous and evergreen trees and shrubs. In addition, narrow wooded ravines also exist, which typically support young, deciduous tree species on moderate slopes. In the bottom of these ravines, small freshwater streams flow toward the Canal. Occasionally, these streams lack a wooded canopy and as a result, emergent and scrub/shrub wetlands develop along the streams narrow floodplains. Artificial types of habitat, such as ponds and impoundments also occur in the Canal Wildlife Area. These human-created habitats do provide value to wildlife, particularly when native vegetation has become established within, or on their perimeters.

GEOLOGY - C & D CANAL

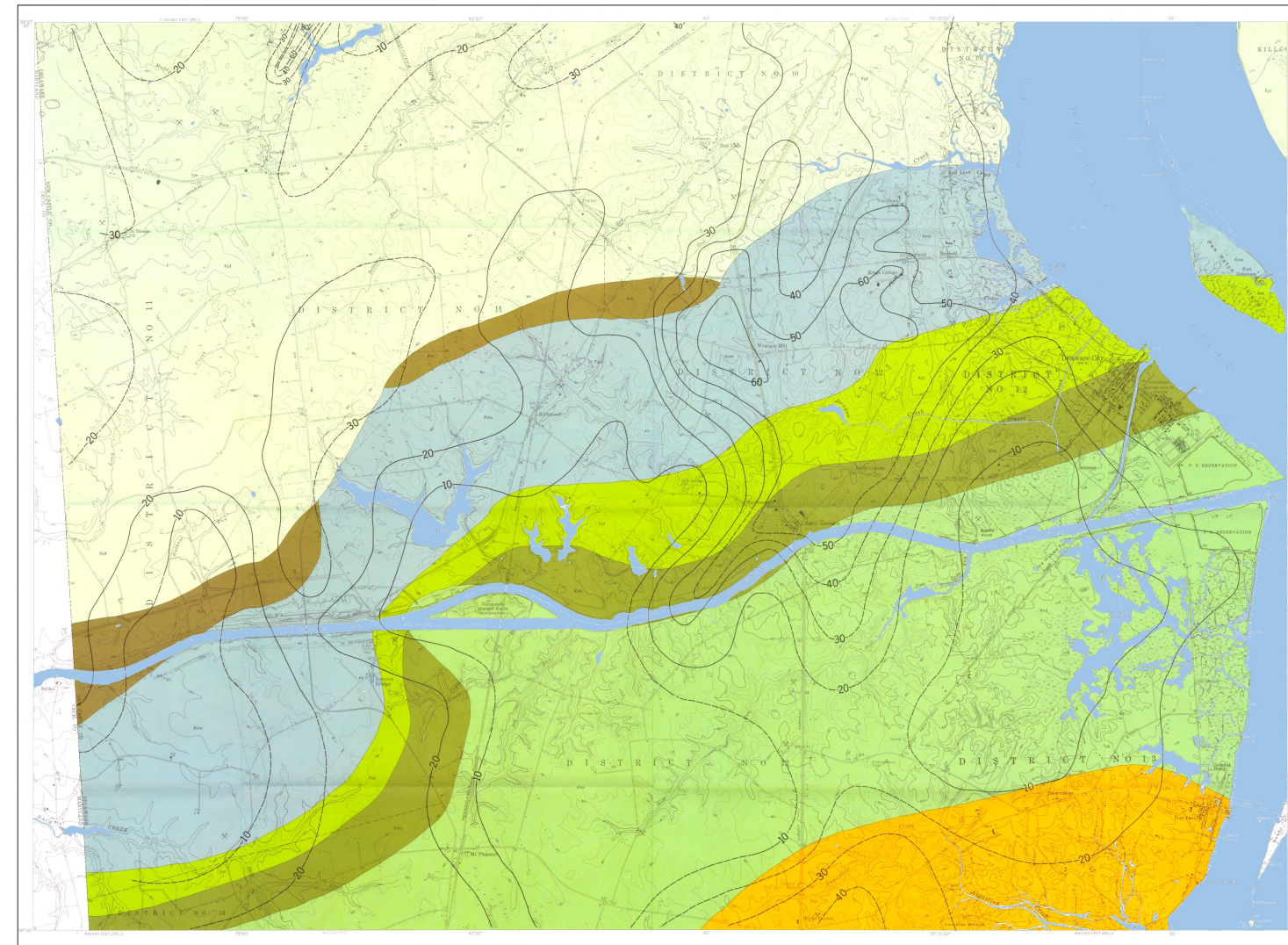
The oldest Coastal Plain unit in Delaware, the Potomac Formation, was deposited on ancient crystalline rocks of the Basement Complex from the latter part of Early Cretaceous time into Late Cretaceous time. Streams transported clays and sands from the Appalachians in the northwest and sediments were deposited probably in a deltaic environment in this part of Delaware.

The overlying white sands and lignitic black silts of the Magothy Formation are separated from the Potomac Foundation by an unconformity. The Magothy Formation indicates the transition from older nonmarine sediments to the later marine deposits. Another small unconformity separates the Magothy from the overlying marine Upper Cretaceous rocks. Magothy sediments were deposited in a shoreline environment containing elements of strand line, barrier island, and lagoonal conditions.

A sequence of varied marine sedimentary rocks was deposited essentially continuously from upper Cretaceous to at least Middle Eocene time. The oldest Cretaceous sediments above the Magothy form the Matawan Group, consisting of the Merchantville, Englishtown, and Marshalltown Formations. The Englishtown Formation was formerly called Wenonah and the Marshalltown was included in the area mapped as Mount Laurel Formation. (Spoljaric and Jordan, 1966.) The area mapped previously as Redbank is probably weathered Marshalltown and Mount Laurel Formation. None of these units persist very far into the subsurface, so the Matawan is assigned formational status at depth a few miles south of the C & D Canal. The Merchantville and Marshalltown sediments were probably deposited in fairly shallow, open marine, perhaps embayed areas as evidenced by the glauconite content and fossils. However, lithology and fossils indicate that the Englishtown represents a shoreline environment in which sea level was dropping.

In Delaware, the name Mount Laurel Formation is synonymous with the name Monmouth used in Maryland and New Jersey. Lithology and fossils indicate a slight regression of the sea during Mount Laurel time.

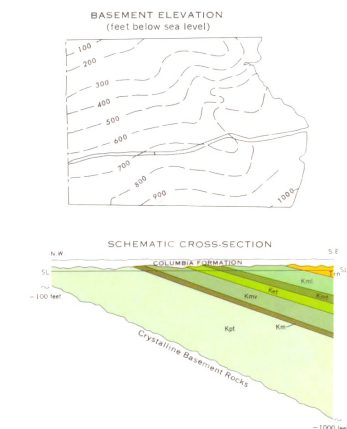
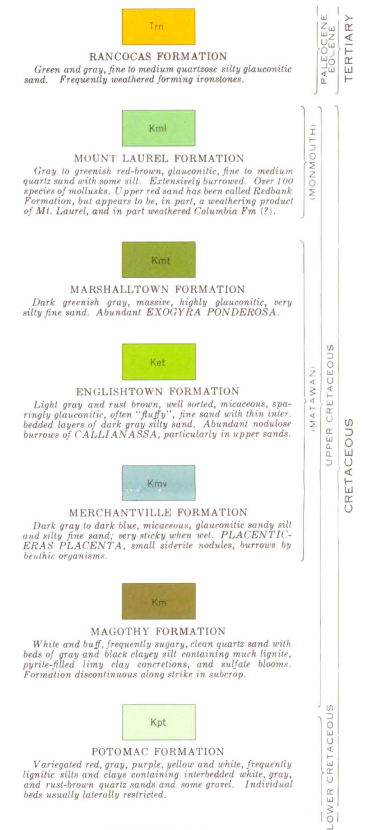
The Paleocene-to-Eocene Age Rancocas Formation is found in the southeastern part of the Canal area of Delaware. There is no obvious unconformity between Late Cretaceous and Early Tertiary Age sediments. The high glaucomite content of the Rancocas Formation indicates open shelf conditions. The area previously mapped as unit B (Spoljaric and Jordan, 1996) is included within the Rancocas Formation because sufficient criteria for a separate unit were not found in the field investigations.



GEOLOGY OF THE CHESAPEAKE AND DELAWARE CANAL AREA, DELAWARE, THOMAS E. PICKETT., 1970

(Note: Base Map is comprised of USGS Topographic Division for Elkton, St. Georges, Delaware City Quadrangles. Map modified by Delaware Geological Survey around RailRoad Bridge area to show new ship channel, therefore many topographic contours are meaningless in this area.)

Much later, during the Pleistocene time, the advance and retreat of the continental glaciers brought about changes in sea level and in the streams draining into Delaware. The Pleistocene Columbia Formation, consisting mostly of coarse sand and gravel, was deposited on the stream-channeled surface of the truncated Cretaceous and Tertiary beds. In the Canal area a major north-south "channel" can be seen in the St. Georges area and a lesser one near Summit Bridge, shown by thickness contours (isopachs). (Source: Delaware Geological Survey, University of Delaware, Robert R. Jordan, State Geologist)



GEOLOGY - DEEP CUT

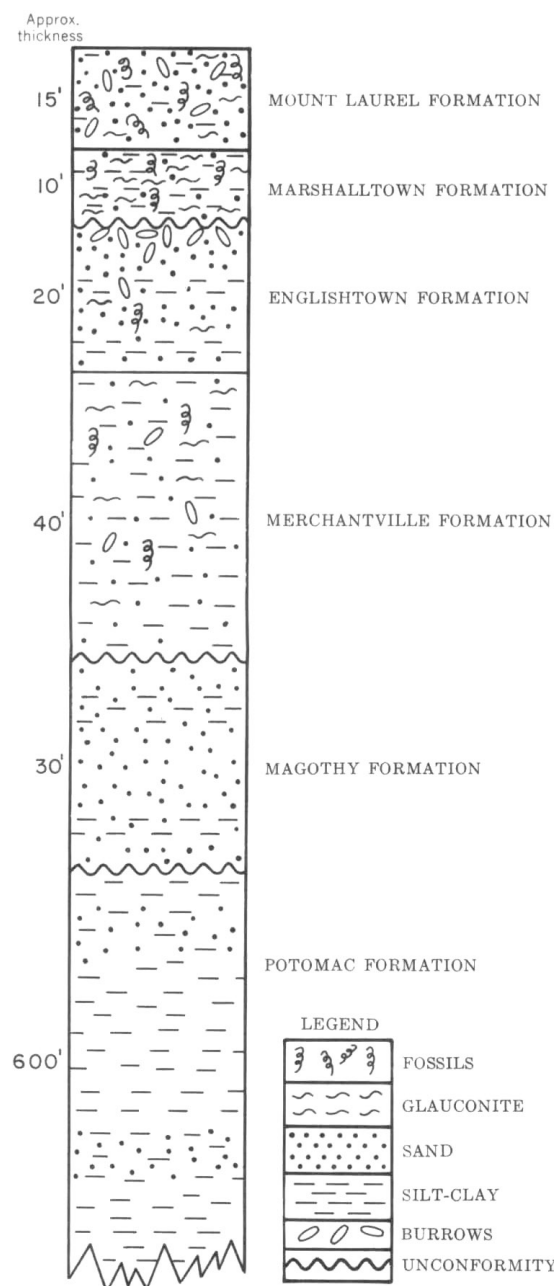
There are three unique geological exposures along the C&D Canal. The three areas are known as the Deep Cut, Low Bluff and the Biggs Farm site. During excavation for the Canal, ancient marine fossil deposits dating back 500 million years were revealed at these sites. Today, rich deposits of trilobites and baculites continue to draw fossil hunters to the area. The closest comparable site in size and quality is at Martha's Vineyard in Massachusetts. All three sites have very high educational value. Two of the sites, The Deep Cut and Biggs Farm lie close to the proposed trail system and should be recognized for special protection as plans develop.

The Deep Cut site is accessible from the present service road that will become the proposed multi-use trail. The site is highly susceptible to erosion. It was reported in 1978 that the bluff was eroding at the rate of about two feet per year. The educational value and environmental sensitivity of this site is very high and should be protected.

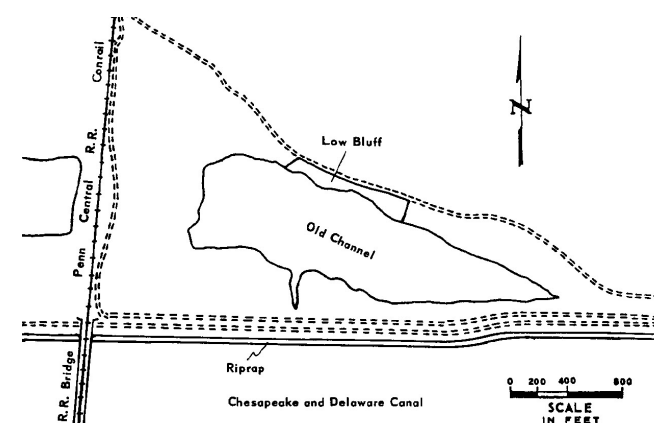
The Biggs Farm site was exposed when the Canal was widened. Attempts to protect this site from erosion and damage in the past have produced mixed results. The educational value and environmental sensitivity of this site is also very high and should be protected.



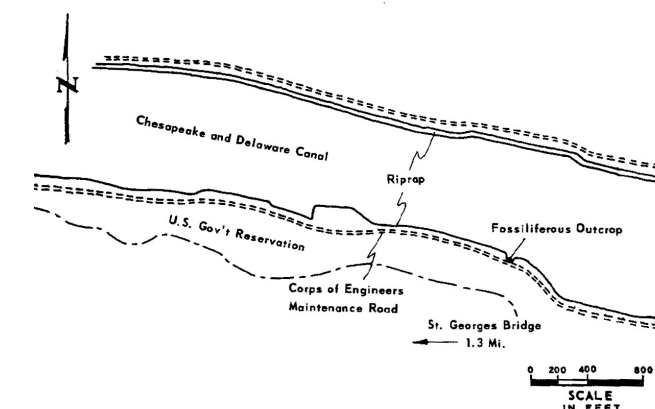
BLUFF AT DEEP CUT - PHOTOGRAPH BY H.H. HARVEY, 1967.



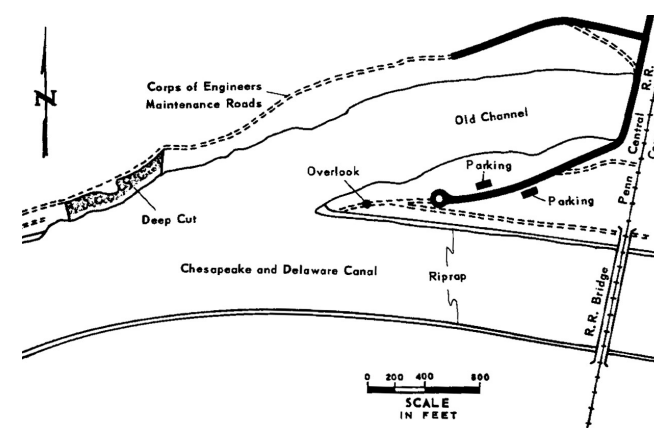
CRETACIOUS FORMATIONS IN THE CHESAPEAKE AND DELAWARE CANAL - GEOLOGY BY THOMAS E. PICKETT, DEL. GEOLOGICAL SOCIETY



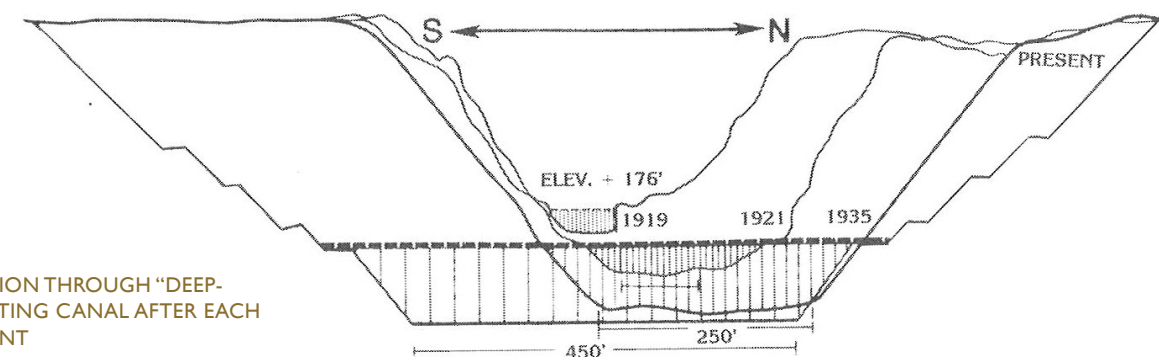
LOW BLUFF C&D CANAL; St. Georges Quadrangle



BIGG'S FARM; St. Georges Quadrangle



DEEP CUT C&D CANAL; St. Georges Quadrangle



CROSS SECTION THROUGH "DEEP-CUT" DEPICTING CANAL AFTER EACH ENLARGEMENT

GEOGRAPHIC AND DEMOGRAPHIC CONSIDERATIONS

There are three distinct municipalities along the C & D Canal, dating back to its creation as an instrumental waterway for commerce and trade. In Maryland, Chesapeake City is located on the north and south sides of the Canal. In Delaware, St. Georges is adjacent to Route 13 on the north side of the Canal. Delaware City occupies the north side of the Canal, along the old branch Canal to the Delaware River. St. Georges and Delaware City in New Castle County, DE and Chesapeake City of Cecil County, MD.

The 7,700 (Delaware, 4986 and Maryland, 2706) acres situated directly along the Canal Waterway, between Chesapeake City and Delaware City and is federally- owned land operated by the Corps. The Corps leases most of the government land to the states of Maryland and Delaware for wildlife management. This has been going on for several years, and is expected to continue indefinitely.

The cities and small towns along the Canal are a story of communities that has been formed in response to the Canal and its unique geographic location. Chesapeake City was named in 1839, ten years after the Canal was opened to traffic. Prior to 1929, when the Canal was dredged to sea-level, ships would stop at Chesapeake City for the locks that allowed them to use the Canal. The Canal has always had a major impact on the town continuing in 1942, when a ship destroyed a bridge that connected the north and south side of town, to the opening of a superstructure bridge in 1949, to the razing of homes in order to enlarge the Canal in the 1960s.

“Today, Chesapeake City is the only town in Maryland that is situated on a working commercial Canal. Most of its interesting 19th-century architecture remains intact, and the area that encompasses it on the south bank has been placed on the National Register of Historic Places. At the city dock, pleasure boaters find a tranquil harbor off the busy Inter-Coastal Waterway, of which the Canal is a major element. From the basin, visitors can walk easily into town or tour the Canal Museum, where the story of the Canal is told and the massive waterwheel and steam engines that filled the locks stand in mute testimony. Outside is a replica of the lighthouses that lined the Canal in days gone by.” (Chesapeake City website, www.seececil.org/)

Between the Delaware/Maryland state border and Route 1 in St. Georges, Delaware, open space north of the Canal lands is quickly being converted from agricultural/crop land to residential and commercial land. Lums Pond State Park occupies 1,757 acres just north of the Canal in Delaware, essentially its geographical midpoint. Major residential and commercial growth is rapidly unfolding south of the Canal.

St. Georges lies south of the C & D Canal and the small remaining portion of St. Georges Creek. It was one of the original “hundreds” in Delaware created in 1682 and was named for St. Georges Creek that once flowed along its northern boundary. A hundred is an administrative division, frequently used in Europe and New England, which historically was used to divide a larger region, into smaller geographical units. Today, most of the bed of St. Georges Creek has been used by the route of the Canal, which has effectively replaced it.

From St. Georges to the Delaware River, there is a mix of industrial (Valero refinery in Delaware City), agricultural, commercial, residential, recreational and large areas of undeveloped land and wetlands/waterways. While St. George’s Hundred is rural and agricultural in places there has been considerable residential and commercial development in the 1980s and 1990s which continues to this day. This area is among the fastest growing parts of Delaware.

Delaware City’s location at the eastern terminus of the Canal in 1829 caused Delaware City “...to become both an operating base and a way station for a number of significant shipping-related activities over the decades.” “Delaware City has evolved through many periods of growth and decline and continues to be a thriving, living community for the people who work and reside within its bounds. Battery Park, located along the Delaware River at the foot of Clinton Street, was recently renovated. Here a visitor is surrounded by a scenic panorama of the Delaware River, Pea Patch Island and the New Jersey shoreline. (www.delawarecity.info/history.html)

Both counties in Maryland and Delaware are areas of projected high growth. Much of the Canal lies in New Castle County, one of three counties in Delaware. New Castle county is considered part of the Philadelphia-Camden metropolitan area and is ranked first in the State for population growth during the 1990s. The estimated population in 2004 was 519,396. This was an increase of 3.82% from the 2000 census. The County is expected to have a 19% increase in population by 2030. The population percent change was also great in Cecil County, Maryland where from April 1, 2000 to July 1, 2004 the population rose by 11.1% to 95,526. Projections for Cecil County for 2030 are 108,800; an increase of 13% in population.



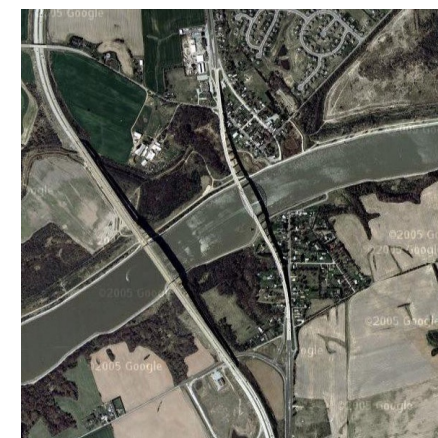
BIRD'S EYE VIEW OF CHESAPEAKE CITY



OLD CANAL - DELAWARE CITY



CHESAPEAKE CITY

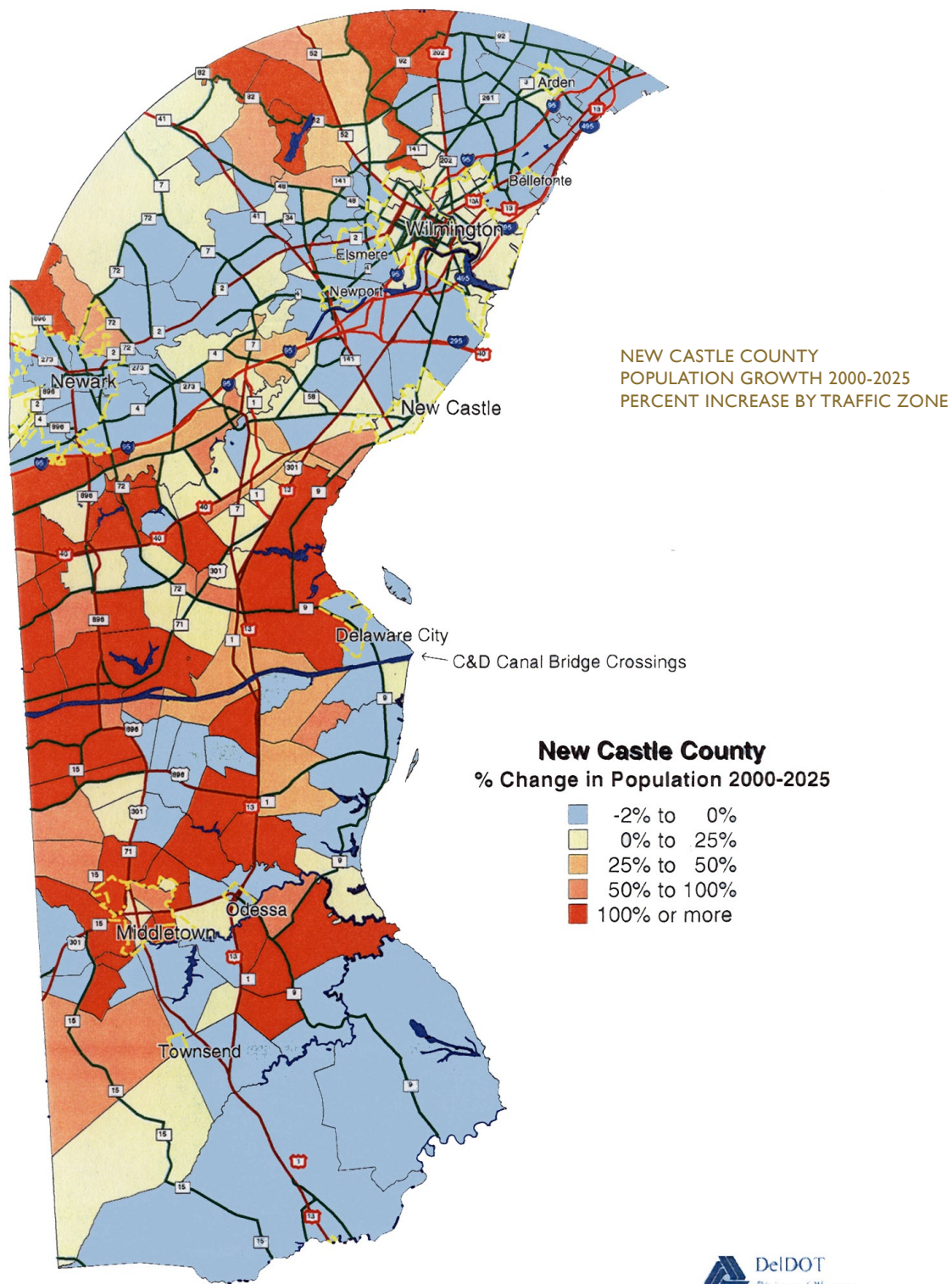


ST. GEORGES



DELAWARE CITY

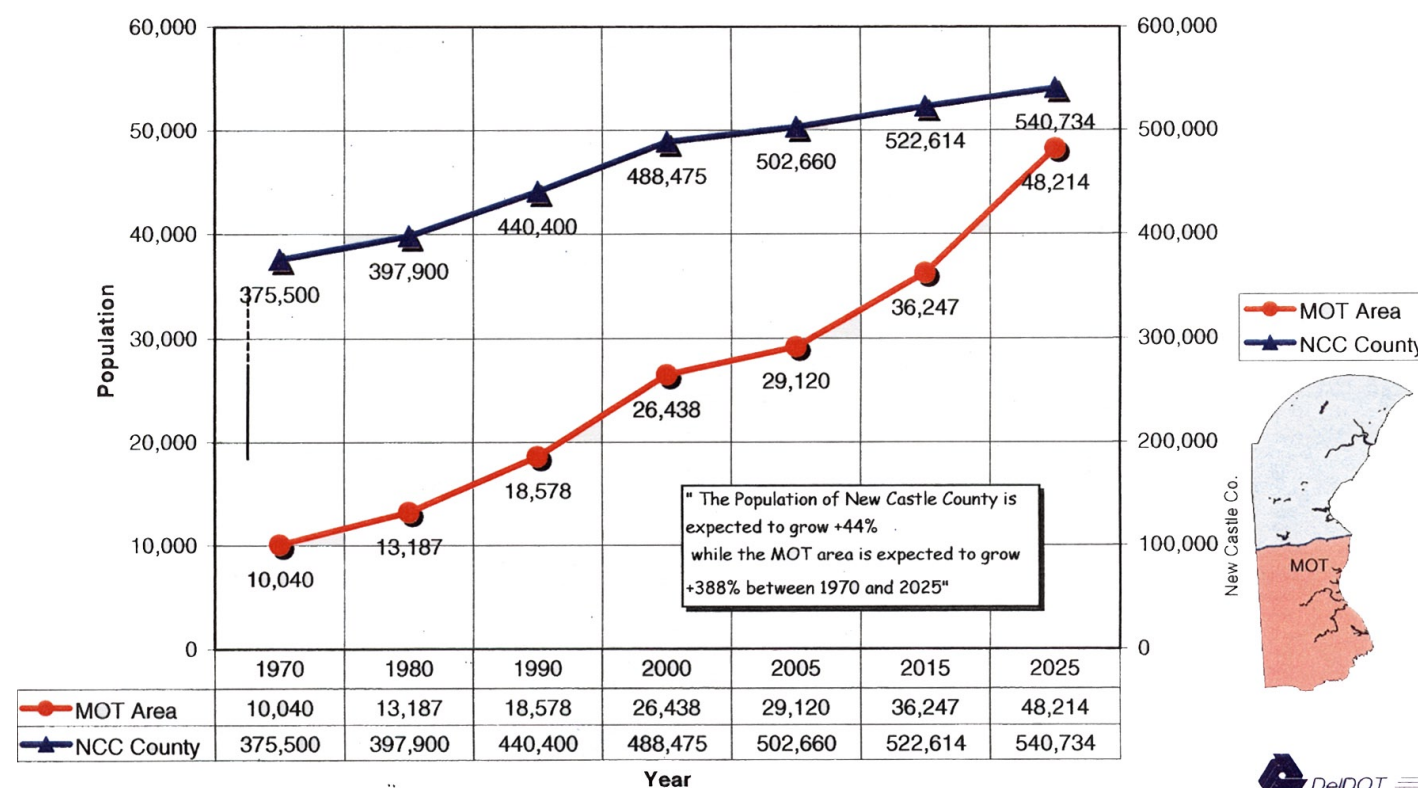
GEOGRAPHIC AND DEMOGRAPHIC CONSIDERATIONS



Population Projections by Age for Cecil County and Maryland, 2000 to 2020

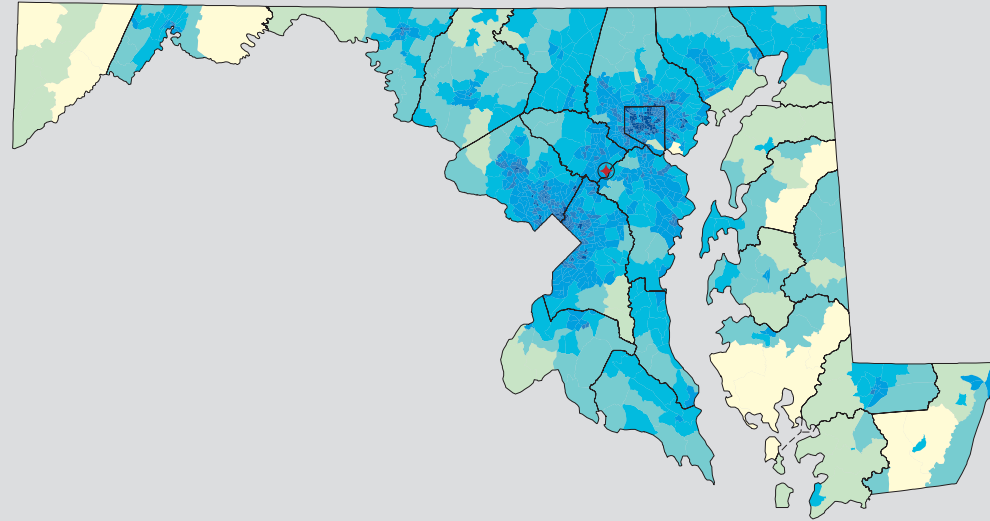
	2005				2020			
	Cecil		Maryland		Cecil		Maryland	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
0-19	28,067	29%	1,556,153	28%	29,922	27%	1,584,647	27%
20-59	53,208	56%	3,138,385	56%	57,827	52%	3,206,448	55%
60 +	14,376	15%	915,954	16%	23,705	21%	1,433,864	18%
Total	95,651	100%	5,610,492	100%	111,454	100%	6,224,959	100%

Source: Maryland Department of Planning, 2004.

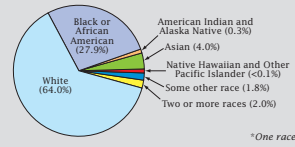


Census 2000: Maryland Profile

Population Density by Census Tract

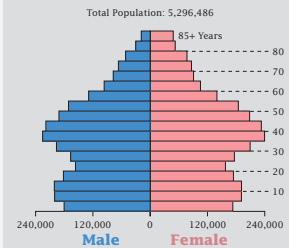


State Race* Breakdown

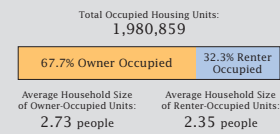


Hispanic or Latino (of any race) makes up **4.3%** of the state population.

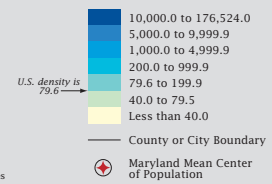
Population by Sex and Age



Housing Tenure



Population Per Square Mile by Census Tract



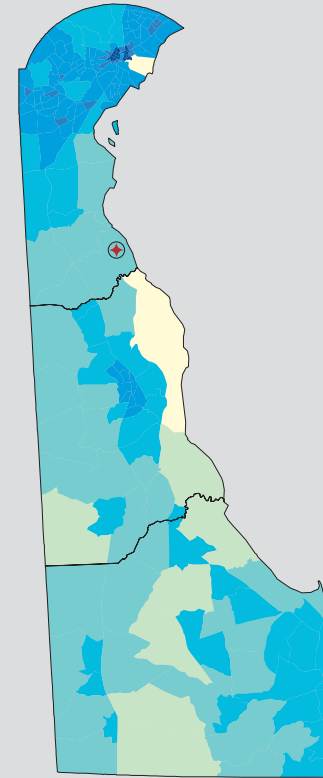
U.S. CENSUS BUREAU
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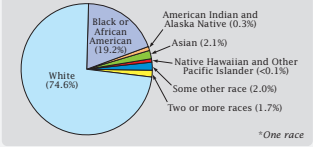
U.S. Department of Commerce Economics and Statistics Administration U.S. CENSUS BUREAU

Census 2000: Delaware Profile

Population Density by Census Tract

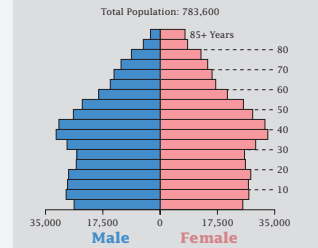


State Race* Breakdown

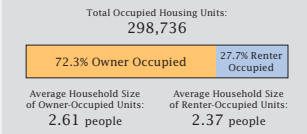


Hispanic or Latino (of any race) makes up **4.8%** of the state population.

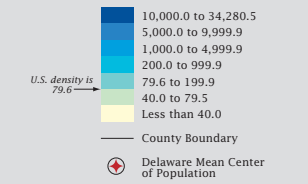
Population by Sex and Age



Housing Tenure



Population Per Square Mile by Census Tract

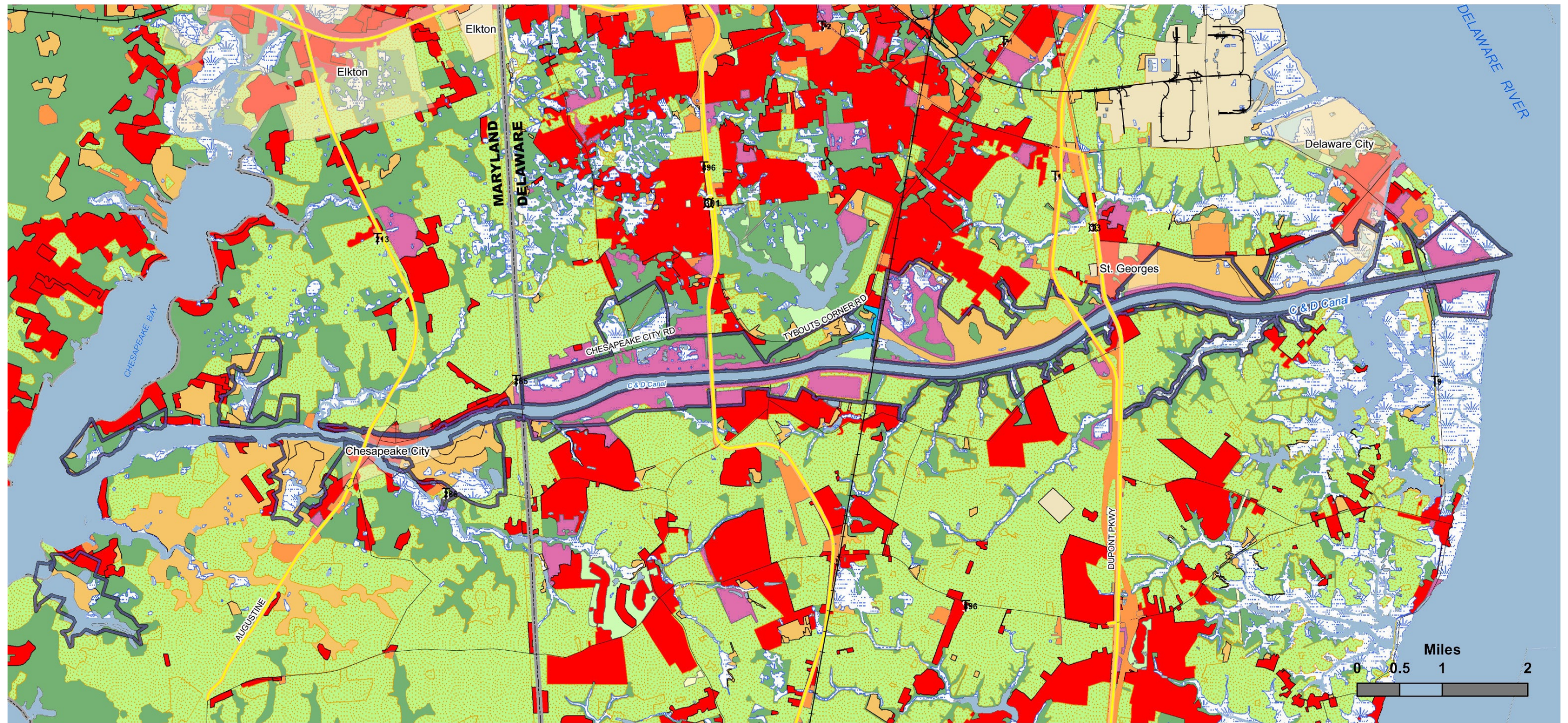


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U.S. Department of Commerce Economics and Statistics Administration U.S. CENSUS BUREAU

CURRENT LAND USE



Legend

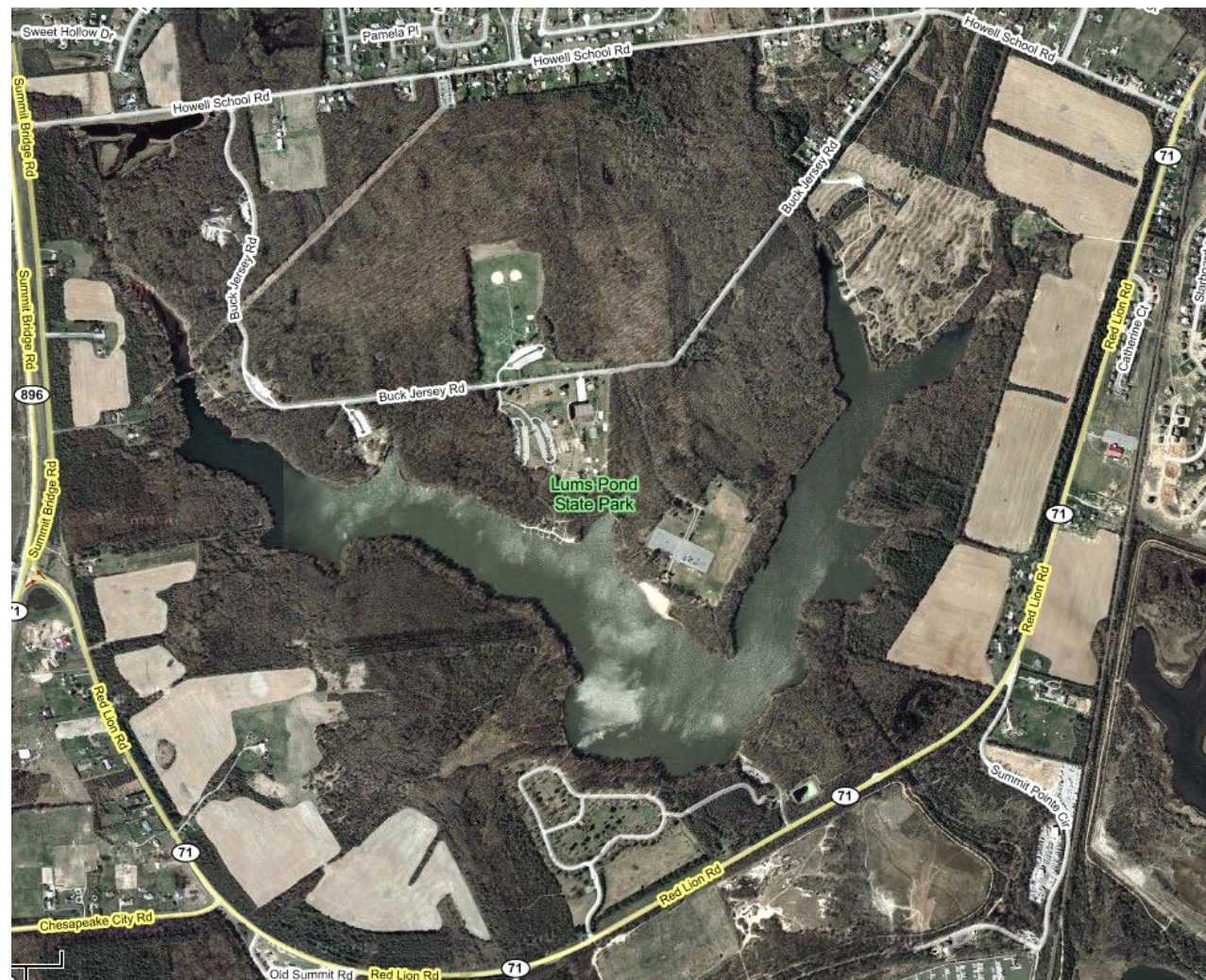
Federal Property	Industrial	Waterways/Streams/Canals/Lakes
Landuse	Marinas	Wetlands
Agricultural/Cropland	Recreational	Other Undeveloped
Commercial	Residential	Other
Forest	Utilities	

DELAWARE STATE PARKS & RECREATION

LUMS POND

Lums Pond State Park is built around the largest freshwater pond in Delaware. The park features fishing, sports facilities, camping, and more on its 1,790 acres on the north side of the Chesapeake and Delaware Canal. Covering 200 acres, Lums Pond itself offers a sandy beach for sunbathing (swimming is not allowed), and boat rentals provide water-bound recreation in the summer months. A boat launching ramp and two piers allow easy access to the water. A 7 mile multi-use trail is open to hiking, mountain bikes and equestrian use. Other shorter nature trails are found in the park.

Before the pond existed, St. Georges Creek flowed through the hardwood forest and was the site of several Native American hunting camps. The creek was dammed in the early 1800s when the C & D canal was built. Water from the pond was used to fill the locks of the canal and power a small mill. This area was first opened as a state park in 1963. The park is owned and operated by the State Division of Parks & Recreation.



MARYLAND PARKS & RECREATION

CECIL COUNTY

Cecil County is characterized by rolling topography that transitions into the Pennsylvania Piedmont to the north and the Atlantic Coastal Plain to the south and to the east. Among the county's most prominent physical features are the granite cliffs of Port Deposit rising steeply from the Susquehanna River. In 1998, the population was 82,522; it is projected to reach 94,600 by 2010. The county's growth areas are concentrated around the towns located along the U.S. Rt. 40/I-95 corridor.

The county covers approximately 222,940 land acres. Fifty-six percent (56%) or 161,522 acres are zoned agricultural. Agricultural lands dominate most of the northern and southern portions of the county. Four hundred sixty-four farms averaging 185 acres each comprise about 38.5% of Cecil County's total land acres. Just under 15,000 acres are enrolled in agricultural districts through the Maryland Agricultural Land Preservation Foundation. Easements have been sold on about 8,700 acres. The Maryland Environmental Trust holds conservation easements on about 2,700 acres, and an additional 600 acres are protected by easements held by other land trusts such as the Cecil Land Trust and the Natural Lands Trust.

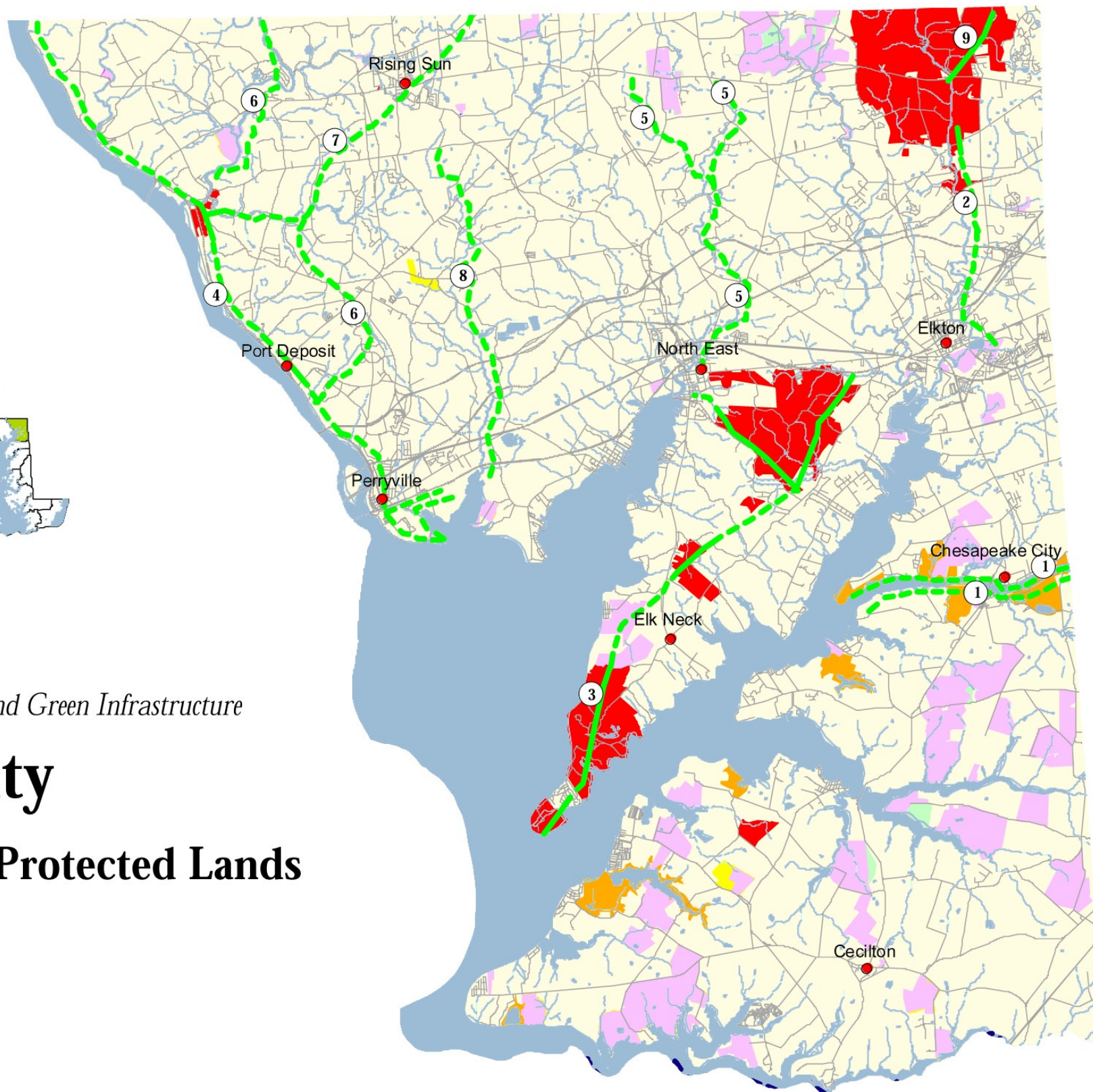
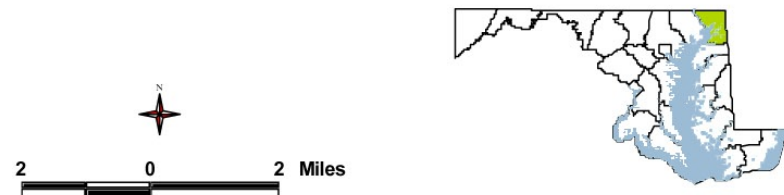
Scout troop marching up a trail. The county's Comprehensive Plan identifies eight potential greenways and four Class II bikeways. The Lower Susquehanna Heritage Greenway is the primary greenway in the county. However, there is ongoing discussion about the possibility for several others that could link parks, trails, and greenways in Pennsylvania and Delaware, with corridor extensions into and through parts of northern Cecil County and along the Chesapeake and Delaware Canal. Elk Neck State Park, Elk Neck State Forest, and the Fair Hill Natural Resources Management Area provide the three largest blocks of publicly owned land in the county.

The planned East-Coast Greenway could eventually be routed through Cecil County if appropriate trail corridors and bike routes are established in the future in Cecil, Harford, and Baltimore counties. A pedestrian bridge across the Susquehanna River would also have to be accomplished to accommodate this route. The Wilmington Metropolitan Area Planning Commission (WILMAPCO) is currently evaluating potential routes. The Maryland East Coast Greenways Committee has identified an interim route that straddles the Chesapeake Bay. (See Appendix B.) The ideal corridor would be an off-road trail in the vicinity of the I-95 corridor through north eastern Cecil County.

CHESAPEAKE AND DELAWARE CANAL GREENWAY

The Chesapeake and Delaware Canal Greenway is a planned greenway linking Welch Point Managed Hunting Area, Elk Forest Wildlife Management Area, Canal National Wildlife Refuge, and Bethel Managed Hunting Area. The U.S. Army Corps of Engineers currently holds ownership to substantial tracts of land along the canal. There are existing trails within its land holdings, and the service road paralleling the canal is being considered for a bike path to link various communities along the canal.

- Agricultural Easements
- MET Easements
- Private Conservation Lands
- County Parks
- DNR Lands
- Federal Lands
- Additional Protected Lands Data Reported by the County
- Existing Greenway
- Potential Greenway



Maryland Atlas of Greenways, Water Trails and Green Infrastructure

Cecil County

Greenways, Water Trails and Protected Lands



Chesapeake and Coastal Watershed Service
 Waterway and Greenways Division
 Maryland Greenways Commission
 Watershed Management and Analysis Division
 © DNR August 2000

CULTURAL RESOURCES

FORT DELAWARE

Located on Pea Patch Island off Delaware City, pentagon-shaped Fort Delaware stands guard over the Delaware River. Today it is a popular State Park and is reached by taking a pleasant ferry ride from Delaware City. It was an even busier place during the Civil War when it served as a prisoner-of-war camp for captured Confederate soldiers.

Pea Patch Island's important strategic position for the defense of Wilmington and Philadelphia against naval attack was recognized in 1819 when the first fort was built on the island. Constructed of wood, this fort was destroyed by a fire in 1832. By 1848, the federal government appropriated funds to build a state-of-the-art coastal fortification. It is this fort that still exists today. The island fortress, combined with gun batteries at what is now Fort DuPont on the Delaware shore and at what is now Fort Mott, New Jersey, formed an imposing defensive system.

Construction of the fort was an expensive undertaking; at a cost of two million dollars, the structure is built atop more than 7,000 pilings driven into the marshy land. Fort Delaware was substantially completed eleven years later in 1859, just before the beginning of the Civil War.

The fort is a massive structure made of granite and brick. The walls are up to 30 feet thick and stand 32 feet high. It was outfitted with the 19th Century's most modern defenses including three tiers of guns. The fort is entered through the sally port after crossing the drawbridge over the 30-foot wide moat that surrounds the fort.

Fort Delaware's role as a coastal defense fortification changed to that of prisoner-of-war camp with the arrival of the first Confederate prisoners after the battle of Kernstown in 1862. As more and more prisoners arrived, additional barracks were erected. They were wooden structures built just north of the fort. By June 1863, there were 6,000 prisoners on the island. Fort Delaware's largest population came in 1863 after the battle of Gettysburg. At this time 12,500 prisoners were housed on the island. Combined with the civilian and Union population, the island's population reached close to 16,000 people making it, some say, the largest city in Delaware for a brief period.

Largely abandoned after the Civil War, the fort was modernized in 1896 by the addition of "disappearing" guns at the south end of the fort. A garrison was posted at the beginning of the Spanish-American War, which remained in place until 1905. The fort was again lightly manned during World War I and at the outset of World War II. But in 1943 the disappearing guns were cut-up for scrap to support the war effort. The fort was closed in 1944 and declared surplus property. It was turned over to the State of Delaware in 1947 and became a State Park in 1951. During its entire history, Fort Delaware never fired a shot in anger. (Source: WWW.DELAWARECITY.INFO)

PORT PENN INTERPRETIVE CENTER

Another attraction in the area is the Port Penn Interpretive Center, located on Route 9 about four miles south of Delaware City. The Center offers displays and programs which explain the folk life of the historic wetland communities along the shores of the Delaware. Self-guided walking tours are available featuring the historic homes of Port Penn, as well as the scenic marshlands surrounding the town. The Center is operated by the State Division of Parks & Recreation.



PHOTO COURTESY OF THE FORT DELAWARE SOCIETY



PHOTO COURTESY OF VISITTHEFORT.COM

CULTURAL RESOURCES

FORT DUPONT

Fort DuPont is located on the shores of the Delaware River at the original Chesapeake & Delaware Canal near Delaware City. During the War of 1812, cannons were mounted on its shore to defend the Delaware River against the British

The first permanent fortification of this site was constructed during the Civil War with the installation of the Ten Gun Battery. In those days, the site was called “The Fort Opposite” due its location across the river from Fort Delaware. Along with Fort Delaware on Pea Patch Island in the Delaware River and Fort Mott on the New Jersey coast, Fort DuPont was part of a three-point defense system - now known as the “Three Forts.”

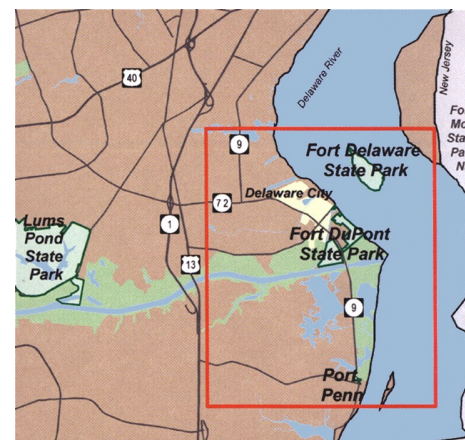
The fortification was strengthened in the 1870s when the battery was expanded to house twenty 15-inch Rodman guns and a concrete powder magazine was constructed. Major improvements were made again during the Spanish-American War in 1898. New batteries were constructed of concrete formed over steel frames to house “disappearing” guns, rapid-fire cannons, and mortars. Many of the bunkers and gun emplacements still exist today. In 1899, the site was named Fort DuPont in honor of Rear Admiral Samuel Francis du Pont, a Civil War hero from Delaware.

In the twentieth-century the fort was used to train soldiers for both World War I and World War II. Between the wars, the fort served as headquarters for the First Engineers Regiment. Many local residents remember units competing to build pontoon bridges across the Branch Canal during training exercises. During World War II, over 3,000 military personnel were stationed at Fort DuPont. It also held over 1,000 German and Italian prisoners-of-war from Rommel’s Afrika Corps. After World War II Fort DuPont was turned over to the State of Delaware. A portion of the site was dedicated as a State Park in 1992.

Text courtesy of delawarecity.info

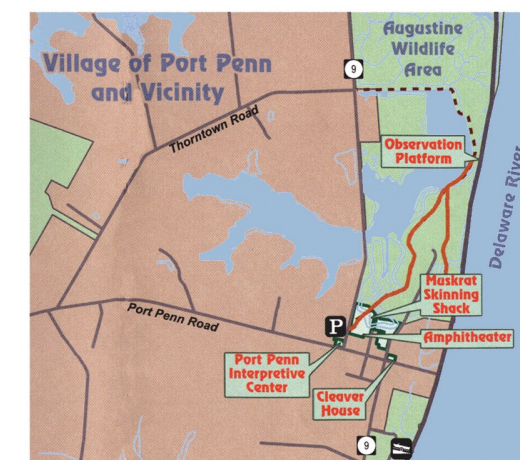


PHOTO COURTESY OF VISITTHEFORT.COM



Legend

Base Information	Facilities
Open Park Land	Parking
Wetland	Telephone
Wooded Park Land	Restrooms
Other Protected Lands	Information Boards
Water	Ferry
Roads	Fortress
Park Features	Fishing
Building	Picnic Tables
Parking	Basketball Courts
Restricted Areas	Tennis Courts
Trails	Scenic Overlook
River View	Trail Head
Prison Camp	Boat Launch
Wetlands	



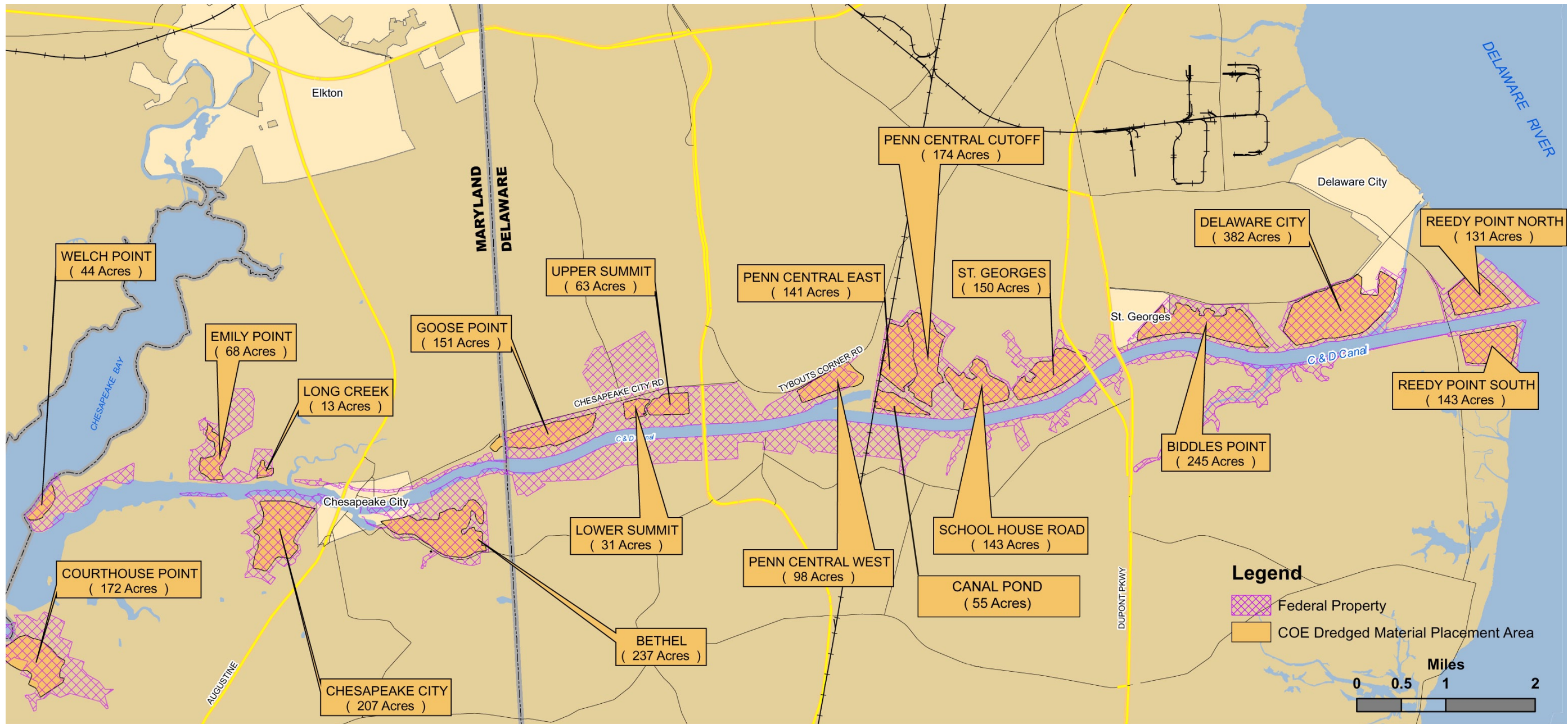
The DRBA’s [Three Forts Ferry Service](#) runs between Fort Mott in New Jersey, Fort Delaware State Park on Pea Patch Island and Delaware City, Delaware. From April through October, visitors experience authentic reenactments of Civil War episodes, both civilian and military, “lantern tours” of the fort at night and demonstrations of how people lived in the 1800s.

Text courtesy of threeforts.Com



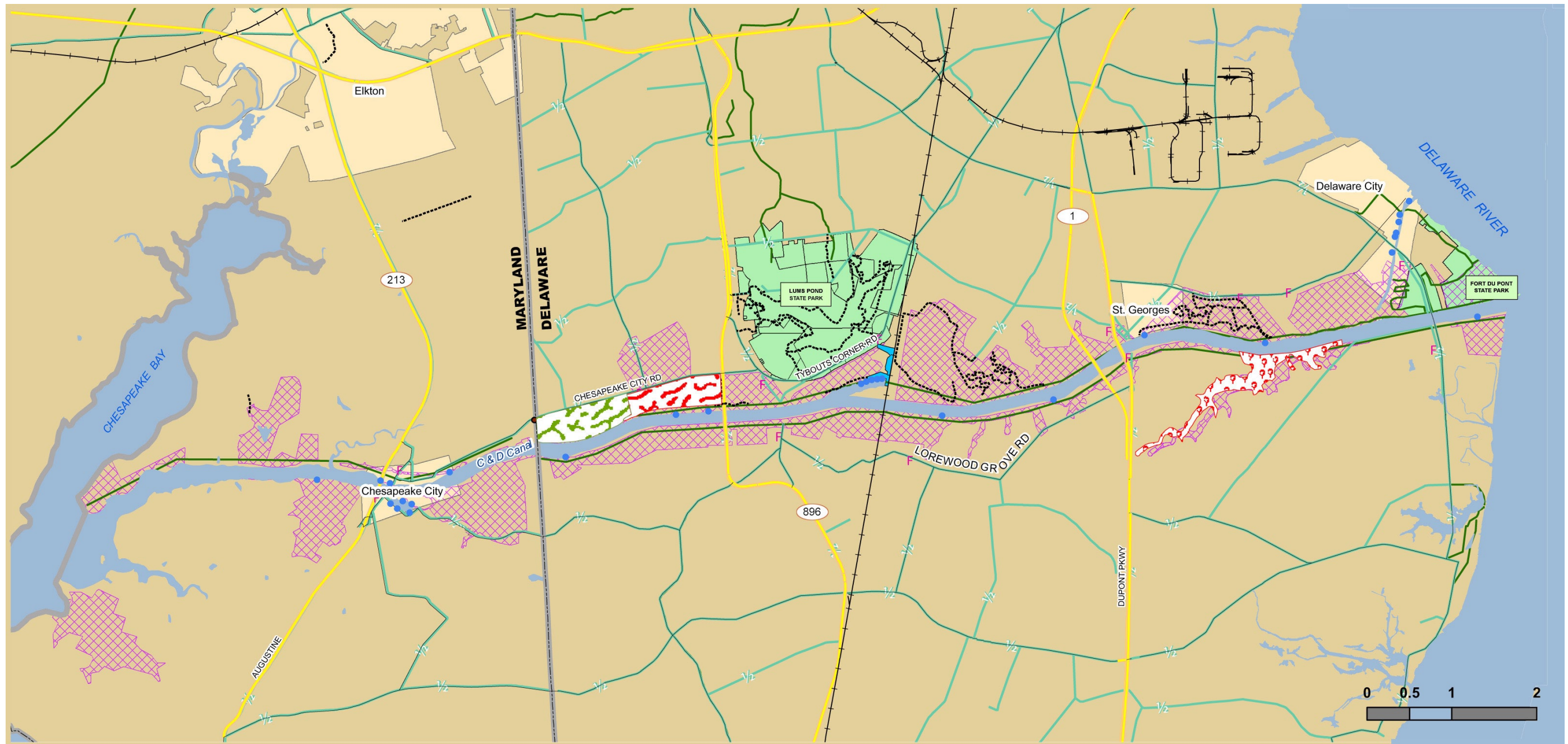
EXISTING CONDITIONS

CORPS DREDGED MATERIAL PLACEMENT AREAS



The Army Corps operates and maintains eighteen (18) Dredge Material Placement Areas directly along the north and south sides of the Canal in Maryland and Delaware. This is land set aside for the disposal of dredge material on a needed basis.

RECREATION AND OPPORTUNITIES



The Canal exists today as a functional waterway with supporting structures that facilitate its operation. In addition, the adjacent Canal property is utilized by local Delaware and Maryland residents during daylight hours for walking, running, biking, hiking, fishing, hunting, bird watching, dog-training, horseback riding among others activities. Restroom facilities are located at the Grass Dale Center in Fort DuPont, south of Delaware City, DE, and at the C&D Canal Museum in Chesapeake City, MD during its hours of operation.

Legend

- Federal Property
- Retriever Training Area
- Dog Training Area
- State Property
- Waterfowl Hunting Area
- Marinas
- Potential Trails
- Fishing Piers / Spots
- Trail Access Points
- Trails

EXISTING BIKE PATHS AND CONNECTIONS

Based on the New Castle County Bicycle Map, there are two statewide routes running over the C & D Canal, utilizing Summit Bridge and St. Georges Bridge. There is also one regional route, which runs along Route 9 and crosses over Reedy Point Bridge south of Delaware City. A series of recreational connector's link these main routes together utilizing county and municipal roads both north and south of the Canal. From these, it is possible to link into local roads and reach the Canal in several locations (see Current Canal major access points above).

In Maryland, Rt. 213 will be a major connection between the Canal Trail and Elkton to the north. Rt. 213 has generous 8 foot shoulders on either side which can accommodate bike traffic in both directions. This will allow linkage between the C&D Canal and potentially to Elk Neck State Forest, located southwest of Elkton and North East along the Northeast River. This forest park includes sandy beaches, marshlands and heavy wooded bluffs.

Moving south on Rt. 213 In Maryland, one could reach the Bohemia and Sassafras Rivers and on down to the southeast peninsula of Maryland.

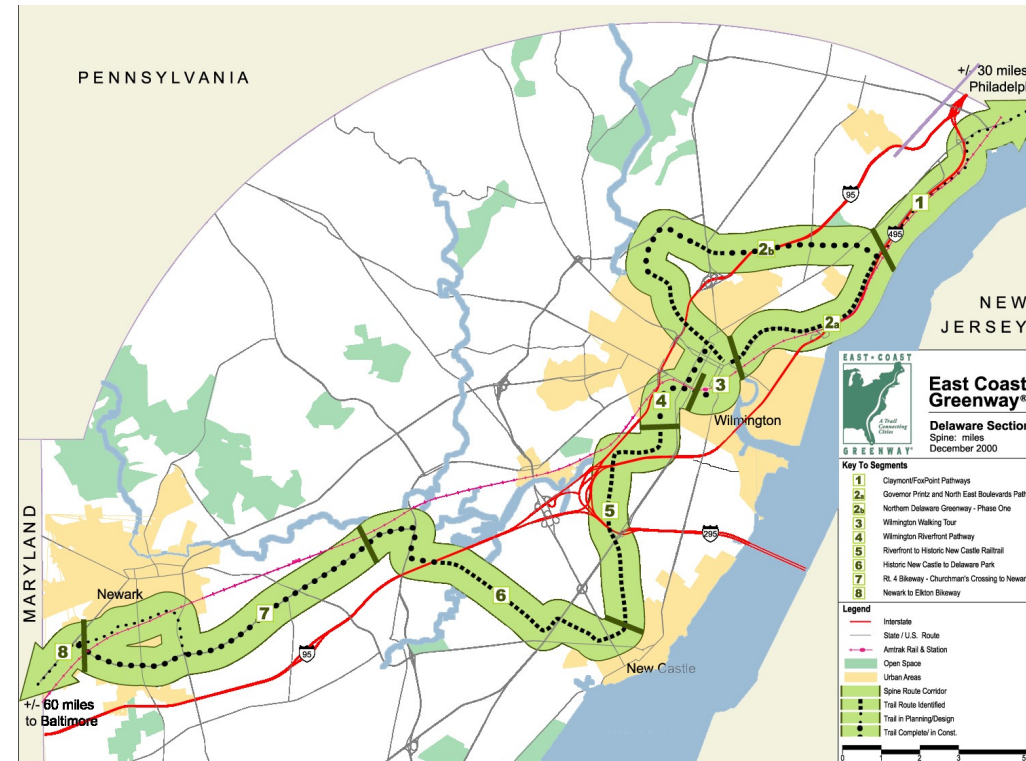
EAST COAST GREENWAY

Sometimes called the urban Appalachian Trail, "...The East Coast Greenway is the nation's first long-distance, city-to-city, multi-modal transportation corridor for cyclists, hikers, and other non-motorized users. The aim is to connect all major cities of the East Coast along a continuous, off road path that spans from Calais, Maine to Key West, Florida." The main route of the East Coast Greenway swings northwest of the Canal at Wilmington to connect Baltimore, Annapolis and Washington, D.C. A trail along the C & D Canal will serve as a connector trail to the main route of East Coast Greenway. (East Coast Greenway Alliance, 2006)

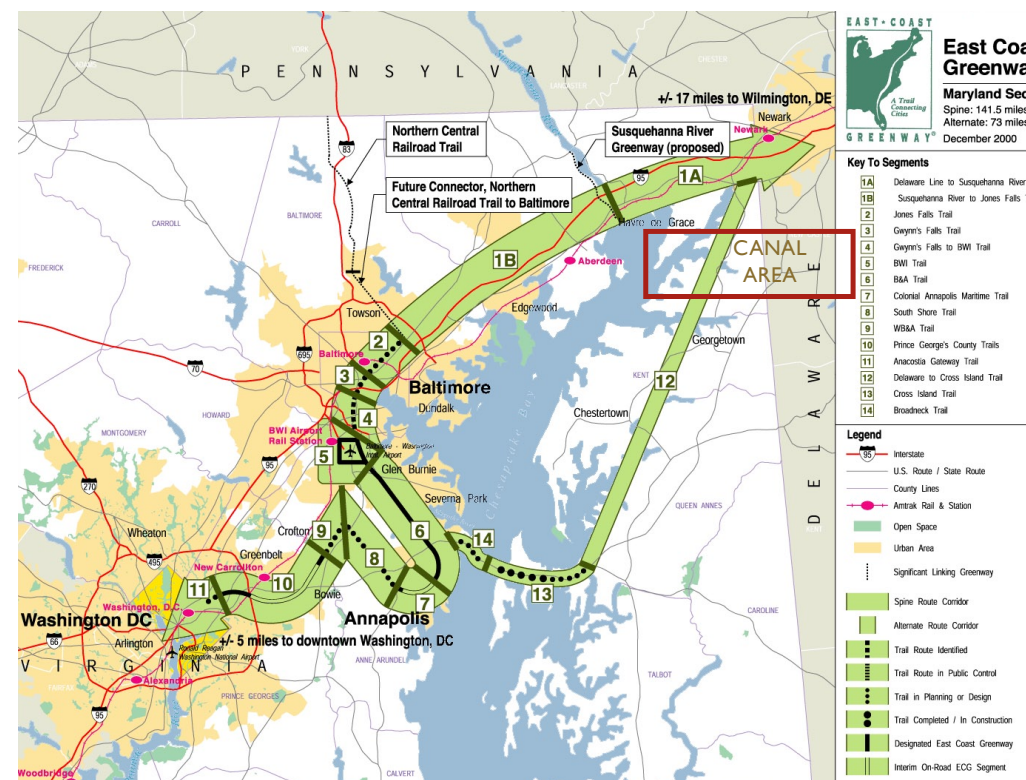
SERVICE ROADS

The land along the C & D Canal has over 100 miles of existing service roads constructed by the Army Corps to help service and maintain the viability of the Canal. In order to gain full access along its banks, the roads were constructed along its entire length, except for areas inaccessible by natural waterways.

At the center of the Canal, where its deepest cuts occur, a series of tier roads are located at varying elevations between the bottom and top of slope. This gives the Corps vertical accessibility as well as providing preventive measures against slope failure. The roads are constructed of gravel and they are drained away from the Canal toward collection swales. The water then collects in a series of drains which eventually drain back into the Canal.



EAST COAST GREENWAY - DELAWARE SECTION



EAST COAST GREENWAY - MARYLAND SECTION



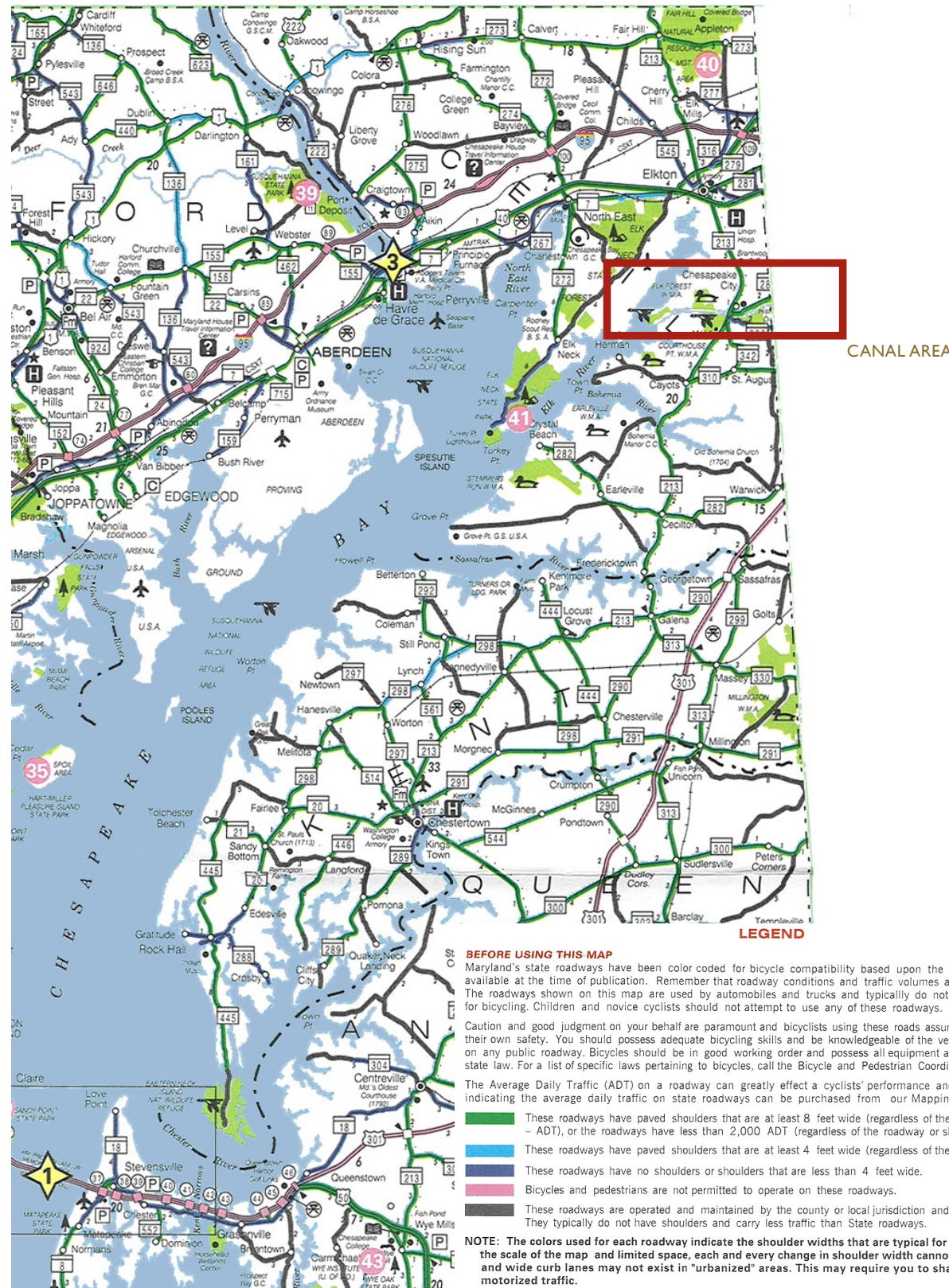
BICYCLISTS ON THE DELAWARE AND MARYLAND TRAILS



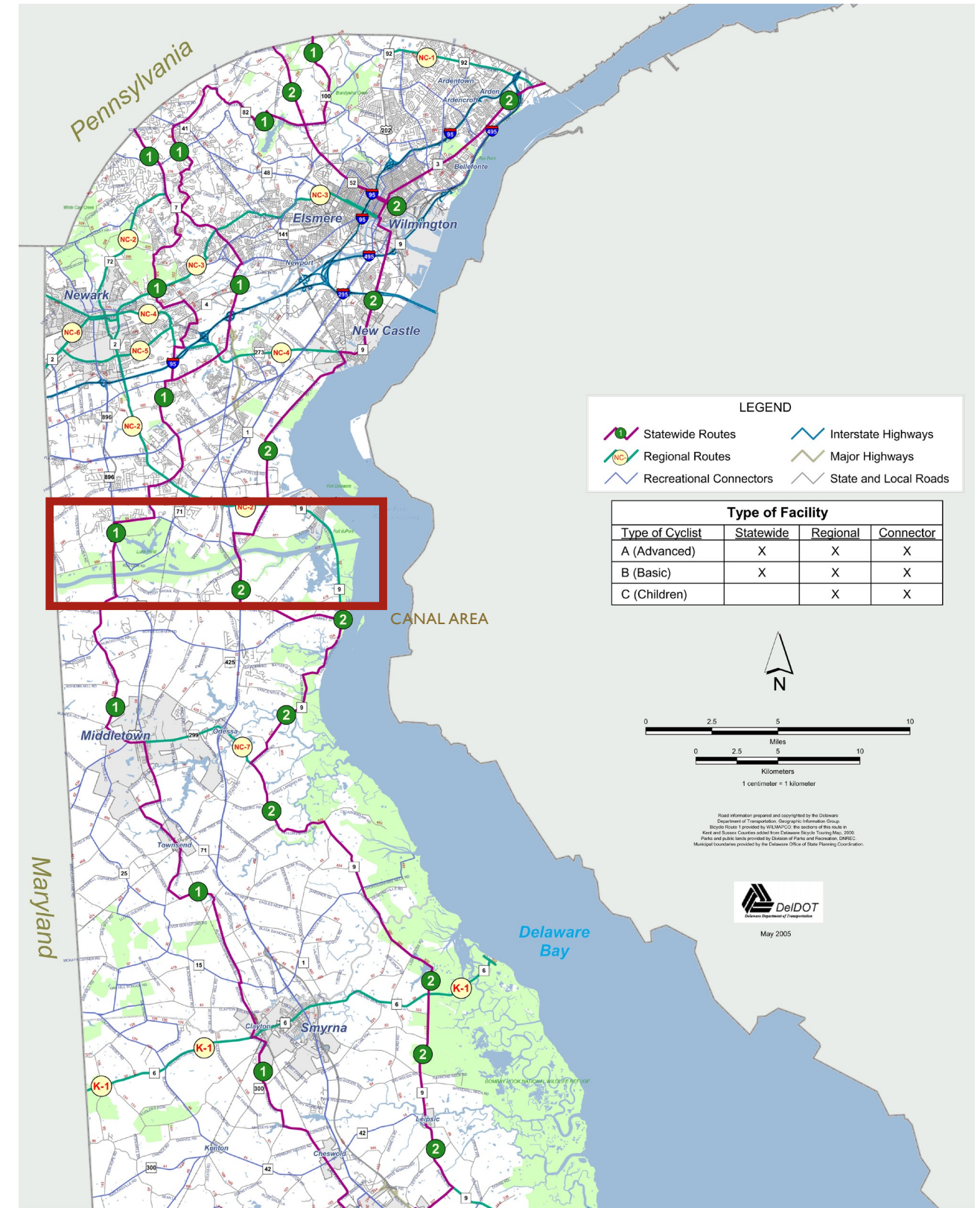
THE FISHING PIERS



THE FISHING PIERS



MARYLAND BICYCLE MAP (PARTIAL)



NEW CASTLE COUNTY ON-ROAD BICYCLE FACILITIES MAP

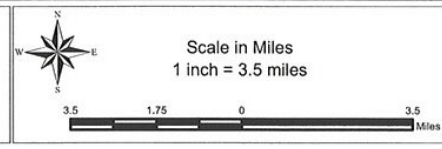
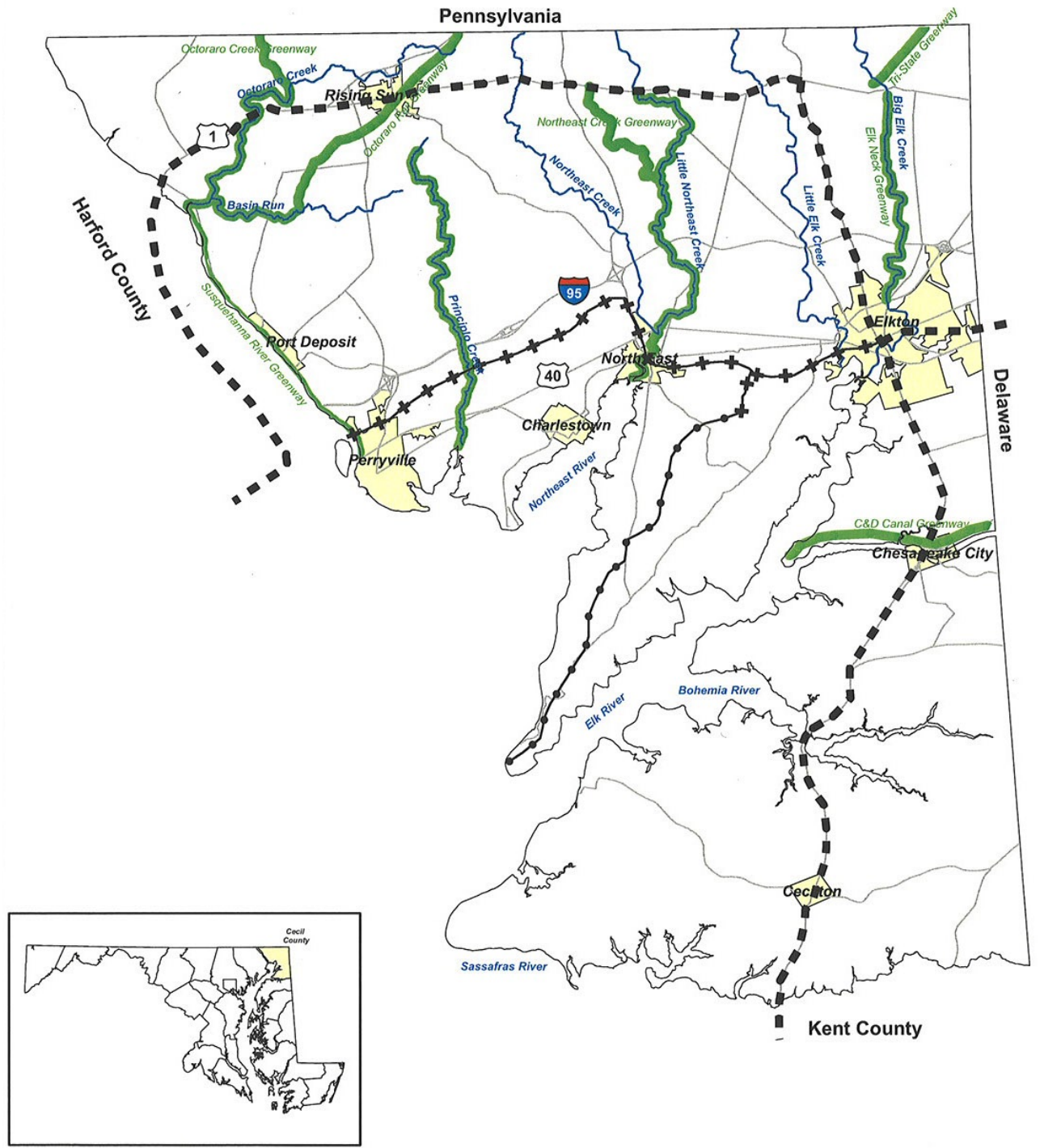
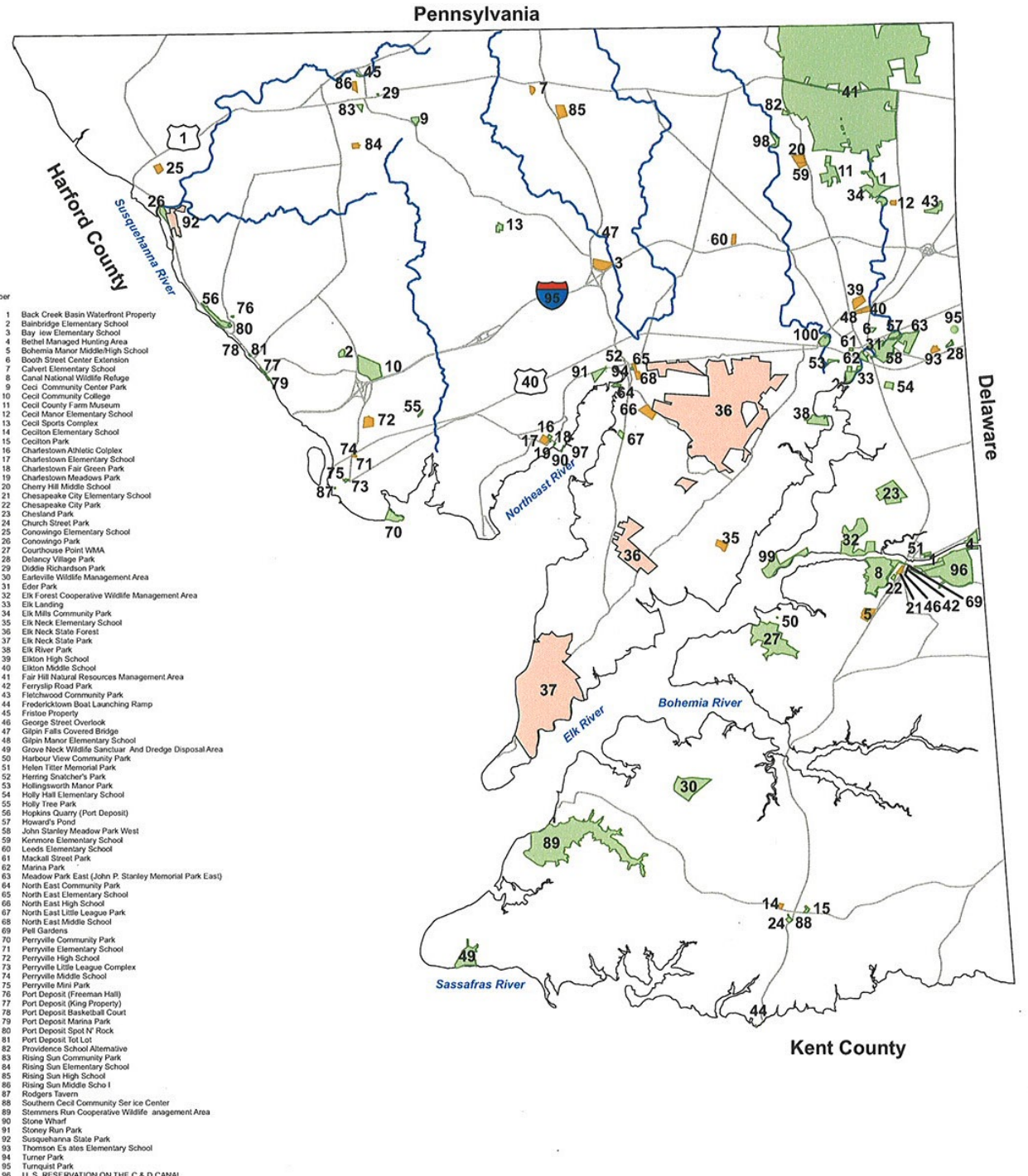


Figure III-4
Trails and Greenways
Cecil County Land Preservation,
Parks, and Recreation Plan



- Map ID Number
- 1 Back Creek Basin Waterfront Property
 - 2 Bainbridge Elementary School
 - 3 Bay View Elementary School
 - 4 Bethel Managed Hunting Area
 - 5 Bohemia Manor Middle/High School
 - 6 Booth Street Center Extension
 - 7 Calvert Elementary School
 - 8 Canal National Wildlife Refuge
 - 9 Cecil Community Center Park
 - 10 Cecil Community College
 - 11 Cecil County Farm Museum
 - 12 Cecil Manor Elementary School
 - 13 Cecil Sports Complex
 - 14 Cecilton Elementary School
 - 15 Cecilton Park
 - 16 Chafestown Athletic Complex
 - 17 Chafestown Elementary School
 - 18 Chafestown Fair Green Park
 - 19 Chafestown Meadows Park
 - 20 Cherry Hill Middle School
 - 21 Chesapeake City Elementary School
 - 22 Chesapeake City Park
 - 23 Chesland Park
 - 24 Church Street Park
 - 25 Conowingo Elementary School
 - 26 Conowingo Park
 - 27 Courthouse Point WMA
 - 28 Delancy Village Park
 - 29 Diddle Richardson Park
 - 30 Earleville Wildlife Management Area
 - 31 Eder Park
 - 32 Elk Forest Cooperative Wildlife Management Area
 - 33 Elk Landing
 - 34 Elk Mills Community Park
 - 35 Elk Neck Elementary School
 - 36 Elk Neck State Forest
 - 37 Elk Neck State Park
 - 38 Elk River Park
 - 39 Elkton High School
 - 40 Elkton Middle School
 - 41 Fair Hill Natural Resources Management Area
 - 42 Ferryship Road Park
 - 43 Fitzhwood Community Park
 - 44 Fredericktown Boat Launching Ramp
 - 45 Fristos Property
 - 46 George Street Overlook
 - 47 Gilpin Falls Covered Bridge
 - 48 Gilpin Manor Elementary School
 - 49 Glove Neck Wildlife Sanctuary And Dredge Disposal Area
 - 50 Harbour View Community Park
 - 51 Helen Tiber Memorial Park
 - 52 Herring Staibler's Park
 - 53 Hollingsworth Manor Park
 - 54 Holly Hill Elementary School
 - 55 Holly Tree Park
 - 56 Hopkins Quarry (Port Deposit)
 - 57 Howard's Pond
 - 58 John Stanley Meadow Park West
 - 59 Kenmore Elementary School
 - 60 Leads Elementary School
 - 61 Market Street Park
 - 62 Marina Park
 - 63 Meadow Park East (John P. Stanley Memorial Park East)
 - 64 North East Community Park
 - 65 North East Elementary School
 - 66 North East High School
 - 67 North East Little League Park
 - 68 North East Middle School
 - 69 Pelt Gardens
 - 70 Perryville Community Park
 - 71 Perryville Elementary School
 - 72 Perryville High School
 - 73 Perryville Little League Complex
 - 74 Perryville Middle School
 - 75 Perryville Mini Park
 - 76 Port Deposit (Freeman Hall)
 - 77 Port Deposit (King Property)
 - 78 Port Deposit Basketball Court
 - 79 Port Deposit Marina Park
 - 80 Port Deposit Spot N' Rock
 - 81 Port Deposit Sol Lot
 - 82 Providence School Alternative
 - 83 Rising Sun Community Park
 - 84 Rising Sun Elementary School
 - 85 Rising Sun High School
 - 86 Rising Sun Middle School
 - 87 Rodgers Tavern
 - 88 Southern Cecil Community Ser Ice Center
 - 89 Stenmors Run Cooperative Wildlife Management Area
 - 90 Stone Wharf
 - 91 Stony Run Park
 - 92 Susquehanna State Park
 - 93 Thomson Estates Elementary School
 - 94 Turner Park
 - 95 Turnquist Park
 - 96 U. S. RESERVATION ON THE C & D CANAL
 - 97 Veteran's Park
 - 98 Wilcox-Carlson Mill Park
 - 99 Welch Point Managed Hunting Area
 - 100 YMCA

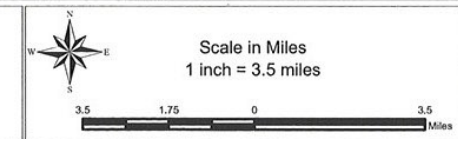
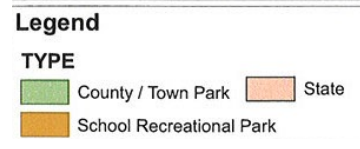


Figure III-2
Recreation and Public Open Space
Cecil County Land Preservation,
Parks, and Recreation Plan

CANAL BRIDGE CROSSINGS

There are five (5) main vehicular and one railroad bridge that currently cross the Canal. One is located at Maryland and four are located in Delaware. They are:

MARYLAND:

Chesapeake City Bridge (1940s)

DELAWARE:

Summit Bridge (1960)

Penn Railroad Lift Bridge (1966)

Reedy Point Bridge (1968)

SR 1 Bridge (1996)

St. Georges Bridge (1940s)

None of these bridges are directly accessible from the Canal service roads.

To understand the traffic volume that occurs on these bridges, please refer to the 'Canal Crossings Study Traffic Forecast Report' prepared by DelDOT on August 7, 2001.

CURRENT CANAL MAJOR ACCESS POINTS

Major Access points exist along the Canal in the following locations, moving from east to west:

MARYLAND:

U.S. Army Corps of Engineers Campus (at C&D Canal Museum)

Lock Street – Chesapeake City north

Charles Street – Chesapeake City south

DELAWARE:

Polktown Place (just west of Reedy Point and south of Delaware City)

Main Street – St. Georges south

C&D Canal Gravel Road – St. Georges north

Old Summit Road (south of Lums Pond State Park)

Old Summit Bridge Road (east of Summit Bridge)

Most of these access points do contain USACE signage identifying Canal and its permitted uses. Also, along the entire length of the Canal, there exist several minor Canal access points which are suitable for current and future access to the Canal.

MARINAS & BOAT ACCESS

Summit North Marina is located in a man-made, freshwater, tidal embayment that is connected to the northern side of the Chesapeake and Delaware Canal (C & D Canal) approximately three quarters of a mile to the south of Lums Pond. The mouth of the marina basin (southwestern end), at the Chesapeake and Delaware Canal, is located between a railroad bridge and Summit Bridge crossings over the canal. An unnamed stream extending from Lums Pond discharges fresh water into the northeastern end of the marina basin. The property, owned by the federal government (Corps), is leased to the State of Delaware, and is subleased to Summit North Marina as a concession operation in Lums Pond State Park. Revenue from the marina is shared with the State of Delaware, Department of Natural Resources and Environmental Control, Division of Parks and Recreation. The original construction of the Marina began in 1989.

MARINA FACILITY DESCRIPTION EXISTING CONDITIONS

The water-based marina facilities currently consist of:

- An access pier along the northern shore of the basin;
- Nine finger piers that extend into the basin;
- 250 boat slips (23 to 27 boat slips along both sides of each finger pier);
- A fuel dock;
- Wastewater pump-out; and
- A travel lift.

The access and nine finger piers are of the floating type that rise and fall in response to changes in water level. Only boats equipped with U.S. Coast Guard approved marine sanitation devices are permitted to berth in the marina. The western portion of the marina basin and the entrance channel between the C & D Canal and the marina basin are periodically dredged to maintain water depth of approximately 12 feet at mean low water (MLW).

The land-based marina facilities currently consist of a marina office, bathhouse, unpaved parking lots, paved and unpaved access roads, a boat and boating equipment sales and repair building, long-term and winter boat storage areas, and a restaurant. The marina is serviced by a sewage collection system and a public potable water system.

PROPOSED EXPANSION

An expansion of the marina is proposed. Proposed land-based facilities include construction of additional parking areas, extension of the access road, and construction of an additional bathhouse to the west of the existing restaurant.

The water-based portion of the proposed expansion includes:

- Dredging a portion of the basin entrance to a depth of approximately 12 feet below MLW;
- Installing three additional floating finger piers, a wave attenuator, and an attached finger pier at the western end of the marina for a total of 90 new slips;
- Installing a new access ramp that will extend from the northern basin shore to the access pier;
- Installing a floating perimeter pier along the southern side of the marina basin to provide berths for approximately 38 transient boats; and
- Constructing a forklift well to facilitate launching and recovering boats.

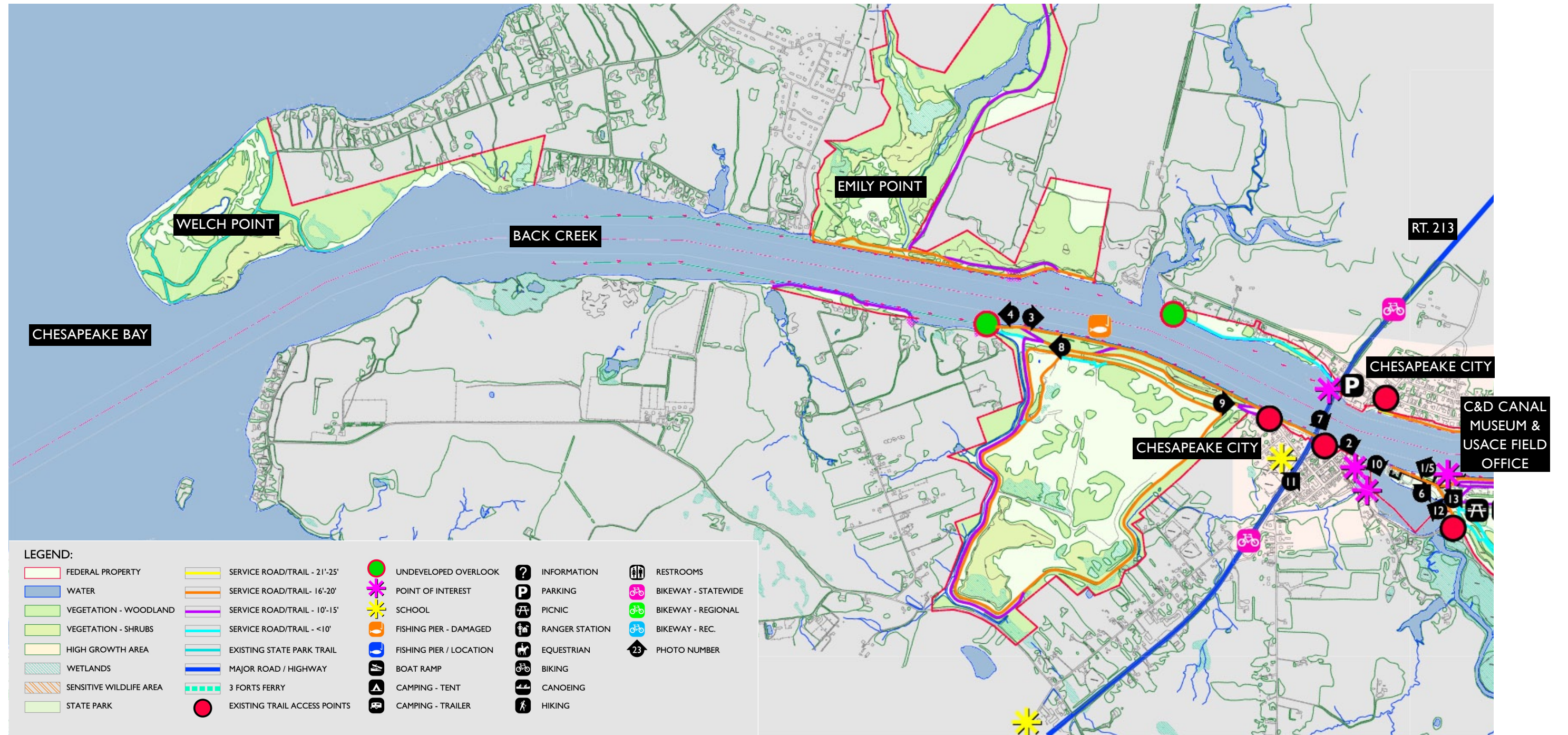
Marinas also exist at two other areas along the Canal: Delaware City and Chesapeake City. In Delaware City, the Delaware City Marina is located on the north side of the old Canal branch, between Route 9 and Clinton Street. A public boat launch located in Fort DuPont State Park on the south side of the old branch Canal.

In Chesapeake City, there are marinas at the north and south sides of the Canal, east of the bridge. The southside marina is located at the western edge of the mooring basin.

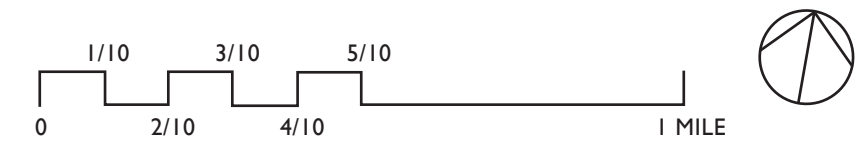
FISHING PIERS

There are currently ten (10) fishing piers owned and operated by the USACE along the Canal. Seven of the ten are failing from major neglect and disrepair. The remaining three are useable but suffer from the same neglect as well as vandalism through fire. Two piers are located in Maryland and eight are located in Delaware.

CURRENT UTILIZATION DIAGRAM – WELCH POINT TO CHESAPEAKE CITY



Photos on opposite page are keyed to the map above



CURRENT UTILIZATION IMAGES – WELCH POINT TO CHESAPEAKE CITY - PHOTOGRAPHS



CHESAPEAKE CITY BRIDGE AT DUSK



CHESAPEAKE CITY BAND SHELL



HOG'S CREEK TRAIL TERMINUS



HOG'S CREEK TRAIL TERMINUS LOOKING WEST



USACE FIELD OFFICE OVERLOOKING CANAL



C&D CANAL MUSEUM



VIEW OF CHESAPEAKE CITY



CHESAPEAKE CITY DREDGED MATERIAL AREA



VIEW TO CHESAPEAKE CITY BRIDGE



CHESAPEAKE CITY MARINA



DOWNTOWN CHESAPEAKE CITY

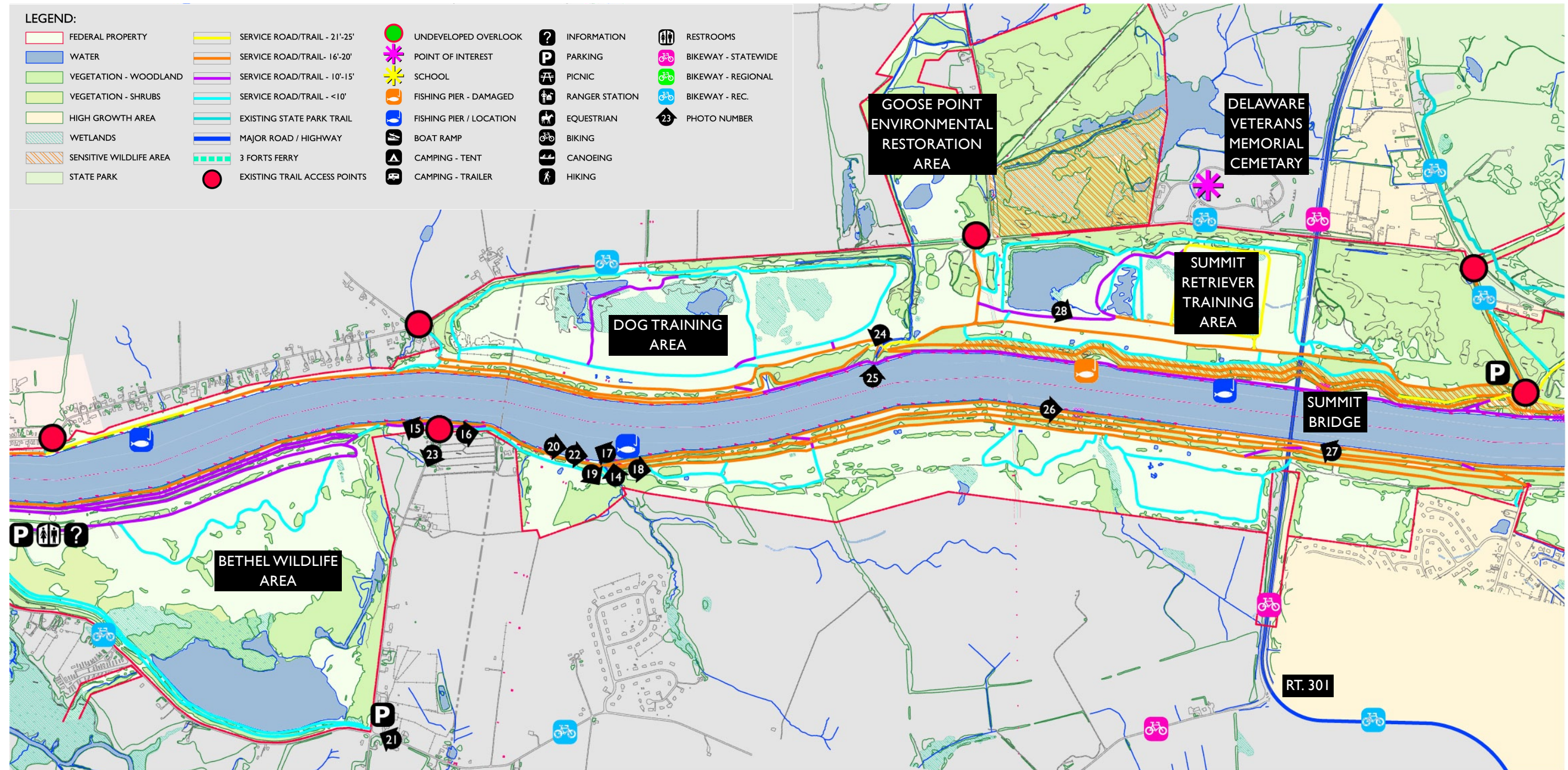


CHESAPEAKE CITY MOORING BASIN

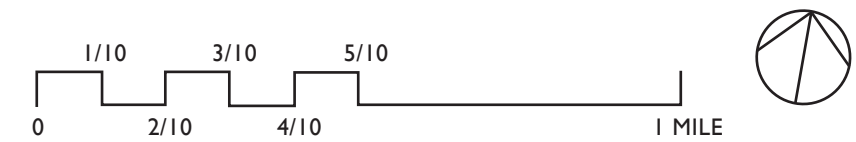


USACE SERVICE ROAD ENTRY

CURRENT UTILIZATION DIAGRAM – CHESAPEAKE CITY TO LUMS POND STATE PARK



Photos on opposite page are keyed to the map above



CURRENT UTILIZATION IMAGES – CHESAPEAKE CITY TO LUMS POND STATE PARK -



BETHEL FISHING PIER



BETHEL - LOOKING WEST FROM TRAIL ACCESS



BETHEL - LOOKING EAST FROM TRAIL ACCESS



BETHEL - LOOKING WEST FROM FISHING PIER



BETHEL THIRD TIER SERVICE ROAD



BETHEL - SIGNAGE



BETHEL - SIGNAGE



BETHEL - WILDLIFE PARKING



BETHEL FISHING PIER



BETHEL - LOOKING SOUTH DOWN ACCESS ROAD



GUTHRIE RUN OUTLET



GUTHRIE RUN DRAINAGE CULVERT



LOWER SERVICE ROAD NEAR SUMMIT

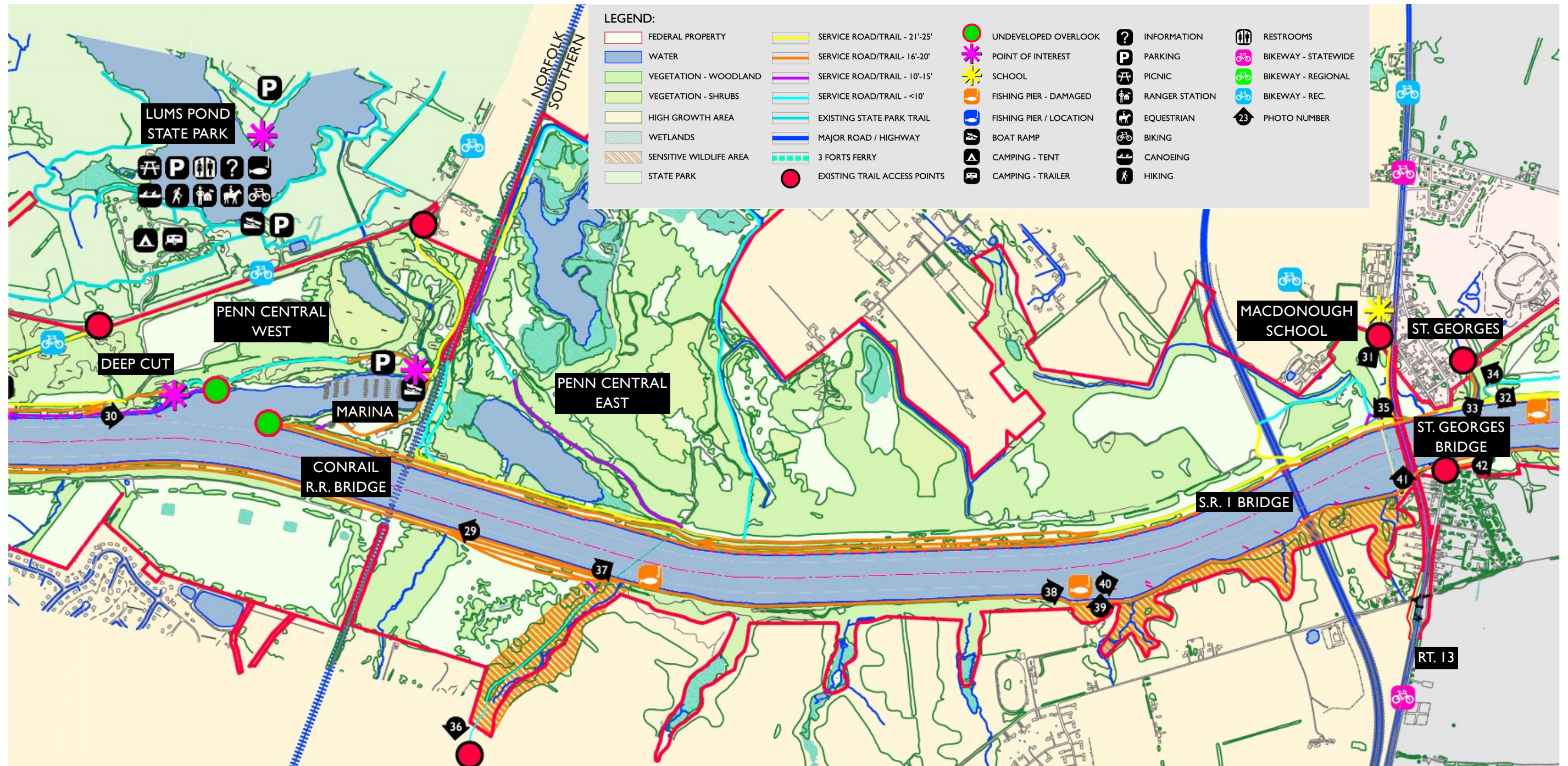


SUMMIT BRIDGE

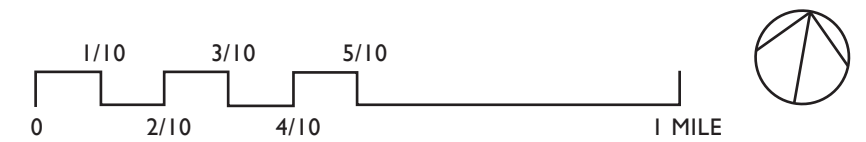


SUMMIT BRIDGE LOOKING SOUTHEAST

CURRENT UTILIZATION DIAGRAM – LUMS POND STATE PARK TO ST. GEORGES



Photos on opposite page are keyed to the map above



CURRENT UTILIZATION IMAGES – LUMS POND STATE PARK TO ST. GEORGES - PHOTOGRAPHS



RAILROAD BRIDGE



SERVICE ROAD ADJACENT TO DEEP CUT



ST. GEORGES BRIDGE NORTH



DAMAGED ST. GEORGES FISHING PIER



ST. GEORGES NORTH - EAST OF BRIDGE



ST. GEORGES NORTH OFF CHESAPEAKE CITY ROAD



ST. GEORGES NORTH



GATE ACCESS AT JOY RUN



UTILITY SPAN EAST OF RR BRIDGE



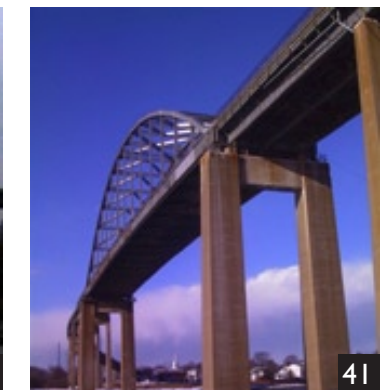
VIEW TO S.R. I BRIDGE



DAMAGED FISHING PIER WEST OF S.R. I BRIDGE



S.R. I BRIDGE AND ST. GEORGES BRIDGE BEYOND

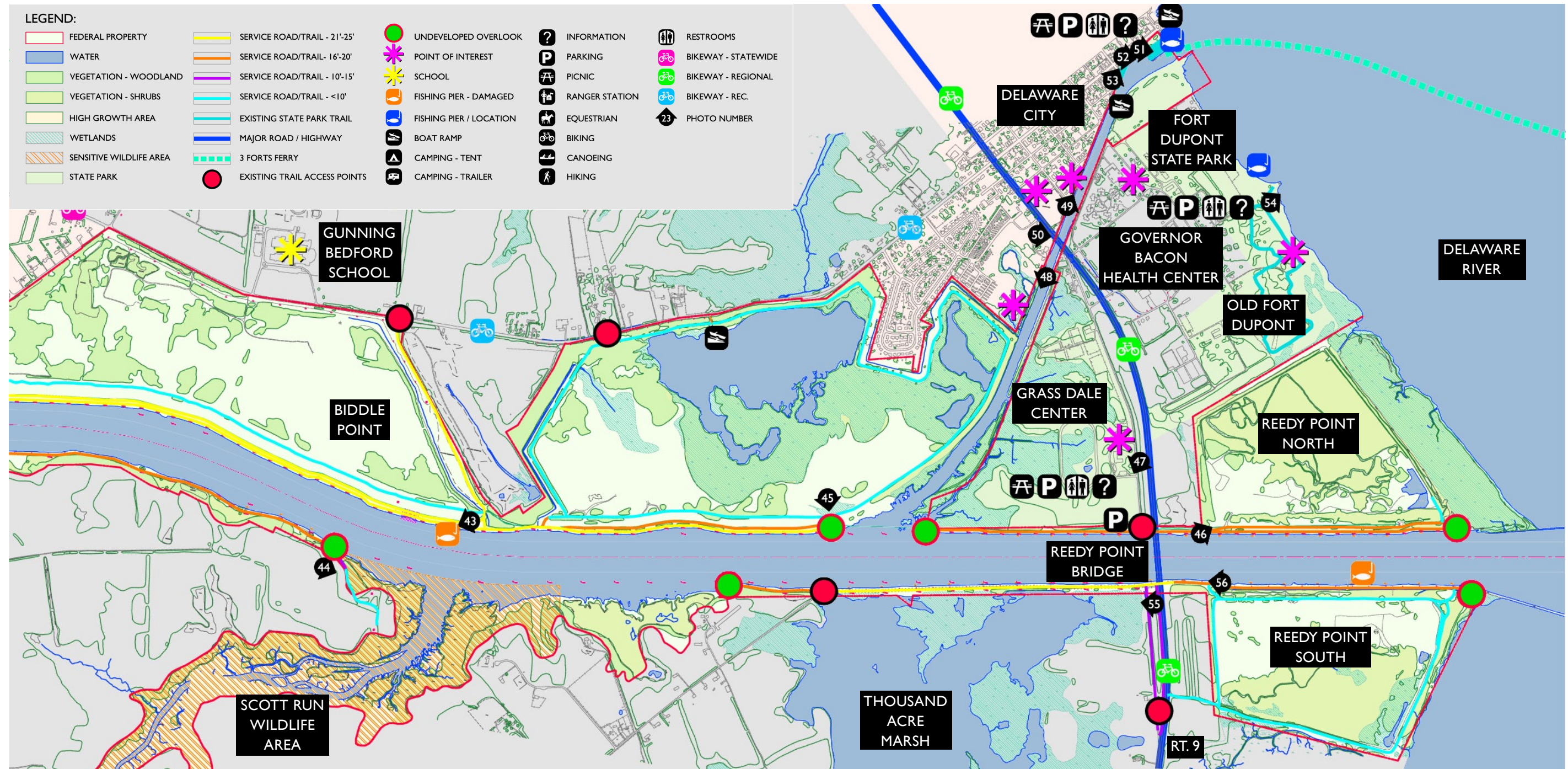


ST. GEORGES BRIDGE

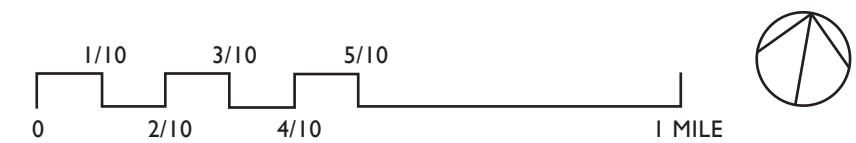


ACCESS TO SERVICE ROAD - ST. GEORGES SOUTH

CURRENT FACILITIES DIAGRAM - ST. GEORGES TO DELAWARE CITY/REEDY POINT



Photos on opposite page are keyed to the map above



CURRENT FACILITIES IMAGES - ST. GEORGES TO DELAWARE CITY/REEDY POINT



43

BIDDLE POINT FISHING PIER



44

SCOTT RUN OVERLOOK



45

REEDY POINT NORTH - LOOKING EAST



46

REEDY POINT NORTH - LOOKING SOUTH



47

GRASS DALE CENTER PARKING AREA



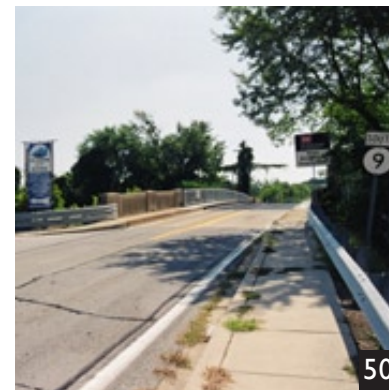
48

OLD BRANCH CANAL



49

OLD BRANCH CANAL - DELAWARE CITY MARINA



50

BRIDGE OVER OLD BRANCH CANAL



51

3 FORTS FERRY BUILDING - DELAWARE CITY



52

DELAWARE CITY PROMENADE LOOKING EAST



53

DELAWARE CITY PROMENADE LOOKING NORTH



54

OLD FORT DUPONT OVERLOOK



55

REEDY POINT BRIDGE LOOKING WEST



56

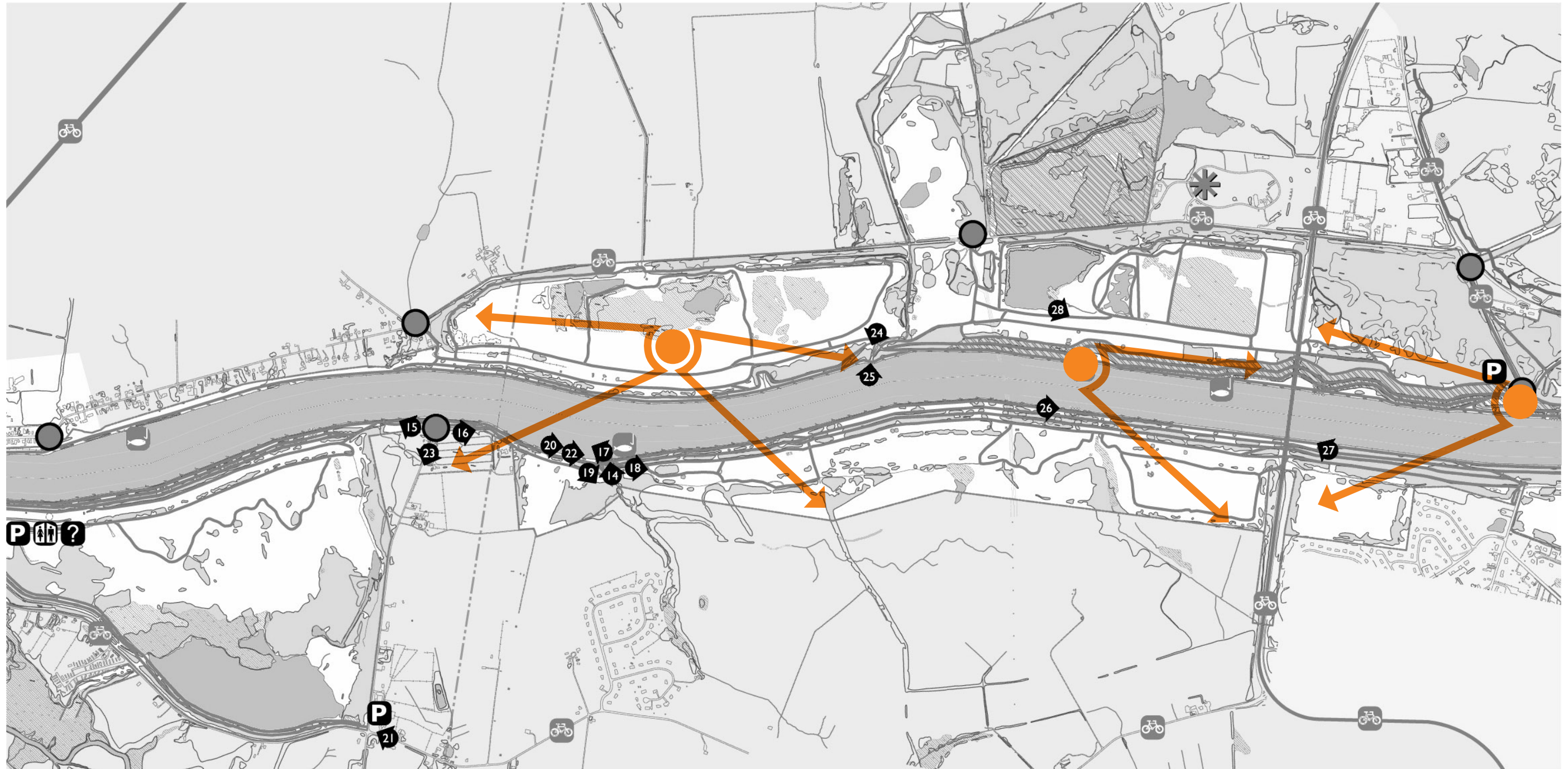
REEDY POINT BRIDGE

EXISTING CONDITIONS

SIGNIFICANT VIEWS - WELCH POINT TO CHESAPEAKE CITY



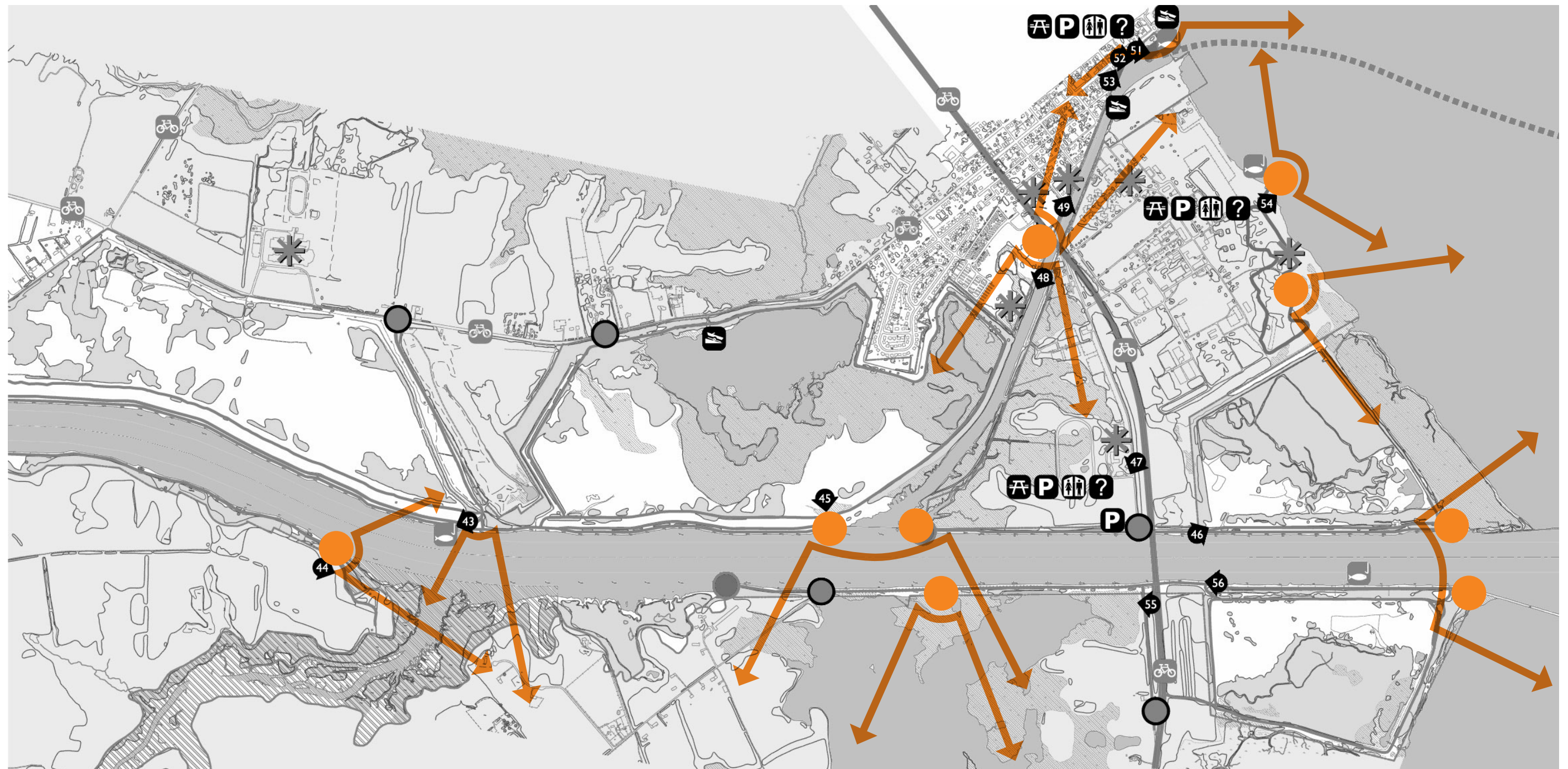
SIGNIFICANT VIEWS - CHESAPEAKE CITY TO LUMS POND STATE PARK



SIGNIFICANT VIEWS - LUMS POND STATE PARK TO ST. GEORGES



SIGNIFICANT VIEWS - ST. GEORGES TO DELAWARE CITY/REEDY POINT



RESULTS OF C & D PUBLIC SURVEY

PUBLIC INVOLVEMENT

The major objectives of the Canal study outreach program were to establish an ongoing dialogue with the public about the study, collect their comments about recreation at the C & D Canal, and merge the knowledge of the Working Group with the public's feedback for inclusion in this Conceptual Study. Prior to establishing the Working Group, Congressman Castle and the Corp of Engineers Philadelphia District conducted a joint press conference at the Canal to announce the study, intent, and funding. Other press conferences, news releases, and media interviews announced the establishment of the working group and the public meetings.

The Working Group, including local, state and federal agencies and organizations, reflects the diversity of the project and the need to collect information from many sources. Sitting at the planning table are members from the U.S. Army Corps of Engineers; Congressman Michael N. Castle's office; Delaware Department of Natural Resources and Environmental Control; Delaware Department of Transportation; New Castle County, Delaware; Delaware Greenways Inc.; Delaware City, Delaware; St. Georges, Delaware; Congressman Wayne Gilchrest's office; Maryland Department of Natural Resources; Maryland Greenways and Water Trails; and Cecil County, Maryland. The Working Group's direct connection to the local, state and regional public fostered good community relations and helped to spread the word about the Canal study and public meetings. Every member had a voice and contributed either directly or indirectly to the project.

As the project commenced, a wealth of studies and other information were available to the Working Group including the State of Delaware Statewide Comprehensive Outdoor Recreation Plan and the Cecil County, MD Land Preservation, Parks, and Recreation Plan. These studies formed the foundation of the recreation activities that were being considered and led to the Planning stage of our public outreach program. In spite of the historical and current information about recreation in Delaware and Maryland, the information about the current and potential recreation along the C & D Canal was scarce due, in part, to recreation being an informal activity. Therefore, the Working Group developed a public survey to gather important information about the preferred recreation choices of both current and potential users. The goal of the survey was to quantify the public's wants and needs for recreation on the C & D Canal and identify the concerns and issues of neighbors and users.

The strategic messages developed by the Working Group:

- Stewards of the environment and wildlife
- Stewards of your tax dollars
- Local and state officials are involved in the study and share your concerns
- Connecting two states
- C & D Canal is a major commercial waterway serving the region and nation
- Recreation is important to quality of life and demand will increase in the future
- Space for recreation is limited
- The project's starting point is a multi-use path
- The project will accommodate many forms of compatible recreation
- The project will not reduce current recreation at the Canal
- We need your input to make this a successful project

The first set of public meetings was conducted in April 2005 over two evenings with one meeting in Delaware and one in Maryland providing public outreach spanning the length of the Canal. The public meetings, attended by 250 people, were an opportunity to inform the public about the Canal, its regional mission and the varied uses of its 9,000 acres: wildlife management areas, wetlands, Canal maintenance and dredge material disposal sites, four Corps-owned bridges, and 24-hour dispatch operations along the 15 miles of the Canal waterway.

The public meetings began with a few remarks from the project sponsors, Congressman Castle and the Philadelphia District Corp Commander, followed by a brief presentation by the project manager and a question and answer session. The public was then encouraged to talk with the Working Group to informally discuss their issues and concerns. A series of posters displaying the wildlife areas, current recreation areas, federal land used for dredge disposal sites, public land surrounding the Canal and an aerial mosaic of the Canal area were tools to engage the public in voicing their concerns and interests. Chart paper on easels was available for the public to write down comments and ask questions.

The written surveys were available at the sign-in table with table space for people to sit and write out their responses to the survey questions. The Canal Study web site (<http://www.nap.usace.army.mil/Projects/CD/index.htm>) launched immediately following the first public meeting which provided information, comments by the public and the opportunity to fill out the same survey provided at the public meetings. The written and online survey would run for 30 days after which DNREC personnel would analyze the results and provide them to the rest of the team. Those people who could not attend the public meetings could access the survey online at the Canal study's web site. In addition to the people who completed public comments, approximately 300 public comments have been received and posted to the Trail Concept Plan website.

A follow-up series of public meetings was held in December 2005 to announce the completion of the analysis and conceptual design for the multi-use path. The meetings, attended by 300 people, were held at the same locations, using the same informal small group discussions and formal presentation followed by a question and answer session. The purpose was to share the survey findings and the conceptual design to the public. The Working Group collected comments about how the public viewed the conceptual design so it could continue developing the study and plans. The posters and presentations were focused on this theme.

The specific results (not scientific) of the outreach program:

Overall, 474 people completed the public survey and 80% were current C&D Canal users. Of those users, 97% stated they use the land and 64% use the water. Half of the survey respondents live in Delaware while 30% live in Maryland.

Based on this survey, dog training is the most popular use of the Canal for current users. Other activities that ranked high among current users are observing wildlife, hiking/walking/jogging and bicycling. The average participation days per year were highest for those observing wildlife followed by hiking/walking/jogging, bicycling and equestrian users.

When asked to rate the importance of both current and potential recreational uses of the Canal, the most important activities (for the survey respondents) were dog training and observing wildlife followed by preserving the area, hiking/walking jogging, fishing and bicycling. It is interesting to note that for both users and non-users observing wildlife and preserving the area ranked in the top three of importance. In addition, observing wildlife and preserving the area ranked among the top 4 potential uses based on the distance respondents lived from the C & D Canal.

Nearly 40% of the respondents indicated that more outdoor facilities and opportunities would encourage them to use the C & D Canal more often and 35% indicated that better security is the factor that would encourage them to use the Canal more.

Overall, the outreach effort has accomplished two important goals. First, the public has gained a greater respect and understanding of the Corps' land usage and responsibilities in and along the C & D Canal. Secondly, everyone (the Public and Working Group) has gained a better awareness of current recreation activities on the Canal and the requirements and potential issues among users.

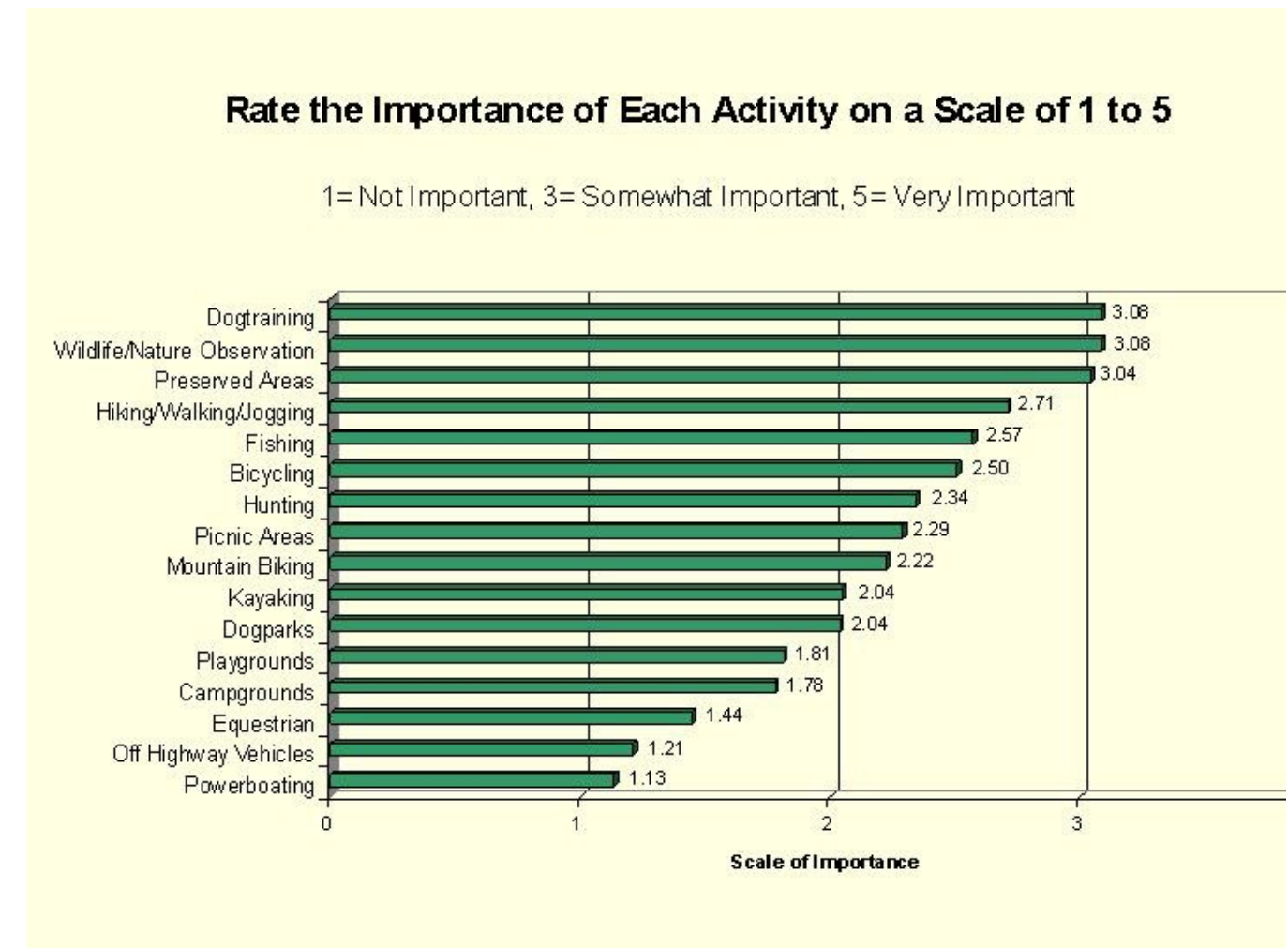
Additionally, this outreach effort provided a means to share information between neighbors and various recreational groups. The information sharing will continue throughout the life of the study and project; public comments and project updates will continue to be posted to the web. To date, we have compiled an email list of approximately 600 people.

Summary of Public Input

Overall the public input was positive but tempered with the concern that the Working Group not favor one form of recreation over another. Major concerns were safety and security, especially from the local homeowners' standpoint, considering the numbers of people who would use the new facility, ensuring the viability of the land to sustain or improve environmentally, and not wanting to add more asphalt to the state's open lands that would only meet the needs of a relatively few groups.

Additional comments focused on:

- Creating educational opportunities
- Losing or curtailing hunting, fishing and other ongoing activities
- Keeping the Canal as it is and making no changes at all
- Concern for the environment and wildlife
- Adding facilities for and allowing recreational opportunities that are currently not authorized at the Canal such as dirt bikes and other off-road vehicles
- Developing a multi-purpose trail for equestrians, walkers, joggers, bikers, and others
- Changing traffic patterns and accessibility for local residents



PLEASE SEE APPENDICES FOR THE FOLLOWING INFORMATION

1. Project web page
2. Sample of public input via email
3. Public Survey from first meeting
4. Survey Presentation from second meeting
5. Public input from second meeting (scanned copies)

MULTI-USE TRAIL DESIGN AND ASSOCIATED AMENITIES

TRAIL DESIGN CONSIDERATIONS

The advantage of building a trail along the C & D Canal is that a majority of the service roads and access points have long been established with construction of the sea-level Canal. Although most tier roads are unpaved; the widths, sight lines for two-way traffic, grading and drainage are in place. Upgrades are required, but overall the stage is set for layout and construction.

The first tier of service road, directly adjacent to the Canal waterway is identified by the Working Group as the best location to create a continuous multi-use trail along both sides from Chesapeake City, MD to Delaware City, DE. The proposed C & D Canal Trail is expected to accommodate various user activities with increasing amounts as population and awareness of the trail grows. Because the trail system will be constructed on an existing service road bed, it must also support ongoing Army Corps of Engineers maintenance operations and emergency vehicle access. These considerations are important factors for determining design decisions regarding the proposed trail.

Accessibility is another important consideration for the proposed trail design. The U.S. Architectural and Transportation Barriers Compliance Board has released proposed Accessibility Guidelines for Outdoor Developed Areas under the Americans with Disabilities Act (ADA). These guidelines provide recommendations for surfacing, width, cross slope, longitudinal slope and other trail characteristics for new and reconstructed trails. There are exemption provisions for cases where the proposed standards would cause substantial harm to historic or natural features, alter the purpose of the trail, or for areas of rugged terrain.

It is not the intention of this study to interpret the applicability or repeat the technical contents of the guidelines. However, the guidelines should be consulted for detailed information as the trail is designed and constructed. The recommendations are consistent with good trail design and have been incorporated into this concept design.

TRAIL PAVING MATERIALS

In order to accommodate the anticipated user activity, provide accessibility and maintain access for future maintenance operations, a paved surface is recommended for the proposed multi-use trail system. The paved surface of multi-use trails typically consists of bituminous concrete (asphalt) or Portland cement on a crushed aggregate base course.

It is recommended that the C & D Trail be constructed of bituminous pavement for several reasons. Bituminous pavement typically has a lower installation cost when compared to other paved trail surfaces. It also has the advantage of a smooth surface, which can be a consideration in areas of heavy pedestrian and roller blade use. The disadvantage is that Bituminous pavement will need periodic sealing and overlays to maintain surface quality.

A second paving material, stone fines, is also proposed for the trail system to accommodate user needs, and to address soil and geological conditions along the trail.

It has been documented by the Army Corp of Engineers that along the planned trail alignment, geological slumping occurs with some regularity in specific areas. Since the sea level construction of the Canal, several service tier access and maintenance roads have been observed sinking (or slumping) in elevation. These areas are currently being monitored for further movement over time. The most recent geotechnical inspection by the USACE of the slumping areas describes the problem in more detail and is included in the Appendix of this report. (see SFY2004 Geotechnical Inspection of the Chesapeake and Delaware Canal Slopes, October 2004)

In order to establish an improved trail surface, a design solution will be required to address the slumping problem to avoid warping, sinking or cracking due to earth movement below subgrade. One solution would be to construct the trail in these slump areas with granular stone fines, in lieu of asphalt pavement. The use of stone fines, will provide adequate trail hardening and will be easier to repair, fill and grade to new, even levels at a potentially lower cost than heavy duty asphalt.

Stone fines have several different names according to locality. The names include crusher fines, cinder or rock dust. Whatever the local name, all are increasingly popular as trail surfaces for multi-use trails for a number of factors. As an alternative to asphalt, crushed stone trails can meet the American Disabilities Act (ADA) Accessibility Guidelines and support a wide range of trail users including hikers, cyclists, baby strollers, wheelchairs and equestrians.

The recommended grade for stone fine trails is less than 8% grade to promote accessible use. Most of the existing grade along the C& D Canal service roads on the lower tier is less than 3%. Stone fines have also proven to be a good alternative in areas that have poor drainage or soil conditions.

“In areas with long periods of rain or snow and clay or silt based soils, park infrastructure trails are often surfaced with concrete or crusher fines to minimize muddy trail conditions and reduce facility maintenance....Trail treads surfaced with 4-6 inches of compacted fines over a landscape fabric (geotextile) can eliminate many of the problems associated with soils and climate. Landscape fabrics or geotextiles are also the key to preventing vegetation from growing into the trail and preventing comingling of the crusher fines with the natural soils.” (T. Boone, The Art of Building Crushed Stone Trails, 2005)

Stone fines are not to be confused with gravel paths. The gravel used in path systems is screened to remove the fines and so the gravel remains loose. This is due to the fact that rounded gravel allows void space or pockets to form between the stones, and resists compaction. Stone fines have no gravel or soil. Stone fines are pure crushed stone which contain the natural binders that allow for the hardening of the trail.

“Crusher fines retain their inherent soil cements and binders which promote soil compaction. Fines that contain too many rounded particles (like some decomposed granites) are more difficult to interlock and often yield a loose and unconsolidated surface. Angular particles like andesite, dolomite, and certain types of granite can easily be wetted and compacted....A good indication of the strength of a rock binder is the hardness of the parent rock.



PHOTOS OF TYPICAL MULTI-USE TRAILS CONSTRUCTED WITH STONE FINES

The harder the source rock, the stronger the binders will be. Crushed rock contains the original rock cements and binders within the rock dust. These binders, combined with water and then compacted with a vibratory roller or plate compactor should produce a solid, compacted surface that resists significant deformation from hiking boots and mountain bike tires.” (T. Boone, The Art of Building Crushed Stone Trails, 2005)

In the areas of known slumping along the trail, if the surface of the trail becomes loose, slumps or uncompacted over time it can be reshaped, wetted and compacted again. Several factors can lead to an unsuccessful stone fine trail, most of which deal with improper construction techniques. They include:

- Lack of fines to bind particles together (high percentage of gravel)
- Improper wetting and compacting
- Lack of angularity in the fines (rounded fines create pore spaces which do not compact)
- Lack of precipitation
- Trail grades greater than 6% (Trail tread grades over 6% will require significantly more maintenance since they tend to unravel or erode over time.)
- Inadequate amounts of natural soil cements in the parent material

“...the best crusher fines for trails exhibit three critical characteristics. The rock source is crushed into irregular angular particles that interlock and bind into a firm matrix. The material has particles ranging from dust to a specified maximum particle size in order to mechanically bind the matrix (ex. 3/8” minus). Lastly, the material must retain all of its original binders in order to be recompacted to a firm surface after shaping, wetting and vibratory compaction.” (T. Boone, The Art of Building Crushed Stone Trails, 2005)

Stone fines are also proposed for the multi-use trails to accommodate those user groups who may wish a “softer” trail surface, such as equestrians and joggers. Many trail systems are now constructed with both materials, side by side, to accommodate a wide array of users.



Side-By-Side Holmes County Trails (Source:<http://holmestrail.org/trail.html>, 2005)

Pictured is a 10-mile section of a newly finished trail in Fredericksburg, Ohio. This path consists of two trails constructed side-by-side. The crushed stone lane is specifically for horse & buggy use, while the asphalt lane is for everyone else. The two trails take up about 14 feet in width at their widest points.

The separation of stone and asphalt is accomplished by adding an extra layer of asphalt on the paved side. The small curb this produces in the middle of the trail does a fine job of keeping the dust from traveling across both surfaces. Along sections where a powdered surface was not desirable, such as over bridges, both lanes feature asphalt.

FIRMNESS, STABILITY, AND SLIP RESISTANCE FOR A VARIETY OF COMMON TRAIL SURFACING MATERIALS

Surface Material	Firmness	Stability	Slip Resistance (dry conditions)
Asphalt	firm	stable	slip resistant
Concrete	firm	stable	slip resistant*
Soil with Stabilizer	firm	stable	slip resistant
Packed Soil without Stabilizer	firm	stable	not slip resistant
Soil with High Organic Content	soft	unstable	not slip resistant
Crushed rock (19 mm (¾”) minus) with Stabilizer	firm	stable	slip resistant
Crushed rock without Stabilizer	firm	stable	not slip resistant
Wood Planks	firm	stable	slip resistant
Engineered Wood Fibers that comply with ASTM F1951	moderately firm	moderately stable	not slip resistant
Grass or Vegetative Ground Cover	moderately firm	moderately stable	not slip resistant
Engineered Wood Fibers that do not comply with ASTM F1951	soft	unstable	not slip resistant
Wood Chips (bark, cedar, generic)	moderately firm to soft	moderately stable to unstable	not slip resistant
Pea Gravel or 38 mm (1-½”) Minus Aggregate	soft	unstable	not slip resistant
Sand	soft	unstable	not slip resistant

Source: US Department of Transportation, Federal Highway Administration, Recreational Trail Design, 2005

TRAIL WIDTHS

“Multi-use trails, by definition, should accommodate various users simultaneously, although this can be difficult given the diverse needs of each user group. Accommodating a range of users within a single trail depends upon trail width, trail surface, and speed of trail users. The width of a trail depends on the land available within the boundaries of your project.” (Trails for the Twenty-First Century, 2001)

This statement holds true for the design of the C&D Canal. The width of the trail will be limited by the current widths of the bottom tier service roads. In most areas, the width will remain constant. However, in some areas, width is constricted by topography and natural waterways. To accommodate a variety of user groups, the trail width will be a minimum of 15’ wide, or comprised of paved and/or stone fines. It will be constructed above the existing gravel road directly adjacent to the Canal.

Trail widths should be adequate for stability and the intended use, but not so wide that the trail becomes undefined and the route is unclear. A multi-use, two lane, paved trail designated for cyclists and equestrians should have a minimum tread width of 10' to 12', with a minimum 5' to 7' soft shoulder (stone fines) and 12' vertical clearance. A cross slope of 2% will ensure positive drainage for the trail surface and meet the maximum cross slope presented in ADA guidelines.

Based on ADA trail accessibility guidelines, passing spaces at least 5' wider than the predominant trail should be provided every one thousand feet (1,000'). These passing areas could be incorporated into points of interest and resting areas along the trail.

TRAIL SIGNAGE

Trail signs fall into two categories: safety and information. Trail users should be informed where they are, where they are going, and how to use trails safely. Signs related to safety are most important and should be considered first. Information signage can enhance the trail users experience. Signage and Maps reach beyond the boundaries of a park to facilitate responsible trail use and extends into the community.

Trail markers should be placed as close to the intersection of trails as possible and should provide orientation information and appropriate use. Trail markers have a good visibility from a distance of 10-20 feet and be readable from a distance of 1 to 4 feet

TRAIL DRAINAGE, EROSION CONTROL AND LANDSCAPE RESTORATION

Stormwater management is a universal problem that impacts all trail systems. The continued increase in stormwater runoff both generated and funneled to a trail can degrade habitat value and water quality as well as the trail itself. Prior to implementing any trail improvements, the entire area should be evaluated to determine the source of any drainage or erosion problems. Any drainage problems from a higher tier, elevation or adjacent areas must be addressed before improving a trail.

Proper drainage is critical to ensure the longevity of any pavement surface. Without proper drainage, any trail surface will eventually erode and degrade. The goal of the trail design is to remove water from the trail at regular intervals along the entire length of the Canal to prevent the trail from becoming a conduit for water. The options for draining a paved trail are similar to those used for roadways, and include inlets, storm sewers, vegetated swales, culverts and pavement underdrains. For the C & D Canal, it is important that final engineering design for the proposed trail system is carefully coordinated with the existing drainage systems of the service roads.

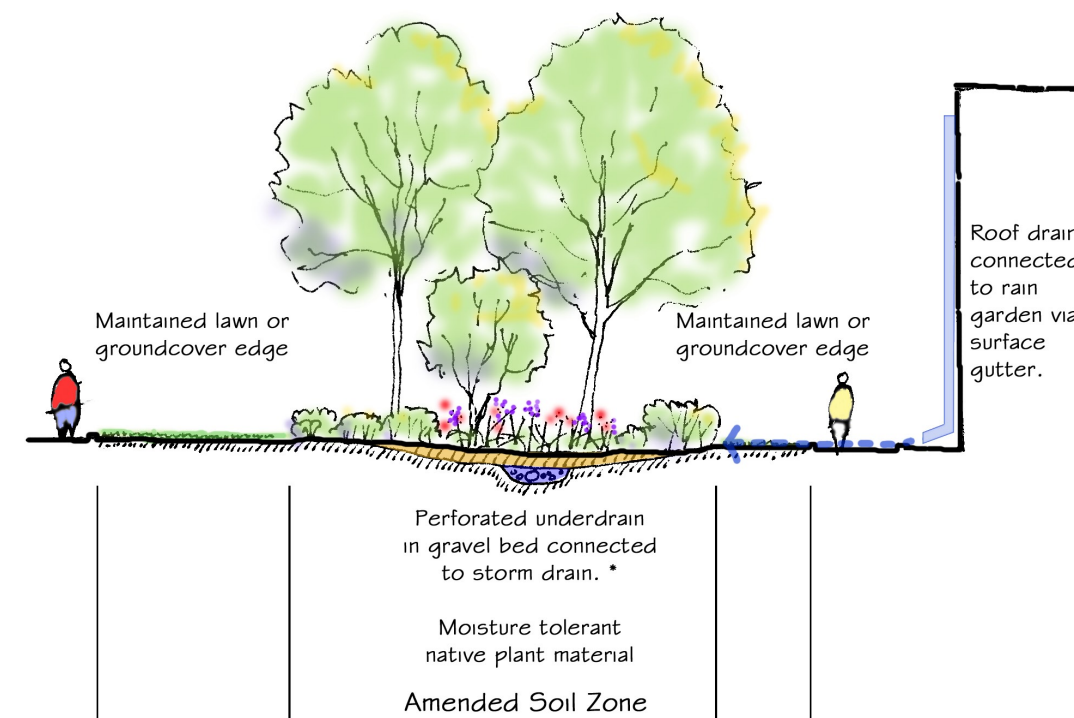
Altering the management of landscapes can also effect substantial reductions in run-off. Solutions to stormwater management should be promoted that maximize opportunities for groundwater recharge. Tall grass and wildflower meadow species can provide friction to slow run-off velocities, and a root system that effects higher levels of infiltration. Tall grass can also serve to inhibit trampling and help to confine users to designated trails.

The integration of landscape restoration and trail development can only be addressed on stabilized land. Serious trampling, soil compaction and stormwater damage must be controlled before restoration can be effective. Soil disturbance is frequently followed by invasion of exotic species.

In open areas, where parking facilities are planned for the trail system, there are likely to be opportunities for impounding surface runoff. The most obvious choices for locating such impoundments are areas where standing water is found during and after a rainstorm and where the existing level of impoundment can be easily increased to provide more retention. Temporary shallow impoundments are essentially broad, shallow retention "puddles" created either by excavation or by the creation of a low berm to hold back water at the point of runoff. Downslope water movement will not be eliminated, but it will be slowed and reduced. Numerous small basins throughout a site can make a significant contribution. The depressions can be managed as turf grass that tolerates standing water for short periods or planted as a wet meadow of ferns, sedges, rushes and native grasses or native lowland trees and shrubs.

Rain gardens, bioswales and bioretention cells can all be employed in the stormwater design for the new trail system. A Rain Garden is a planting bed system with some rainfall retention and storage capacity, and can take many forms. Rain gardens should be carefully designed to enhance the character of the existing landscape. In practice, the important distinction as a stormwater mitigation measure is the inclusion of rainfall volume capture, with a combination of physical processes (slow infiltration and evapo-transpiration) reducing the retained volume prior to a subsequent rainfall. Areas of turf and/or planting beds that now typically convey run-off by sheet flow to the stormwater infrastructure system can be converted to dispersed shallow basins for small-scale storage.

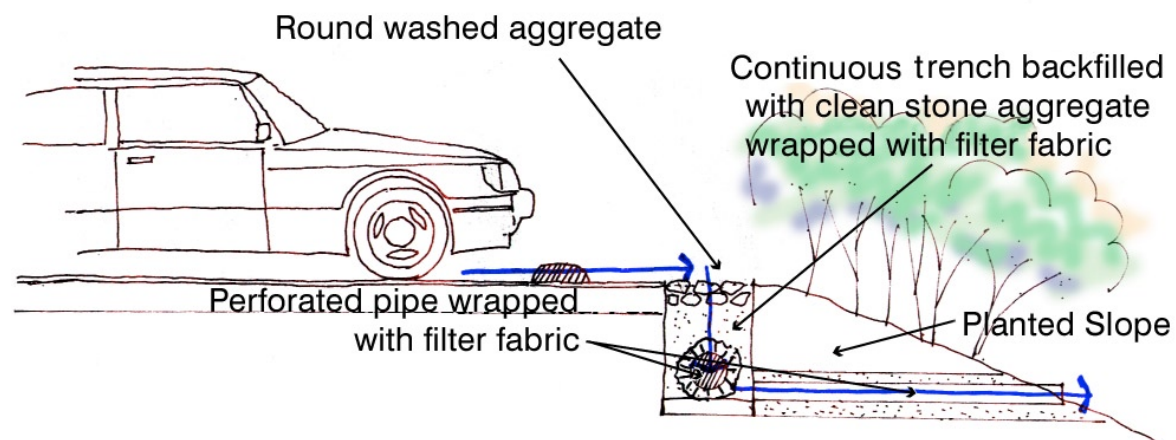
Rain gardens will require grading to create depressional areas that are strategically placed to intercept the first flush of run-off from adjacent impervious surfaces pervious areas such as roofs, roads and parking lots. The function of rain gardens is to reduce the volume of run-off that is entering the storm drains. In addition, water quality benefits are realized as the first flush of stormwater run-off may contain the highest concentrations of non-point source pollutants that wash off of impervious surfaces. Rain gardens effectively capture and filter these pollutants.



Conceptual Stormwater Sketch at Trailhead/Comfort Stations only.



Bioretention cells are designed to function similar to rain gardens, except that they collect larger quantities of runoff. The cells are designed with more temporary storage and have more depth and structure than a rain garden.



Note: These options are not suitable solutions in areas above or adjacent to the extensive underdrain system already in place to prevent slope failures.

Bioswales or vegetated swales are an alternative to standard underground storm sewer systems. They intercept or receive impervious surface runoff and blend infiltration and slow conveyance of stormwater. The soil matrix of the swale can be amended to enhance infiltration and percolation of stormwater runoff. These swales can be engineered to handle the high frequency, low intensity storm events while providing vegetated filtering. Bioswales are discharged to groundwater, storm sewer intakes or directly to surface water.

USER GROUP TARGETS

The C & D multi-use trail is designed to accommodate an array of non-motorized users including walkers, hikers, joggers, runners, bicyclists, in-line skaters, equestrians, bird-watchers, boat-watchers, anglers, nature lovers, and picnickers and be handicap-accessible.

Wherever very different kinds of users share trail facilities, it is important to recognize and accommodate their differing needs or conflicts of use.

Cyclists moving at a fast speed easily startle horses, for example, creating potentially dangerous situations. Walker and wildlife may also be startled by cyclists. Walkers slowing suddenly may pose hazards to cyclists. The conflicts are inherent in mixed use and cannot be reconciled by trail design alone.

Often the conflicts are as much perceived as they are real. "Crowding was rated ...as the most important trail-related cause of conflict. In general, social/ behavioral factors were rated as being more important causes of conflict than were trail-related factors." (Gambil, Multi-Use Trail Management Policy: User-Group Conflict and Resource Impact Issues, 2005) Adequate trail width, appropriate signage, surface material and adequate trail maintenance are all critical considerations for a successful multi-use trail system.

Studies have shown that there are programmatic solutions to resolving trail conflicts. They include user-based programs such as:

1. Education of user-groups by user-group organizations and media on proper trail use and trail etiquette
2. Education to be provided by trail-managing agencies
3. Brochures, maps and other trail-related information for dissemination to trail users
4. Communication between trail-managing agencies and user-groups
5. Patrolling or monitoring to reduce conflict on their multi-use trails - Volunteer patrols have been effective ways to reduce conflicts and enforce trail etiquette
6. Involve user groups in the decision making process and in trail maintenance programs

The trail design has accounted for the existing recreational activities that occur. Hunters and dog trainers are very active groups that have a long tradition of using the Canal lands. This plan is designed so that hunters will continue to have access to their current designated hunting grounds in both Maryland and Delaware. These activities do not presently take place at the first tier of service road, where the trail is planned.

Equestrians will have continued access to the trail, including the second level tier trails which will be unpaved. Use of the first tier trail will be through separation by use of surface materials and signage. Where horses are allowed, a soft stone fines surface will be provided to accommodate their needs. During the Public Workshops in December 2005, several representatives of the Equestrian groups requested adequate parking for horse trailers, with pull through space and water available for both people and horses. Equestrians are an active user group along the Canal, where they presently enjoy over 30 miles of unpaved trail along the service roads and at Lums Pond State Park.

Overall, the multi-use trail is intended to meet the needs of the current user groups polled during the 'Chesapeake and Delaware Canal Recreation Study Public Involvement' public questionnaire as well as future needs as the trail is constructed over time.

FUTURE ACCESS POINTS

One goal of the C & D Canal Trail is that it interconnect with open space and future greenways and trails across New Castle and Cecil counties, and, thus add to the green infrastructure of the region as a whole (see pp. 32-33).

A New Castle County Greenways Plan is currently being drafted that will incorporate both on an off road connections into Lums Pond State Park and Delaware City from the north and therefore with the East Coast Greenways (see page 30), Washington Rochambeau Revolutionary Route (W3R), slated to be designated a Federal trail in the fall of 2006, and the Northern New Castle County History Corridor. To the south, the Greenways Plan will encompass Scott Run's Loop, running into Middletown and points south.

New Trail heads will be developed in locations that are within population centers or future growth areas, provide connectivity with existing and/or planned greenways and parks, and will first consider existing points of access to the Canal.

Many existing trail access points will be developed into trailheads with parking and other amenities. They will be located where they are most suitable to site comfort stations and utilities, adequate space for parking, proximity to the trail and Canal, prominent views, population centers, safety, existing infrastructure and favorable topography. New trailheads will be developed in locations that are within population centers or future growth areas and will first consider existing points of access to the Canal.

MARYLAND (SEE CONCEPTUAL DIAGRAM PP. 54-55)

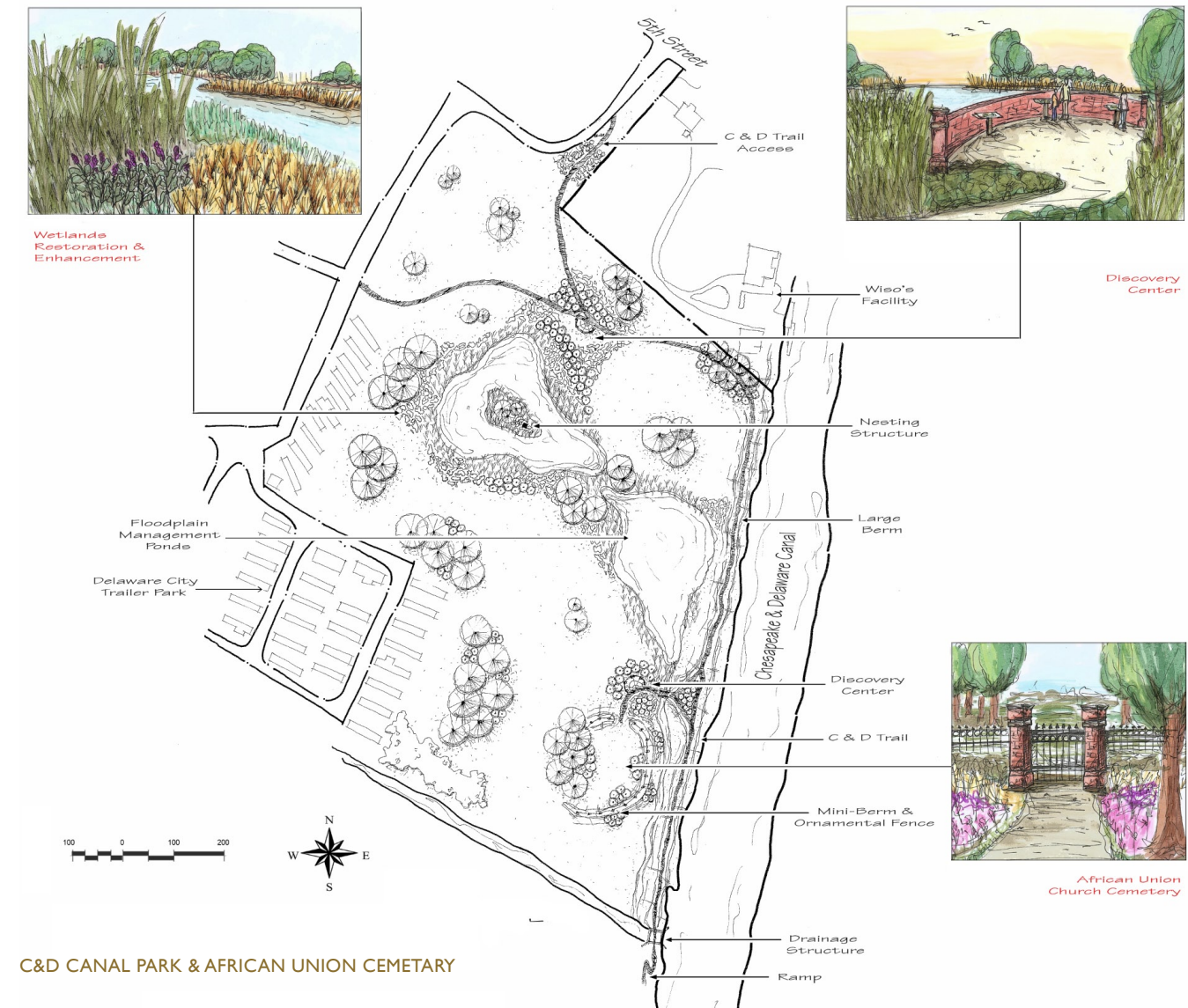
Trailheads	General Location
USACE*	Campus (at C & D Canal Museum) peninsula
Chesapeake North*	West of Lock Street and Bridge
Chesapeake South*	West of Charles Street and Bridge on second tier overlooking bridge

DELAWARE (SEE CONCEPTUAL DIAGRAM PP. 55-57)

Trailheads	General Location
Grass Dale *	Polktown Place and adjacent to Grass Dale Center
Delaware City	Adjacent to Three Forts Ferry Building
Reedy Point	Reedy Point South just east of bridge
Biddle Point	Southeast of Gunning-Bedford high school
St. Georges North*	Between Route 1 Bridge and St. Georges Bridge
St. Georges South *	East of St. Georges Bridge at bottom of access road
Deep Cut/Marina	West of railroad bridge on previously constructed park knoll
Joy Run	East of railroad bridge along fourth tier road west of Joy Run
Guthrie East	West of Old Summit Road and Summit Bridge on first tier
Summit Bridge South*	East of Summit Bridge on fourth tier by Old Summit Bridge Road
Bethel East	Adjacent to fishing pier on first and/or third tier

* Existing Main Trail Access Point (and/or vicinity)

Future Access Points - DELAWARE CITY, DE



C&D CANAL PARK & AFRICAN UNION CEMETARY

The plan above has been proposed by Delaware City and illustrates a trail link and loop along the west bank of the Old Branch Canal. This trail would connect from the proposed multi-use trail to the the marina and Delaware City waterfront. The trail will pass the historic African Union Cemetery.

Delaware Greenways is proposing a potential loop that would connect Joy Run and Welfare/Whitehall on the south side of the Canal and would tie in with the proposed C & D Multi-use Trail.

Lums Pond State Park is located in the midway point along the north side of the Canal. The potential exists to link this large park and its extensive trail system to the C&D Canal Multi-use trail.

Future Access Points - WELFARE/WHITEHALL SCOTT RUN NATURE LOOP

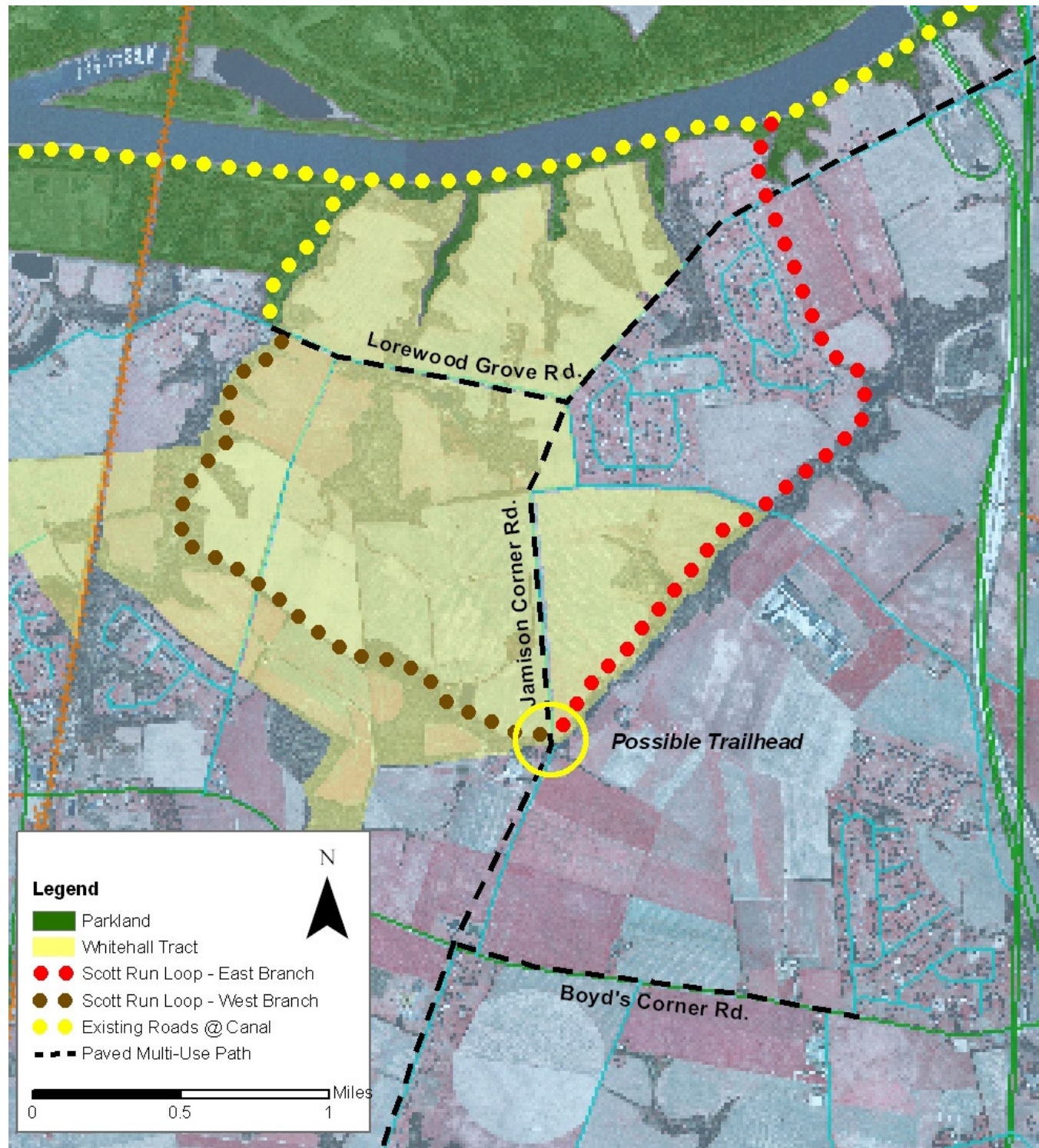


IMAGE COURTESY DELAWARE GREENWAYS INC., 2005

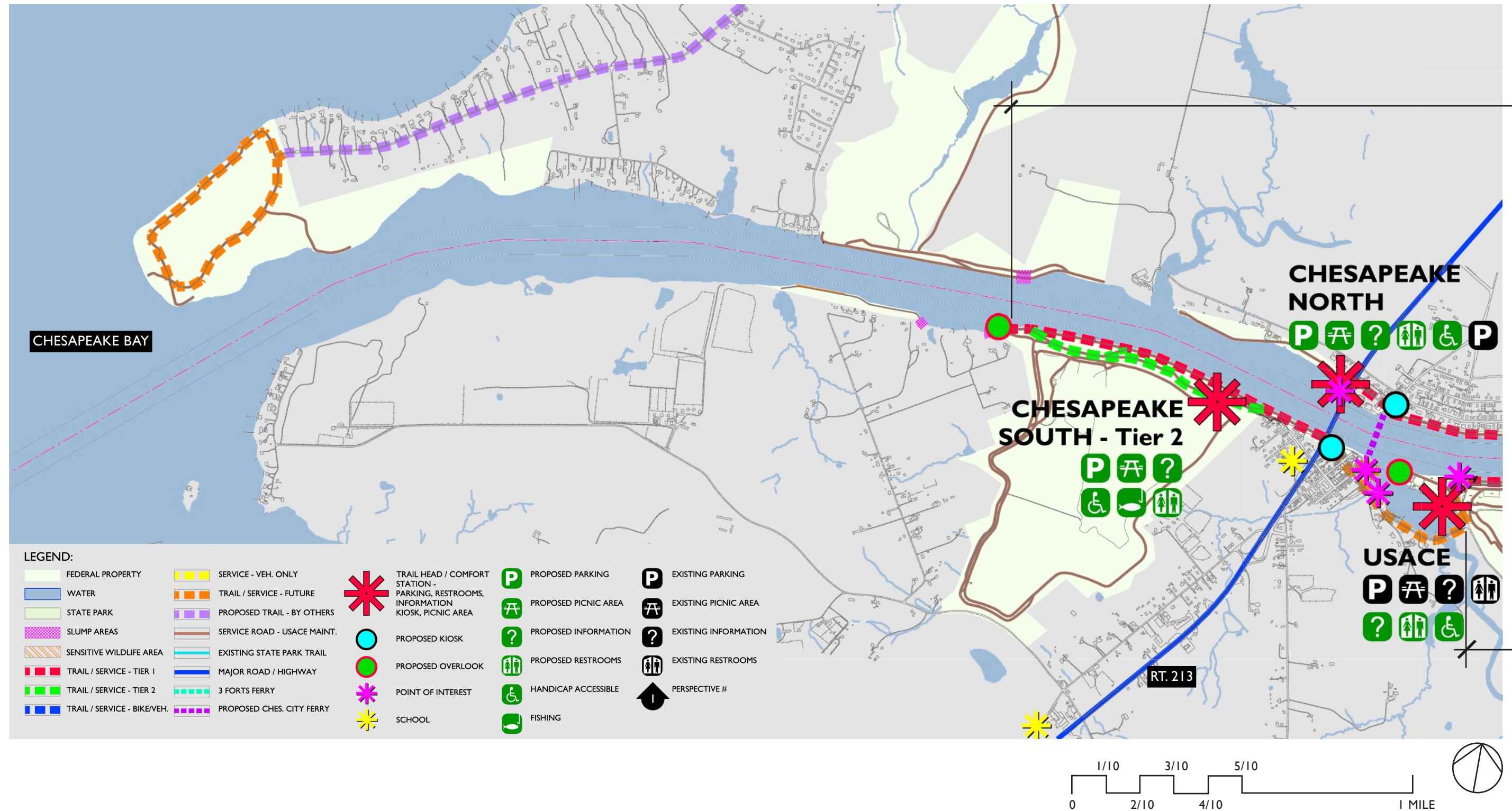
Future Access Points - LUMS POND STATE PARK



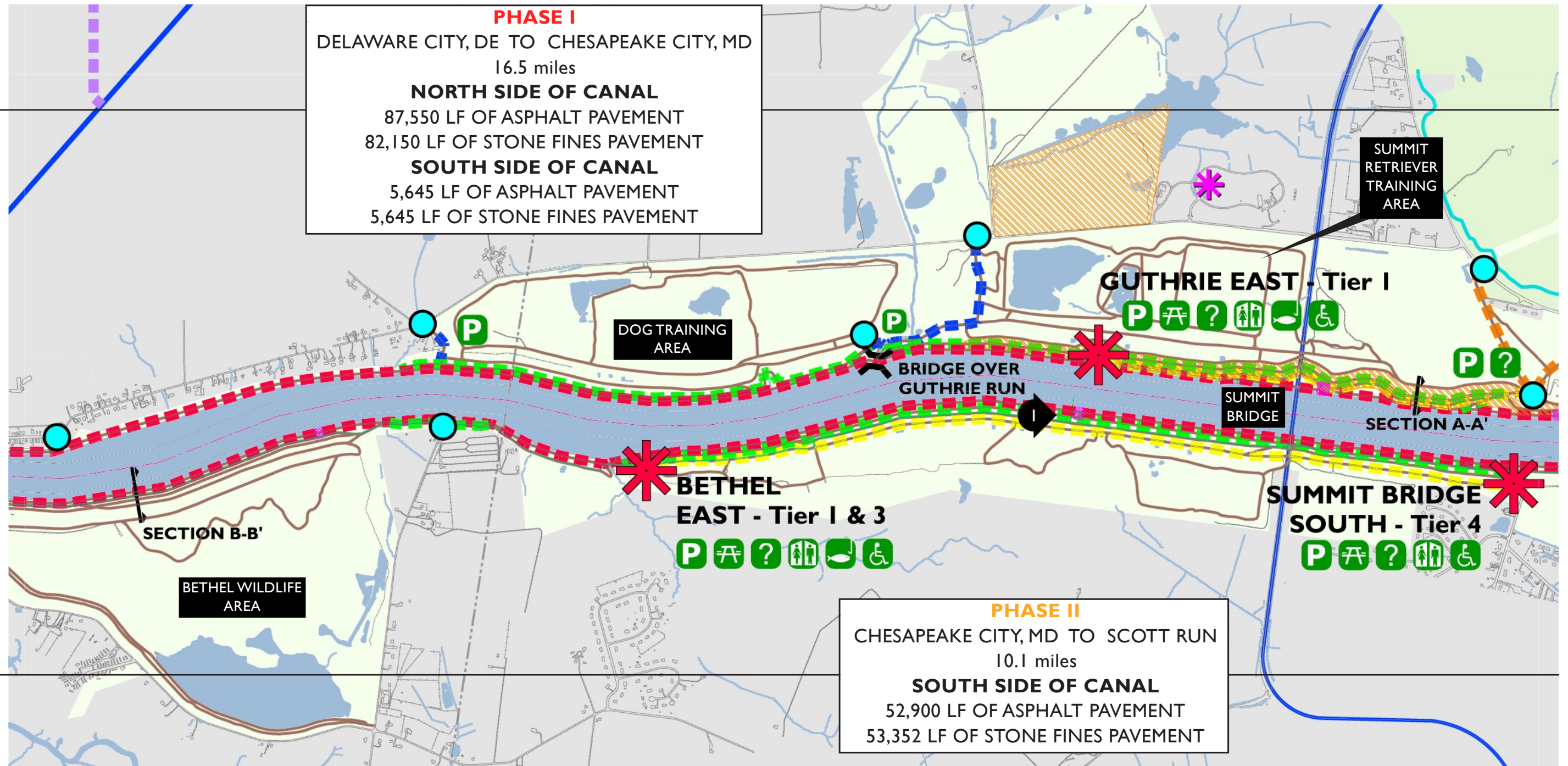
IMAGE COURTESY DNREC

RECOMMENDED PLAN

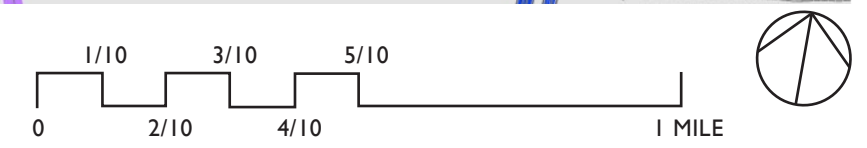
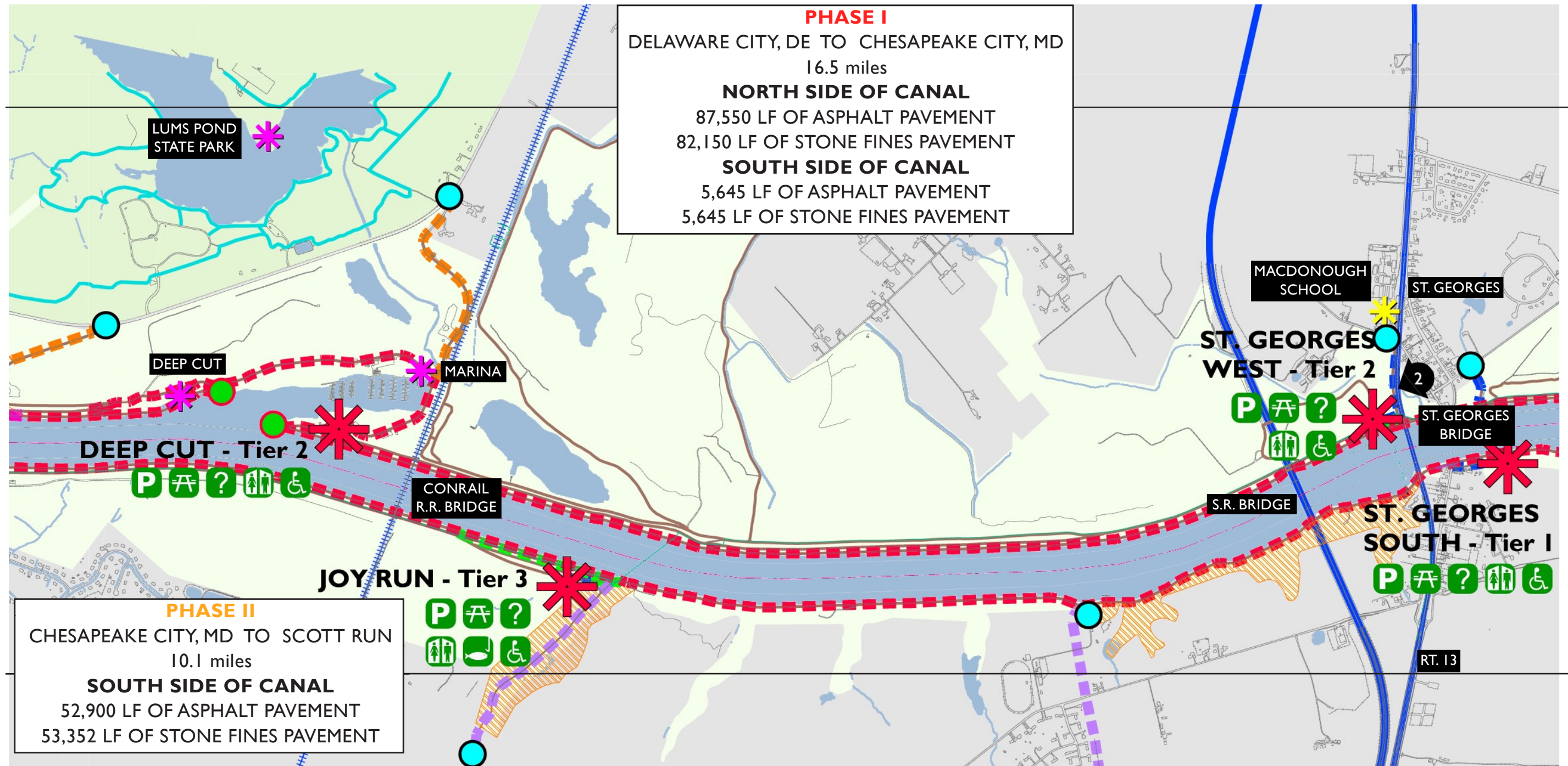
CONCEPTUAL DESIGN DIAGRAM - WELCH POINT TO CHESAPEAKE CITY



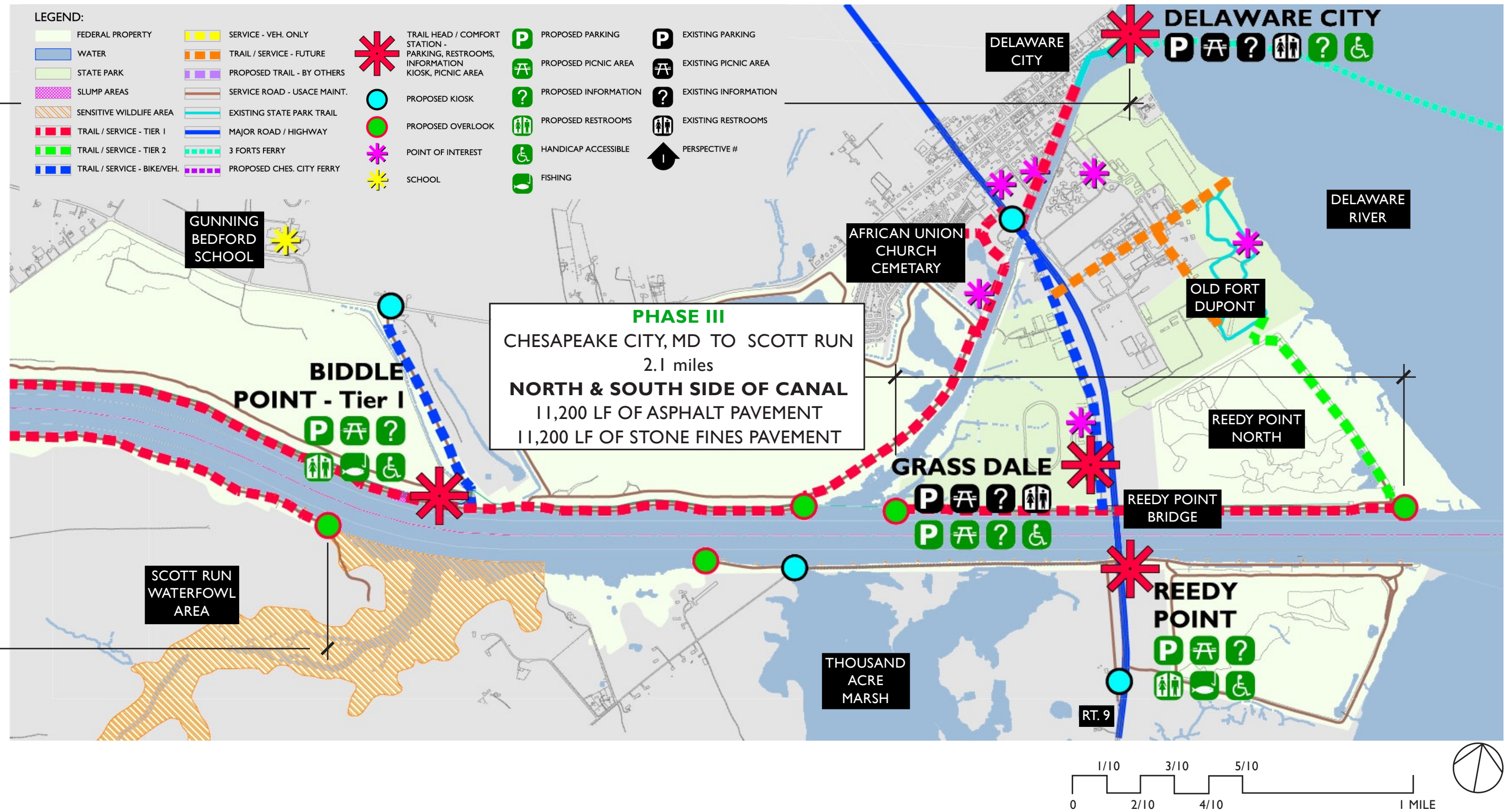
CONCEPTUAL DESIGN DIAGRAM - CHESAPEAKE CITY TO LUMS POND STATE PARK



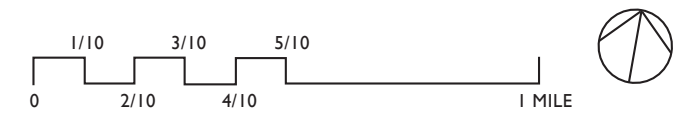
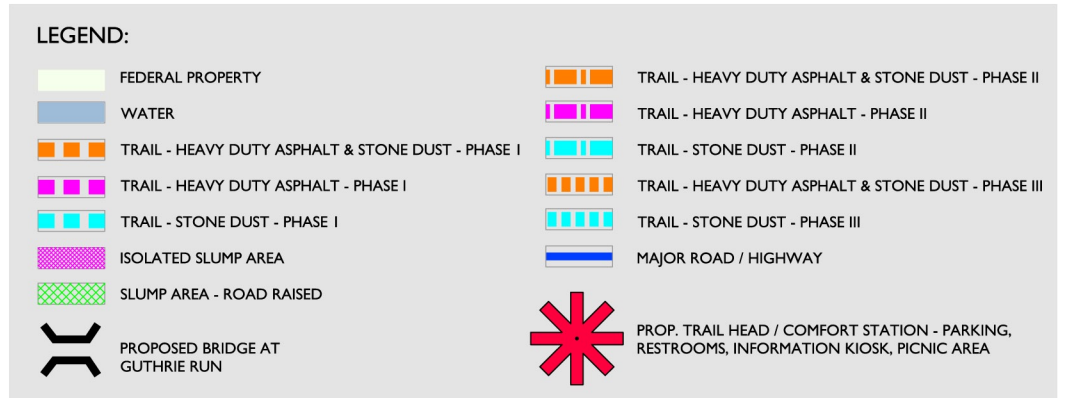
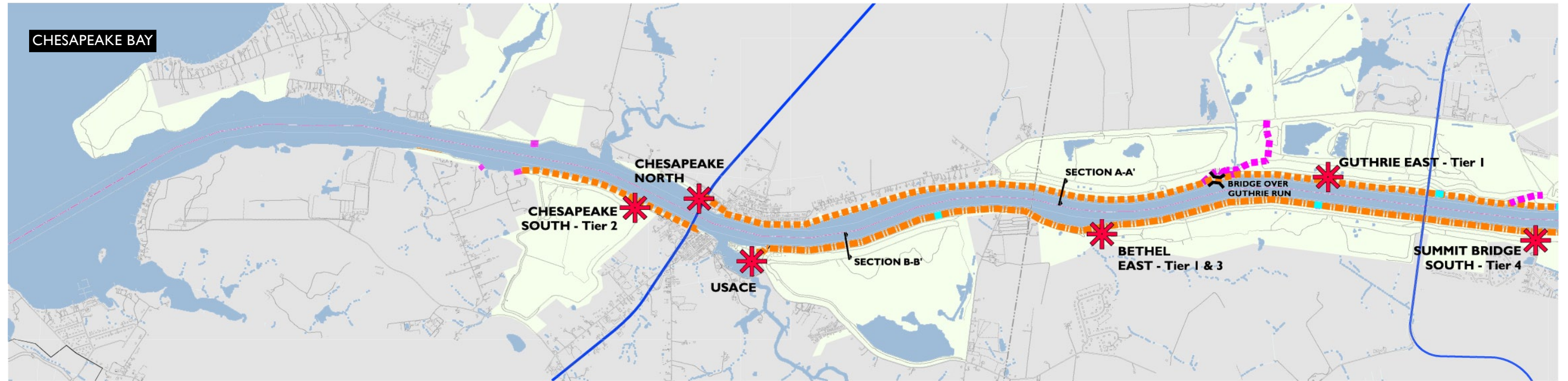
CONCEPTUAL DESIGN DIAGRAM - LUMS POND STATE PARK TO ST. GEORGES



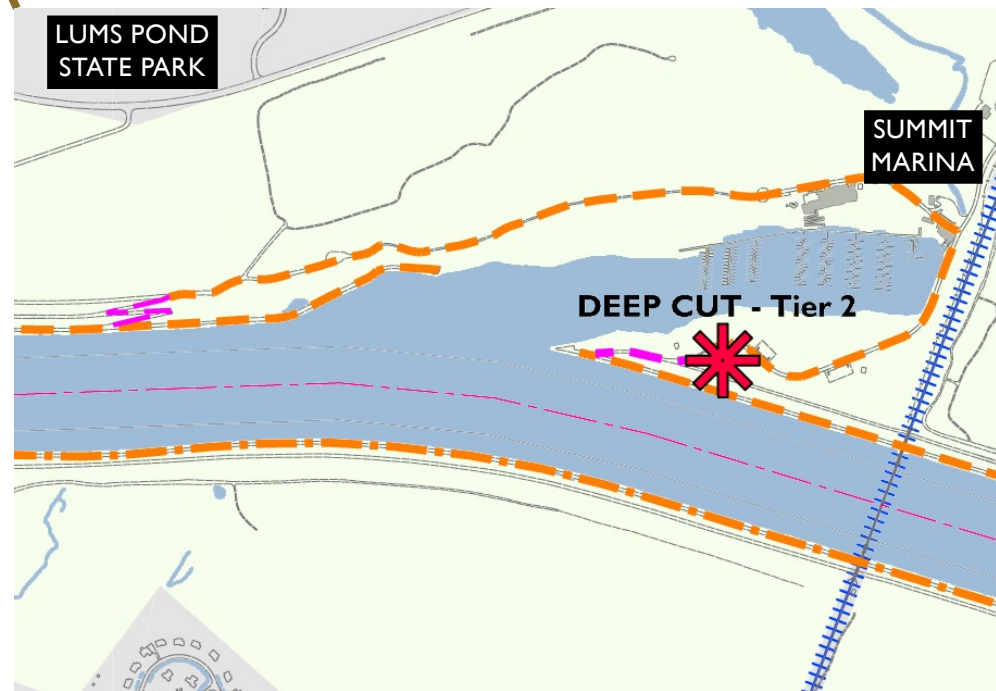
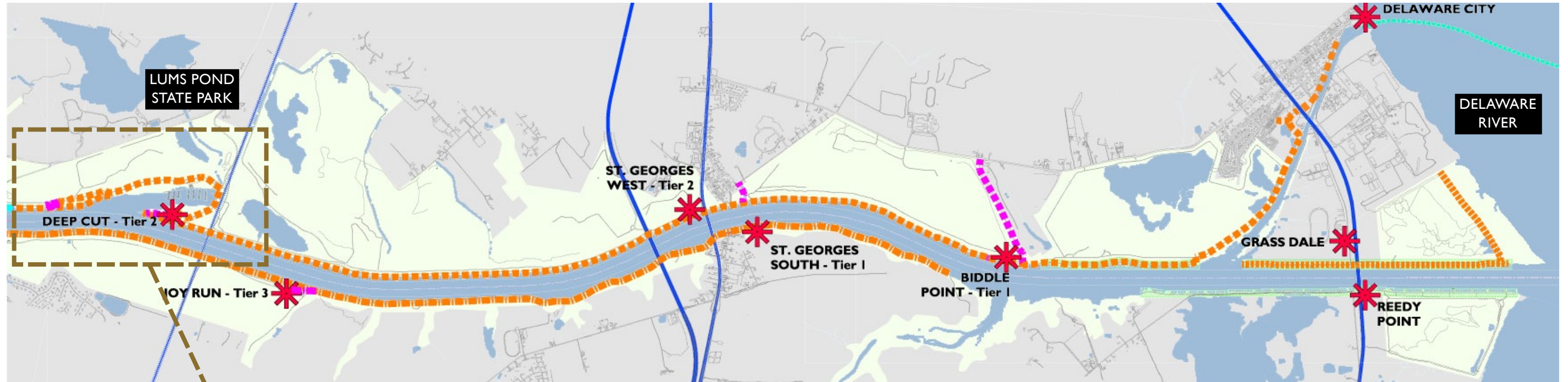
CONCEPTUAL DESIGN DIAGRAM - ST. GEORGES TO DELAWARE CITY/REEDY POINT



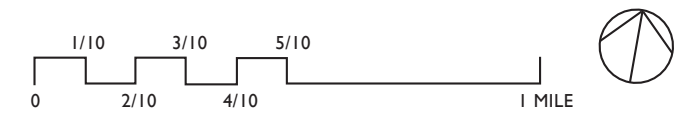
PAVEMENT DIAGRAM - WELCH POINT TO LUMS POND STATE PARK



PAVEMENT DIAGRAM - LUMS POND STATE PARK TO REEDY POINT



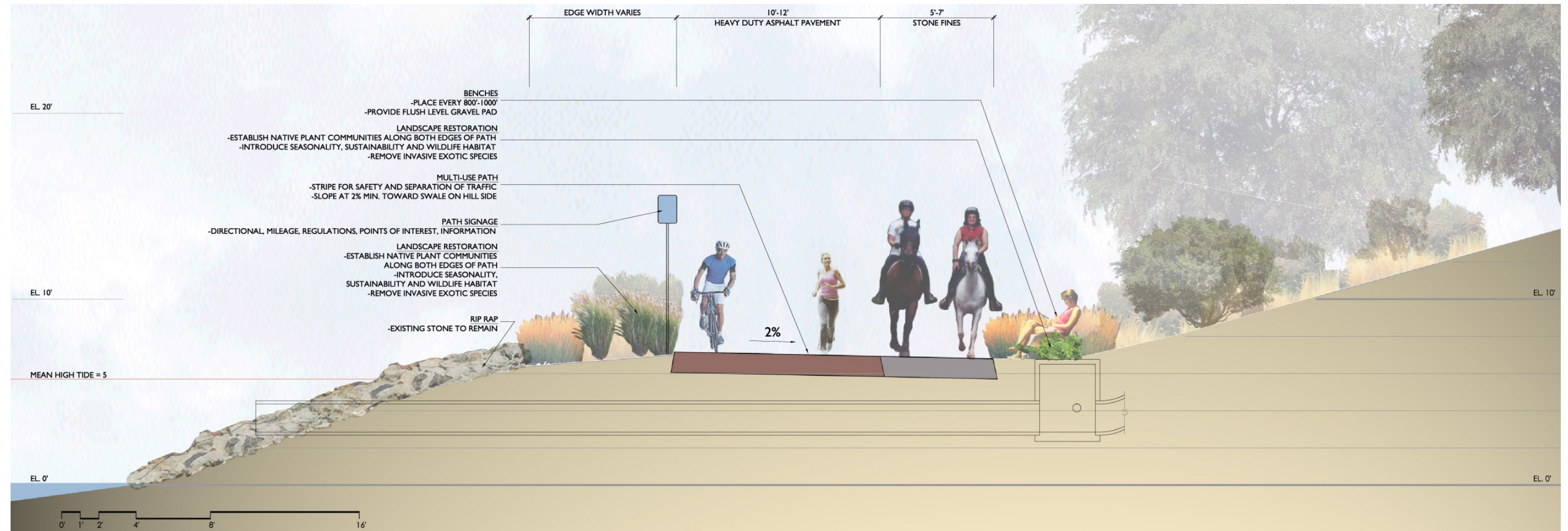
BLOW UP OF DEEP CUT



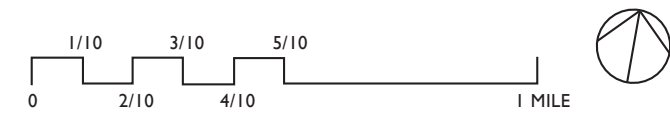
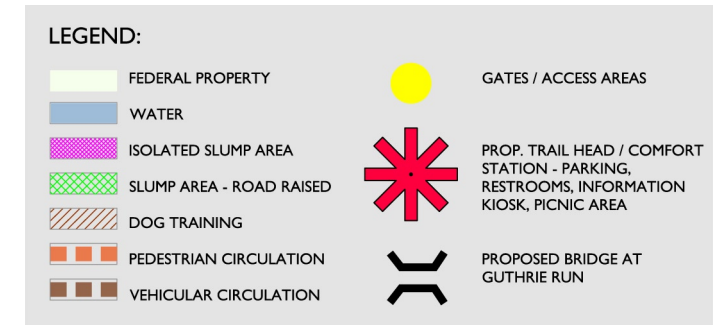
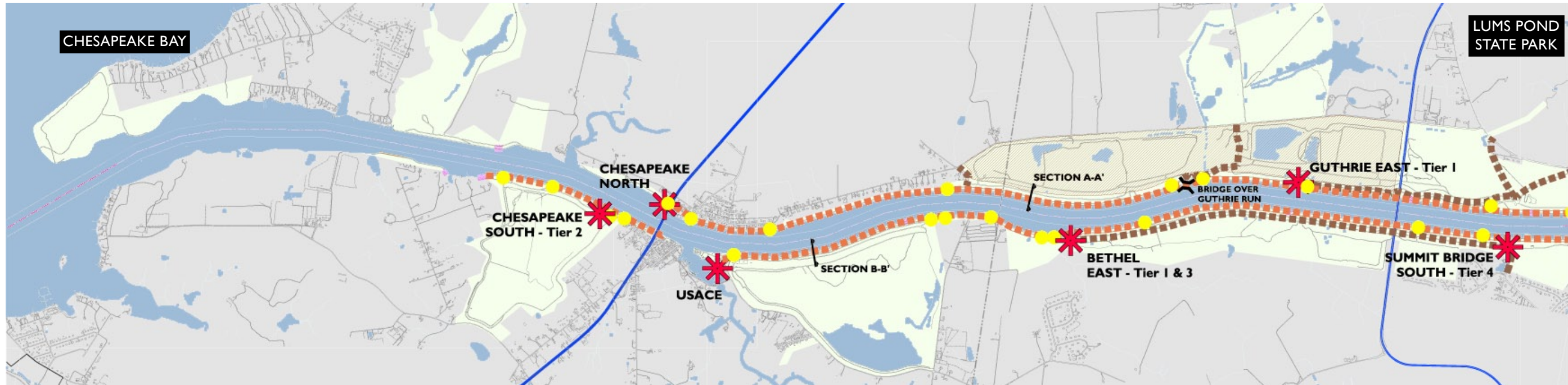
SECTION A-A' - TRAIL SECTION AT SLUMPING AREAS



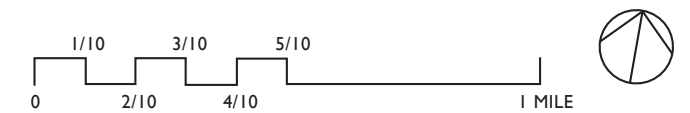
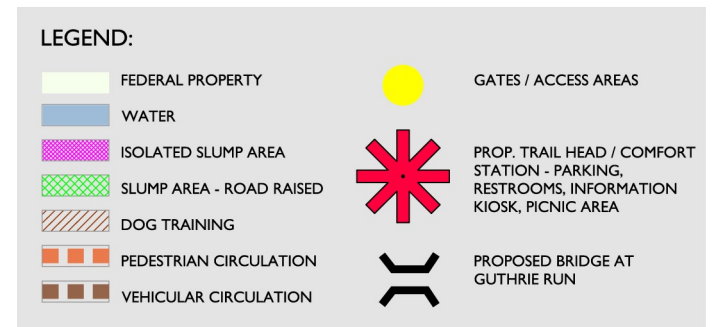
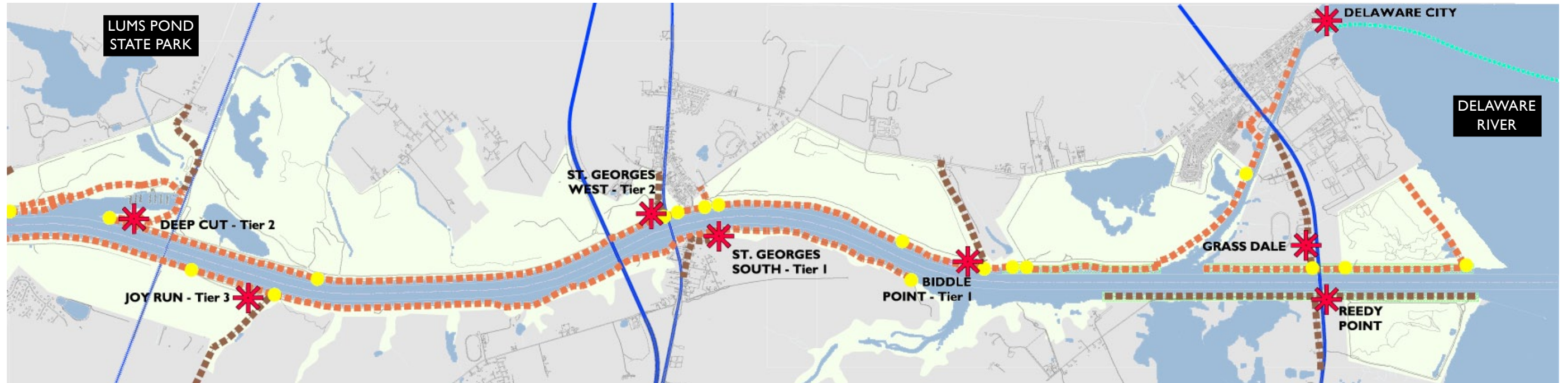
SECTION B-B' - TYPICAL TRAIL SECTION



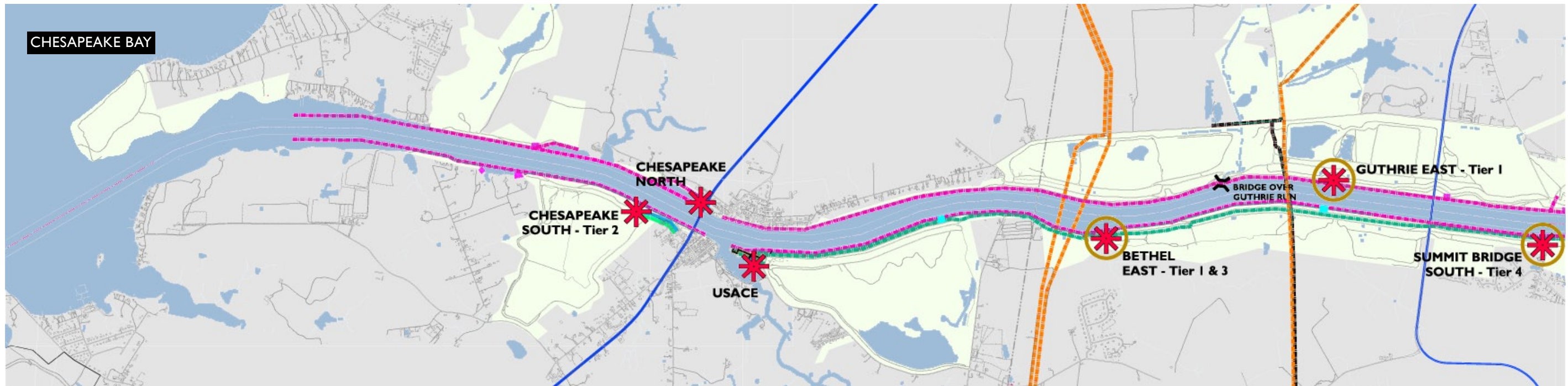
CIRCULATION DIAGRAM - WELCH POINT TO LUMS POND STATE PARK



CIRCULATION DIAGRAM - LUMS POND STATE PARK TO DELAWARE CITY/REEDY POINT



UTILITY DIAGRAM - WELCH POINT TO LUMS POND STATE PARK



TRAIL HEAD UTILITY GUIDELINES

COMPOSTING TOILETS

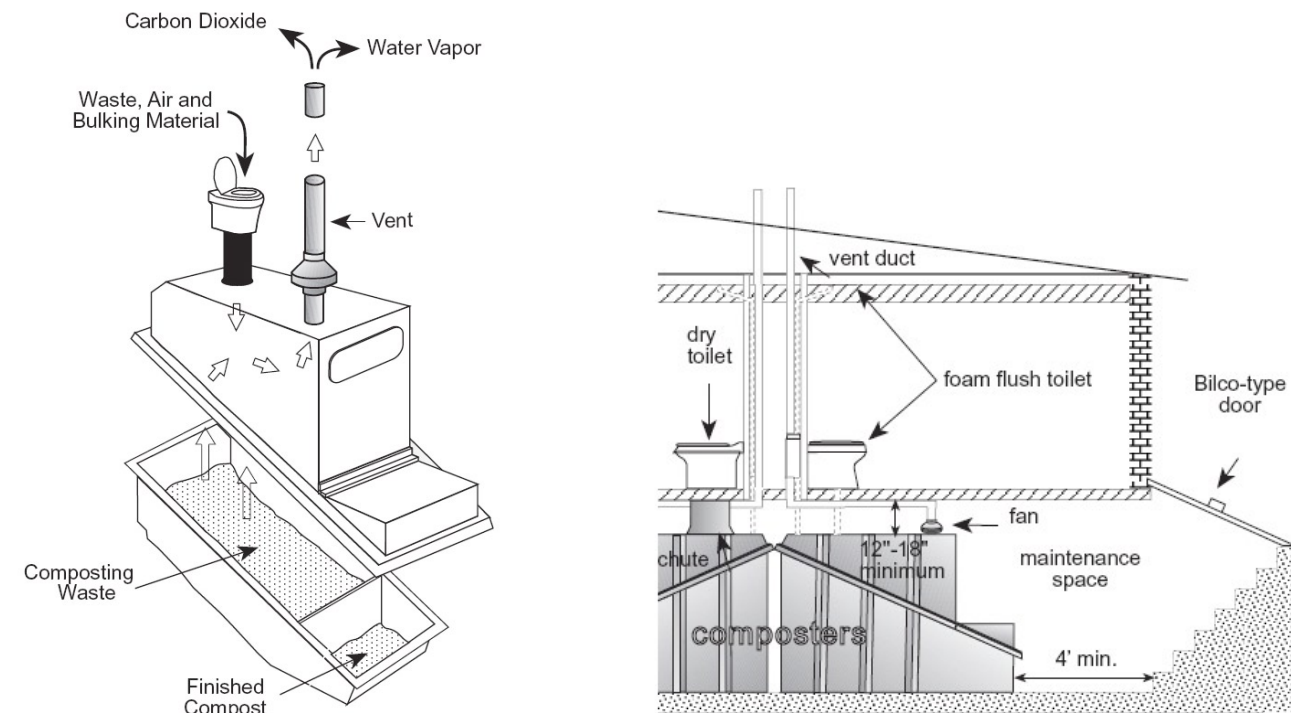
Composting is the natural, aerobic decomposition of organic material. That means “harmless” bacteria, fungi and enzymes will reduce the organic waste as much as 95%. This process operates in the presence of air and moisture and produces safe, useful end product.

While the biology and chemistry of the composting process is complex, composting can be managed effectively if three key factors: air, temperature, moisture and their role in the composting process is understood.

When the composting process is complete, 95% of the original material will have been converted to water vapor and other harmless gases. The remaining 5% should be odorless, a rich brown color and have the texture of coffee grounds with a pH of seven or above.

For the C & D Canal, composting toilets are being recommended at comfort stations located away from existing utility corridors or areas, such as Chesapeake City and Delaware City. This will help keep infrastructure costs down by eliminating need for construction of additional water and sewer lines along the canal.

Such facilities have already been effectively installed and utilized at Pea Patch Island, Fort Delaware.



COMPOST SYSTEM OVERVIEW - COURTESY OF CLIVUS MULTRUM

UTILITY DIAGRAM - LUMS POND STATE PARK TO DELAWARE CITY/REEDY POINT



TRAIL HEAD UTILITY GUIDELINES

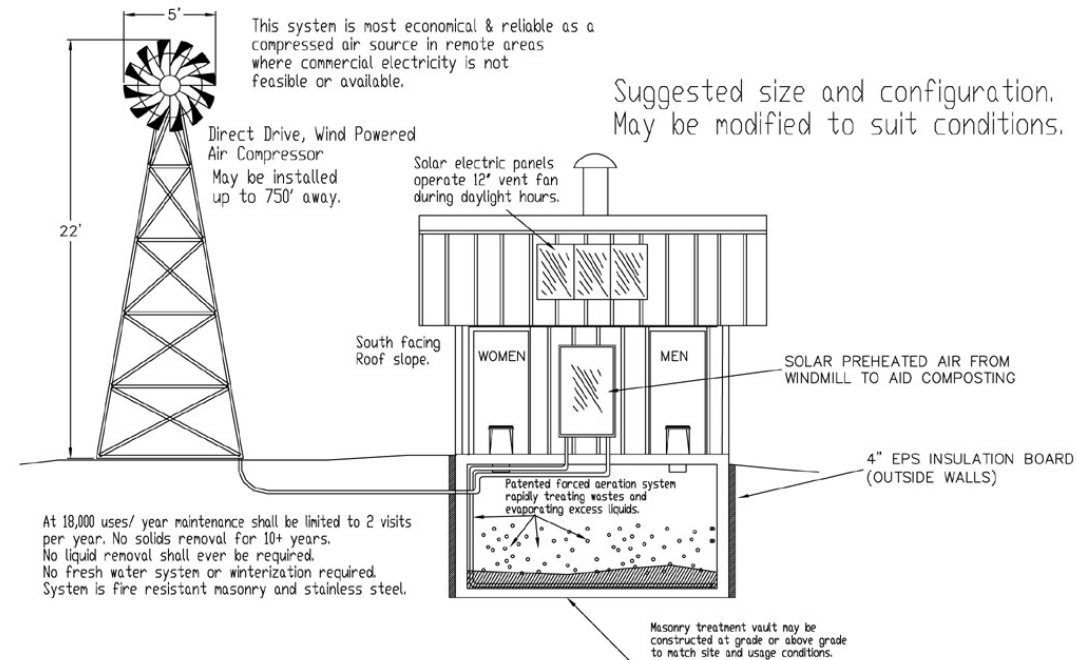
SOLAR PANELS

The composting toilets can also be run utilizing electricity generated by solar panels placed on the rooftop of each restroom facility. Again, this will reduce construction costs associated with running new electrical conduits from existing utilities.



SOLAR ROOF PANELS ON FORT DELAWARE - COURTESY OF BIO-SUN

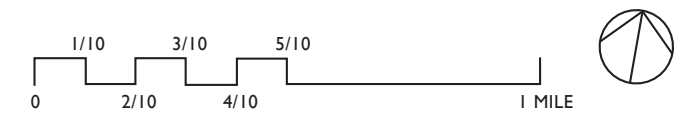
DIRECT DRIVE WIND POWERED AIR COMPRESSOR



WIND AND SOLAR DIAGRAM - COURTESY OF BIO-SUN

LEGEND:

	FEDERAL PROPERTY		EXIST. WATER
	WATER		PROPOSED WATER
	SLUMP AREA		PROPOSED SEWER
	EXIST. POWER		PROPOSED COMPOSTING RESTROOM
	EXIST. ELECTRIC/LIGHTING		MAJOR ROAD / HIGHWAY
	EXIST. GAS		PROP. TRAIL HEAD / COMFORT STATION - PARKING, RESTROOMS, INFORMATION KIOSK, PICNIC AREA
	EXIST. TELE/FIBEROPTIC		
	EXIST. SANITARY SEWER		



HABITAT RESTORATION & LANDSCAPE MANAGEMENT

“Restoration is not a one time thing, any more than raising a child is.” - Leslie Sauer, Andropogon Associates

The development of the multi-use trail will result in opportunities to improve the ecological aesthetic of the area immediately adjacent to the trail and its amenities; raise awareness of regional native plant species; and increase the biodiversity of the Canal lands. The “restoration” of the landscape will be incremental, just as it has been throughout the history of Canal lands, by managing the process of ecological succession.

“Ecosystem integrity and function set the necessary conditions for biodiversity to flourish by achieving stability.” (Dennis Martinez, Society for Ecological Restoration, 1995)

The Canal lands no longer resemble the typical Coastal Plain physiography, especially along the Canal edge where the proposed trail is planned. “The configuration of the Canal tends to accentuate area climate. Winds are accelerated by the canyon effect of high Canal banks and move unrestricted across large disposal areas on the high plateaus. The same canyon effect acts as a summer heat trap when the wind dies. Climate at Canal level can be extremely hot and humid in mid-summer. The effects of hot, dry soils, on vegetation on north shore banks angled directly into the sun, is particularly noticeable in summer periods of high temperature and humidity and little wind.” (Design Memorandum No. 28, ACOE, September 1977)

The restoration /landscape strategies in these areas, therefore, cannot use a former state as a model. Rather, the successful landscape restoration plan must reflect current conditions of soil, availability of moisture, and exposure in conjunction with the policies that affect the daily operations of the Canal.

This plan outlines several typical conditions for the proposed trail and suggests a set of Landscape Design and Management Principles as outlined below:

LANDSCAPE DESIGN AND MANAGEMENT GUIDELINES

- Consider undertaking extensive soil reworking and massive planting efforts only where the landscape is in collapse, overwhelmed by non-native invasive species, or extensively eroded.
- Specify native plant species. Wherever possible, contract grow plant material from local seed. Utilize native plant species that may be missing from the area where they are appropriate.
- Do not displace or modify any relatively healthy natural system.
- Minimize disturbance to any natural area.
- Do not compromise natural and cultural resources such as geological formations, stream corridors by activities that threaten their character and preservation.
- Protect and expand remaining wetlands wherever possible. Reestablish natural drainage patterns and hydrologic regimes where they have been disturbed.
- Establish missing links and provide connectivity, such as forest edges where possible.

CANAL / WATER EDGE

Conditions

- Very poor soils
- Exposed site - wind/full sun
- Little available moisture for plant material
- Must comply with maintenance requirements of the Army Corp. of Engineer - no woody shrubs or trees along Canal Waterway edge

SUGGESTED PLANT LIST

TALL GRASS AND MEADOW SPECIES - DRY AREAS WILDFLOWERS/BOTANICAL NAME

Asclepias tuberosa
Aster linariifolius
Aster spectabilis
Baptisia australis
Boltonia asteroides
Coreopsis lanceolata
Coreopsis tripteris
Chrysanthemum leucanthemum
Echinacea purpurea
Helianthus angustifolius
Helianthus mollis
Helianthus strumosus
Monarda fistulosa
Rudbeckia fulgida
Solidago sempervirens
Solidago caesia

COMMON NAME

Butterfly weed
Stiff aster
Showy aster
Blue false indigo
Boltonia
Lance-leaf coreopsis
Coreopsis
Ox eye daisy
Purple coneflower
Gold Lace
Downy Sunflower
Woodland Sunflower
Wild Bergamot
Brown-eyed Susan
Seaside goldenrod
Bluestem goldenrod

GRASSES/ BOTANICAL NAME

Andropogon gerardii
Calamagrostis canadensis
Glyceria canadensis
Panicum virgatum
Schizachyrium scoparium
Elymus canadensis
Elymus Species
Eragrostis trichodes
Juncus tenuis
Tridens flavus

COMMON NAME

Broom sedge
Blue Joint grass
Rattlesnake grass
Switch grass
Little Bluestem
Canada Wild Rye
Silky Wild Rye
Sand Love Grass
Path Rush
Purple Top



PURPLE CONEFLOWER



WILD BERGAMOT



BUTTERFLY WEED



BLACK EYED SUSAN



JOE PYE WEED



SWAMP ROSE

INLAND EDGE OF TRAIL

Conditions

- Poor soil, but opportunity to amend soil conditions
- Moisture available due to runoff from upper tiers and adjacent slopes - condition from dry to moist depending on site conditions
- Semi-exposed - sun and partial shade
- Woody shrubs and trees allowed

SUGGESTED PLANT LIST

TALL GRASS AND MEADOW SPECIES - DRY AREAS

LOWLAND WOODLAND AND WETLANDS SPECIES
BOTANICAL NAME

CANOPY AND UNDERSTORY TREES

- Acer rubrum
- Amelanchier canadensis
- Betula lenta
- Fraxinus pennsylvanica
- Salix nigra
- Quercus bicolor

SHRUBS

- Aronia melanocarpa
- Cephalanthus occidentalis
- Clethra alnifolia
- Hibiscus moscheutos
- Ilex verticillata
- Rosa palustris
- Spirea latifolia
- Viburnum dentatum

WILDFLOWERS

- Aster novae-angliae
- Asclepias incarnata
- Caltha palustris
- Eupatorium purpureum
- Hibiscus moscheutos
- Rudbeckia laciniata
- Veronica noveboracensis

COMMON NAME

- Red Maple
- Shadblow
- Sweet Birch
- Green Ash
- Black Willow
- Swamp white oak

- Black chokeberry
- buttonbush
- Sweet pepperbush
- Swamp rose mallow
- Winterberry
- Swamp Rose
- Meadowsweet
- Arrowwood

- New England Aster
- Swamp Milkweed
- Marsh marigold
- Joe Pye Weed
- Swamp Rose Mallow
- Greenheaded coneflower
- Ironweed



TURTLEHEAD



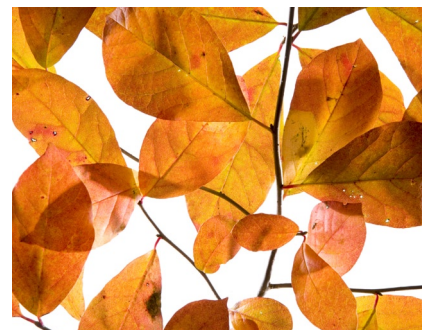
GOLDENROD



SASSAFRAS



SWEETBAY MAGNOLIA



BLACK GUM

PARKING AREAS

Conditions

- Soil Conditions vary, but opportunity to amend
- Moisture available due to runoff from upper Tiers and adjacent slopes and captured run-off
- Bioswale areas can be integrated with parking lot design to capture stormwater and create small wetlands
- Semi-exposed - sun and partial shade
- Woody shrubs, small trees, canopy trees can be planted to create shade and diversity

SUGGESTED PLANT LIST

TALL GRASS AND MEADOW SPECIES - DRY AREAS

OLD FIELD SMALL TREES & SHRUBS
BOTANICAL NAME

- Comptonia peregrina
- Juniperus virginiana
- Myrica pennsylvanica
- Rhus copallina
- Viburnum Prunifolium

MESIC SOIL CONDITIONS

CANOPY & UNDERSTORY TREES

- Fraxinus Americana
- Sassafras albidum
- Quercus alba
- Quercus coccinea
- Quercus prinus
- Ilex opaca
- Amelanchier canadensis
- Betula lenta

BIOSWALE AREAS

CANOPY & UNDERSTORY TREES

- Magnolia virginiana
- Nyssa sylvatica
- Quercus alba

SHRUBS

- Clethra alnifolia
- Ilex glabra
- Ilex verticillata
- Vaccinium corymbosum

WILDFLOWERS

- Chelone glabra
- Juncus effusus
- Lobelia cardinalis
- Lobelia syphilitica
- Monarda didyma

GRASSES

- Calamagrostis canadensis
- Glyceria canadensis
- Panicum virgatum

COMMON NAME

- Sweet fern
- Red cedar
- Bayberry
- Shining Sumac
- Black Haw

- American ash
- Sassafras
- White oak
- Scarlet oak
- Chestnut oak
- American Holly
- Shadblow
- Sweet Birch

- Sweetbay Magnolia
- Black Gum
- White oak

- Sweet pepperbush
- Inkberry
- Winterberry
- Highbush Blueberry

- Turtlehead
- Soft rush
- Cardinal Flower
- Blue lobelia
- Bee Balm

- Blue Joint grass
- Rattlesnake grass
- Switch grass



SCARLET OAK



WINTERBERRY



SWAMP OAK



LITTLE BLUESTEM

GENERAL DESIGN GUIDELINES FOR TRAIL DEVELOPMENT

The objective of the proposed improvements is to encourage recreational activity along the Canal and foster responsible use. The primary goal of management is to confine the impacts of the trail to the trail. The strategies to accomplish this are both physical, as well as programmatic.

A great trail is memorable and worth returning to year after year, season after season. The most successful trails are those that were purposefully planned to foster a rich visitor experience. The well-maintained trail is especially successful. The Chesapeake & Delaware Canal Trail and associated amenities should comprise a system that affords access and influences the nature of the visitor's experience.

As the plan for the trail and amenities are refined and implemented over time the following guidelines should be met:

- Create well-defined trailheads that have good connections
- Provide access points and gateways to adjacent neighborhoods
- Provide for adequate parking and controlled access to the trails

TRAIL FEATURES

The proposed trail features include trailheads, signage, maps, comfort stations, benches, fishing piers and parking areas.

- Trailheads are the welcoming entrances to the trail. This is where visitor information about use and destinations is available. Controlled access of vehicles to trail is necessary at trail heads.

Two materials are proposed for the trail surface:

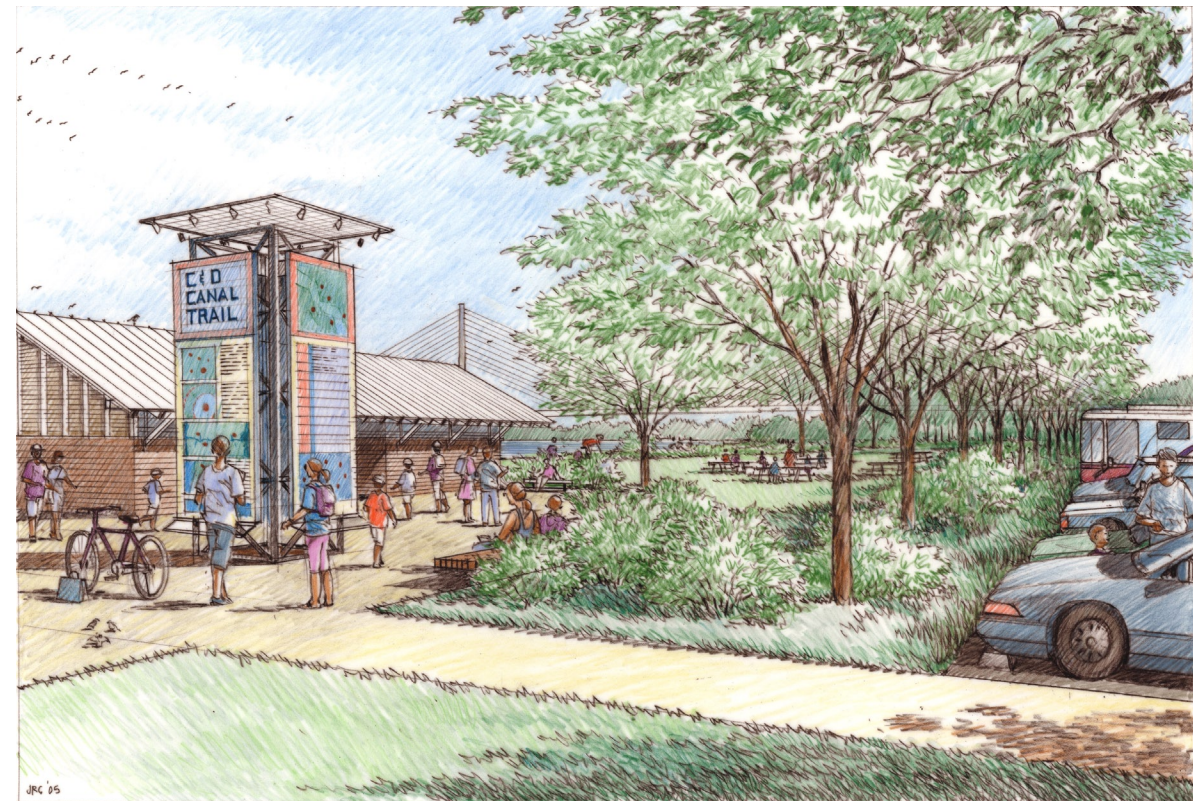
1. Bituminous Asphalt to provide access for the widest diversity of users and accommodate the most intense use. Paved trails provide all-weather access.

2. Stone fines adjacent to accommodate more user groups,

- Comfort Stations are an important amenity and will be located where adequate surveillance is present. (Isolated facilities often create difficult security conditions and require a disproportionate level of maintenance.) Existing utilities will be used wherever possible. In areas where utilities are unavailable, composting systems and solar powered systems will be employed.
- Parking areas will be created on both sides of the Canal Lands at over a dozen sites. The concept is to develop and improve already cleared and relatively flat land adjacent to trail head areas. These sites will be developed to accommodate a flexible number of cars, starting with a modest number (20-30 cars) at first. Future expansion can be added as needed. The parking areas will be unpaved gravel surfaces designed to infiltrate stormwater runoff. (Note: This option is not a suitable solution in areas above or adjacent to the extensive underdrain system already in place to prevent slope failures. Plantings for the parking areas include trees to provide shade and species that will thrive in bioswale areas to accommodate runoff in the landscape.
- Residents who presently utilize the fishing piers will enjoy restored facilities. Parking for these piers will generally be located at the trail heads closest to the piers. Public vehicle access will be restricted along the first and second tier where new trails are located, with exception of Guthrie East trailhead which is located on tier one.



PERSPECTIVE 1 - SEE CONCEPTUAL DIAGRAM FOR PLAN LOCATION. VIEW LOOKING EAST TOWARD SUMMIT BRIDGE ON THE SOUTH SIDE OF THE CANAL.



PERSPECTIVE 2 - SEE CONCEPTUAL DIAGRAM FOR PLAN LOCATION. VIEW LOOKING WEST TOWARD THE SR. I BRIDGE.

PRELIMINARY OPINION OF COST & PHASING STRATEGY SUMMARY

A phased approach to trail development is planned for the C & D. At the completion over 29 miles of multi-use trail will be built on the north and south side of the Canal.

PHASE ONE

DELAWARE CITY TO CHEESAPEAKE CITY - NORTH SIDE OF THE CANAL - 16.5 Mile Trail
 CHESAPEAKE CITY TO HOG RUN - SOUTH SIDE OF THE CANAL - 1 Mile Trail

- Amenities Include: Comfort Stations/Trailheads
 Parking Areas
 Benches
 Overlook structures
 Landscape Restoration
 Stormwater/Erosion Controls
 Trail Surface - Paved Asphalt & Compacted Stone Fines - 11.1 Miles
 Trail Surface - Compacted Stone Fines - 6.02 miles
 Repair and Replace Fishing Piers
 Gates/Bollards/Signage
 Bridge at Guthrie Run
 Utilities

SUBTOTAL PHASE ONE	\$7,780,100.
15% Contingency	\$1,167,015.
12% Design and Engineering Contingency	\$ 933,612.
OPINION OF COST PHASE ONE	\$9,880,727.

PHASE TWO

CHESAPEAKE CITY TO SCOTT RUN - SOUTH SIDE OF THE CANAL - 10.1 Mile Trail

- Amenities Include: Comfort Stations/Trailheads
 Parking Areas
 Benches
 Overlook structures
 Landscape restoration
 Stormwater/Erosion Controls
 Trail Surface - Paved Asphalt & Compacted Stone Fines - 9 Miles
 Trail Surface - Compacted Stone Fines - 1.1 miles
 Repair and Replace Fishing Piers
 Gates/Bollards/Signage
 Utilities

SUBTOTAL PHASE TWO	\$5,335,950.
15% Contingency	\$ 800,393.
12% Design and Engineering Contingency	\$ 640,314.
OPINION OF COST PHASE TWO	\$6,776,657.

PHASE THREE

REEDY POINT - NORTH AND SOUTH SIDE OF CANAL - 2.1 Mile Trail

- Amenities Include: Comfort Stations/Trailheads
 Parking Areas
 Benches
 Overlook structures
 Landscape restoration
 Stormwater/Erosion Controls
 Trail Surface - Compacted Stone Fines - 2.1 miles
 Repair and Replace Fishing Piers
 Gates/Bollards/Signage
 Utilities

SUBTOTAL PHASE THREE	\$1,722,595.
15% Contingency	\$ 258,389.
12% Design and Engineering Contingency	\$ 206,711.
OPINION OF COST PHASE THREE	\$2,187,695.

TOTAL FOR THREE PHASES **\$18,845,079.**

OPERATIONS, MAINTENANCE, AND SECURITY

SUMMARY AND BUDGET COSTS

“If you build it, they will come.” Larry Davis, an engineer on the Cape Cod Canal, quoted this famous line from the movie *Field of Dreams*, when he was referring to the two and a half million visitors that come to use the Cape Cod Canal recreation facilities every year. “And when they come, it is vital that you have visitor assistance ready for them.”

The C & D Canal has never had Corps of Engineers Park Rangers on patrol, but the proposed multi-use trail will bring about the need for government employees to manage the increase in public use. For Phase I, the project will need four full time rangers that will work in two shifts (trail use will be limited to daylight hours). They will patrol the Canal in maintenance trucks, and mountain bikes for visitor assistance, and also help with facility maintenance such as landscaping. The rangers will work out of the U.S. Army Corps of Engineers Project Office located on the Canal in Chesapeake City. They will have citation authority to enforce laws and rules that govern the proposed recreation areas. The wildlife management and hunting law enforcement responsibilities on the Canal lands will remain with the states of Maryland and Delaware, and their current law enforcement personnel. Additional trail rangers will be required for the Phases II and III of the trail, and supplementary seasonal rangers may be required for increased public trail use in the warmer months. Seasonal resident contractors that camp in personal campers at selected sites can also be used for visitor assistance and maintenance.

The construction and public use of the multi-use trail and facilities will significantly increase the maintenance load of the Corps of Engineers Project Office. The trail and surrounding terrain will have to be carefully maintained, requiring more labor and equipment than has been historically required for the existing maintenance roads. The trail will have two surfaces (asphalt and stone dust), side by side for the length of the trail. Both surfaces will require some regular maintenance, but a Plant Replacement and Improvement Program (PRIP), will be implemented and budgeted to have funds available for complete replacement or rehabilitation of the surfaces in the future.

The increase in the amount of facility structures, utilities, and landscaping improvements along the Canal will require O&M funding for replacement parts and materials, maintenance equipment, and hired or contracted labor. The comfort stations will need janitorial services and require utility services such as electricity and water. The proposed amenities such as signs, gates, parking lots, and kiosks will have to be maintained and replaced periodically. There will be landscape areas that will require more maintenance than what exists at these areas now. These subjects are broken down in an estimated annual O&M budget.

The O&M budget estimate for the proposed recreation improvements, including the materials, equipment, and labor for Phase I amounts to about \$1,000,000 per year. All three phases total to approximately \$2.4 million. This is consistent with Cape Cod, which has a recreation budget of about \$2.5 million. The C&D trail will be double the length of the Cape Cod trail, but Cape Cod has a large campground in its charge, which equals out the O&M burden between the two recreation projects, and verifies the similar costs.



3. C & D CANAL AT CHESAPEAKE CITY, MARYLAND. MD-213 CROSSES THE 2-LANE BRIDGE, WHICH HAS 135 FEET OF VERTICAL NAVIGATIONAL CLEARANCE ABOVE THE AVERAGE HIGH TIDE WATER LEVEL. PHOTO IMAGE COURTESY OF THE U.S. ARMY CORPS OF ENGINEERS.



4. C & D CANAL AT REEDY POINT AND DELAWARE RIVER WITH PEA PATCH ISLAND IN THE DISTANCE. PHOTO IMAGE COURTESY OF THE U.S. ARMY CORPS OF ENGINEERS.

DELAWARE DIVISION OF FISH AND WILDLIFE SECURITY PROPOSAL FOR C & D CANAL TRAIL

The Delaware Division of Fish and Wildlife (Division) is presenting the following proposal to enforce Delaware State Criminal Code; State Traffic Code (DWI and reckless driving); State Fish, Wildlife and Boating Statutes, and area specific regulations on the C&D Canal Wildlife Area. These activities are currently being done (albeit not at the level probably desired due to existing staff shortages) by existing Fish and Wildlife Enforcement Agents (Division’s Enforcement Section); however, with the increased visitor use and additional recreational activities anticipated with the proposed Canal Recreational Plan, an increased enforcement presence will be required. The Division is proposing the following increase in staff and associated annual funding to address these increased demands:

PHASE I -

Labor	Enforcement officers (includes benefits/fringes)	\$71,500 x 4	\$286,000
Equipment	Patrol vehicles (fleet services)	\$8,250 x 4	\$ 33,000
	Uniforms and safety equipment	\$8,250 x 4	\$ 33,000
Total			\$352,000

PHASE II & III -

Labor	Enforcement officers (includes benefits/fringes)	\$71,500 x 2	\$143,000
Equipment	Patrol vehicles (fleet services)	\$8,250 x 2	\$ 16,500
	Uniforms and safety equipment	\$8,250 x 2	\$ 16,500
Total			\$176,000

ALL PHASES

Grand Total \$528,000 Annually

This proposal represents those enforcement needs specific to Delaware and does not include those needs specific to Maryland. It is anticipated that Maryland would have a similar proposal, albeit reduced proportional to the amount of C&D Canal area within their jurisdiction. This proposal also represents an alternative to the need for federal rangers as these duties would be undertaken by the Delaware Fish and Wildlife agents. In the event that a federal presence is still desired, another alternative might involve a combination of both the federal and division proposals although some measure of increased resources will be necessary.

The following is a partial list of why the Division feels its Fish and Wildlife agents would better address enforcement activities associated with the proposed Canal Recreation Plan:

1. Fish and Wildlife agents will have access to several boats stored on or near the Canal to address recreation activities on the water.
2. Fish and Wildlife agents are part of a larger staff within the county and as needs dictate additional staff can be requested to address special events or to fill in for Canal staff during extended leave (medical, family, and military).

3. Fish and Wildlife agents already have an administrative, technical and supervisory support system.
4. Fish and Wildlife agents have an office complex adjacent to the Canal with appropriate logistical and clerical support as well as prisoner and evidence holding facilities.
5. Many of the existing violations that occur on the Canal warrant more than a ticket. Many will require an arrest. Will federal rangers be able to perform these activities and will these violations be prosecuted in federal court?
6. Fish and Wildlife have full state powers of arrest/authority including those beyond fish and wildlife statutes. Since the rangers will not, will Fish and Wildlife agents be required to address these issues as well as the hunting and fishing violations?
7. Will federal rangers address activities away from the Canal? And if not who will address these activities. The Cape Cod Canal, use a model, does not have anywhere near the amount of upland area that is associated with the C&D Canal.
8. Fish and Wildlife agents are currently familiar with the Canal and already have significant contacts with both the county and state police force.
9. Fish and Wildlife agents are already plugged into the Homeland Security network, a growing concern associated with the Canal.
10. Fish and Wildlife agents are also deputized to enforce U.S. Fish and Wildlife regulations.



C & D CANAL AT REEDY POINT BRIDGE AND DELAWARE RIVER WITH PEA PATCH ISLAND IN THE DISTANCE. PHOTO IMAGE COURTESY OF THE U.S. ARMY CORPS OF ENGINEERS.

CONCLUSION

This plan is a step towards improving the recreational potential of the C & D Canal lands for a variety of activities in Delaware and Maryland. The vision and goal is to realize the extraordinary potential for recreation and natural area protection afforded by these public lands. The focus of the study was to develop a conceptual plan for trail development while restoring, renewing and integrating the richness already present along the Canal lands. Important areas that serve as links in many places merit upgrading. The proposed budget places the priority on the most used feature - a multi-use trail system - that serves a diversity of users.

There are significant resources along or near the Canal that impact the planning decisions for facilities and trail development, such as existing marinas, state park lands, historic sites, scenic viewpoints, connections to historic towns, residential neighborhoods, and state-wide greenway trail and bicycle routes. These cultural, historical and natural resources are important in order to understand the local needs and to determine the need for access points, connections and trail amenities. The proposed phasing of the multi-use trail recognizes these resources and supports the needs of the present population with an understanding of future trends in population growth.

This study has begun an important dialogue with the community through the outreach effort. The benefit has been a two-way exchange that has allowed the public to gain a greater respect and understanding of the Corps' land usage and responsibilities in and along the C & D Canal and has allowed the Corp and the Working Group to gain a better awareness of current recreation activities on the Canal and the requirements and potential issues among users. The recommendations of this study reflect an attitude of realistic optimism by the current users for a high quality recreational experience and the sustainability of the communities' environment.

As the regional population grows, public awareness and involvement will continue to be necessary in order to manage higher levels of diverse use and to improve and protect environmental conditions. Communication and education fosters appropriate use and positive user involvement.

A new trail system along the Canal must also achieve a change in the management of what at present are Corp maintenance service roads. The primary goal of management will be to confine the impacts of the trail to the trail. This goal requires good design and adequate infrastructure as well as user compliance with the rules of the trail. The strategies to accomplish this are both physical as well as programmatic, such as the decision to limit the access of motorized vehicles on the multi-use trail.

Despite the complex nature of trail development in general, and the Canal lands in particular, the proposed guidelines for managing the proposed trail system are fairly simple:

- Confine the impacts of the trail to the boundaries of the trail.
- Accommodate mixed trail uses. All legitimate users deserve access to the trail system. The goal is to provide balanced access utilizing split trail surfaces of asphalt and stone dust. Involve users in the effort to upgrade the standard of care. Informed trail users are responsible trail users.
- Implement infrastructure improvements that are adequate for the level of proposed use. Accommodate responsible use of the trail without compromising environmental quality.
- Effectively promote courtesy and compliance with rules of the trail.

Current users value the access to the natural environments that the trail system allows and have voiced support for the trail design concept. Throughout the study, participants emphasized the relationship between access to the Canal lands, recreational activity and quality of life.

Public concerns underscore the need for a future Comprehensive Recreation Master Plan that will allow for a thorough understanding of the economic, social and environmental systems of the Canal lands. Integrating ecological systems with landscape structure and function is an inherently complex component of the planning process, as the conflicts between development efforts and conservation endeavors are becoming increasingly pertinent in our modern society. An integrated approach to planning and management of the Canal lands would recognize that communities are complex webs of interdependent systems each in order to provide a healthy, productive and meaningful life for the members of the community.



THE C & D'S EASTERN TERMINUS AT REEDY POINT ON THE DELAWARE RIVER. PHOTO COURTESY THE CORPS.

APPENDIX

BIRD SPECIES IDENTIFIED IN THE CANAL DISPOSAL AREAS SURVEYED - From Habitat Assessment of the C & D Canal Upland Disposal Areas for the C & D Canal Deepening Feasibility Study, prepared december 1994 by Environmental Resources, Inc.

SCIENTIFIC NAME	COMMON NAME
Agelaius phoeniceus	Red-winged blackbird
Anas sp.	Teal
Anas platyrhynchos	Mallard
Anas rubripes	Black duck
Ardea herodias	Great-blue heron
Bubulcus ibis	Cattle egret
Buteo jamaicensis	Red-tailed hawk
Butorides virescens	Green heron
Cardinalis cardinalis	Cardinal
Cathartes aura	Turkey vulture
Colaptes auratus	Yellow-shafted flicker
Colinus virginianus	Bobwhite quail
Contopus borealis	Olive-sided flycatcher
Corvus brachyrhynchos	American crow
Cyanocitta cristata	Blue jay
Dendrocopos puvescens	Downy woodpecker
Dendroica petechia	Yellow warbler
Dumetella carolinensis	Catbird
Hydroprogne caspia	Caspian tern
Iridoprocne bicolor	Tree swallow
Larus argentatus	Herring gull
Larus atricilla	Laughing gull
Larus delawarensis	Red-billed gull
Meleagris gallopavo	Turkey
Melospiza melodia	Song sparrow
Mimus polyglottos	Mockingbird
Molothrus ater	Brown-headed cowbird
Myiarchus crinitus	Great-crested flycatcher
Panidion haliaetes	Osprey
Parus carolinensis	Carolina chickadee
Passer domesticus	House sparrow
Passerina cyanea	Indigo bunting
Pipilo erythrophthalmus	Rufous-necked pheasant
Plegadis falcinellus	Glossy ibis
Protonotaria citrea	Prothonotary warbler
Riparia riparia	Bank swallow

Shorebird migration, Black and Yellow-crowned Night Herons flying overhead at the end of the canal at dusk (Reedy Point vicinity).

AMPHIBIANS AND REPTILES IDENTIFIED IN THE CANAL DISPOSAL AREAS SURVEYED - From Habitat Assessment of the C & D Canal Upland Disposal Areas for the C & D Canal Deepening Feasibility Study, prepared december 1994 by Environmental Resources, Inc.

Rana catesbeiana	Bullfrog
Terrapene c. carolina	Eastern box turtle

VEGETATION: - From Habitat Assessment of the C & D Canal Upland Disposal Areas for the C & D Canal Deepening Feasibility Study, prepared december 1994 by Environmental Resources, Inc.

SPECIES IDENTIFIED IN THE CANAL DISPOSAL AREAS SURVEYED

Acer negundo	Box elder <i>n</i>
Acer rubrum	Red maple <i>n</i>
Acer saccharinum	Silver maple <i>in</i>
Ailanthus altissima	Tree-of-heaven <i>in</i>
Albizia julibrissin	Mimosa <i>in</i>
Alisma plantago-aquatica	Water plantain
Amaranthus cannabinus	Tidmarsh water hemp
Ambrosia trifida	Giant ragweed
Amelanchier canadensis	Oblong-leaf serviceberry <i>n</i>
Anagallis arvensis	Scarlet pimpernel
Andropogon virginicus	Broomsedge <i>n</i>
Apios americana	Ground nut
Aralia spinosa	Hercules' club
Aristida dichotoma	Poverty grass, three-awned grass
Aristida curtissii	Curtis' three awn grass
Asclepias syriaca	Common milkweed
Asplenium platyneuron	Ebony spleenwort
Aster sp.	Aster
Aster vimineus	Small white aster
Betula populifolia	Gray birch <i>n</i>
Boehmeria cylindrical	False nettle
Botrychium sp.	Grape fern
Campsis radicans	Trumpet creeper
Carya glabra	Pignut hickory <i>n</i>
Carya ovalis	Sweet pignut hickory <i>n</i>
Carya tomentosa	Mockernut hickory <i>n</i>

Ceratophyllum demersum	Coontail
Chenopodium album	Lamb's quarters
Chenopodium sp.	Goosefoot
Cichorium intybus	Chicory
Cinna latifolia	Drooping woodreed
Cirsium vulgare	Bull thistle
Convolvulus arvensis	Field bindweed
Conyza canadensis	Horseweed
Coreopsis sp.	Tickseed sunflower
Cornus florida	Flowering dogwood <i>n</i>
Coronilla varia	Crown-vetch <i>in</i>
Corylus americana	Hazelnut <i>n</i>
Crataegus sp.	Hawthorn <i>n</i>
Cyperus sp.	Umbrella sedge
Cytisus scoparius	Scotch broom
Daucus carota	Queen Anne's lace
Desmodium sp.	Beggar's ticks
Dichanthelium clandestinum	Deertongue
Dichanthelium sphaerocarpon	Round-fruited panic grass
Digitaria sp.	Crab grass
Diospyros virginiana	Persimmon <i>n</i>
Echinochloa crus-galli	Barnyard grass
Echinochloa walteri	Walter's millet
Elaeagnus angustifolia	Russian olive
Elaeagnus umbellata	Autumn olive
Eleocharis obtusa	Blunt spikerush
Eleocharis parvula	Small spikerush
Eleocharis quadrangulata	Square-stem spikerush
Eragrostis curvula	Weeping lovegrass
Euonymus americanus	American strawberry bush <i>n</i>
Eupatorium hyssopifolium	Hyssop-leaved thoroughwort
Eupatorium pubescens	Hairy thoroughwort
Eupatorium serotinum	Late-flowering thoroughwort
Fagus grandifolia	American beech <i>n</i>
Festuca arundinacea	Tall fescue
Galeopsis tetrahit	Hemp dead nettle
Heterotheca subaxillaris	Camphorweed
Hibiscus moscheutos	Swamp rosemallow

SCIENTIFIC NAME

COMMON NAME

Hieracium canadense	Canada hawkweed	Nuphar lutea	Yellow cow-lily
Hypericum sp.	St. John's wort	Nyssa sylvatica	Black gum <i>n</i>
Ilex opaca	American holly <i>n</i>	Obolaria virginica	Pennywort <i>n</i>
Impatiens capensis	Jewelweed	Oenothera biennis	Common evening primrose
Ipomoea hederacea	Ivy-leaved morning glory	Panicum dichotomiflorum	Fall panicum
Ipomoea sp.	Wild morning glory	Panicum verrucosum	Warty panicum
Juglans nigra	Black walnut <i>n</i>	Panicum virgatum	Switchgrass <i>n</i>
Juncus canadensis	Canada rush	Parthenocissus quinquefolia	Virginia creeper <i>n</i>
Juncus effusus	Soft rush	Paulownia tomentosa	Princess tree <i>in</i>
Juncus tenuis	Path rush	Smilax sp.	Greenbrier
Juncus sp.	Rush	Solidago graminifolia	Grass-leaved goldenrod
Juniperus horizontalis	Creeping juniper <i>n</i>	Solidago juncea	Early goldenrod
Juniperus virginiana	Eastern red cedar <i>n</i>	Solidago patula	Rough-leaved goldenrod
Lactuca canadensis	Wild lettuce	Solidago puberula	Downy goldenrod
Lactuca scariola	Prickly lettuce	Solidago rugosa	Wrinkled-leaved goldenrod
Lathyrus pratensis	Yellow vetchling	Solidago sp.	Goldenrod
Leersia oryzoides	Rice cutgrass	Sparganium sp.	Burreed
Leersia virginica	White grass <i>n</i>	Spiraea tomentosa	Steeple bush
Lepidium virginicum	Wild peppergrass <i>n</i>	Taraxacum officinale	Common dandelion
Leptochloa fascicularis	Spangle top	Toxicodendron radicans	Poison ivy
Lespedeza cuneata	Sericea lespedeza	Tridens flava	Purple top grass
Lespedeza sp.	Bush clover	Trifolium arvense	Rabbit-foot clover
Linaria vulgaris	Butter-and-eggs	Triplasis purpurea	Purple sandgrass
Lindera benzoin	Spice bush <i>n</i>	Typha latifolia	Broad-leaved cattail
Liquidambar styraciflua	Sweet gum <i>n</i>	Ulmus americana	American elm <i>n</i>
Liriodendron tulipifera	Tulip poplar <i>n</i>	Vaccinium corymbosum	Highbush blueberry <i>n</i>
Lonicera japonica	Japanese honeysuckle <i>in</i>	Vaccinium vacillans	Lowbush blueberry <i>n</i>
Lonicera morrowi	Morrow honeysuckle	Verbascum blattaria	Moth mullein
Lonicera tatarica	Tartarian honeysuckle	Verbascum thapsus	Common mullein
Ludwigia palustris	Marsh seedbox	Verbena hastata	Blue vervain
Ludwigia peploides	Floating seedbox	Viburnum dentatum	Arrowwood <i>n</i>
Lysimachia lanceolata	Lanced-leaf loosestrife	Viburnum nudum	Smooth haw <i>n</i>
Lythrum salicaria	Purple loosestrife <i>in</i>	Vicia cracca	Cow vetch
Malus sp.	Crab apple	Vitis sp.	Wild grape
Melilotus sp.	Sweet clover	Xyris sp.	Yellow-eyed grass
Morus rubra	Mulberry		
Myrica pensylvanica	Bayberry <i>n</i>		
Myriophyllum spicatum	Eurasian watermilfoil		
Nelumbo lutea	American lotus <i>n</i>		

n = native*in* = invasive

MEMORANDUM FOR FILES

SUBJECT: FY2004 Geotechnical Inspection of the Chesapeake and Delaware Canal Slopes

I. INTRODUCTION.

A. REFERENCES.

(1) ER 1110-2-100, "Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures," dated 15 February 1995.

(2) Geotechnical Appendix, "Feasibility Report, C&D Canal – Baltimore Harbor Connecting Channels (Deepening) Delaware and Maryland," dated August 1996.

B. PURPOSE AND AUTHORITY. The purpose of this report is to document and communicate the condition of the slopes of the Chesapeake and Delaware (C&D) Canal with the primary consideration that a severe slope failure could endanger the ship channel or bridge piers. This inspection was performed under the authority of Reference 1a(1) by Bruce R. Rogers, P.G., of Geotechnical Section on 30 August 2004.

2. INSPECTION OBSERVATIONS.

A. GENERAL. Both the north and south slopes of the canal were inspected while driving along the canal. The local stratigraphy of the canal is such that different geologic units outcrop within different zones of the canal (see Figure 1). Previous slope failures along the canal have been found to be associated with locations where the canal is cut through the Mount Laurel (Station 14 to 21), Magothy (Station 49 to 54), and the Patapsco/Raritan formations (Station 54 to the west end of the canal); whereas, there have been no slope failures where the canal is cut through the Marshalltown, Englishtown, and Merchantville formations. A slope stability analysis performed during the C&D Canal Deepening Feasibility Study [Reference 1a(2)] indicated that the factor of safety against slope failure for the Magothy and Patapsco/Raritan formations is less than one. This means that these formations are inherently unstable under existing conditions. Emphasis was placed on these areas while conducting the inspection. In addition, since the last inspection, new slope movements at Stations 51+250 on the north bank, 54+900 on the north bank, and 70+130 on the south bank were brought to the attention of the undersigned by C&D Canal operations personnel. Further, an additional area of new movement at Station 82+800 on the north bank was noticed during the inspection. The following subparagraphs, which are in station order, provide additional information about these locations.

B. STATION 21+200, NORTH BANK. (NOTE: This location has been incorrectly described as Station 20+000 in past reports.) A shallow slope failure that was repaired in 1991 was still evident at Station 21+200 on the north bank, which is between the St. Georges Bridge and the Delaware City Branch Channel.

The arcuate sloughed area had been cut back and the lowest level road realigned around the repair at this location (see Photo 1). There was no evidence of any new significant movement in this area, and a comparison to Photos from previous inspections indicated no apparent change. This location should be visually checked quarterly by C&D Canal operations personnel as well as inspected annually by Geotechnical Section personnel. Any observation by C&D Canal operations personnel of cracking, slumping, or sloughing should be brought to the immediate attention of Geotechnical Section.

C. STATION 29+250, SOUTH BANK. A concrete retaining wall was observed at this location, which is at the town of St. Georges (see Photo 2). Since the wall provides stability to the bank, the undersigned decided to include this feature in the inspection. The wall was in good overall condition. The alignment, backfill, and weep holes were all in satisfactory condition. There was some spalling that could be considered normal for this type of concrete feature, except for one 6" long spall near the east end that had rebar showing (see Photo 3). This spall should be repaired as soon as possible to protect the structural integrity of the structure.

D. STATION 51+250, NORTH BANK. Movement in this location, which is under an overhead pipeline near the location of the old Summit Bridge, consists of cracking along the south bank of the second level road, forming the head of the slope failure, and barely-observable cracking and dipping of the lower road, forming the east and west flanks of the slope failure. The movement location coincides with a previous movement in 1979, and is likely a reactivation of this slope movement plane. The cracking was not as pronounced during this inspection as it was in February 2004 when the movement was brought to the attention of the undersigned. Photo 4 depicts the movement along the west flank of this slope failure as observed in February 2004. It was determined that the movement at this location was not severe enough to warrant installation of geotechnical instrumentation. This location should be visually checked quarterly by C&D Canal operations personnel as well as inspected annually by Geotechnical Section personnel. Any observation by C&D Canal operations personnel of cracking, slumping, or sloughing should be brought to the immediate attention of Geotechnical Section

E. STATION 54+900, NORTH BANK. Movement in this location, which is just east of Summit Bridge, consists of cracking along the south bank of the second level road, forming the head of the slope failure, and cracking and dipping of the lower road, forming the east and west flanks of the slope failure (see Figure 2 and Photos 5 through 7). The movement location is on the west flank of a previous movement in 1982, and is likely a reactivation of a portion of this slope movement plane. The cracking was not as pronounced during this inspection as it was in February 2004 when brought to the attention of the undersigned; however, the dip in the road was certainly still obvious. This movement apparently started a few years ago, but was not observed by the undersigned during previous annual inspections. The severity of the movement warranted the installation of an inclinometer (see Photo 8) in order to determine the depth to the movement plane, horizontal movement at depth, and rate of movement. The inclinometer was measured five times between installation on 6 May 2004 and 31 August 2004. By the latter date, the inclinometer had moved about 0.4" (see Figure 3), and the rate of movement was steady over the entire period (see Figure 4). The inclinometer should continue to be read quarterly, and this location should be visually checked quarterly by C&D Canal operations personnel as well as inspected annually by Geotechnical Section personnel. Any observation by C&D Canal operations personnel of cracking, slumping, or sloughing should be brought to the immediate attention of Geotechnical Section.

F. STATION 58+500, SOUTH BANK. Geotechnical Section has been monitoring an existing slope failure that became apparent in 1986 at Station 58+500 on the south bank of the canal (see Photos 9 through 11). The movement location coincides with previous movements in 1927 and 1966, and is likely a reactivation of this slope movement plane. The slope failure has an arcuate head rising from the lowest level road toward the second level road with the highest point being about 7' (horizontally) from the edge of the second level road. The width of the slide plane along the centerline of the lowest level road is about 150'. Geotechnical instrumentation consisting of two inclinometers and six piezometers was installed in 1990 (see Figure 5). One inclinometer and two piezometers were installed within the slope failure itself adjacent to the lowest level road. One inclinometer and two piezometers were also installed above the slope failure adjacent to the second level road. Two additional piezometers were installed adjacent to the third level road. The two piezometers and one inclinometer that were installed within the failure plane sheared off within 3 months of installation as expected. The failure plane surface was then identified at 30' below the lowest level road. The inclinometer on the second level road has shown less than 0.5" of movement since installation 14 years ago, indicating that the slope failure is not increasing in extent. The geotechnical instrumentation should continue to be read quarterly, and this location should be visually checked quarterly by C&D Canal operations personnel as well as inspected annually by Geotechnical Section personnel. Any observation by C&D Canal operations personnel of cracking, slumping, or sloughing should be brought to the immediate attention of Geotechnical Section.

G. STATION 70+130, SOUTH BANK. Movement in this location consists of barely-observable, arcuate cracking across part of the lower road. The movement location coincides with a previous movement in 1968, and is likely a reactivation of this slope movement plane. The cracking was not as pronounced during this inspection as it was in April 2004 when the movement was brought to the attention of the undersigned. Photo 12 depicts the movement along the west flank of this slope failure as observed in April 2004. It was determined that the movement at this location was not severe enough to warrant installation of geotechnical instrumentation. This location should be visually checked quarterly by C&D Canal operations personnel as well as inspected annually by Geotechnical Section personnel. Any observation by C&D Canal operations personnel of cracking, slumping, or sloughing should be brought to the immediate attention of Geotechnical Section.

H. STATION 82+800, NORTH BANK. Movement in this location consists of obvious dipping of the lower road, forming the east and west flanks of the slope failure (see Photo 13). The head of the slope failure must be on the slope toward the second level road, but it was not readily apparent. The movement location coincides with a previous movement in 1966, and is likely a reactivation of a portion of this slope movement plane. The width of the slide plane along the centerline of the lowest level road is about 225'. This movement location had not been brought to the attention of the undersigned by C&D Canal operations personnel; rather, it was spotted from the opposite side of the canal during this inspection. This location should be visually checked quarterly by C&D Canal operations personnel as well as inspected annually by Geotechnical Section personnel. Any observation by C&D Canal operations personnel of cracking, slumping, or sloughing should be brought to the immediate attention of Geotechnical Section. Consideration should be given for installation of an inclinometer at this location.

I. STATIONS 83+200 AND 84+000, SOUTH BANK. Sloughing was observed at these two locations from the opposite side of the canal (see Photos 14 and 15). The sites were not inspected due to lack of vehicular access as well as lack of severity of sliding. These locations should be visually checked quarterly by C&D Canal operations personnel as well as inspected annually by Geotechnical Section personnel. Any observation by C&D Canal operations personnel of cracking, slumping, or sloughing should be brought to the immediate attention of Geotechnical Section. C&D Canal operations personnel should advise Geotechnical Section personnel on access to these sites for closer inspection.

3. CONCLUSIONS AND RECOMMENDATIONS.

Slope movement has been observed, instrumented, and documented during the past inspection year. Geotechnical Section personnel will continue to provide inspection and monitoring services to Operations Division for the C&D Canal slopes. It is recommended that as long as the ship channel is not threatened by any of these slope movements, then the present maintenance and management of the affected road sections should continue to be the course of action. If a more severe condition is indicated by the results of continued visual monitoring or geotechnical instrumentation, a further review of the recommendations will be performed. At that time, proposals for design, construction, and maintenance of barriers to prevent or control movement will be presented, along with cost estimates. It is also recommended that an inclinometer be installed at Station 82+800 on the North Bank. A preliminary cost estimate for installation and initial reading of the inclinometer is \$12,000, split evenly between contract and hired labor funds. Locations to be visually monitored quarterly are listed in Table 1.



PHOTO 1. STATION 21+200, NORTH SIDE, LOOKING WEST, 30 AUG 04. LOCATION OF A PREVIOUS SLOPE FAILURE. THIS AREA WAS CUT BACK AND PROTECTED WITH RIPRAP.



PHOTO 2. STATION 29+250, SOUTH SIDE, LOOKING EAST, 30 AUG 04. CONCRETE RETAINING WALL AT ST. GEORGES.



PHOTO 4. STATION 51+250, NORTH SIDE, LOOKING WEST, 12 FEB 04. EAST FLANK OF SLOPE FAILURE.



PHOTO 6. STATION 54+900, NORTH SIDE, LOOKING WEST, 12 FEB 04. CRACKING ALONG EDGE OF SECOND LEVEL ROAD.



PHOTO 3. STATION 29+250, SOUTH SIDE, 30 AUG 04. SPALL WITH REBAR SHOWING IN THE RETAINING WALL SHOWN IN PHOTO 2.



PHOTO 5. STATION 54+900, NORTH SIDE, LOOKING WEST, 12 FEB 04. EAST FLANK OF SLOPE FAILURE.



PHOTO 7. STATION 54+900, NORTH SIDE, LOOKING EAST, 30 AUG 04. WEST FLANK OF SLOPE FAILURE.



PHOTO 8. STATION 54+900, NORTH SIDE, 30 AUG 04. INCLINOMETER INSTALLED TO MONITOR SLOPE MOVEMENT.



PHOTO 10. STATION 58+500, NORTH SIDE, 30 AUG 04. LOOKING ALONG THE WEST FLANK AT THE HEAD OF THE SLOPE FAILURE.



PHOTO 12. STATION 70+130, SOUTH SIDE, 30 AUG 04. LOOKING ALONG THE EAST FLANK FROM THE HEAD OF THE SLOPE FAILURE.



PHOTO 9. STATION 58+500, NORTH SIDE, LOOKING EAST, 30 AUG 04. WEST FLANK OF SLOPE FAILURE.



PHOTO 11. STATION 58+500, NORTH SIDE, LOOKING WEST, 30 AUG 04. EAST FLANK OF SLOPE FAILURE.



PHOTO 13. STATION 58+500, NORTH SIDE, LOOKING EAST, 30 AUG 04. WEST FLANK OF SLOPE FAILURE.



PHOTO 14. STATION 83+200, SOUTH SIDE, 30 AUG 04. LOOKING AT THE SLOUGHING FROM THE NORTH SIDE OF THE CANAL.



PHOTO 15. STATION 84+000, SOUTH SIDE, 30 AUG 04. LOOKING AT THE SLOUGHING FROM THE NORTH SIDE OF THE CANAL.

RESULTS OF C & D PUBLIC SURVEY

Chesapeake & Delaware Canal Recreation Study 2005 Public Involvement

Public Questionnaire

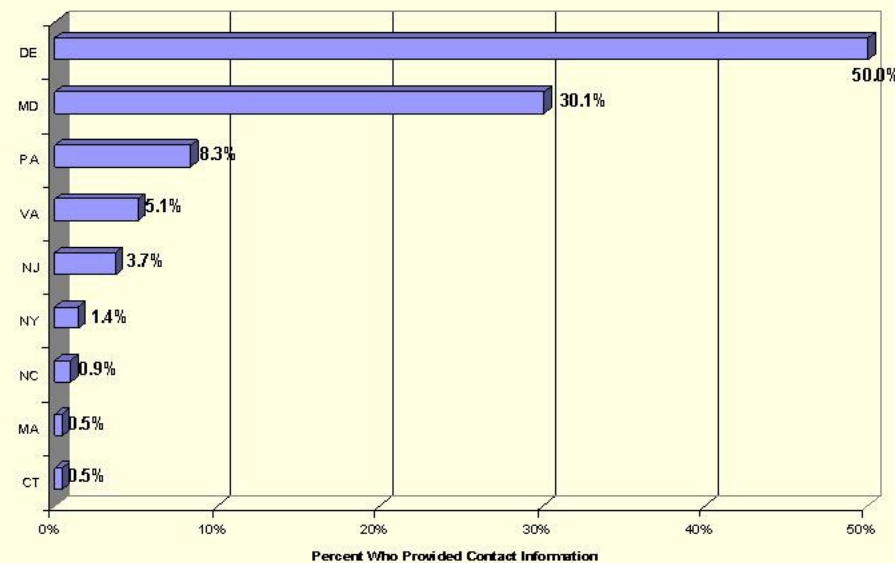
Public Involvement:

- A questionnaire was developed by the Working Group to gather information on how the public uses the C&D Canal lands for recreation and their vision for future recreation uses.
- Workshops:
 - April 25th at Delaware City, De 4-8pm
 - April 26th at Chesapeake City, Md 4-8pm
- The questionnaire was available at the workshops and on-line at <http://www.nap.usace.army.mil/Projects/CD/index.htm>.
- The public was encouraged to complete the questionnaire at the workshop, on line or mailed.

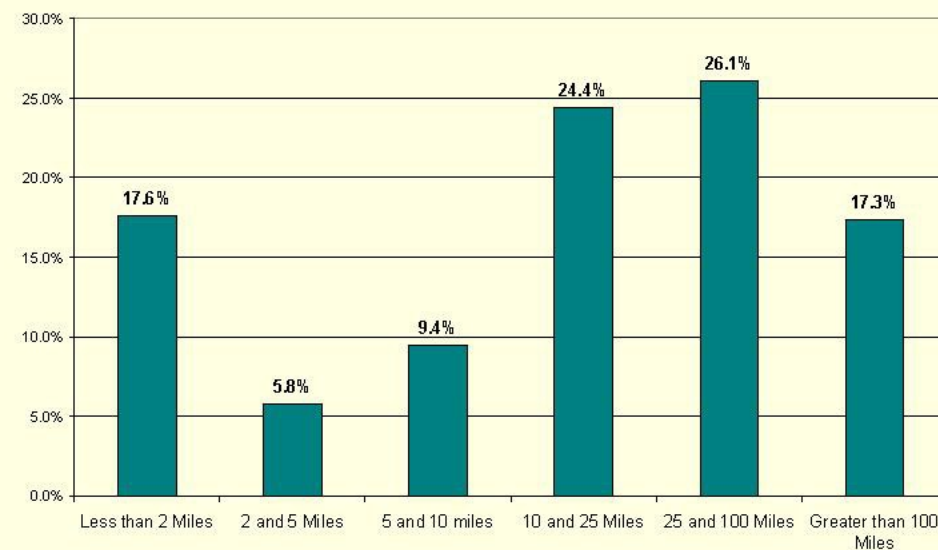
General Data:

- 474 respondents
 - 343 web-entries
 - 131 mail-in entries
- 80% of the respondents are C&D Canal users
- *C&D Canal users*
 - 97% use land
 - 64% use water

Survey Respondents By State



Distance to the C&D Canal from Home



Survey Information Collected

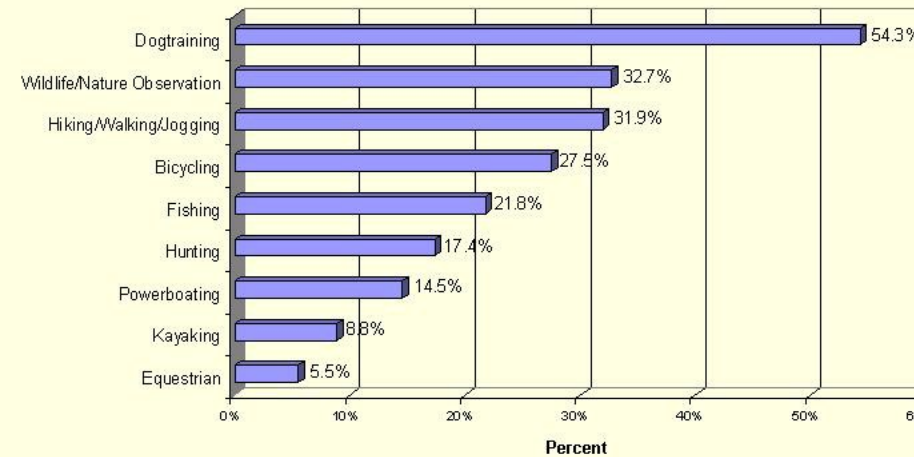
- Activities and frequencies of current C&D Canal users
- Rating the importance of both existing and possible recreation activities on a 1 to 5 scale
- Enhancements that would encourage the public to use the C&D Canal more often

Current C&D Canal Users

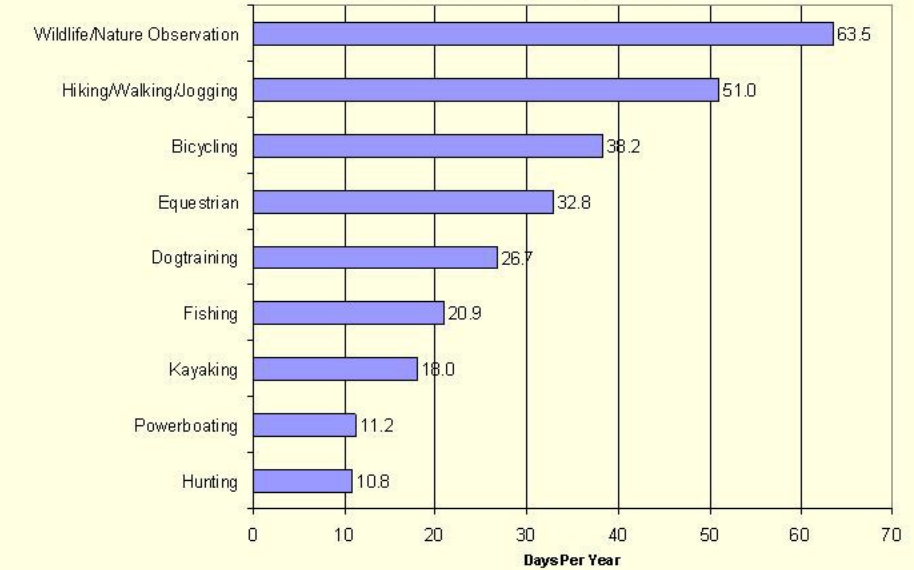
- Do you currently use the lands and/or waters of the C&D Canal for recreation? Yes No
- If you answered yes to question 1, please tell us how many times per year you or a member of your household participates in each of the following existing activities.

Outdoor Activity	Times per year
<input type="checkbox"/> Hunting	
<input type="checkbox"/> Fishing	
<input type="checkbox"/> Power boating	
<input type="checkbox"/> Kayaking/canoeing	
<input type="checkbox"/> Wildlife /nature observation	
<input type="checkbox"/> Hiking or walking or jogging	
<input type="checkbox"/> Dog training	
<input type="checkbox"/> Bicycling	
<input type="checkbox"/> Equestrian	
<input type="checkbox"/> Other (specify)	

How Do You Currently Use The C&D Canal For Recreation? (384 Respondents)



Average Participation Days Per Year By Users of the C&D Canal



Current and Possible Recreation Activities

- Below are lists of both existing activities and possible activities to be evaluated under the Study. Please let us know how important each is to you.

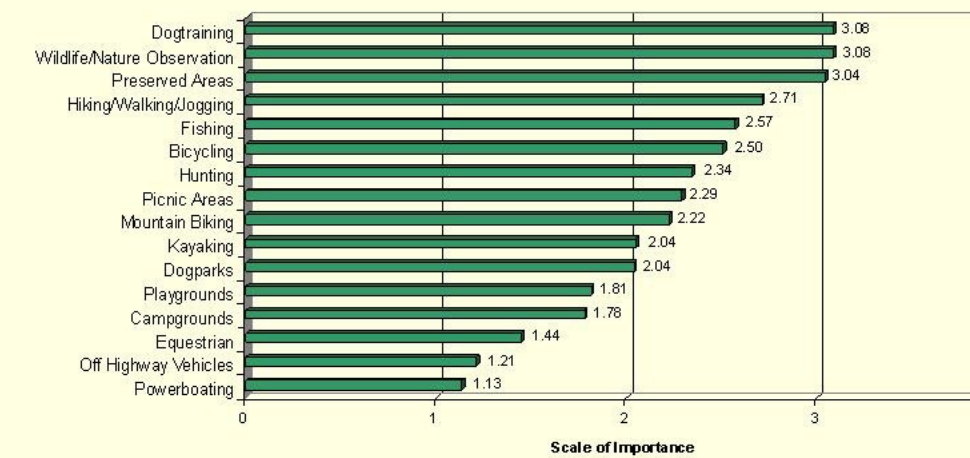
(Scale of 1 to 5)
 1 = Not Important
 3 = Somewhat Important
 5 = Very Important

Current and Possible Recreation Activities

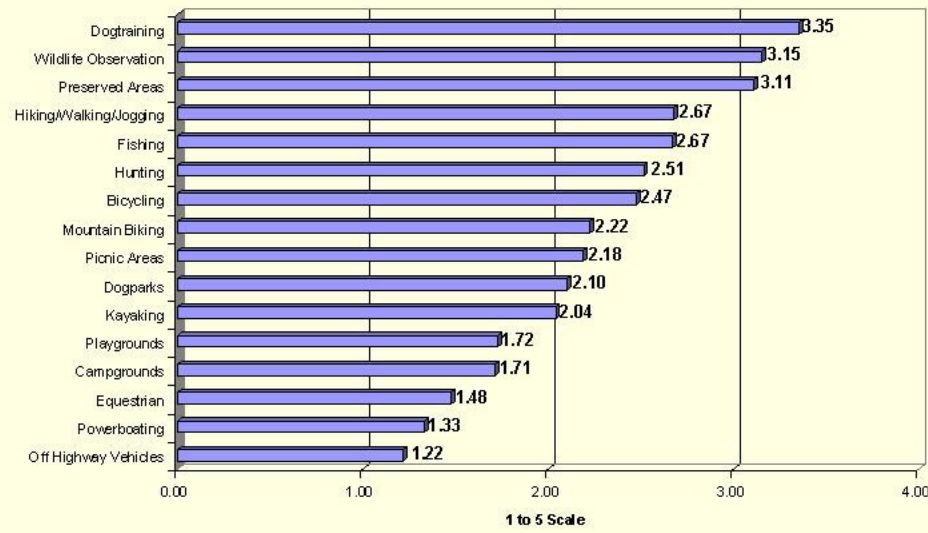
- | | |
|---|--|
| Existing Activities | Possible Activities |
| <input type="checkbox"/> Hunting | <input type="checkbox"/> All – terrain vehicle sites (ATV) |
| <input type="checkbox"/> Fishing | <input type="checkbox"/> Campgrounds |
| <input type="checkbox"/> Power boating | <input type="checkbox"/> Dog parks |
| <input type="checkbox"/> Kayaking/canoeing | <input type="checkbox"/> Preserved areas |
| <input type="checkbox"/> Wildlife /nature observation | <input type="checkbox"/> Mountain biking |
| <input type="checkbox"/> Hiking or walking or jogging | <input type="checkbox"/> Picnic areas |
| <input type="checkbox"/> Dog training | <input type="checkbox"/> Playgrounds |
| <input type="checkbox"/> Bicycling | <input type="checkbox"/> Other (specify) |
| <input type="checkbox"/> Equestrian | |

Rate the Importance of Each Activity on a Scale of 1 to 5

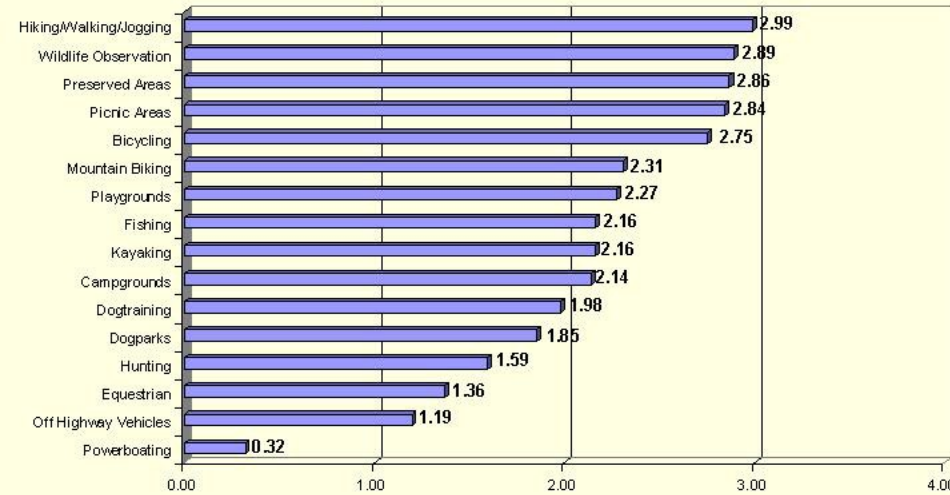
1= Not Important, 3= Somewhat Important, 5= Very Important



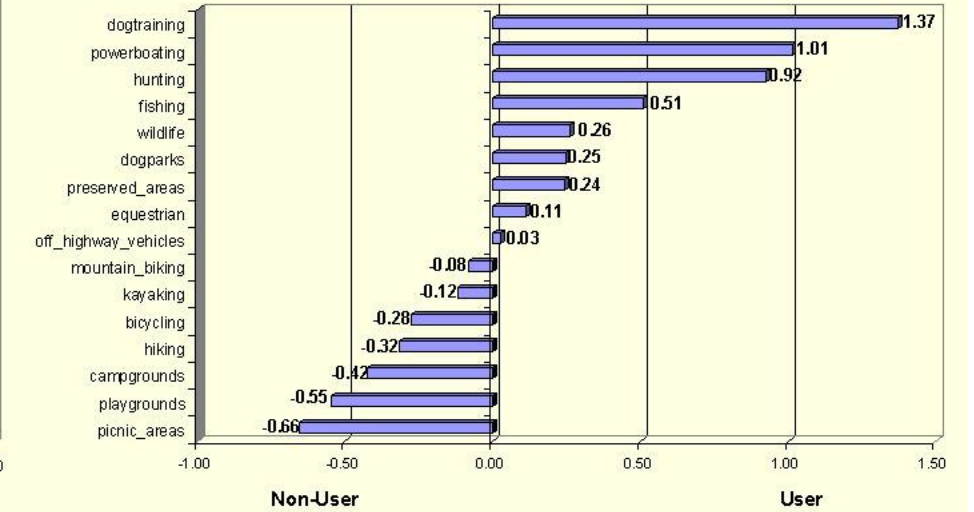
Users Average Response



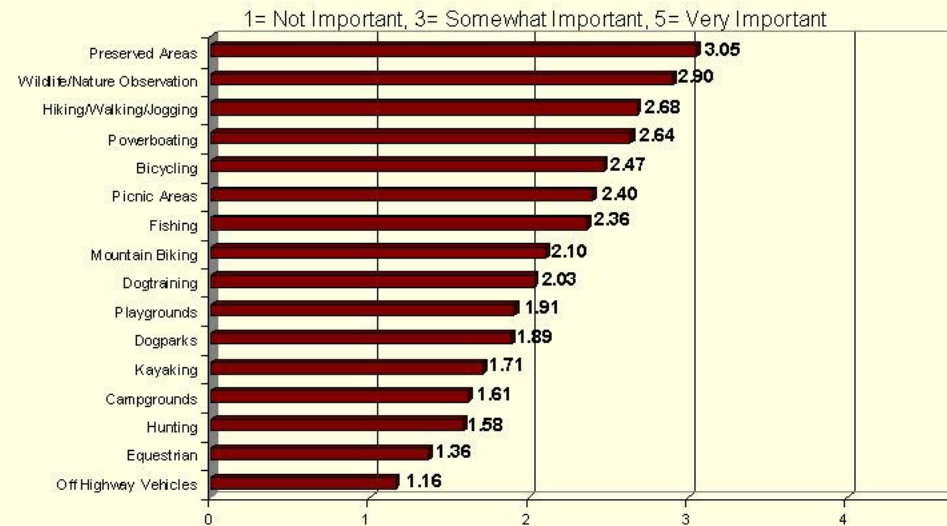
Non-Users Average Response



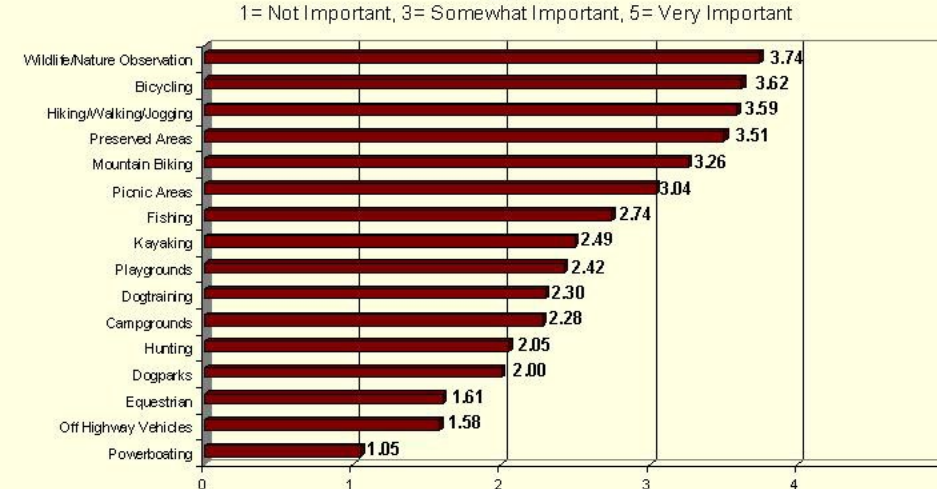
What Users and Non-Users Would Like To See At The C&D Canal



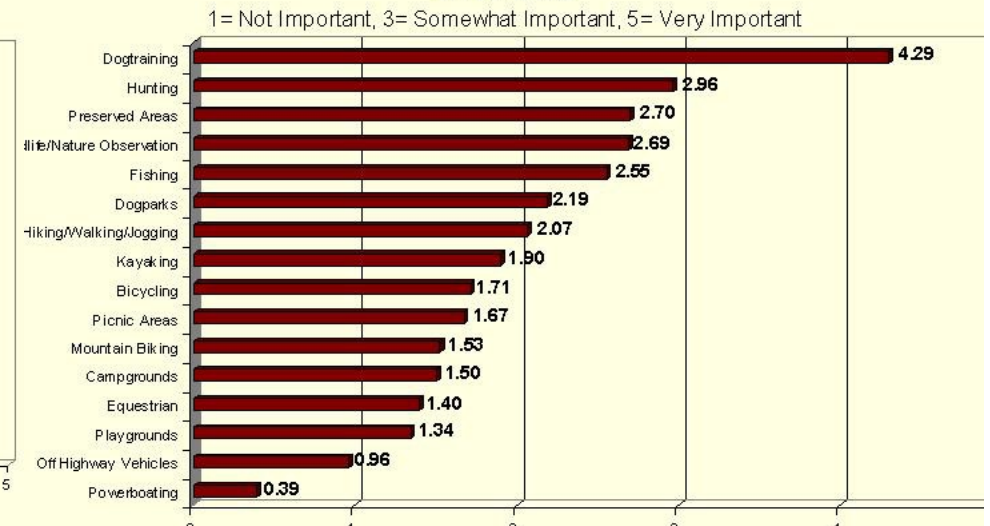
**Rate the Importance of Each Activity
96 Respondents Living Within 3 miles of the C&D Canal**



**Rate the Importance of Each Activity
166 Repondents Living Between 3 and 20 Miles from the C&D Canal**



**Rate the Importance of Each Activity
207 Repondents Living Greater than 20 Miles from the C&D Canal**

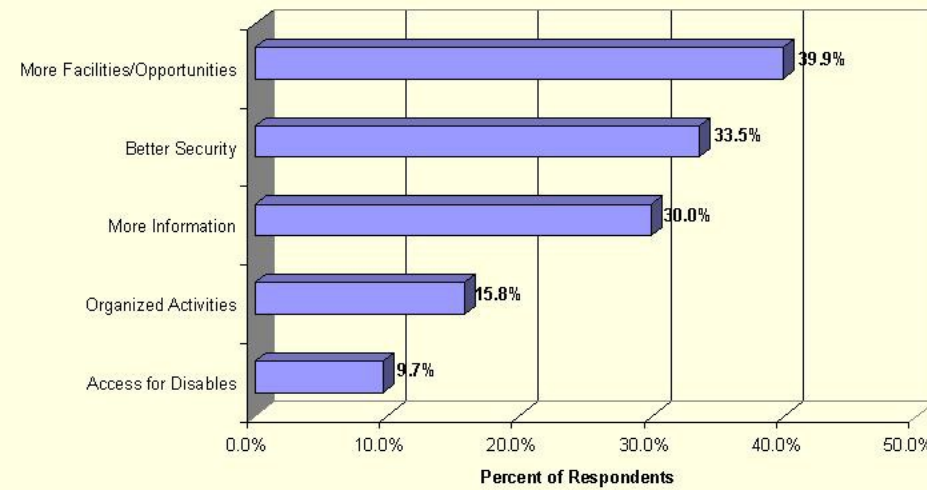


Enhancements That Would Encourage More Use

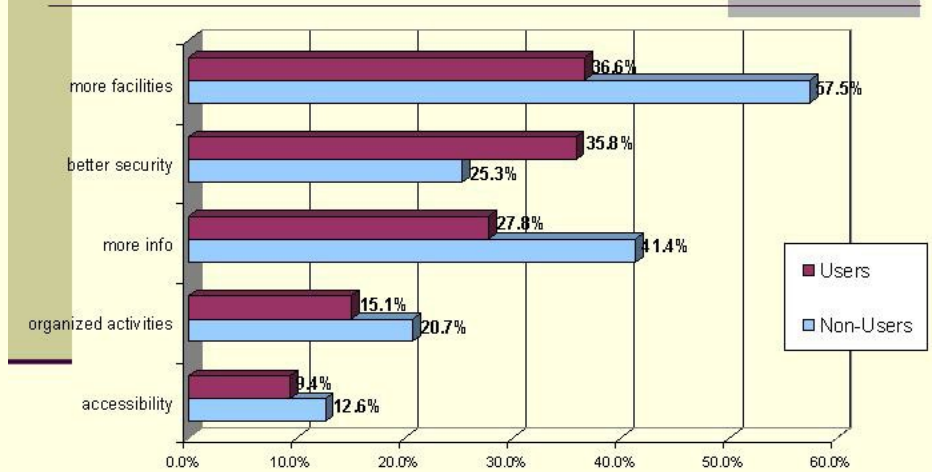
What would encourage you to use the C&D Canal area more? (Check all that apply)

- More outdoor facilities and opportunities
- More information about opportunities and facilities
- Better security within the area
- Increased accessibility for persons with disabilities
- More opportunity to participate in organized activities
- Other (specify)

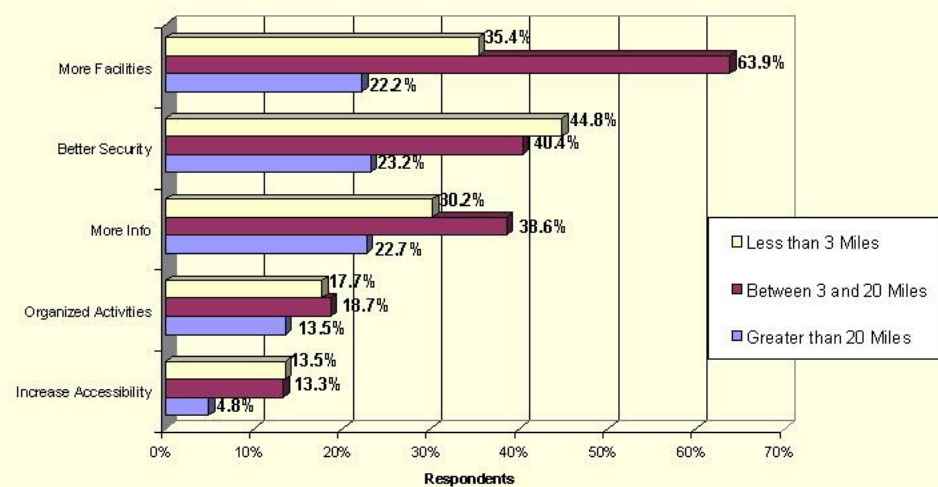
Enhancements Needed (Overall)



What Enhancements Would Encourage You To Use The C&D Canal Area More?



What Enhancements Would Encourage You to Use the C&D Canal Area More?



**Chesapeake and Delaware Canal Recreation Study
Public Involvement**

Background

The C&D Canal Recreation Study Working Group is coordinating with federal, state, county and local agencies, stakeholders, and citizens to determine which of the existing recreational facilities should be expanded and what types of new recreational facilities should be provided along the publicly owned lands directly adjacent to the Chesapeake and Delaware Canal waterway.

The Working Group has launched this study with the idea that a multi-use trail for pedestrians and bicyclists will enhance recreation along the Canal. Your input is needed to determine how the Canal lands and waters are currently used, and what other recreational facilities and opportunities should be provided.

Questionnaire

The first thing that will help the Working Group is an understanding of how the C&D Canal lands and waters are currently utilized. Please take a few minutes to answer the questions below.

1. Do you currently use the lands and/or waters of the C&D Canal for recreation?

Yes No If Yes, check which resource(s) you use. Land Water

2. If you answered yes to question 1, please tell us how many times per year you or a member of your household participates in each of the following existing activities. If you answered no, please skip to questions 3.

Outdoor Activity	Times per year
Hunting	
Fishing	
Power boating	
Kayaking/canoeing	
Wildlife/nature observation	
Hiking or walking or jogging	
Dog training	
Bicycling	
Equestrian	
Other (specify)	
Other (specify)	
Other (specify)	
Other (specify)	

3. Below are lists of both existing activities and possible activities to be evaluated under the Study. Please let us know how important each is to you.

? = Don't know 1 = Not Important 3 = Somewhat Important 5 = Very Important

Existing Activities

Hunting	?	1	2	3	4	5
Fishing	?	1	2	3	4	5
Power boating	?	1	2	3	4	5
Kayaking or canoeing	?	1	2	3	4	5
Wildlife/nature observation	?	1	2	3	4	5
Hiking or walking or jogging	?	1	2	3	4	5
Dog training	?	1	2	3	4	5
Bicycling	?	1	2	3	4	5
Equestrian	?	1	2	3	4	5

Possible Activities

Off-highway vehicles	?	1	2	3	4	5
Campgrounds	?	1	2	3	4	5
Dog parks	?	1	2	3	4	5
Preserved areas	?	1	2	3	4	5
Mountain biking	?	1	2	3	4	5
Picnic areas	?	1	2	3	4	5
Playgrounds	?	1	2	3	4	5
Other (specify)	?	1	2	3	4	5
Other (specify)	?	1	2	3	4	5
Other (specify)	?	1	2	3	4	5
Other (specify)	?	1	2	3	4	5
Other (specify)	?	1	2	3	4	5

4. What would encourage you to use the C&D Canal area more? (Check all that apply)

Enhancement	Needed
More outdoor facilities and opportunities	
More information about opportunities and facilities	
Better security within the area	
Increased accessibility for persons with disabilities	
More opportunity to participate in organized activities	
Other (specify)	
Other (specify)	
Other (specify)	

5. Why should the Working Group consider additional recreation facilities and opportunities along the C&D Canal?

6. Why should the Working Group *not* consider additional recreation facilities and opportunities along the C&D Canal?

7. How many miles do you live from the C&D Canal?

8. Additional comments or questions.

If you would like to be added to our mailing list and/or e-mail list, please provide the following:

Name	
Address	
City, State	
Zip Code	
Telephone	
E-mail	

APPENDIX : C & D CANAL WILDLIFE AREA, SUMMIT RETRIEVER TRAINING AREA

2004 - 2005

CHESAPEAKE AND DELAWARE CANAL WILDLIFE AREA SUMMIT RETRIEVER TRAINING AREA

GENERAL DOG TRAINING REGULATIONS

1. Dog training activities are restricted to designated dog training areas from March 1-August 31(See attached map). From September 1-February 28 dog training may take place on any suitable area within the C&D Canal Wildlife Area during open hunting seasons for the game that the dog is being trained to hunt.
2. During field trial events permitted by the Division, dog training areas may be closed to the public. A signage system at appropriate access areas will be used to provide notice when a permitted field trail is occurring and that the dog training area is closed.
3. Individuals are not permitted to drive or operate motorized vehicles off established and maintained roadways on lands administered by the Division, including dog training areas.
4. Individuals are not permitted to drive or operate unlicensed vehicles on lands administered by the Division, including dog training areas.
5. Firearms are not permitted on lands administered by the Division from March 1 - August 31, except by permit during legal hunting seasons or on areas established by the Division as a designated dog training area. Target shooting is prohibited. Call Ommelanden Shooting Range for year-round target shooting information at 323-5334.

SUMMIT RETRIEVER TRAINING AREA

1. The Division has established a retriever training area along the northside of the canal between Route 896 and Guthrie Run (a.k.a The Waterfall). This area is restricted to the training of sporting dogs in the act of retrieving (See attached map).
2. In a cooperative stewardship agreement with the Division of Fish and Wildlife, the Delaware Bay Retriever Club is assisting the Division in the management of this area. Except during permitted field trial events, the club does not maintain any exclusive use of the area and the area is open to all members of the public engaged in the retriever training of their dogs.
3. The Summit Retriever Training Area is closed to hunting except during the archery and firearm deer seasons (See Exception below). No dog training is permitted during any firearm deer seasons, except on Sundays (See Exception Below).
4. **Firearm deer hunting will not be permitted in the Summit Retriever Training Area during the Special October Antlerless Firearm Season and as such dog training is permitted. Archery hunting will be permitted.**
5. It is unlawful to enter the Summit Retriever Training Area for any purpose other than to train dogs in the act of retrieving or to hunt deer during the firearm or archery deer seasons. It is unlawful to fish, operate model or full size boats, ride horses or bicycles, or conduct any other activity on the area.

OTHER SPORTING DOG TRAINING AREAS - The Division has also established a sporting dog training area located immediately west of the Summit Retriever Training Area, along the northside of the canal between Guthries Run and the Maryland State Line, referred to as The Bowl Sporting Dog Training Area. The training of all sporting dogs is permitted within this area. Hunting and falconry is also permitted within this area.

Patrick J. Emory, Director

For further information, contact the Division of Fish and Wildlife, Dover, Delaware, 19901, Telephone: (302) 739-5297 or the Augustine Wildlife Area (834-8433).

To report wildlife or wildlife area violations, or to contact an enforcement agent call the Department Communication Center toll free at 1-800-523-3336.

State and Federal law prohibit discrimination on the basis of race, color, national origin, age, sex, religion and/or handicap or disability. If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information, please write to:

Office for Equal Opportunity
U. S. Department of Interior
Washington, D. C. 20240

Division of Fish and Wildlife
89 Kings Highway
Dover, DE 19901

Federal Aid Project W-5-D

APPENDIX : C & D CANAL REGULATIONS

2005 - 2006

CHESAPEAKE AND DELAWARE CANAL WILDLIFE AREA

Persons may hunt on the Chesapeake and Delaware Canal Wildlife Area only as directed by the above rules, which have been established by Wildlife Regulation 3908 (WR-3908) of the Division of Fish and Wildlife, pursuant to Section 103, 7 Delaware Code.

A. GENERAL HUNTING REGULATIONS

1. Hunters are cautioned not to trespass on private lands.
2. The Summit Retriever Training Area is closed to hunting except during the firearm deer seasons (see attached map); however, deer hunting will not be permitted in the training area during the Special October Antlerless Firearm Season.
3. Lums Pond State Park has separate hunting regulations. Secure maps and hunting regulations at the Park Office.
4. No hunting is permitted within posted safety zones and refuges. Hunters are cautioned that several new safety zones have been established (See attached map)

B. UPLAND SMALL GAME AND DEER HUNTING

1. Deer and upland small game hunting is prohibited in Scotts Run (See map).
2. Deer hunting will be permitted on this area during the Special October Antlerless Firearm Season (except within the Summit Retriever Training Area where only archery hunting will be permitted). Archery hunters during this special season and other firearm seasons must meet fluorescent orange requirements.
3. No permanent stands or structures are allowed and all parts of portable stands must be removed at the end of the day. No portable stands or tree steps that cause damage to trees are allowed.
4. Deer hunting by driving is permitted on the Chesapeake and Delaware Canal Wildlife Area between the hours of 9:00 am and 3:00 p.m. No more than six (6) resident hunters may participate in actively driving deer at any one time. Non-residents may not participate in actively driving deer and must hunt from stationary locations.
4. Upland small game hunting is closed during the December and January shotgun deer seasons.
5. Falconry seasons and regulations are the same as upland small game hunting.
6. Hand gun hunting for deer is not permitted on this area.

C. WATERFOWL HUNTING

1. Hunters hunting in Scott's Run must use the established blind sites on a first come, first serve basis (See attached map).
2. Hunters using blinds in the tide marsh must have a boat and required safety equipment to hunt. See Delaware Hunting Guide.
3. Jump shooting of waterfowl is permitted on other areas of the C&D Canal Wildlife Area, except the Summit Retriever Training Area.

D. FIREARMS AND PAINTBALL GUNS

1. No firearms on lands administered by the Division from March 1 - August 31 except by permit during legal hunting seasons or authorized by the Division of Fish and Wildlife. Target shooting is prohibited. Call Ommelanden Shooting Range for year-round target shooting information at 323-5333.
2. The discharge or possession of paintball guns on lands administered by the Division is prohibited.

E. DOG TRAINING REGULATIONS. This area has special dog training regulations including areas designated for specialized training of retrieving breeds and other sporting breeds. For specifics please consult the Summit Retriever Training Area map.

F. TRAPPING. Not permitted except with a valid state contract or permit.

G. Vehicles. Motorized vehicles are only permitted on established and maintained roads. All motorized vehicles must be licensed.

H. HORSEBACK RIDING - Horses may be used only on established roads open to vehicular traffic except for activities approved by the Division.

Patrick J. Emory, Director

For further information, contact the Division of Fish and Wildlife, Dover, Delaware, 19901, Telephone: (302) 739-9912 or the Augustine Wildlife Area (834-8433).

To report wildlife or wildlife area violations, or to contact an enforcement agent call the Department Communication Center toll free at 1-800-523-3336.

State and Federal law prohibit discrimination on the basis of race, color, national origin, age, sex, religion and/or handicap or disability. If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information, please write to:

Office for Equal Opportunity
U. S. Department of Interior
Washington, D. C. 20240

Division of Fish and Wildlife
89 Kings Highway
Dover, DE 19901 Federal Aid Project W-5-D



information you may find at these locations. Links are provided consistent with the purpose of this DoD Web site.

Evidence of this is the nature of the website as it will act as an information portal for the public to share its comments, concerns, data, and questions.

We need your input to help develop recreation along the C&D Canal now and for future generations. The project will not end with the first shovel of dirt but will be an ongoing regional legacy.

Please visit the site regularly for upcoming public information workshops announcements, study updates, and to provide us feedback and tell us how we can better serve you through this website.

[Army] || [Corps of Engineers] || [North Atlantic Division] || [Philadelphia District]

Project Links

[Project Home](#)

[Photo Gallery](#)

[Public Input](#)

[C&D Canal Recreational Study Group conducts two open houses in April 2005](#)

Project Updates

[Press Release: Castle Announces Open Houses to Unveil C&D "Multipurpose Recreational Trail" Conceptual Design](#)

[Open Houses and Update on C&D Canal Recreation Project](#)

[Dec. 5 and 6, 2005](#)

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External Links

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Project

Chesapeake & Delaware Canal Recreation Study

The partners in the C&D Canal Recreation Study Working Group, U.S. Army Corps of Engineers; Delaware Congressman Michael N. Castle; U.S. Congressman Wayne Gilchrest; Delaware's Department of Natural Resources and Environmental Control and Department of Transportation; Maryland's Department of Natural Resources; New Castle County, DE.; Cecil County, MD; and Delaware Greenways, Inc. have begun to study potential recreational opportunities and infrastructure improvements along the Chesapeake and Delaware Canal.



The working Group's Mission

The goal of the C&D Canal Recreation Study is to work with Delaware and Maryland State agencies and other interested partners to investigate potential future recreational usage of the C&D Canal and compile a final report with recommendations to implement these recommendations for the betterment of recreational opportunities available to the citizens of Delaware and Maryland. These recreational uses include hunting, fishing, bicycling, hiking, birdwatching and other popular forms of outdoor recreation. Demand for these and other uses will only increase as the population continues to expand around the canal. To enhance existing recreation along the canal and consider new uses, planning for the future at this time is very important.

The starting point for our C&D Canal Recreation Study came from comments provided to the State of Delaware for its Statewide Comprehensive Outdoor Recreation Plan 2003 to 2008. The State of Maryland has listed the C&D Canal as a potential recreational greenway in its Statewide Greenways Atlas since 1992. The group is recommending that a multi-use trail for walkers, joggers and bikers serve as the main element in all plans to enhance recreation along the Canal .

The C&D Canal has a long history and is one of only two commercially vital sea-level Canals in the United States. Forty percent of all ship traffic in and out of the Port of Baltimore travels through the Canal. As it takes on an additional role, it will continue to be a focal point and serve the region well.

A key component of the study process is public involvement. The C&D Canal Recreation Study Working Group plans to make every effort to enlist your support and work closely with its stakeholders in this regional effort.

Study Documents & Presentations



- [CD Canal Dec Survey Poster](#)
- [CD Canal Presentation conceptual](#)
- [3035 DELAWARE 120505](#)
- [C&D Recreation Study Updated Diagrams](#)
 - [Utility Diagram for Multi-use Path and Amenities—half scale](#) (6 MB)
 - [Utility Diagram for Multi-use Path and Amenities—full scale](#) (7 MB)
 - [Circulation Diagram for Multi-use Path and Amenities — full scale](#) (6 MB)
 - [Circulation Diagram for Multi-use Path and Amenities — half scale](#) (5 MB)
 - [Composite Diagram for Multi-use Path and Amenities — half scale](#) (54 MB)
 - [Composite Diagram for Multi-use Path and Amenities — full scale](#) (82 MB)
 - [Concept Diagram for Multi-use Path and Amenities —half scale](#) (16 MB)
 - [Concept Diagram for Multi-use Path and Amenities —full scale](#) (17 MB)
 - [Pavement Diagram for Multi-use Path and Amenities — half scale](#) (9 MB)
 - [Pavement Diagram for Multi-use Path and Amenities —full scale](#) (9 MB)
- [C&D Canal Public Workshop Presentation](#)
- [C&D Canal Maps \(PDF format\)](#)
 - [Big_aerial](#) (66 MB)
 - [C&D COE Disposal areas final](#)
 - [C&D landuse final](#) (1 MB)
 - [C&D recreation final](#)
 - [C&D wildlife final](#)
 - [Poster final](#) (31 MB)
- [State of Delaware Statewide Comprehensive Outdoor Recreation Plan](#)
- [Cecil County's Land Preservation, Parks, and Recreation Plan](#)

In The News...



- [Ideas for trail along C&D Canal to be reviewed](#) -- December 3, 2003
- [Workshops set for recreation project](#)

The News Journal, DE - 8 April 2005
... Mike Castle first announced his plan to further develop the C&D Canal into a recreational site in spring 2004 and since then has secured \$150,000 in federal ...

- [Castle, Army Corps and partners seek public input to the C&D Canal recreational study](#)
- [Congressman Castle Plans C & D Canal Park](#)

 Additional Links...

- Congressman Michael N. Castle <http://www.house.gov/castle/>
- Congressman Wayne Gilchrest <http://gilchrest.house.gov/>
- Delaware City www.delawarecity.info
- Delaware Department of Natural Resources and Environmental Control <http://www.dnrec.state.de.us/dnrec2000/>
- Delaware Department of Transportation <http://www.deldot.net/index.shtml>
- New Castle County, Delaware <http://www.co.new-castle.de.us/home/webpage3.asp>
- Delaware Greenways <http://www.delawaregreenways.org/>
- Cecil County, Maryland <http://www.ccgov.org>
- Chesapeake City, Maryland <http://www.chesapeakecity.com/>
- DNREC hunting maps: <http://www.dnrec.state.de.us/fw/wildlifemaps.htm>
- Maryland Greenways - <http://www.dnr.state.md.us/greenways/>
- Maryland Atlas of Greenways, Water Trails, and Green Infrastructure - <http://www.dnr.state.md.us/greenways/introduction.html>
- Maryland's Green Print Program - <http://www.dnr.state.md.us/greenways/greenprint/>
- Maryland DNR Wildlife and Heritage Service - <http://www.dnr.state.md.us/wildlife>
- Maryland DNR Guide to Hunting and Trapping - <http://www.dnr.state.md.us/huntersguide/index.asp>
- Maryland DNR Fisheries Service - <http://www.dnr.state.md.us/fisheries/fishingreport/frmapindex.html>

WE WANT TO HEAR FROM YOU!

Help us keep improving our website... Send your questions, problems and comments to the [Philadelphia Dis](#)

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It is intended for unclassified, non-sensitive, non-privacy act information.

**Chesapeake and Delaware Canal Recreation Study
Multipurpose Recreational Trail Conceptual Design Open House
Gunning Bedford Middle School, Delaware City, Delaware
December 5, 2005**

The partners in the C&D Canal Recreation Study thank you for attending this open house and request your comments on the multipurpose recreational trail conceptual design and any other aspects of the Canal's potential for recreation in the future. You can send additional comments to our mailing addresses.

To help us in our efforts to serve the public could you please let us know how you heard of this open house? Circle the one or ones that apply.

Newspaper

Radio

Email

Word of Mouth

Flyers

Other_____

Please place your comments in the box at the main table. Or, if you prefer to mail your comments to us please send them to U.S. Army Corps of Engineers, 100 Penn Square East, Wanamaker Bldg., Attn: Merv Brokke, Rm. 600, Philadelphia, PA 19107-3390

INITIAL COMMENTS VIA EMAIL TO C & D STUDY

I made my first visit to the canal this past weekend and thought it was just beautiful. I do hope you take the concerns seriously in reference to motor bikes, ATV's and speed boats. My personal opinion is that mixing these elements with the function of the canal is just asking for trouble.

I am a horse owner and would appreciate you considering equestrian use as a viable alternative. Keeping in mind the goal to provide a multi-use trail for walkers, joggers and bikers and "to enhance recreation along the Canal" I do feel that equestrians would be a much more compatible choice. Equestrians can successfully share recreation areas with joggers, hikers, etc and are much more environmentally friendly than the alternative. Including horses in the proposal would prove to be an excellent choice and would blend well with the existing use as well as the proposed use.

Before making a decision, why not walk the area yourself. The peace and quiet that is found there is what really makes you appreciate nature and is one of the reasons that I found the area so appealing.

I will not be able to attend either of the public meetings but wanted to inform you of my support of the proposed project. I'm an avid cyclist who is an active member of White Clay Bicycle Club & rides regularly. Development of cycling trails along the C&D canal would be great for off road cycling & I would like it recorded that I support the building of such trails. I think these trails would be used extensively and be an asset to Delaware & Maryland's recreational facilities.

Thank you very much for your concern for EVERYONE that uses the state parks! Many Parks are limiting the areas available to horsesback riders or are trying to eliminate our use altogether. This is very refreshing news! The C&D canal is a beautiful place to ride and it would be wonderful to have a such a nice trail for us to enjoy! All citizens pay taxes and should have equal access to our state areas. This is a great idea and we will be thrilled to see it become a reality. Thanks again for including the equestrian citizens!

I was pleased to hear about this recreational study. Upon review I was very displeased to see the omission of equestrian use from the proposed study. I board my horse on a property that backs up to the canal and use those fields and roadways frequently on trail rides. I would hate to see that area opened up to bikers, hikers and joggers only to lose use of it myself. I'm sure I speak for many equestrians in the area. If the greenway plan is to move forward please include the possibilities of equestrian use as well. We are a large part of that "greenway" community already. It's almost all we have left due to serious over development in the area. Our properties border the Army Corp of Engineers Property. Please don't lose us as part of the big picture.

I am a current user of the canal trails/area on horseback. We would greatly like to be considered as an important part of the canal recreation study. We would like horse trails and /or access to be considered as part of the new project. Not just hikers, joggers and bikers. There are tons of boarding farms in the 'hacking' vicinity of the canal (of which I am one) and would like the opportunity to continue to use the area. Horses do not destroy the trails and we are respectful of the environment. Please do not disregard us as a vital part of this plan. It is important to include the people who actually live along the canal and have horses as part of their lives.

I am a Delaware resident that supports the development of recreational non-motorized paths along the canal.

I think that one of the recreational activities that should be considered would be a safe place (large hill) to do some sledding in the winter. We don't get much snow, but when we do it would be nice to have a safe and convenient place where we can take our children to go sledding. New Castle County developed a hill in their new park in the Bear/Glasgow area and one just like it could be set-up in the C&D area for the residents of lower New Castle County. It wouldn't take much to develop this idea in conjunction with bike paths, parking lots, restrooms, etc.

We are writing to voice our support for multi use trails along the Chesapeake and Delaware Canal. As hikers and trail riding bicyclists, we are aware of the tremendous need for long-distance off road trails here in Delaware. The C & D Canal area is an ideal location and we whole heartedly support a multi use trail system along both sides of the canal connected via bike lanes on the bridges.

I speak for many families of Middletown, Delaware when I state there is a need for a safe winter sledding area south of the canal. Up until this year, families utilized St. Annes Church Cemetery to enjoy the winter snow. This year, signs were put in place and county police patrolled to make sure no one was sledding in the cemetery. That left us no where to go.

There is a sledding hill north of the canal at the new park in Bear. It is located at the intersection of 896 and 40. I don't feel we should have to travel north (especially in winter weather) and intrude on the local residents there to enjoy a little sledding.

I do not think it is a good idea to develop the C & D canal area. Can't we leave wild places alone without trying to ruin them with pavement, benches, baseball fields, parking lots, restrooms, visitor centers and the like? Hiking is currently available on miles of dirt roads, and the lowest level is even graveled for easy walking. Fishing piers are already in place up and down the canal. We have a dog training area and acres and acres for hunting. Developed recreation already exists in the area at Lums Pond State Park which backs up to the canal. Why do we need to develop another area? If we bring more people into this area it will be hard to balance all of the current activities with people "strolling" along these "walking" paths, or "watching ships" from special "ship watching places". The C & D canal area is great just the way it is, let's not get crazy and pave over everything. This is how it is here; it is not like where ever these people who want to change it come from.

Has anyone suggested an off-road park for those of us that like to use the C&D canal for off roading fun I would appreciate an honest response as several friends are very interested in any plans you may have concerning this.

No one has mentioned where exactly this will be. Is it on the north or south side and what part of the canal in Delaware?

Please bring back the Delaware State Championship Enduro.

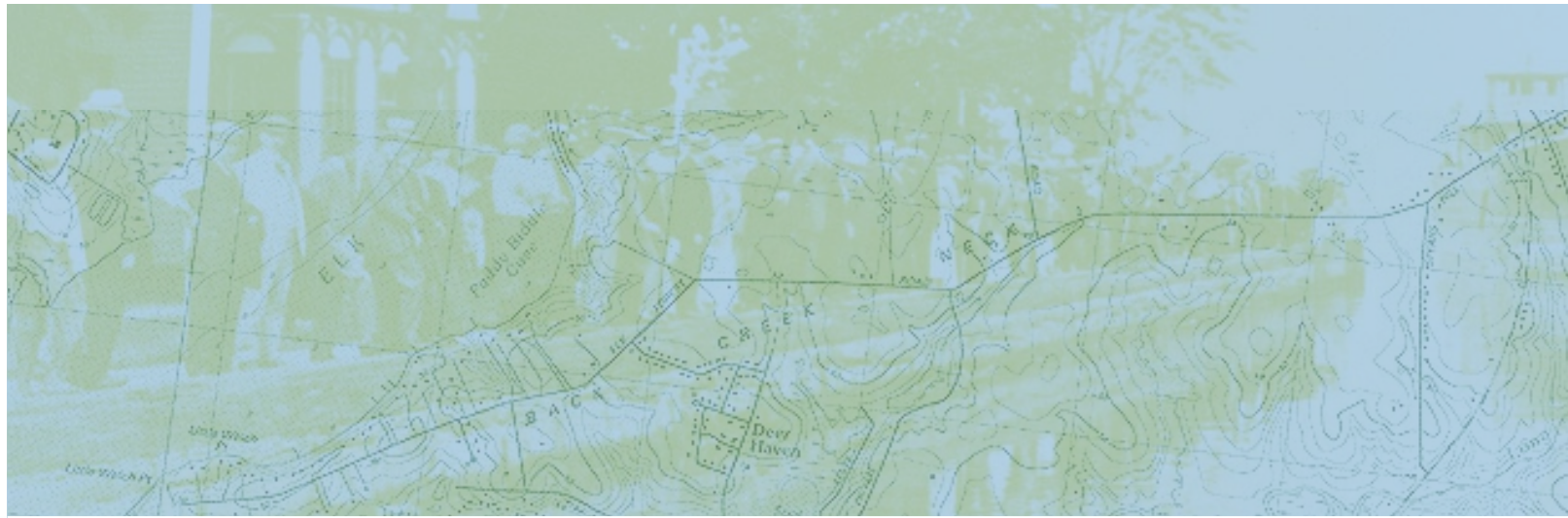
I am originally from Chicago's North Side and far north suburbs, now living in Delaware. When going back to visit, they have a continuous development along the North Branch of the Chicago River Banks. It consists of a concrete pathway with benches and a variety of artists sculptures spread out for miles along side the pathway. It is always being used by walkers, joggers, bikers, families with children and a pleasant sight to view from the roadway running alongside. All the sculptures are unique to see ranging from very contemporary to recognizable. You can interact with the sculptures if you want to. Hope you can do something similar so this can be a pleasant experience as I have seen in the Chicago area.

I live in North Chesapeake City and I have several concerns about developing this area for recreation. One of my main concerns is ATV use on the levies. It is already unbearable on spring, summer, fall weekends and evenings with all of the noise coming from ATV's. It is hard to enjoy ourselves in our own yards due to the noise and I am afraid that it will only get worse. There is also concern over more speed boat traffic in the canal. As it is, when the Chesapeake Inn closes (approximately 2:00 a.m.), cigarette boats and other loud boats race thru the canal once they get past the no wake zone. It also happens during the day, but is extremely upsetting when it happens in the middle of the night.

I have an elderly uncle who's property backs up to the canal. I am concerned for him with trespassers and the possibility of someone breaking into his house with access to the canal roads. Is there going to be controlled access to the canal roads and will they be patrolled?

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CHESAPEAKE AND DELAWARE CANAL.

Notice is hereby given, that this *CANAL* is
NOW OPEN FOR NAVIGATION.

The Locks are 100 feet in length, by 22 feet in width, and the Canal can be navigated by Vessels within those dimensions, and drawing 7 feet of water.

The rates of Toll have been fixed, so that, as far as possible, this *CANAL* is made as the most **EXPEDITIOUS** and **SAFE** channel of communication between the waters of the Chesapeake and Delaware.

However the Locks, vessels may be used at reasonable prices at each end of the Canal.

For information in relation to the Canal, rates of Toll, &c. may be had, on application at the Company's Office, No. 14 Walnut Street, Philadelphia.

ROBERT M. LEWIS, President.
WILLIAM W. BROWN, Vice-President.

