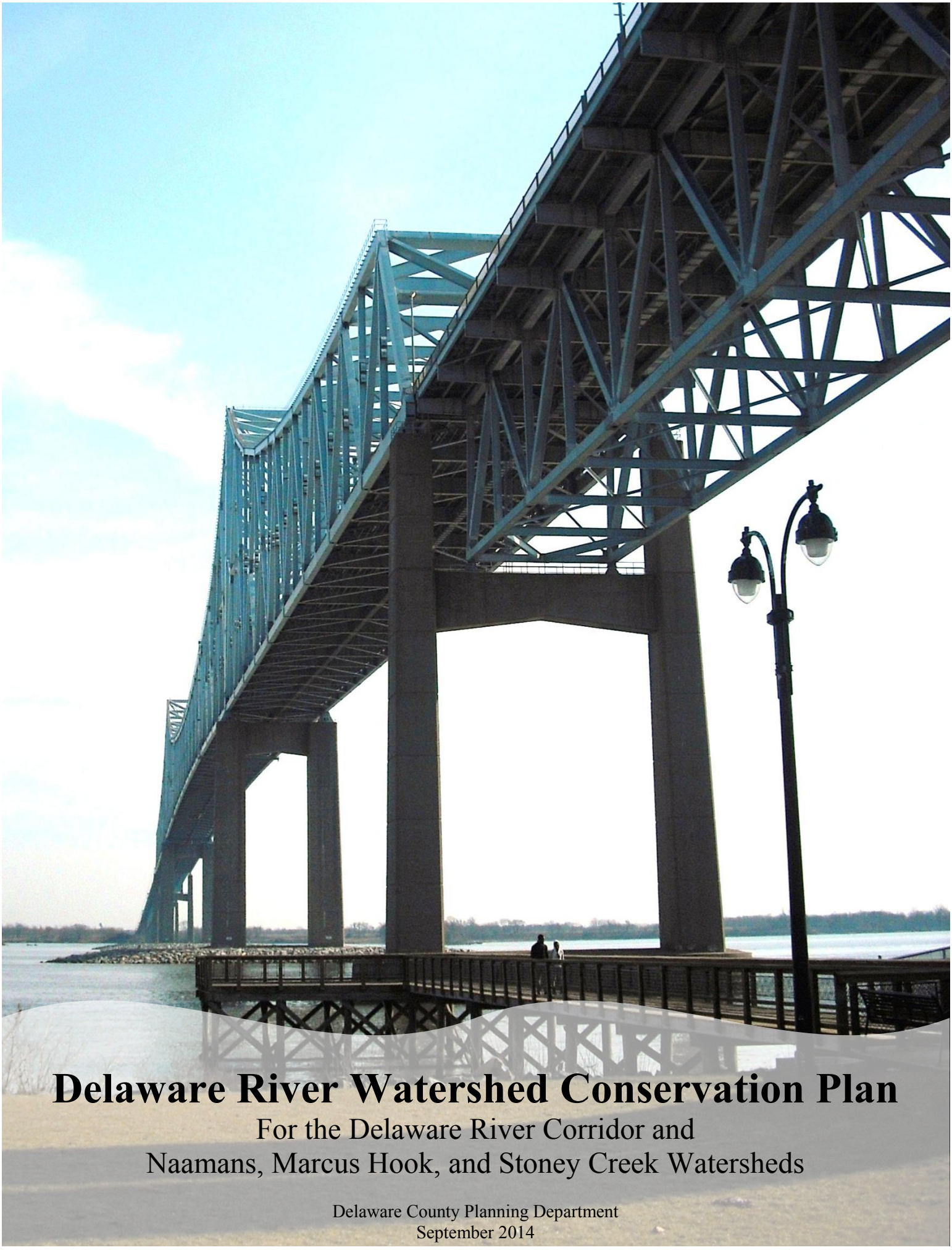

Delaware River Watershed Conservation Plan

For the Delaware River Corridor and Naamans, Marcus Hook, and Stoney Creek Watersheds

Delaware County Planning Department

September 2014

RESOLUTION
of
DELAWARE COUNTY COUNCIL
with respect to
COMMUNITY CONSERVATION PARTNERSHIPS GRANT PROJECT (BRC-RCP-14-285)

WHEREAS, the County of Delaware has prepared a Rivers Conservation Plan for the Delaware River; and,

WHEREAS, the purpose of the Plan is to identify significant natural, recreational and cultural resources; identify issues, concerns and threats to river resources and values; and recommend methods to conserve, enhance and restore the Delaware River watershed areas, including the Delaware River and related streams and land area; and,

WHEREAS, the Plan was financed in part by a Community Conservation Partnerships Program grant under the administration of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation, under contract number **BRC-RCP-14-285**.

NOW, THEREFORE, BE IT HEREBY RESOLVED by the Delaware County Council that:

a. The project was completed in accordance with the Grant Agreement.
b. All project expenditures have been made and were in accordance with the Grant Agreement.
c. The Plan and related materials are acceptable to the County of Delaware.
d. The Plan and related materials will be used to guide future rivers conservation decisions.
e. The County of Delaware requests that rivers, river segments or tributaries defined in the Plan above be listed on the Pennsylvania Rivers Registry.

Approved by Delaware County Council on September 17, 2014.

Anne M. Coogan

Anne Coogan, County Clerk

Delaware River Conservation Plan

For the Delaware River Corridor and Naamans, Marcus Hook, and Stoney Creek Watershed

SEPTEMBER 2014

PREPARED BY:

DELAWARE COUNTY PLANNING DEPARTMENT
Court House and Government Center Building
201 West Front Street
Media, PA 19063

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This project was financed in part by a grant from the Community Conservation Partnerships Program, Keystone Recreation, Park and Conservation Fund, under the administration of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

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GLOSSARY OF ACRONYMS

B&B – Bed and Breakfast

BCVB – Brandywine Conference and Visitors Bureau

BGN – United States Geographic Survey's Board on Geographic Names

BMP – Best management practice

BRPCP – Baldwin Run Pollution Control Plant

C2P2 – Community Conservation and Partnerships Program

CDBG – Community Development Block Grant

CERCLIS – Comprehensive Environmental Response, Compensation, and Liability System

CHRS – Cultural Heritage Research Services, Inc.

CRC – Chester-Ridley-Crum Watersheds Association

CRS – Community Rating System

CSO – Combined sewer overflow

CZM – Coastal Zone Management Program

CZTF – Delaware County Coastal Zone Task Force

DCCD – Delaware County Conservation District

DCNR – Pennsylvania Department of Conservation and Natural Resources

DCPD – Delaware County Planning Department

DCVA – Darby Creek Valley Association

DCED – Pennsylvania Department of Community and Economic Development

DELCORA – Delaware County Regional Water Quality Control Authority

DRC – Delaware River Corridor

DVRPC – Delaware Valley Regional Planning Commission

EAC – Environmental advisory council

ECG – East Coast Greenway

EPA – United States Environmental Protection Agency

EV – Exceptional value

FEMA – Federal Emergency Management Agency

GIS – Geographic Information Systems

GSI – Green Stormwater Infrastructure

HARB – Historic Architectural Review Board

HOA – Homeowners' Association

HUD – Federal Department of Housing and Urban Development

HQ – High quality

I&I – Inflow and infiltration

LID – Low impact development

MCM – Minimum control measure

MGD – Million gallons per day

MPC – Municipalities Planning Code

MS4 – Municipal separate storm sewer system

NCWA – Naamans Creek Watershed Association

NHI – Natural Heritage Inventory

NFIP – National Flood Insurance Program

NMS – Naamans, Marcus Hook, and Stoney Creek Watersheds

NOAA – National Oceanic and Atmospheric Administration

NRCS – Natural Resource Conservation Service

NPDES – National Pollution Discharge Elimination System

NWI – National Wetlands Inventory

PADEP – Pennsylvania Department of Environmental Protection

PaGWIS – Pennsylvania Groundwater Information System

PEC – Pennsylvania Environmental Council

PECO – Pennsylvania Electric Company

PEMA – Pennsylvania Emergency Management Agency

PennDOT – Pennsylvania Department of Transportation

PFBC – Pennsylvania Fish and Boat Commission

PGC – Pennsylvania Game Commission

PHL – Philadelphia International Airport

PNDI – Pennsylvania Natural Diversity Inventory

PNHP – Pennsylvania Natural Heritage Program

RCP – Rivers conservation plan

SALDO – Subdivision and land development ordinance

SEPTA – Southeastern Pennsylvania Transit Authority

SSO – Sanitary sewer overflow

SWDCMA – Southwest Delaware County Municipal Authority

TMDL – Total maximum daily load

USFWS – United States Fish and Wildlife Service

WWF – Warm water fishes

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RIVERS CONSERVATION PLAN
EXECUTIVE SUMMARY

INTRODUCTION

To date, Rivers Conservation Plans have been completed for all of the watersheds in Delaware County with the exception of the Delaware River Watershed. With the completion of this Rivers Conservation Plan (RCP), Delaware County will have comprehensive management strategies for the water, land, cultural, historic, and recreational resources of all of its watersheds. This RCP draws from previously completed plans that address the adjacent Chester, Ridley, Crum, and Darby watersheds, respectively. Efforts have been made to ensure that all recommendations in this Plan are in agreement with those existing RCPs to help promote a cohesive strategy for protecting the Study Area's resources. Since the Naamans Creek portion of the NMS watersheds extends into New Castle County, Delaware, sections of the plan also explore how to coordinate activities affecting the health of resources across the state boundary.

BACKGROUND

The Pennsylvania Rivers Conservation Program was established to "conserve and enhance river resources through preparation and accomplishment of locally initiated plans." The focus of the program is on providing technical and financial assistance to local municipalities and river support groups (i.e., watershed organizations) to carry out planning, implementation, acquisition, and development activities. The program is funded, in part, by the Pennsylvania Department of Conservation and Natural Resources (DCNR), through the Keystone Recreation, Park and Conservation Fund Act of 1993, a component of the Community Conservation Partnership Program (C2P2). The first step in the program is the development of a Rivers Conservation Plan, which identifies significant natural, recreational, and cultural resources. As part of the local planning process, issues, concerns, and threats to river resources and values are identified and recommendations are provided to address these concerns. The recommendations focus on conserving, enhancing, and restoring the rivers that are the subject of the RCP.

STUDY AREAS

With the exception of the Delaware River watershed, which includes direct drainage areas and the Naamans, Marcus Hook, and Stony Creek watersheds, every watershed in Delaware County currently has an RCP. This plan serves as an RCP for the Delaware River watershed areas, addressing, as appropriate, adjacent land areas and stream corridors. The two overlapping sub-Study Areas, Delaware River Corridor (DRC) and Naamans, Marcus Hook, and Stoney Creek (NMS) watersheds, cross municipal and watershed boundaries, providing a unique challenge to developing a single RCP. While the resources (both natural and cultural) vary greatly between the sub-Study Areas, the geographic location and physical infrastructure of the areas reveal intimately related river corridors.

Delaware River Corridor

The Delaware River Corridor (DRC) is demarcated by the Delaware River to the south, and on the north by Interstate-95. The DRC Study Area includes the direct drainage area, and the "pockets" of the other watersheds that originate upstream and drain to the Delaware River. This corridor represents the linear area along the River comprised of similar land uses, resources, and concerns. The Study Area municipalities include: Marcus Hook, Trainer, and Eddystone Boroughs; Chester City; and Lower Chichester, Chester, Ridley and Tinicum Townships. Land use in the DRC is dominated by the area's industrial heritage, with industries and associated worker housing and related land uses.

Naamans, Marcus Hook, and Stoney Creek Watersheds

The Naamans, Marcus Hook, and Stoney Creek watersheds (referred to as the NMS Study Area in this plan) are defined more traditionally than the DRC Study Area. The NMS Study Area includes three small watersheds. These watersheds are located in the southwest corner of Delaware County and contain portions of Aston, Bethel, Chester, Lower Chichester, and Upper Chichester Townships; Marcus Hook and Trainer Boroughs; and Chester City. The unique thing about these watersheds is that, although geographically small, land use is significantly different between the upper and lower portions of the watersheds. The upper portion of the watershed is generally suburban, with single-family, detached homes comprising most of the land use. The lower portion of the watersheds, closest to the DRC, overlaps with the DRC and is much more similar in resources and land use patterns to the DRC sub-Study Area than the NMS sub-Study Area.

RELATIONSHIP TO OTHER STUDIES

Although there have been a number of coastal zone and stormwater studies prepared for the DRC area, the NMS area has gone largely unstudied.

Delaware River Corridor

The DRC communities have benefited from many planning efforts over the years. The issues faced by the municipalities along the riverfront are unique and well known. Considerable work has already been undertaken to restore and maintain the distinct character of these communities. The DRC area lies within a federally designated Coastal Zone Management Program (CZM) area, which allows municipalities to apply to Pennsylvania Department of Environmental Protection (PADEP) for CZM-funded studies. Several of the CZM-funded studies prepared to date include:

- *Delaware County Waterfront Resources Management Plan* (1992) – discusses the coastal zone's many cultural, historic, and natural resources, in relation to the area's land uses
- *Delaware County Coastal Zone Compendium of Waterfront Provisions* (1998) – serves as a tool to help provide direction for planning in the coastal zone corridor

- *Delaware County Industrial Heritage Parkway: Route 291/13 Beautification and Greenway Plan* (2002) – calls for a unified thematic approach to beautification and landscaping in the Route 291/13 Corridor and inclusion of the East Coast East Coast Greenway, a path for bicyclists and pedestrians that will stretch from Maine to Florida
- *Delaware County Route 291/13 Industrial Heritage Parkway and Greenway Landscape and Signage Guidelines* (2005) – provides graphic standards for signage, streetscape, landscaping, and bikeway elements to be installed in the Route 291/13 Corridor
- *Delaware County Industrial Heritage Parkway Interpretive Signage Guidelines* (2013) – provides specific guidelines for interpretive signs in the Route 291/13 Corridor, as well as actual fabrication-ready signage artwork

Other previously completed plans for the Delaware River corridor were developed as part of the County of Delaware's Renaissance Program. The *Delaware County Renaissance Program Planning Area 1 Action Plan – Marcus Hook, Trainer, and Lower Chichester* (2003) identified the need for stream corridor protection activities, East Coast Greenway implementation, planning for a possible Marcus Hook Creek Greenway, and streetscape improvements. The *Delaware County Renaissance Program Planning Area 2 Action Plan* (2003), prepared for Chester City, Chester Township, and Upland and Parkside Boroughs, identified flood abatement projects for Chester Creek, streetscape improvements along Edgmont Avenue, rehabilitation efforts for the historic Triangle One buildings, and adaptive reuse of the Franklin Building in Chester City.

The *Delaware County Renaissance Program Planning Area 3 Action Plan* (2003) listed several projects that addressed waterfront access, recreation, and historic preservation in Tinicum, Ridley Township, and Eddystone. The *Action Plan* also recommended that an Industrial Heritage Corridor Planning Task Force be formed to coordinate development and redevelopment activities for the Route 291 corridor. A separate project for rehabilitation of existing stormwater collection and management systems was identified.

Naamans, Marcus Hook, and Stoney Creek Watersheds

In contrast to the DRC area, the NMS watersheds have a comparable lack of studies and resource inventories. The joint *Aston, Lower Chichester, and Upper Chichester Multi-municipal Comprehensive Plan* (2005) addressed the need for making improvements to reduce flooding and to conduct planning activities for trails. However, there has not been any follow-up to bring the municipalities together to look at stormwater issues or to conduct a feasibility study for linear greenways. This RCP will serve as a basis for multi-municipal collaboration among the DRC and NMS communities.

RIVERS CONSERVATION PLAN

PURPOSE

The primary purpose of this RCP is to address concerns and threats to the river resources by identifying recommendations to guide future efforts for watershed conservation, restoration, and enhancements. Upon adoption of this plan, it will be placed on the Pennsylvania Rivers Registry. Listing on the Rivers Registry opens up the municipality to additional grants and other funding sources for projects that relate to the recommendations described in the plan.

Implementation grants are intended to assist communities in conducting resource studies, such as water quality surveys and monitoring, usage and accessibility studies, and trail feasibility and greenway studies, among others. Development grants are intended for use in carrying out specific construction projects for features like trails and trailheads, playgrounds, parks, and stream bank fencing. Acquisition grants are also available and are intended to aid municipalities in procuring lands for recreation and/or conservation purposes. This can be done via fee simple purchase or through the use of conservation easements. It should also be noted that recommendations in an RCP can help to leverage funding under other DCNR or PA Department of Environmental Protection (PADEP) programs.

One of the major outcomes of this document is to tie the land area from other watershed RCPs to the small pockets of Delaware River direct drainage located in the DRC Study Area. This allows the County to close the gaps between the existing watershed plans to focus on a single linear corridor along the Delaware River. Additionally, the NMS portion of the Study Area comprises a portion of Delaware County that has no prior studies or plans related to stormwater management or watershed conservation. Through the identification of stormwater and water quality issues, recreational needs, historic and cultural resources, and by creating a vision for the watersheds, this RCP can guide Study Area municipalities' conservation and development efforts into the future.

PUBLIC PARTICIPATION

The Delaware County Planning Department (DCPD) undertook an extensive public participation process which included reaching out to citizens and watershed stakeholders. Dual planning teams, comprised of community members from the respective sub-Study Areas, were formed to help assist with data collection, identification of major issues, and development of plan recommendations. In conjunction with the Delaware County Coastal Zone Task Force, the planning team worked with local DRC municipal officials and organizations to gain critical insight into the Study Areas. A separate group was formed for the NMS Study Area, comprised of municipal staff, engineers, Pennsylvania and Delaware environmental organizations, and citizens. The planning teams met on several occasions to address water, natural, cultural, and historic resources, as well as other watershed needs and concerns.

ISSUES & RESOURCES

Cultural Resources

Due to its long history of human settlement, the Study Area contains diverse cultural resources, including historic and archeological sites. Relics of Native American tribes and early European settlers are scattered throughout the landscape. Archaeological artifacts remain intact beneath many of the streets and open spaces of the Study Area. Early settlement by Europeans and prior inhabitance by Native American tribes in Aston and Bethel Townships and Chester City resulted in moderate to high potential for the discovery of archeological resources. Several of the most notable historic sites include the Chester Courthouse, which was built in 1724 and is the oldest public building in continual use in the United States, and the Chichester Friends Meetinghouse, one of the earliest Friends meeting places in Pennsylvania. Preserving and enhancing such important historic resources is an important step in protecting the rich cultural background so intertwined with the Study Area's communities.

The Chester Courthouse, constructed in 1724, is the oldest public building in continual use in the U.S.

Natural Resources

The natural resources of the DRC and NMS were major contributing factors in the settlement and subsequent development of the Study Area. These resources influenced how and where people settled in the Study Area. Much of the natural landscape has changed since the area was first developed.

The areas closest to the Delaware River lie almost entirely within the Atlantic Coastal Plain. These areas are generally comprised of low, flat, poorly drained land extending the length of the Delaware River shoreline. The middle and upper reaches of the NMS, however, lie within the Piedmont formation, defined by rolling hills with steep slopes and deep valleys. Both the DRC and NMS were once heavily wooded with old-growth forests. However, with European settlement in the 1600s, many of the forested areas were cut for timber and the land cleared for productive agricultural use.

The landscape of the DRC has been greatly influenced by the industrial development along the river edge. Most of the remaining woodlands in the DRC lie along stream valleys and in residential areas. Significant woodlands remain Upper Chichester and Trainer, as well as along Chester Creek in Chester City. There are considerably more woodlands in the upper NMS, than in the DRC. The *Natural Heritage Inventory of*

Delaware County, Pennsylvania (NHI), prepared by the Western Pennsylvania Conservancy in 2011, highlights three major woodlands in the NMS watersheds for their relative ecologic value and importance to overall watershed health. Many of the wetlands within the DRC can be found in Tinicum near Plum Hook Creek and the John Heinz National Wildlife Refuge, which is home to roughly 200 acres of tidal wetlands. Wetland habitats in the NMS are found in isolated pockets, and are much smaller in size than those found in the DRC.

Biological Resources

The NHI highlights the rich biological resources of Delaware County and provides documentation of unique plant and animal species. The report also provides a wealth of information regarding important habitat areas, and makes recommendations concerning how to manage and protect them. The NHI identifies limited habitat in the DRC due to its dense industrial development; the exception is the area near the John Heinz National Wildlife Refuge at Tinicum (Heinz Refuge). The tidal wetlands comprising the Heinz Refuge contain some of the rarest landscapes in Pennsylvania, hosting numerous important plant and animal species. In the NMS area, the NHI cites numerous unique ecosystems. Many of the notable natural communities in the NMS are located in old growth wooded areas.

Much of the original upland forest habitat of the Study Area was comprised of a mix of oaks and hickories, depending on the microclimate. Over time, however, that has changed significantly due to timber harvesting and development. Today, many of the remaining forested areas primarily contain red oaks, red maples, and tulip trees. These trees have established themselves, in part, due to their acclimation to the microclimate and through forest succession after clearing and harvesting. Most of these stands of woodland can be found along stream corridors. The Coastal Plain forest, which previously occupied the southern portion of the Pennsylvania border of the Delaware River, thrived on the wet, sandy soils of the DRC. Coastal Plain forests are marked by sweetgum, oaks, and American beech trees, with an understory of small broadleaved evergreen trees and shrubs. There is very limited Coastal Plain forest remaining in the DRC, most of which lies within the Heinz Refuge and Tinicum woods.

Intertidal mudflat on the north side of Little Tinicum Island. Image Source: Andrew Strassman (PNHP)

Prior to development, the NMS Area also contained pockets of grassland, meadow, and open field, scattered throughout the upland forest. The grasslands and meadows

supported various grasses, wildflowers, and animals. Today, only a few meadow sites remain throughout the NMS Study Area, primarily along utility rights-of-way and on homeowners' association open space.

The NHI details several natural areas of statewide significance, in particular, Little Tinicum Island, located in the Delaware River, offshore from Tinicum Township. It is surrounded by a freshwater intertidal mudflat community that supports numerous plant and animal species of concern. Another site of statewide significance is the Heinz Refuge, which contains the largest remaining area of freshwater tidal marsh in the state. The Inventory also details specific areas of high significance across the DRC and NMS. Sites of exceptional significance, as identified in the NHI, include the Darby Creek Mouth Mudflat in Ridley and Tinicum Townships, Little Tinicum Island in the Delaware River, and the John Heinz National Wildlife Refuge at Tinicum.

Open Space and Recreation Resources

Open spaces and recreation resources are distributed throughout both the NMS and DRC. However, due to the differing development patterns, the types and sizes of open space and recreations resources vary. There are many different types of open space resources in the Study Area, including both passive and active parkland, pocket parks, urban gardens, and homeowners' association lands.

The DRC contains several major riverfront parks and numerous smaller community parks farther inland. Riverfront parks include Market Square Memorial Park in Marcus Hook, Barry Bridge Park in Chester, and Governor Printz Boulevard in Tinicum. Other significant open space resources include Little Tinicum Island, located in the Delaware River, offshore from Tinicum Township (part of William Penn State Forest); and the John Heinz National Wildlife Refuge at Tinicum, located along Darby Creek and I-95.

Market Square Memorial Park in Marcus Hook is a popular riverfront destination.

There are also a number of smaller parks with active recreation facilities in the DRC. They generally include ball fields, basketball courts, and playgrounds, all of which experience heavy use.

In the NMS, the open space is primarily focused around active recreation. School district and municipally-owned athletic fields are a great resource for local residents, and are generally open for public use. In addition, a great deal of open space has been preserved as part of new developments. These lands, which are generally controlled by a homeowners' association (HOA), often contain floodplains and steep slopes that are not suitable for development.

Special Issues and Topics

While the Study Area has not traditionally been thought of as a major tourism destination, a number of efforts in recent years have focused on enhancing the area's appeal to people from other parts of Delaware County, as well as from the Philadelphia area and beyond. Much of this focus has been on locations in the DRC where there are many marketable assets, including the area's industrial heritage, parks, marinas, and cultural resources. However, there are also resources in the NMS area worth considering as part of a tourism program. Additional assets for tourism in both sub-Study Areas include historic homes, natural areas, scenic landscapes, and more.

There have been many substantial efforts to revitalize the DRC riverfront, particularly in Chester City. One of the mostly widely publicized is PPL Park in Chester City. The stadium, which opened in 2010 at the cost of $120 million, is home to the Philadelphia Union professional soccer team. The stadium serves as a rich cultural and recreational resource, as it also hosts concerts and regional and national sporting tournaments. Additionally, municipalities within the DRC are working to implement a section of the East Coast Greenway (ECG), an urban trail that will span over 3,000 miles from Maine to Florida. The proposed route for the trail passes directly through the DRC, along the Route 291/13 corridor. The implementation of the trail represents a significant opportunity for municipalities along the corridor to promote its heritage and enhance amenities along the trail for users.

RECOMMENDATIONS AND IMPLEMENTATION

Recommendations

This Rivers Conservation Plan makes recommendations to address the issues, needs, and opportunities discussed in the plan. Many of them were made as a result of information supplied through the public participation process, which included key person interviews with municipalities and other stakeholders, such as watershed organizations and businesses.

The plan contains a number of recommendations common to both the DRC and the NMS. An example is the recommendation for establishment of municipal environmental advisory councils (EACs) to advise the local planning commissions, park and recreation boards, and elected officials on the protection, conservation, management, promotion, and use of local natural resources. Newly formed EACs could help to champion and implement some of the recommendations identified in this plan.

The recommendations for the DRC are generally focused on redevelopment and increasing green infrastructure, access to the river, and implementation of multi-municipal efforts along the Route 291/13 corridor, including streetscape beautification and installation of the East Coast Greenway.

The recommendations for the NMS Study Area focus on more traditional RCP watershed goals of ensuring water quality, managing development pressure, and providing open space opportunities, including public access to waterways and establishing a public trail network that links the communities.

Implementation

One of the first steps for RCP implementation is to identify specific actions, responsible entities, technical and financial needs, and a timeline for implementation. Table 1 provides a comprehensive overview of the recommendations and associated implementation. It provides additional columns to indicate which watershed(s) the recommendations are applicable to, timing, lead organizations, sources of technical support, and potential project partners. The actions do not appear in any particular order, except by chapter. As evidenced by the implementation matrix, many of the recommendations will require coordination between local, county, and state government, and other agencies.

The Rivers Conservation Program provides technical and financial assistance to communities and rivers support groups for conservation activities. Upon municipal adoption of the RCP, the corresponding river or stream is placed on the Pennsylvania Rivers Registry. Once the watershed is placed on the Registry, it becomes eligible for several types of grants, depending on how they relate to the recommendations described in the plan.

TABLE 1
IMPLEMENTATION STRATEGY FOR THE DELAWARE RIVER CORRIDOR AND THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS AREA

Timing Key:
*High Priority - whether completion is long or short term, these items get top consideration.
LG = Laying the Groundwork - Actions that set up other actions. These must be done first, so should begin immediately.
S = Short Range (1-2 years / ASAP)
M = Medium Range (2-5 years)
L = Longer Range (5-10 years or more)
O = Ongoing

ID #	Recommended Action	Study Area	Timing	Lead Organization	Partners	Technical Support	Reference Page
LU-1	Create additional public access points along Study Area waterways.	DRC/NMS	O	GB ,CD	DCNR, DVRPC	DCNR, DVRPC	3-8, 3-9
LU-2	Complete a brownfields inventory for each municipality in the Study Area.	DRC/NMS	S	GB, CD	DCCC, DCED, PADEP	PADEP, USEPA	3-13
LU-3	Pursue opportunities for cleanup and redevelopment of known or potentially contaminated sites.	DRC/NMS	O	GB, DCCC	DC, PADEP, USEPA	PADEP, USEPA	3-14
LU-4	Buffer industrial land uses through landscaping, screening, and other mechanisms to preserve the aesthetics in Study Area communities.	DRC/NMS	O	GB, I/B	DC, I/B	DC	3-7
LU-5	Protect significant viewsheds of the Delaware River through adoption of local ordinances that require preservation of views.	DRC	S	GB	DC	DC	3-9
LU-6	Balance the needs of existing industries with the desire to attract new public access, recreational, and business redevelopment opportunities.	DRC	O	GB	BCVB, DC, DCCC	DC, DCED	3-8
LU-7	Implement waterfront zoning districts or waterfront zoning overlays to preserve the Delaware River shoreline for water dependent and water-enhanced uses.	DRC	S	GB	DC	DC	3-9
CR-1	Adopt local policies and programs to preserve historic and cultural assets.	DRC/NMS	S	GB	DC, HG	DC, HG, PHMC	4-2
CR-2	Update municipal surveys, as necessary, and convert records to electronic format for use in geographic information systems (GIS).	DRC/NMS	M	DC	GB, HB	PHMC	4-3
CR-3	Promote restoration and adaptive reuse of historic buildings.	DRC/NMS	O	GB	DC, HG	PHMC	4-2
CR-4	Adopt and/or strengthen historic preservation ordinances and create historic architectural review boards (HARBs) that would assist with municipal preservation programs.	DRC/NMS	S	GB	HG	DC, PHMC	4-2
CR-5	Promote historic people, places, and events in open spaces and along trails through the use of interpretive signage.	DRC/NMS	M	BCVB	DC, GB, HG	DC, HG	4-2
CR-6	Create a listing of publicly accessible historic resources for future interpretation.	DRC/NMS	M	DC	GB, HG	BCVB, PHMC	4-11
NR-1	Maintain and enhance environmental ordinances, including those dealing with stormwater and floodplain management and the protection of riparian buffers, woodlands, wetlands, and steep slopes.	DRC/NMS	O	EAC, GB	DC	DC, LT	5-8,
NR-2	Promote the use of low impact development (LID) techniques for new development and redevelopment.	DRC/NMS	O	EAC, ED, GB	DCCC	DVRPC, PADEP, USEPA	5-39
NR-3	Maintain a stringent stormwater management ordinance that minimizes impacts to water quality and quantity in order remain in compliance Act 167 and the requirements of the municipal MS4 stormwater management permit.	DRC/NMS	O	GB, EAC	DC, PADEP	DC, PADEP, USEPA	5-42
NR-4	Participate in the Community Rating System through the National Flood Insurance Program to help reduce the risk of flood damage and to lower the cost of flood insurance premiums.	DRC/NMS	O	GB	DC, FEMA	DC, DCED, FEMA	5-43

ID #	Recommended Action	Study Area	Timing	Lead Organization	Partners	Technical Support	Reference Page
NR-5	Implement a public education program to address inflow and infiltration (I&I).	DRC/NMS	S	GB	DC, DELCORA	DC, DELCORA	5-40
NR-6	Establish a stormwater best management practice (BMP) initiative to encourage retrofit of properties with green infrastructure, such as rain gardens, bioswales, and pervious paving.	DRC/NMS	M	DC	EAC, GB, WO	DVRPC, PADEP, USEPA	5-45
NR-7	Develop a program, possibly in conjunction with an environmental advisory council (EAC), schools, or a watershed group, to promote awareness to residents and businesses about stormwater and water quality issues.	DRC/NMS	S	DC	EAC, Schools, WO	PADEP, USEPA	5-39
NR-8	Conduct site-specific studies for flooding.	DRC/NMS	M	GB	FEMA, PADEP	FEMA, PADEP	5-44
NR-9	Work with watershed organizations and other community groups to educate the public about the importance of riparian buffers.	DRC/NMS	O	DC	EAC, GB, LT, WO	DCNR, PADEP, WO	5-45
NR-10	Identify locations for stream bank and riparian buffer restoration, and undertake implementation projects throughout the Study Area.	DRC/NMS	M	GB, WO	EAC, DC, LT, R, Schools	DC, PADEP	5-45
NR-11	Identify and prioritize opportunities to increase tree cover in residential neighborhoods, commercial street corridors, and in industrial areas.	DRC	S	DC	GB, R, STC, TV	DC, TV	5-18
NR-12	Work with regional and local organizations to reintroduce freshwater tidal wetlands along the Delaware River and at the mouth of tributary streams.	DRC	L	GB	CZTF, DC, DCNR, WO	DC, PADEP, USEPA	5-34
NR-13	Implement conservation ordinances, development practices, and other tools to protect woodlands with the largest blocks of contiguous forest.	NMS	S	GB	EAC, DC, DCNR, LT	DC, DCNR, LT	5-17
NR-14	Work with HOAs to develop management plans for their sensitive natural areas and protected open space.	NMS	M	GB	DC, LT, WO	DC, LT, WO	5-25
NR-15	Implement a stream naming program in order to encourage better stewardship of local waterways.	NMS	O	WO	GB, HG	DC, LT	5-46
NR-16	Connect failing and antiquated on-lot septic systems to existing sewers when and where feasible.	NMS	S	GB	DELCORA	PADEP	5-40
NR-17	Prepare an Act 167 plan for the NMS watersheds.	NMS	L	DC	GB, WO	PADEP	5-42
BR-1	Amend zoning and subdivision land development ordinances to promote sustainable land development practices to minimize or mitigate potential impacts of development on natural communities.	DRC/NMS	S	GB	DC, EAC, LT	DC, LT	6-2
BR-2	Preserve and enhance sensitive natural communities and wildlife areas through proactive planning and land management.	DRC/NMS	O	DC	GB, LT, R	DCNR, LT	6-2
BR-3	Utilize the Natural Heritage Inventory (NHI) to prioritize preservation areas and land management techniques.	DRC/NMS	O	GB	DC, LT, WO	DCNR	6-5
OS-1	Continue to preserve land and develop parks and other public open space, as appropriate, along the Delaware River and other Study Area waterways.	DRC/NMS	O	DC, GB	CZTF, DC, GB	DCNR, LT, PADEP	7-4
OS-2	Create local trail networks that link neighborhood trails, parks, historic resources and other destinations in the study area with the regional greenway network, including the East Coast Greenway.	DRC/NMS	M	GB	BCVB, DC. DVRPC, R	DC, DCNR, DVRPC	7-20
OS-3	Establish new trails along streams, open corridors, and along road and utility rights-of-way.	DRC/NMS	M	GB	DC, LT, R	DC, DCNR, DVRPC	7-20

ID #	Recommended Action	Study Area	Timing	Lead Organization	Partners	Technical Support	Reference Page
OS-4	Partner with “friends of” groups to help maintain and improve park and natural area resources while encouraging community stewardship.	DRC/NMS	O	GB	EAC, R	DC, DCNR	7-7
OS-5	Promote a variety of recreational activities in municipal parks, as appropriate, in order to meet the needs of an active, diverse community.	DRC/NMS	S	GB	EAC, R	DC	7-2
OS-6	Partner with educational groups, including schools, to promote environmental education activities in parks.	DRC/NMS	M	GB	Schools, WO	DC	7-15
OS-7	Explore opportunities to increase passive open space as part of the revitalization process.	DRC	O	GB	DC, DCCC	DCNR	7-4
OS-8	Explore opportunities to develop pocket parks and community gardens in urban areas, especially on vacant lots and brownfields.	DRC	O	GB	DC, DCCC, R	DCNR, USEPA	7-7
OS-9	Participate in the development of the Delaware River Water Trail for recreational canoeists and kayakers.	DRC	O	PEC	DC, DVRPC, GB	DCNR	7-19
OS-10	Increase both physical and visual riverfront access opportunities by providing viewing areas and boat launch facilities.	DRC	O	GB	DC, CZTF, PFBC	DC, DCNR, PFBC	7-4, 7-19
OS-11	Maximize opportunities for creating connectivity through the use of trails in new development.	NMS	O	GB	EAC, R	DC, DCNR	7-15
SI-1	Partner with the Brandywine Conference and Visitors Bureau (BCVB) to promote the coastal zone corridor through social media and interactive mapping.	DRC/NMS	S	DC	BCVB, CZTF, DCCC, HG	PADEP	8-3
SI-2	Promote heritage tourism and other cultural activities, including historic house and village tours, mill and farm tours, and ghost tours, and war reenactments.	DRC/NMS	M	HG	DC, GB, R	BCVB, DC, DCNR	8-3
SI-3	Evaluate the applicability of Cheste rcity's Climate Adaptation element for use in other Study Area Communities	DRC/NMS	S	DC	CZTF, GB, I/B		8-5
SI-4	Implement the East Coast Greenway as a mechanism to promote trail connection to Study Area attractions.	DRC	L	GB	CZTF, DC, DVRPC	DC, DVRPC, PEC	8-2
SI-5	Work with County Planning, the County Commerce Center, and the Brandywine Conference and Visitors Bureau to develop tourism support services, such as hotels, restaurants, and bicycle-related facilities.	DRC	L	DC	DVRPC, GB	DCNR	8-2
SI-6	Develop a marketing campaign for the Corridor using the Internet and social media techniques nfor navigation through the area and interpretation of heritage resources.	DRC	M	DC	DCNR, GB		8-3
SI-7	Pursue State Byway Status for Route 291/13.	DRC	S	DC	CZTF, GB	PennDOT	8-3
SI-8	Work with regional entities to identify a strategy to protect and restore tidal wetlands and shorelines along the Delaware River and its tributary streams.	DRC	L	DC	DCNR, GB, NPO, PADEP	DVRPC, NPO, PADEP, USEPA	8-4
SI-9	Identify and plan for potential risks to riverfront infrastructure associated with possible storm surges or sea level increase.	DRC	M	GB	DC, DVRPC, I/B, PennDOT	DVRPC, NPO, USEPA	8-4
SI-10	Evaluate existing levees and tide gates for structural integrity and adequacy to handle storm surges.	DRC	M	GB	ACE, FEMA	ACE, FEMA	8-5
SI-11	Explore assets in the study area for potential tourism value and regional appeal.	NMS	S	DC	BCVB, GB, HG	DCNR, DVRPC, PEC	8-3

ID #	Recommended Action	Study Area	Timing	Lead Organization	Partners	Technical Support	Reference Page
I-1	Initiate joint planning activities and revitalization programs through the promotion of municipal partnerships.	DRC/NMS	O	DC	GB, LT, WO	DCED, DVRPC	9-2
I-2	Utilize the full range of planning tools and programs to implement the recommendations listed in the RCP.	DRC/NMS	O	GB	DC	DC	9-16, 9-17
I-3	Form joint or individual environmental advisory councils (EACs) to address recommendations in the Rivers Conservation Plan.	DRC/NMS	S	GB	PEC, R	DC, PEC	9-2
I-4	Coordinate with County and municipal historic groups on watershed projects to gather local cultural and historic information, and to implement preservation and educational programs that raise awareness about the Study Area's history.	DRC/NMS	O	GB	BVCB, DC, HG, WO, R	DC, HG	9-12
I-5	Partner with local school districts and universities to maximize opportunities for collaboration to create awareness about watershed issues.	DRC/NMS	S	GB	EAC, R, Schools, WO	DC, LT	9-13
I-6	Work with area universities to identify technical assistance and service learning opportunities and additional community activities.	DRC/NMS	O	GB	DC, R, Schools	DC	9-14
I-7	Partner with the Darby Creek Valley Association (DCVA) and Chester-Ridley-Crum Watersheds Association (CRC) to assist with watershed issues that exist within the Delaware River drainage areas.	DRC	O	GB	DC, EAC, WO	DC	9-11
I-8	Participate in the Delaware County Coastal Zone Management Task Force to share information about riverfront corridor issues and to participate in coastal zone planning efforts.	DRC	O	GB	BCVB, DC, HG, I/B, WO	DC	9-12
I-9	Form a watershed organization to address water resource and other related issues that exist within the NMS watersheds.	NMS	S	R	DC, GB, WO	DC, PEC	9-11
I-10	Identify opportunities to work with local homeowners' associations to address restoration of riparian buffers, maintenance of open space, and reforestation.	NMS	O	GB	DC, R, WO	DC, PADEP	9-12

ACE	Army Corps of Engineers
BCVB	Brandywine Conference and Visitors Bureau
CZTF	Delaware County Coastal Zone Task Force
DC	County of Delaware (Planning Department, Conservation District, Parks Department, etc.)
DCCC	Delaware County Commerce Center
DCED	Pennsylvania Department of Community and Economic Development
DCNR	Pennsylvania Department of Conservation and Natural Resources
DELCORA	Delaware County Regional Water Quality Control Authority
PADEP	Pennsylvania Department of Envronmental Protection
DVRPC	Delaware Valley Regional Planning Commission
EAC	Environmental Advisory Council
USEPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency (FEMA) (or Pennyslvania Emergency Management Agency (PEMA))
GB	Governing Body (municipal and consultant staff)
HG	Historical Group
I/B	Industry and/or Businesses
LT	Land Trust (i.e., Natural Lands Trust, Brandywine Conservancy, etc.)
NPO	Non-Profit Organization
PEC	Pennsylvania Environmental Council
PennDOT	Pennsylvania Department of Transportation
PFBC	Pennsylvania Fish and Boat Commission
PHMC	Pennsylvania Historic and Museum Commission
R	Residents and Civic Organizations (friends groups, civic organizations, homeowners associations)
Schools	Schools, school districts, colleges, universities, etc.
STC	Shade Tree Commission (municipal)
TV	TreeVitalize
WO	Watershed Organization (e.g., CRC, DCVA, NCWA)

CHAPTER 1
INTRODUCTION

STUDY AREA OVERVIEW

Rivers Conservation Plans (RCPs) have become an essential tool used in efforts to "conserve and enhance" Pennsylvania's watersheds. Through support from the Pennsylvania Department of Conservation and Natural Resources's (DCNR) Rivers Conservation Program, RCPs have been developed for all of Delaware County's larger watersheds, including: Ridley Creek (1997), Chester Creek (2001), Darby Creek (2004), and Crum Creek (2005). Brandywine Creek is included in Chester County's *Watersheds* plan (2002). Until now, the only watershed that had yet to be addressed was the Delaware Direct Drainage Area.

The Study Area includes pockets of land draining directly to the Delaware River within the County's Delaware River Corridor (DRC), as well as the Naamans Creek, Marcus Hook Creek, and Stoney Creek watersheds, (also referred to as Naamans-Marcus Hook-Stoney Creek or NMS). Refer to Map 1-1 to view all of Delaware County's watersheds. As such, this RCP addresses two overlapping, yet unique sub-Study Areas. In addition, it should be noted that several municipalities are located within both portions of the Study Area (refer to Table 1-1 and Study Area Maps 1-2 and 1-3).

TABLE 1-1
STUDY AREA MUNICIPALITIES

Municipality	Location
Chester City	DRC
Eddystone Borough	DRC
Ridley Township	DRC
Tinicum Township	DRC
Chester Township	DRC/NMS
Lower Chichester Township	DRC/NMS
Marcus Hook Borough	DRC/NMS
Trainer Borough	DRC/NMS
Aston Township	NMS
Bethel Township	NMS
Upper Chichester Township	NMS

Source: DCPD, 2013

The Delaware River Corridor (DRC) sub-Study Area consists of a linear area extending from the Delaware State line to the City of Philadelphia, roughly located between Interstate 95 and the Delaware River. This area, which includes portions of other major watersheds tributary to the Delaware River, as well as the "pockets" of land between

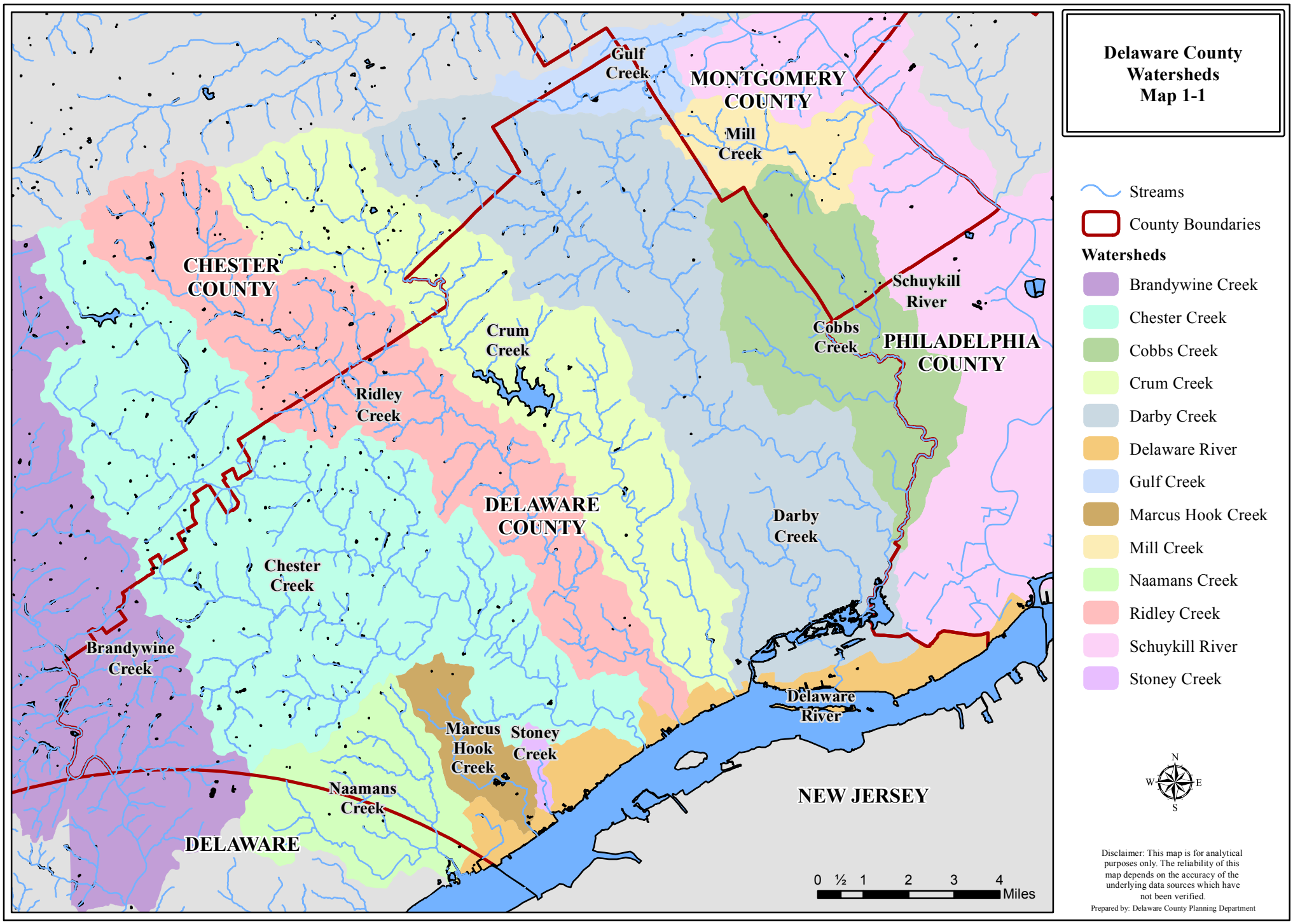
them that drain directly to the River, closely mirrors the federally designated Coastal Zone. The pockets of direct drainage are found in Chester City; Chester, Lower Chichester, Ridley, and Tinicum Townships; and Eddystone, Marcus Hook, and Trainer Boroughs. The DRC has a rich history that dates back to the Lenni-Lenape Native Americans who lived beside the Delaware River, and the early European settlers, including the Swedes that inhabited Tinicum, and William Penn, who originally landed in Chester. The area also has a long industrial heritage, with American Viscose, Baldwin Locomotive, Boeing, and many other large manufacturers shaping the Delaware riverfront. US Route 13 (in Marcus Hook and Trainer) and PA Route 291 (that runs through the remaining municipalities) constitute the interior spine of the Delaware River corridor, linking many of the Delaware River communities, while also passing through the lower ends of the Chester, Ridley, Crum, and Darby Creek watersheds.

The Naamans, Marcus Hook, and Stoney Creek (NMS) watersheds sub-Study Area is located in the southwest corner of Delaware County. It primarily contains portions of Bethel and Upper Chichester Townships, and a small residential piece of Aston Township. Chester City, Chester and Lower Chichester Townships, and Marcus Hook and Trainer Boroughs lie within both the DRC and the NMS watersheds area. Thus, their historic settlement and land use patterns more closely resemble those of the DRC communities. Though quite historic in its own right, the NMS area differs greatly from the DRC in that the strong development pressure typical of many communities in western Delaware County has occurred relatively recently.

There are notable differences in the way development has occurred in the NMS over the years. Nearest to the Naamans Creek headwaters in the north and west, there is an overarching emphasis on residential land uses with newer housing developments that feature relatively large lot sizes and single-family homes. Further downstream, in the area shared with the DRC, industry dominates the land use. There are older, more densely-populated neighborhoods with smaller single-family, twin, and row homes. The Naamans Creek watershed is unique in that it flows southward through the state of Delaware into the Delaware River. It is one of only five interstate streams in the entire four-state Delaware River Basin.

With the completion of this RCP Delaware County will have comprehensive management strategies for the water, land, cultural, historic, and recreational resources of all of its watersheds. By creating a vision for the watersheds, this RCP can guide Study Area municipalities' conservation and development efforts into the future.

This RCP draws from previously completed plans that addressed the adjacent Chester, Ridley, Crum, and Darby watersheds, respectively. Efforts have been be made to ensure that all recommendations in this Plan are in agreement with those existing RCPs to help promote a cohesive strategy for protecting the Study Area's resources. Since the Naamans Creek portion of the NMS watersheds extends into New Castle County, Delaware, sections of the plan also explore how to coordinate activities affecting the health of resources across the state boundary.


Delaware County
Watersheds
Map 1-1
Gulf Creek
MONTGOMERY COUNTY
Mill Creek
CHESTER COUNTY
Schuykill River
Cobbs Creek
PHILADELPHIA COUNTY
Crum Creek
Ridley Creek
DELAWARE COUNTY
Darby Creek
Chester Creek
Brandywine Creek
Delaware River
Marcus Hook Creek
Stoney Creek
Naamans Creek
NEW JERSEY
DELAWARE
0 ½ 1 2 3 4 Miles
Streams
County Boundaries
Watersheds
Brandywine Creek
Chester Creek
Cobbs Creek
Crum Creek
Darby Creek
Delaware River
Gulf Creek
Marcus Hook Creek
Mill Creek
Naamans Creek
Ridley Creek
Schuykill River
Stoney Creek
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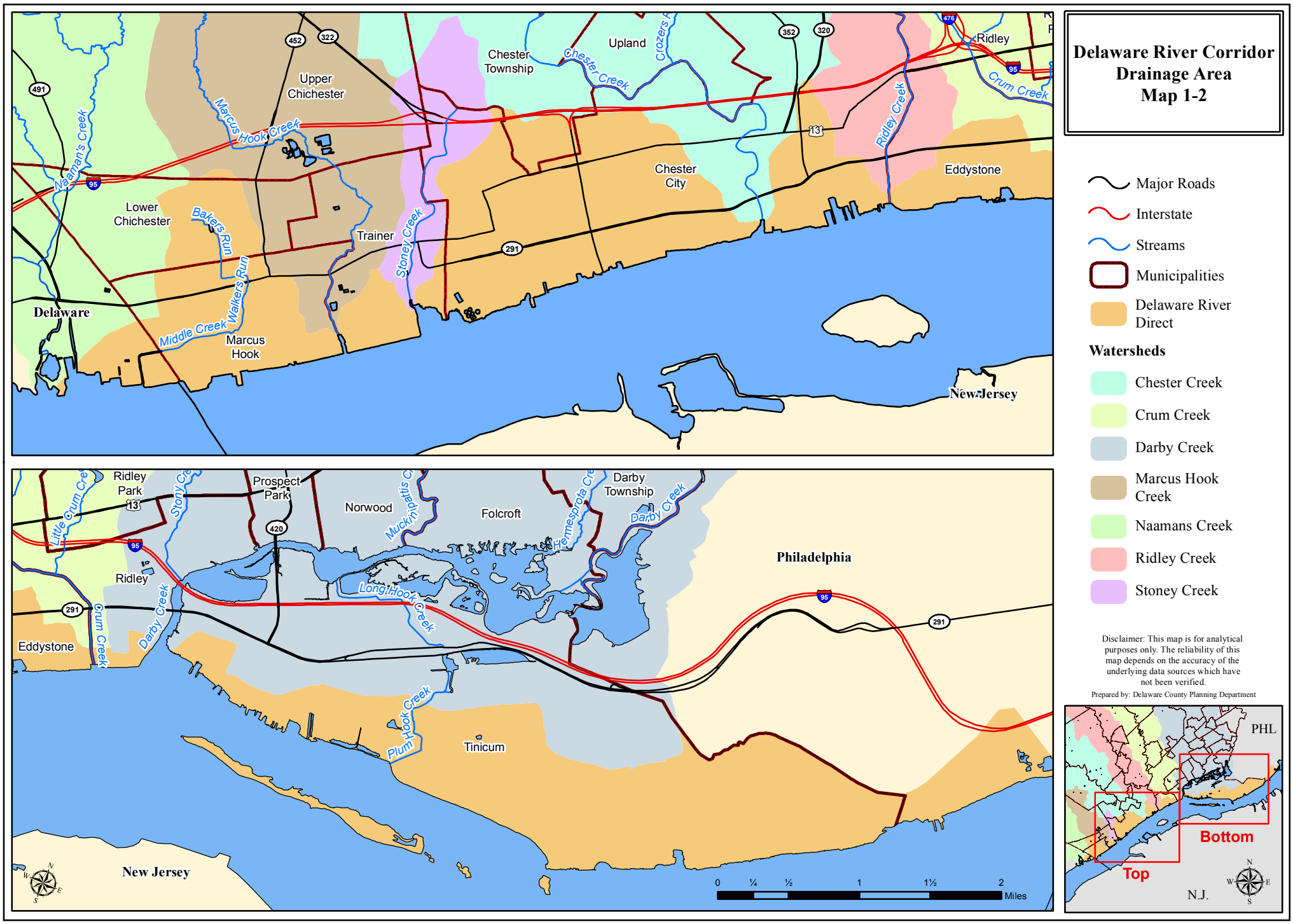
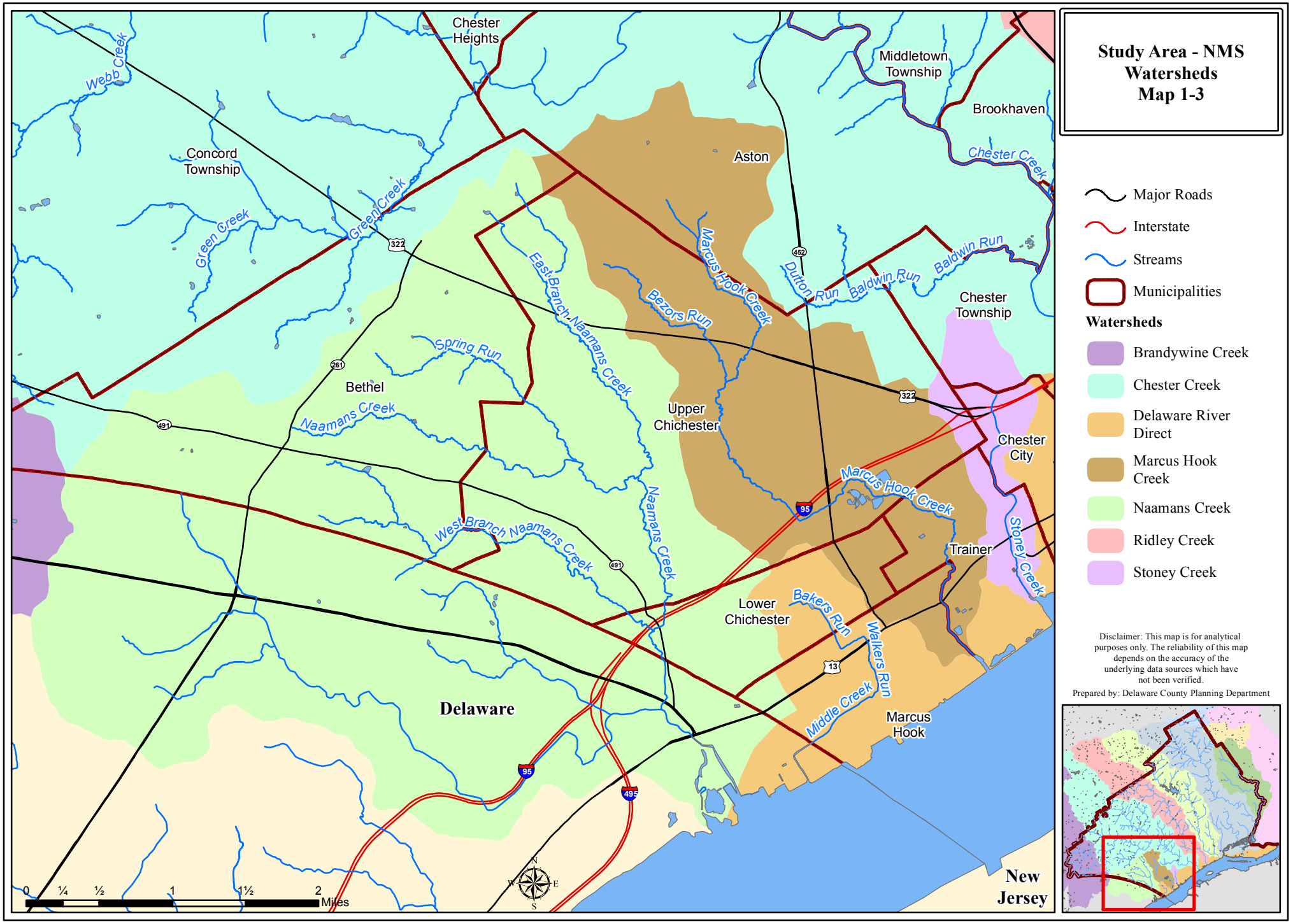
S
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department


Delaware River Corridor
Drainage Area
Map 1-2
Major Roads
Interstate
Streams
Municipalities
Delaware River Direct
Watersheds
Chester Creek
Crum Creek
Darby Creek
Marcus Hook Creek
Naamans Creek
Ridley Creek
Stoney Creek
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Upper Chichester
Chester Township
Upland
Ridley
Lower Chichester
Chester City
Eddystone
Trainer
Delaware
Marcus Hook
New Jersey
Ridley Park
Prospect Park
Norwood
Folcroft
Darby Township
Philadelphia
Ridley
Eddystone
Tinicum
New Jersey
Marcus Hook Creek
Naaman's Creek
Baker's Run
Walker's Run
Middle Creek
Stoney Creek
Ridley Creek
Crum Creek
Darby Creek
Little Crum Creek
Muckinipattis Creek
Hermesprota Creek
Long Hook Creek
Plum Creek
0 ¼ ½ 1 1½ 2 Miles
PHL
Bottom
Top
N.J.


Study Area - NMS Watersheds Map 1-3
Major Roads
Interstate
Streams
Municipalities
Watersheds
Brandywine Creek
Chester Creek
Delaware River Direct
Marcus Hook Creek
Naamans Creek
Ridley Creek
Stoney Creek
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Chester Heights
Middletown Township
Brookhaven
Aston
Concord Township
Chester Township
Bethel
Upper Chichester
Chester City
Trainer
Lower Chichester
Marcus Hook
Delaware
New Jersey
Webb Creek
Green Creek
Chester Creek
Marcus Hook Creek
Dutton Run
Baldwin Run
Bezors Run
East Branch Naamans Creek
Spring Run
Naamans Creek
West Branch Naamans Creek
Stoney Creek
Bakers Run
Walkers Run
Middle Creek
322
452
261
491
95
495
13
0 ¼ ½ 1 1½ 2 Miles
N
S
E
W

PURPOSE OF A RIVERS CONSERVATION PLAN

The Pennsylvania Rivers Conservation Program was designed with the intent of conserving and enhancing river resources through the preparation of locally initiated RCPs. An RCP is a valuable tool for identifying significant natural, recreational, and cultural resources that exist within a watershed. It also addresses concerns and threats to river resources, as well as other issues deemed important by local stakeholders. The RCP includes recommendations to guide future efforts for watershed conservation, restoration, and other projects and improvements to promote water quality for future generations.

The Rivers Conservation Program provides technical and financial assistance to communities and rivers support groups for conservation activities. Upon municipal adoption of the RCP, the corresponding river or stream is placed on the Pennsylvania Rivers Registry. Once the watershed is placed on the Registry, it becomes eligible to apply for several types of grants administered by DCNR, depending on how they relate to the recommendations described in the plan.

Implementation grants are available to assist communities in conducting resource studies, such as water quality surveys and monitoring, usage and accessibility studies, and trail feasibility and greenway studies. Development grants are intended for use in carrying out specific construction projects for features like trails and trailheads, playgrounds, parks, and stream bank fencing. Acquisition grants are also available, and are intended to aid municipalities in procuring lands for recreation and/or conservation purposes. This can be done via fee simple purchase or through the use of conservation easements. It should also be noted that recommendations in an RCP can help to leverage funding under other DCNR or PA Department of Environmental Protection (PADEP) programs.

THE RCP IN RELATION TO OTHER STUDIES

Though similar in many ways to other types of plans, such as comprehensive land use or revitalization plans, RCPs have at least one distinct difference – instead of approaching conservation issues at the county or municipal scale, RCPs address issues at a watershed scale. This allows for a more comprehensive approach to addressing the various issues identified in the plan. It can also help to facilitate intergovernmental cooperation on land and water management issues.

DELAWARE RIVER CORRIDOR

The DRC communities have benefited from many planning efforts over the years. The issues faced by the municipalities along the riverfront are unique and well known. Considerable work has already been undertaken to restore and maintain the distinct character of these communities. The DRC area lies within a federally designated Coastal Zone Management Program (CZM) area, which allows municipalities to apply to PADEP for CZM-funded studies. Several of the CZM-funded studies prepared to date include:

- *Delaware County Waterfront Resources Management Plan* (1992) – discusses the coastal zone's many cultural, historic, and natural resources, in relation to the area's land uses
- *Delaware County Coastal Zone Compendium of Waterfront Provisions* (1998) – serves as a tool to help provide direction for planning in the coastal zone corridor
- *Delaware County Industrial Heritage Parkway: Route 291/13 Beautification and Greenway Plan* (2002) – calls for a unified thematic approach to beautification and landscaping in the Route 291/13 Corridor and inclusion of the East Coast Greenway, a path for bicyclists and pedestrians that will stretch from Maine to Florida
- *Delaware County Route 291/13 Industrial Heritage Parkway and Greenway Landscape and Signage Guidelines* (2005) – provides graphic standards for signage, streetscape, landscaping, and bikeway elements to be installed in the Route 291/13 Corridor
- *Delaware County Industrial Heritage Parkway Interpretive Signage Guidelines* (2013) – provides specific guidelines for interpretive signs in the Route 291/13 Corridor, as well as actual fabrication-ready signage artwork

Other previously completed plans for the Delaware River corridor were developed as part of the County of Delaware's Renaissance Program. The *Delaware County Renaissance Program Planning Area 1 Action Plan – Marcus Hook, Trainer, and Lower Chichester* (2003) identified the need for stream corridor protection activities, East Coast Greenway implementation, planning for a possible Marcus Hook Creek greenway, and streetscape improvements. The *Delaware County Renaissance Program Planning Area 2 Action Plan* (2003), prepared for Chester City, Chester Township, and Upland and Parkside Boroughs, identified flood abatement projects for Chester Creek, streetscape improvements along Edgmont Avenue, rehabilitation efforts for the historic Triangle One building, and adaptive reuse of the Franklin Building in Chester City.

The *Delaware County Renaissance Program Planning Area 3 Action Plan* (2003) listed several projects that addressed waterfront access, recreation, and historic preservation in Tinicum, Ridley, and Eddystone. The *Action Plan* also recommended that an Industrial Heritage Corridor Planning Task Force be formed to coordinate development and redevelopment activities for the Route 291 corridor. A separate project was listed to help rehabilitate existing stormwater collection and management systems.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

In contrast to the DRC area, the NMS watersheds have a comparable lack of studies and resource inventories. The joint *Aston, Lower Chichester, and Upper Chichester Multi-municipal Comprehensive Plan* (2005) addressed the need for making improvements to reduce flooding and to conduct planning activities for trails. However, there has not been any follow-up to bring the municipalities together to look at stormwater issues or to conduct a feasibility study for linear greenways. This RCP will serve as a basis for multi-municipal collaboration among the DRC and NMS communities.

PUBLIC PARTICIPATION PROCESS

Public participation is essential to the development of an RCP. As such, the public participation process for this RCP included reaching out to citizens and watershed stakeholders. Dual planning teams, comprised of community members from the respective sub-Study Areas, were formed to help assist with data collection, identification of major issues, and development of plan recommendations. Members helped to assist with data collection, identify major issues, and development of plan recommendations. Planning team members attended separate meetings for each portion of the Study Area.

The Delaware County Coastal Zone Task Force (CZTF), which includes municipal staff and nonprofit organizations, as well as staff from DCNR and PADEP, served as the DRC planning team. A separate group was formed for the NMS watersheds, consisting primarily of municipal staff and engineers, Pennsylvania and Delaware environmental organizations, as well as citizens. Meeting notices were sent to the CZTF, Planning Team members, municipal engineers, and other interested parties (i.e., historical societies) via the Delaware County Public Historic and Preservation Network email distribution list.

Meeting topics for both portions of the Study Area addressed water, natural, cultural, and historic resources, as well as other watershed needs and concerns. The DRC team also met to discuss future revitalization and tourism efforts to be included in the plan. The NMS group held an additional meeting to recap preliminary recommendations and to discuss considerations and possibilities regarding the formation of a watershed stewardship group. (Refer to Appendix A: Public Participation Materials, which includes meeting minutes, interviews, and other information from public meetings.)

A final public meeting was held on September 24, 2014 at the Marcus Hook Community Center. This time, attendees were presented with the RCP's final text and recommendations.

CHAPTER 2
STUDY AREA BACKGROUND

This Rivers Conservation Plan (RCP) has two distinct, yet overlapping areas of study. Many differences exist between the two portions of the Study Area. The low-lying communities of the Delaware River Corridor (DRC) reflect a highly developed riverfront; while the hilly Naamans, Marcus Hook, and Stoney Creek (NMS) watersheds area is defined more by its residential neighborhoods (refer to maps 2-1 and 2-2). The development patterns in each of the areas are a function of their shared, yet distinctly different histories.

The DRC area has a long history of industry, beginning with its days as a major shipping port through its rapid industrialization during the 1800s, and continued boom through World War II. The area still enjoys a mix of employers, ranging from industries such as Kimberly-Clark and Monroe Energy, which operate along the Delaware River, to the technical and financial services that operate in Chester's Wharf at Rivertown building.

The NMS portion of the Study Area, particularly in the upper reaches of the Naamans and Marcus Creek watersheds, has grown drastically in population over the past few decades. Much of this growth can be attributed to the construction of homes with larger lot sizes on previously undeveloped land. As such, the area follows a more suburban, automobile-dependent land use pattern.

HISTORY OF THE STUDY AREA

DELAWARE RIVER CORRIDOR

The Delaware County waterfront has a rich history that dates back hundreds of years. The Lenni Lenape Native Americans inhabited the area for its exceptional hunting and fishing grounds. Europeans first arrived in the area in 1609, when Henry Hudson explored the Delaware Bay and points north. The area was quickly recognized as an excellent location for the fur trade. This created a rivalry among Dutch, Swedish, and British settlers throughout the mid-17th century. The first permanent European settlement was established on Tinicum Island in 1643 by Swedish Governor Johan Printz. However, this colony, named New Sweden, did not grow larger than 1,000 people.

The British took control of the west bank of the Delaware River in 1644. In 1682, William Penn and a fleet of Quaker immigrants landed at the mouth of Chester Creek in what is now the City of Chester. It was here that he held his first governmental and religious meetings, announced his innovative "Frame of Government," and convened the first "Assembly and Courts." Penn originally intended to place his seat of government in Chester, but relocated to what is now the City of Philadelphia.

Due to heavy reliance on water transportation at the time, Delaware County's riverfront became a focal point for governmental and economic activities. Two surviving historical

resources exemplify the corridor's maritime history. The first resource is the set of four ice piers (also referred to as ice-breakers) constructed in 1785 along the Marcus Hook shore to keep the Delaware free of ice in the winter. The first federally funded public works project, they were made of timber with iron tips. The piers were later reconstructed in stone, and are still in use today. The second resource, the Lazaretto, was built on Tinicum Island in 1799 as a response to the repeated yellow fever epidemics of the 18th century, was the nation's first quarantine station and hospital. During the 19th century, the Lazaretto conducted ship health inspections and clearance certifications for both the economic trade and for many thousands of immigrants that entered the United States.

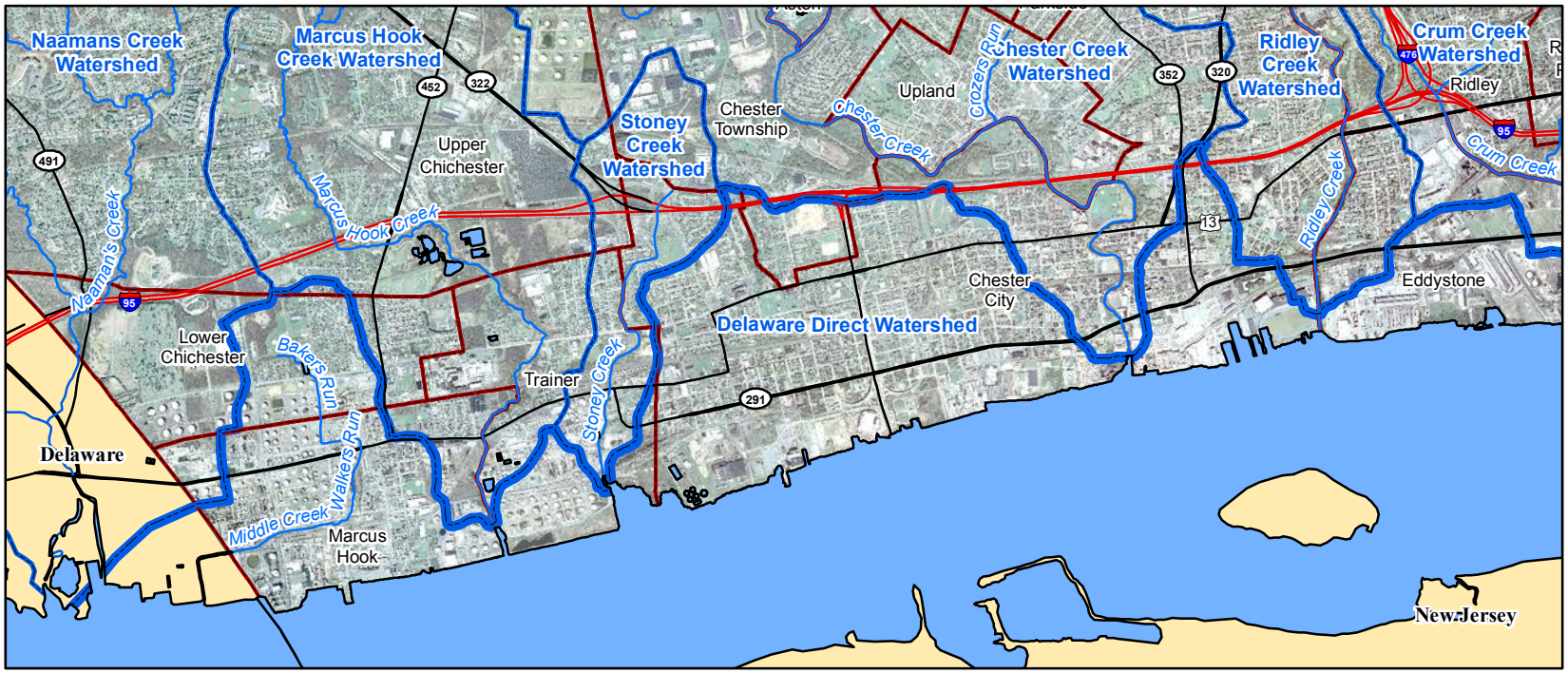
Over the years, the waterfront emerged as a hub for regional trade, where goods from interior farms and mills were sold to shipmasters and merchants. The considerable value of the trading activities attracted pirates who raided the markets of Philadelphia, Chester, and Marcus Hook. Among the visitors believed to have frequented the markets and taverns of Marcus Hook and Chester was Edward Teach, the man also known as Blackbeard, one of history's most infamous pirates.

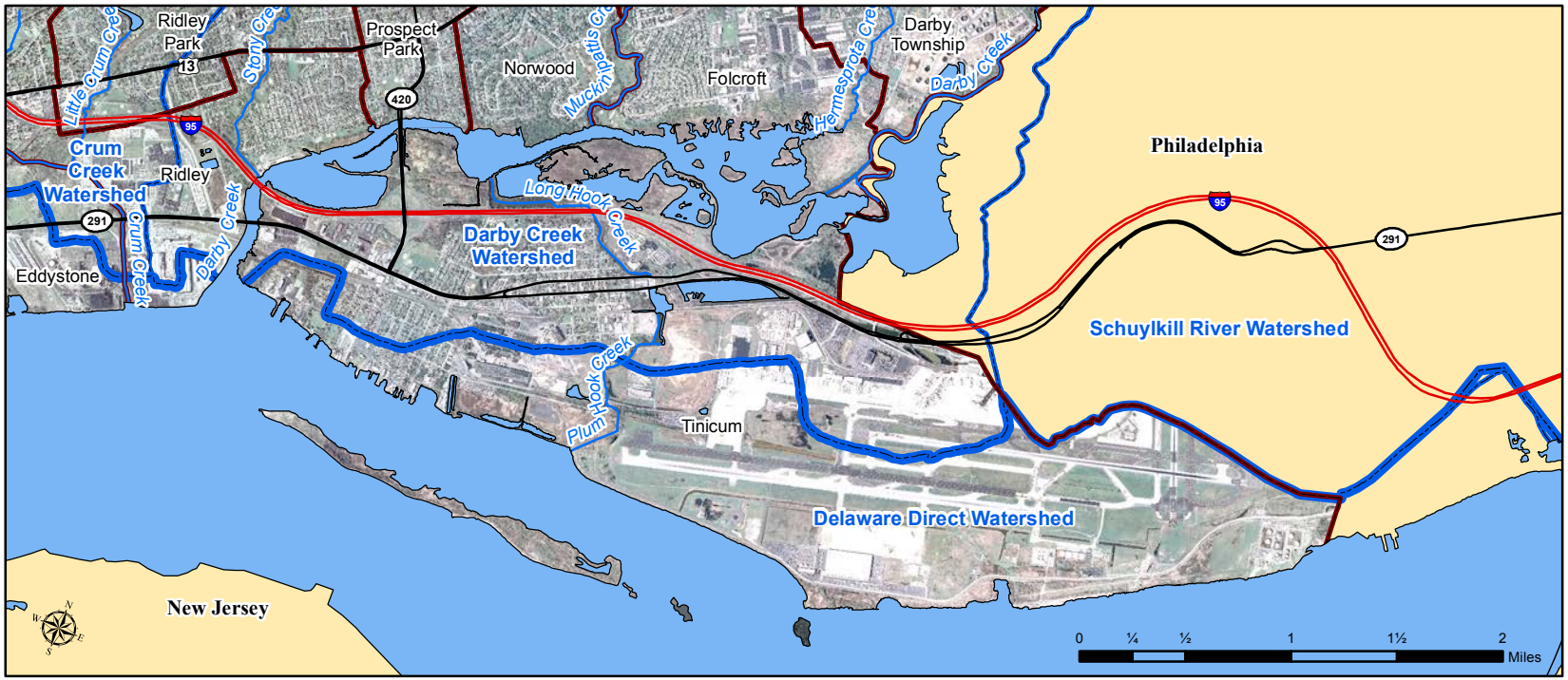
Throughout the 1800s, people were drawn to the riverfront for its hotels, amusement parks, and boating. Commercial fishing fleets sought large schools of herring and shad from the Delaware River. In 1892, the Bear Creek Refinery helped to initiate the river's new era as a hub for petroleum refining and shipping. The emergence of steam power and railways provided transportation to move goods and products away from the river to other markets. During the late 1800s and into the 1900s, the Delaware River shore became increasingly industrial, with three major rail systems (Pennsylvania, Reading, and Baltimore & Ohio), establishing links to the riverfront areas.

Among the large industries located along the Delaware River were the Roach Shipyard (1859), Baldwin Locomotive Works (1906), American Viscose Company (1910), the Remington Arms factory (1914), Sun (later Penn) Shipbuilding & Dry Dock Company (1916), the Philadelphia Electric Company (PECO; 1918), Scott Paper Company (1918), Congoleum (1920), Reynolds Aluminum (1960s), Westinghouse Electric Company, and Fisher Body. Boeing arrived to the area during the 1960s after it bought out the Vertol Aircraft Corporation, which was located in nearby Morton.

Beginning in the 1910s, the waterfront industries concentrated on manufacturing goods for World Wars I and II, and the Korean War. Eddystone was home to both the Remington Arms rifle plant and the Eddystone Ammunition Corporation, which provided a large percentage of the rifles and artillery shells used during WWI. Due to the density of military industries along Delaware County's riverfront, the Philadelphia Airport was closed to civilian use from 1943 until June 26, 1945. However, as the United States emerged out of wartime, the industries found it difficult and increasingly expensive to remain competitive. Later on, the factories began to close, as the costs of power, water, labor, and infrastructure became relatively high compared to the subsidized South and Southwest.

Delaware River Corridor Aerial Map 2-1

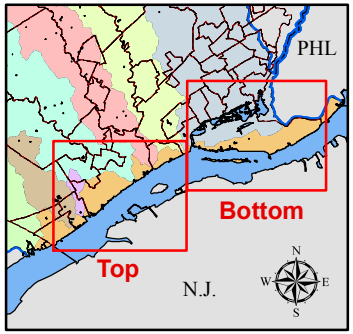


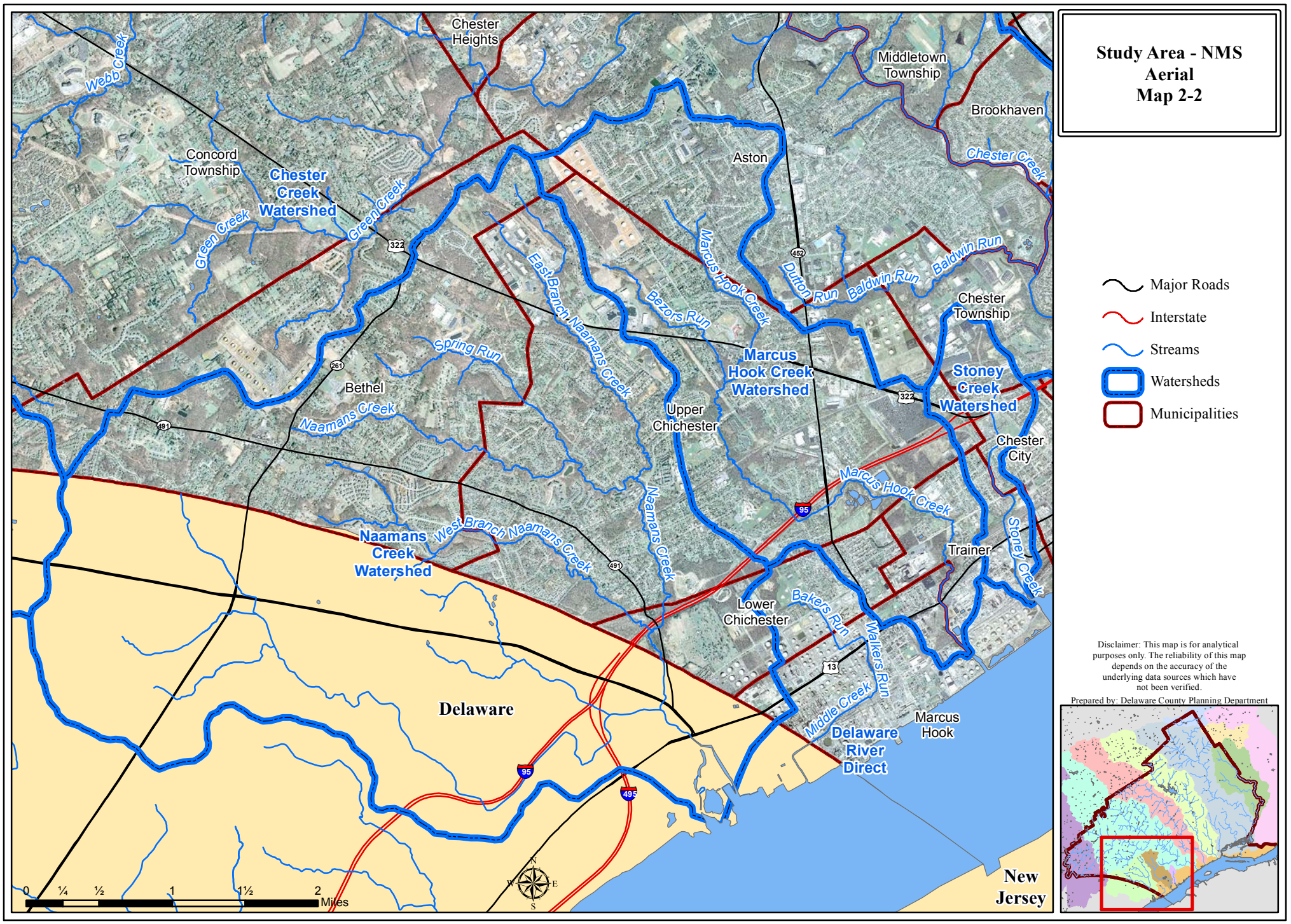


Major Roads
Interstate
Streams
Municipalities
Watersheds

Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.

Prepared by: Delaware County Planning Department




Study Area - NMS
Aerial
Map 2-2
Chester Heights
Middletown Township
Brookhaven
Webb Creek
Concord Township
Chester Creek Watershed
Green Creek
Aston
Chester Creek
Marcus Hook Creek
Dutton Run
Baldwin Run
Chester Township
Bezors Run
East Branch Naamans Creek
Spring Run
Bethel
Marcus Hook Creek Watershed
Stoney Creek Watershed
Naamans Creek
Upper Chichester
Chester City
Marcus Hook Creek
Naamans Creek Watershed
West Branch Naamans Creek
Neamans Creek
Trainer
Stoney Creek
Lower Chichester
Bakers Run
Walkers Run
Middle Creek
Delaware River Direct
Marcus Hook
Delaware
New Jersey
Major Roads
Interstate
Streams
Watersheds
Municipalities
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Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department

The 1960s and 1970s brought about the general flight of industry from the Northeast, and the Sun Belt emerged as a popular area for northern industries and manufacturers to relocate. Coupled with growing competition from foreign markets, the advantages of having an industrial waterfront were reduced. Additionally, some investors became concerned about potentially higher costs for adapting old structures to commercial needs.

In past centuries, Delaware County's riverfront has served as a major port of entry and an industrial power, playing a central role in the country's rapid economic growth. Despite the difficult times endured in recent decades, the riverfront is showing signs of recovery. Riverfront parks now steadily attract visitors to Marcus Hook, Chester, and Tinicum. Old industrial buildings, such as the Wharf at Rivertown (formerly the PECO power plant) in Chester, and Baldwin Tower in Eddystone, have been transformed into Class A office space.

The East Coast Greenway, a national off-road, multi-use trail for bicyclists and pedestrians will stretch from Maine to Florida; it will run through Delaware County's riverfront communities. PPL Park opened to rave reviews in 2010. Today, it serves as a centerpiece for the Delaware River's re-emergence as an area with a bright future. Harrah's Philadelphia Casino and Racetrack, located in Chester, is another major attraction that draws people to the area, while also providing jobs for local residents. Combined with the new ramps that link I-95 to Routes 322 and 291/13, visitors are now able to navigate the riverfront corridor. Future efforts will focus on the implementation of streetscaping and signage plans along Route 291/13, continued redevelopment of brownfield sites for new business and open space, and showcasing this area as a destination for reinvestment and tourism.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

Municipalities that comprise the upper portions of the NMS watersheds include Aston, Bethel, Lower Chichester, and Upper Chichester Townships. They were originally part of the territories inhabited by the Lenni Lenape Native Americans. The Lenni Lenape were a peaceful tribe who lived a quasi-nomadic lifestyle, following the seasons and the abundant wildlife indigenous to the area. Although there is no documentation of any permanent Native American settlements in the four townships, it is presumed that the Lenni Lenape traveled through the area to reach the bountiful Delaware River in the spring, only to retreat to higher, inland elevations in the winter.

In 1664, under direction of the Duke of York, the English took control of the settlements along the Delaware River in Delaware County. With the land patents granted to William Penn, English settlers began arriving in greater numbers in the 1680s. The whole area, which encompassed Marcus Hook and Trainer Boroughs and Upper and Lower Chichester Townships, was called "Chichester." The area split into smaller towns in 1735, but Upper and Lower Chichester were not recognized as separate governmental units until 1759. Aston Township was first settled in 1682 and incorporated in 1688. The township included Chester Heights Borough until its separation in 1945.

As with many Delaware County municipalities, these three townships began as agricultural communities, evolving gradually into the form we see today. The majority of the early settlers in the area were Quaker farmers who quickly began establishing farmsteads throughout the three Townships. Early Quaker meetings, such as the *Chichester Friends Meeting*, were also formed around this time. These were not only some of the first religious establishments in the area, but also became anchor points for settlement patterns, transportation routes, and social gatherings.

Area roads often began as narrow trails since wagons were not in wide usage until after 1725. These roads began, in many cases, as Native American trails, but quickly grew to connect villages and farms with regional market centers, such as those located in Chester and Marcus Hook, among others. The 18th century saw the development of crossroads commercial centers to handle distribution of local agricultural goods, and provided an outlet for items and services not readily available to farmers at home. Crossroads villages such as Village Green and McCaysville (Boothwyn) featured amenities such as blacksmiths, wheelwrights, schools, churches, post offices, general stores, and residences, all clustered around major intersections. In this sense, the crossroads were to become not only commercial centers, but social hubs as well. Agricultural products were brought to the nearby riverfront market towns of Chester and Marcus Hook where they were purchased by shipping merchants.

In the early 19th century, the formerly agrarian-based economies of Aston and Lower Chichester began to evolve into early manufacturing economies, comprised mostly of mills, which were located along Chester, Marcus Hook, and the West Branch of Chester Creeks. The water-dependent nature of these mills, combined with the close proximity of the mill workers' housing to the mill itself, led to a concentration of development, particularly in Aston. After the mid-1800s, goods were increasingly distributed via railroad to larger regional hubs.

Linwood, located in Lower Chichester, also owes its origins to the mill industry, though its rise correlated more closely with the railroad industry than with the waterways. Over the years, Lower Chichester and Aston became more densely developed as a result of the shift to manufacturing and the need for related housing and services. Conversely, Upper Chichester maintained a largely agricultural-based system of mill works, which were used to process locally grown grains.

From the late 19th to early 20th century, industrial expansion northward from the Delaware River communities exerted an ever greater influence on the area as large, formerly-agricultural lands were bought and subdivided for industrial uses, particularly in Lower Chichester. This, combined with the increasingly widespread usage of the automobile and public transportation, in turn spurred demand for worker housing in the area as the population grew faster and became more mobile. This increased mobility allowed workers to live farther away from large employment centers, and suburban expansion became a driving force for development in Aston and Upper and Lower Chichester Townships. By mid-century, the population of Upper Chichester increased eight-fold from 601 residents in 1900 to 5,280 in 1940. In 1949, the Conchester Highway

(Route 322) was built to provide speedier access to less-developed areas. This further encouraged large tracts of Upper Chichester to be purchased for conversion into residential and some industrial uses.

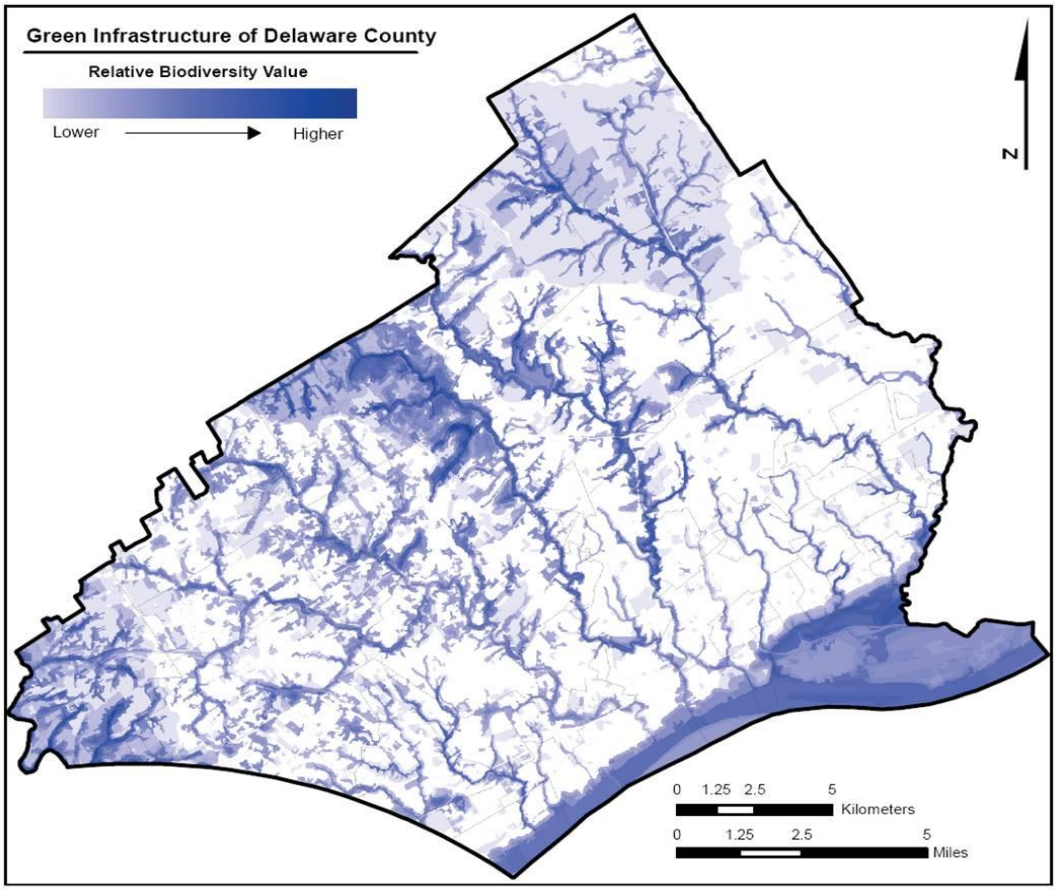
The latter half of the 20th century has seen continued expansion and infill development, with sustained economic prosperity creating even greater industrial and commercial growth. In recent decades, considerable residential development has defined the changes in land use patterns throughout the NMS communities. Municipal regulations and proactive zoning have created clustered areas of specific uses, such as industrial parks and shopping centers. The core of the municipalities' heritage is still visible in their crossroads and mill villages as well as the historic residences there.

Although Bethel had been established and settled by 1683, around the same time as the other municipalities in the area, its development history is slightly different. Bethel remained largely agricultural throughout its history. Situated on one large and two smaller gneiss ridges between the Chester and Brandywine Creeks, Bethel did not have the benefit of substantial water power with which to attract mills and heavy industry. While the soils in the area were productive enough to yield fairly large farms, they were never considered to be of any exceptional value, especially when compared to surrounding areas. The distance from Philadelphia, Wilmington, and other major commercial centers, may explain the reason for Bethel's comparative lack of development. It was not until much more recently that the area has seen any strong pressure to subdivide. In the past few decades, however, Bethel has seen numerous, large residential developments. It grew from 2,438 residents in 1980, to 8,791 residents in 2010, an increase of more than 350% in just 30 years. Development pressure continues to this day.

PHYSICAL DESCRIPTION

The Delaware River lies at the heart of Delaware County's history and natural environment. The river serves not only as the namesake for the County, but also as a major influence on the development patterns, cultural heritage, and economic activity of the entire Philadelphia region, both historically and in present times. In addition to the river, the County has a wealth of tributary creeks and stream valleys that shape the landscape. These creeks provided early settlers with important transportation routes. Later, they were utilized for mills and other industrial operations. As settlement spread inland from the river, the vast old growth forest was gradually replaced by farmland, and eventually urban and suburban development. This development pattern contributed to the fragmentation of the County's natural areas. Most of these remaining natural areas lie along stream banks, and on steep slopes and rocky areas that were unsuitable for farming or development. Figure 2-1 shows Delaware County's remaining green infrastructure. The Study Area has a relatively low biodiversity value; however, given its historic development pattern, this is not altogether surprising.

FIGURE 2-1
GREEN INFRASTRUCTURE OF DELAWARE COUNTY



Source: Natural Heritage Inventory of Delaware County, 2011

Today, the Study Area's streams and remaining open spaces serve important environmental functions and provide recreational opportunities, despite the increasing intensity of development on surrounding land. As public awareness of these resources (and the various threats affecting them) has increased, so has stewardship. In the more highly-developed portions of the Study Area, communities are working to restore access to the creeks and riverfront so that residents may enjoy recreational opportunities that had previously been hindered by intense industrial development along the water. There have also been successful efforts to protect natural areas and agricultural lands in the western part of the County through conservation easements and clustered development.

Most of the DRC spans a relatively flat, linear corridor of coastal plain, approximately 12-miles long, that runs from New Castle County, Delaware to the City of Philadelphia (refer to Map 1-2). This area features 17.9 miles of Delaware River shoreline. Chester City; Chester, Ridley, and Tinicum Townships; and Eddystone, Marcus Hook, and Trainer Boroughs all have land that drains directly into the Delaware. The direct drainage areas of the Corridor exist in "pockets" that lie between the County's other large watersheds, including Chester, Ridley, Crum, and Darby Creeks. The DRC lies within a

federally designated Coastal Zone area. The Delaware River and portions of its tributaries are tidal.

The NMS area is comprised of three separate watersheds that drain to the Delaware River (refer to Map 1-3). The downstream areas of the NMS area, including Marcus Hook and Trainer Boroughs, and Chester and Lower Chichester Townships lie in the Atlantic Coastal Plain. The upstream areas include parts of Aston, Bethel, and Upper Chichester Townships. There are much greater differences in elevation, with many small tributaries that flow into the main branches of the respective creeks. The Naamans Creek watershed is the largest of the three, with a total land area of 14.4 square miles. Just over half (7.4 square miles) of this basin lies in Delaware County, with the remainder flowing south into New Castle County, Delaware. The Marcus Hook Creek watershed spans 5.2 square miles, while the Stoney Creek drainage area is 0.8 square miles. Together, the total area of the NMS area in Delaware County is 13.4 square miles.

TRANSPORTATION

The Philadelphia International Airport (PHL), which comprises much of Tinicum Township's land area, is one of the busiest airports on the East Coast and serves as a major economic asset. According to statistics provided by PHL, it accommodated 30.5 million passengers in 2013, with 432,884 takeoffs and landings. PHL hosts over 200 businesses that employ more than 141,000 workers. Its economic impact on the region is estimated at $14.4 billion, with a major expansion to take place over the next 15 years.

Traditionally, the Delaware River has served as a major thoroughfare for shipping. Philadelphia is still one of the largest freshwater ports in the world. Although the number of vessels entering the Delaware River for shipping purposes may not be as high as it once was, there are still a number of active piers in Delaware County. Table 2-1 lists the number of vessel arrivals along the Delaware River during 2012.

TABLE 2-1
VESSEL ARRIVAL STATISTICS – 2012

Location	Number of Vessels
Fort Mifflin	129
Sun Oil, Marcus Hook	26
Monroe Energy	19
Penn Terminals	125
Hog Island	5

Source: Maritime Exchange for the Delaware River and Bay, 2014

The DRC's transportation network sees a high volume of traffic pass through the west-east Route 291/13 and Interstate 95 corridors. Newly constructed ramps from Interstate 95 to Route 291 provide easy access to the Chester waterfront, including the PPL Park soccer stadium and Harrah's Philadelphia Casino and Racetrack. The Commodore Barry

Bridge, the longest cantilever bridge in the country, is the only bridge within the Study Area that crosses the Delaware River into New Jersey.

Amtrak and the Southeastern Pennsylvania Transportation Authority (SEPTA) both operate on the rail lines that pass through the riverfront corridor. SEPTA's Wilmington regional rail line has stations at Eddystone, Chester City, and Marcus Hook. Several bus routes link the riverfront communities to neighboring municipalities, with Routes 113 and 119 running between Marcus Hook and Chester, and Route 37 running along Route 291 from Eddystone to Tinicum before heading into Philadelphia.

The most dominant feature of the lower NMS area's transportation network is Interstate 95, which passes through Upper and Lower Chichester, and Chester Townships. Most of the watersheds' industrial areas can be found along Routes 291 and 13 (Marcus Hook and Trainer). The NMS communities also contain several crucial pieces of the regional transportation network. Among the other significant roadways are US-322 (Conchester Highway) and Routes 452 (Market Street), 491 (Naamans Road), and 261 (Foulk Road). The area's proximity to so many important roadways, as well as its location between northern Delaware and Philadelphia, makes it an important hub for regional shipping and distribution. Its importance is underscored by the presence of CSX/Total Distribution Services, a large holding station that is located between I-95 and US-322. Every year, thousands of cars are brought here via rail before they are shipped overseas or transported to car dealers.

The Study Area's regional connectivity also helps to explain its rapid residential growth. With access to so many major roadways, people are able to live farther out in the suburbs, while still being convenient enough to commute to large employment centers near Wilmington and Philadelphia.

EMPLOYMENT

The Study Area, in particular the DRC communities, are fortunate to have a large number of job opportunities. While not all of the following employers may fall within the DRC or NMS municipalities (e.g., Crozer Health), they are still located in the Study Area and are easily accessible by the Study Area's residents. There are a number of different employment types, ranging from healthcare and technology companies to industry and manufacturing. Refer to Table 2-2 for a listing of major employers in the Study Area.

The revitalization of the riverfront communities is helped by the addition of the Harrah's Casino in Chester, which employs over 1,000 people and the Wharf at Rivertown, which houses Wells Fargo, Synygy, and Admin Server in the old Pennsylvania Electric Company (PECO) power plant. In January 2011, the Power Home Remodeling Group announced that it would be moving 400 jobs into the Wharf, with the possibility of adding more jobs in the future. PPL Park, which opened in 2010 on Chester's waterfront, houses the Major League Soccer team, the Philadelphia Union. Although no official

numbers have been released, estimates state that the stadium employs nearly 500 people on game days.

TABLE 2-2
MAJOR EMPLOYERS IN STUDY AREA

Name	Municipality	# Of Employees
Boeing Company - Rotocraft Division	Ridley Township	5,000+
Crozer Keystone Health Systems*	Chester City	5,000+
Harrah's Philadelphia Casino & Racetrack	Chester City	1,000+
Kimberly-Clark Paper Products	Chester City	1,000+
Wells Fargo	Chester City	1,000+
Keystone Mercy Health	Tinicum Township	1,000+
United Parcel Service	Tinicum Township	1,000+
Sun Oil Company	Marcus Hook Borough	500+
Philadelphia Union/PPL Park (game days)	Chester City	500+
Fisher Tank	Chester City	200+
Power Home Remodeling Group	Chester City	200+
Oracle	Chester City	200+
Comcast	Aston Township	200+
Monroe Energy	Trainer Borough	200+
Congoleum Corporation	Trainer Borough	200+
Synygy	Chester City	200+

*Crozer Hospital is located in the City of Chester. Crozer also operates a medical center in Springfield Township. Employment data was not broken out by facility.
Source: Delaware County Commerce Center, accessed at http://www.delcopa.org/top-employers.php, 2013.

Several major employers are also located just beyond the Study Area boundaries. Crozer-Keystone Health System employs over 5,000 people throughout Delaware County, many of whom work in Chester City. Widener University, which is just outside of the DRC area, provides over 1,000 jobs in Chester. The Eddystone Crossings shopping center, which is located on Chester Pike, is also just outside of the DRC area. This retail center, which is anchored by Wal-Mart, employs a sizeable number of local workers. Comcast's Aston office lies on the boundary of the Chester Creek and Marcus Hook Creek watersheds. Comcast employs over 200 employees in Delaware County, many of whom work out of this location. Alloy Surfaces, a defense contractor, also provides over 500 jobs in Chester Creek portion of Chester Township.

In the fall of 2011, both the Sun Oil and Conoco Philips oil refineries announced they would be sold or closed. Thanks in large part to a cooperative effort between elected officials at the local, county, state, and federal level, new owners and new uses for the refineries were established. The Conoco Phillips site was sold to Monroe Energy, a wholly-owned subsidiary of Delta Airlines, which now uses the site to produce jet fuel. The Sun Oil site in Marcus Hook is now being used by Sunoco Logistics, Inc., as a major east coast hub for natural gas products. The site's location along the Delaware River and

close proximity to large Marcellus Shale and Utica Shale formations across Pennsylvania makes it a tremendous asset in the natural gas industry.

SOCIO-ECONOMIC PROFILE OF THE STUDY AREA

In general, the socio-economic make-up of the DRC and the NMS areas are quite different. Many of these differences are due to their original development patterns, with the Delaware riverfront communities being some of the first areas to be developed with industrial uses and related worker housing. As such, the residential land development pattern is more compact and the associated population reflects many years of demographic change. The DRC municipalities tend to be ethnically diverse, with lower income levels and higher rates of poverty than other parts of Delaware County. In contrast, the upper NMS watershed area remained largely agricultural until recent decades, and reflects a more suburbanizing land use pattern and population.

The demographic data shown below is based on the entire municipality (land area both in and out of the Study Area), as it was difficult to break the information down for portions of each municipality. Notes:

1. Most of Ridley Township's residential population lies outside of the Study Area (land area in the Study Area is primarily industrial).
2. A large portion of Tinicum Township's land area is comprised of airport runway or is encompassed in the Heinz Refuge.

POPULATION

The City of Chester has the largest population as well as the highest density of any municipality in the Study Area. As noted above, most of Ridley Township's residential population lives outside of the DRC portion of the Study Area, and Tinicum Township's density appears low due to much of the land area being taken up by runways and tidal marsh. Generally speaking, the municipal densities in the DRC reflect the fact that many of the riverfront communities have extensive land areas dominated by industrial uses. So, while the municipalities tend to have small populations (refer to Table 2-3), they are located in smaller, more densely packed neighborhoods. The communities of Aston, Bethel, and Upper Chichester, located in the upper NMS area, are neither heavily nor densely populated.

As noted in Table 2-3, most of the DRC communities closest to the Delaware River are projected to lose population between 2010 and 2025. In contrast, the upper NMS communities of Aston, Bethel, and Upper Chichester are projected to gain significant population during the same period. This is reflective of the strong development pressure being experienced by these rapidly suburbanizing communities.

TABLE 2-3
STUDY AREA POPULATION

Municipality	Location	Population 2010	Total Land Area (Sq. Mi.)	2010 Population Density (Sq. Mi).	2025 Projected Population	2010-2025 Projected (% Change)
Chester City	DRC	33,972	6.01	5,653	34,097	0.37%
Eddystone Borough	DRC	2,410	1.50	1,607	2,401	(-0.37%)
Ridley Township	DRC	30,768	5.27	5,838	30,625	(-0.46%)
Tinicum Township	DRC	4,091	8.71	470	4,055	(-0.88%)
Chester Township	DRC/NMS	3,940	1.39	2,835	3,994	1.37%
Lower Chichester Township	DRC/NMS	3,469	1.11	3,125	3,459	(0.29%)
Marcus Hook Borough	DRC/NMS	2,397	1.62	1,480	2,418	0.88%
Trainer Borough	DRC/NMS	1,828	1.34	1,140	1,777	(-2.79%)
Aston Township	NMS	16,592	5.74	2,891	16,786	1.17%
Bethel Township	NMS	8,791	5.67	1550	9,204	4.70%
Upper Chichester Township	NMS	16,738	6.73	2,487	17,014	1.65%

Source: U.S. Census Bureau, 2010 Census; Regional, County, and Municipal Population Forecasts, 2010-2040, Delaware Valley Regional Planning Commission, 2013.

INCOME

Median family income levels vary throughout the Study Area, with generally lower incomes in the industrialized DRC communities of Chester, Marcus Hook, Eddystone and Trainer (refer to Table 2-4). According to the American Community Survey (2012), Pennsylvania's median family income was $65,980.

The portions of the NMS shared with the DRC are comprised primarily of lower-income communities, with poverty levels generally higher than average. The northern portions, of the NMS, however, are more affluent and have much lower rates of poverty.

TABLE 2-4
INCOME BY MUNICIPALITY

Municipality	Location	Median Family Income	% Of Families Below Poverty Level
Chester City	DRC	$34,853	26.6%
Eddystone Borough	DRC	$45,938	15.2%
Ridley Township	DRC	$75,868	7.5%
Tinicum Township	DRC	$67,250	5.8%
Chester Township	DRC/NMS	$59,949	16.2%
Lower Chichester Township	DRC/NMS	$52,311	16.1%
Marcus Hook Borough	DRC/NMS	$42,981	13.7%
Trainer Borough	DRC/NMS	$45,156	14.6%
Aston Township	NMS	$89,447	2.3%
Bethel Township	NMS	$123,864	1.5%
Upper Chichester Township	NMS	$85,389	3.0%

Source: U.S. Census Bureau, 2008-2012 American Community Survey

EDUCATION

The DRC communities generally have high school graduation rates of over 85% (for people age 25 and older). The exceptions are Chester City, Marcus Hook, and Trainer, which still have graduation rates above 75% (refer to Table 2-5). Graduation rates in the Upper NMS watersheds are nearly 90% or above.

Of the DRC and lower NMS municipalities, Ridley Township had the highest percentage of residents with a Bachelor's degree (21.5%), followed by Chester Township (14.6%). Of the upper NMS municipalities, Bethel had the highest percentage of residents with

Bachelor's degrees (46.4%), followed by Aston and Upper Chichester (with 29.2% and 24.8%, respectively).

TABLE 2-5
EDUCATION LEVELS BY MUNICIPALITY*

Municipality	Location	% High School Graduate Or Higher	% Bachelor's Degree Or Higher
Chester City	DRC	78.4%	9.8%
Eddystone Borough	DRC	87.0%	11.5%
Ridley Township	DRC	91.2%	21.5%
Tinicum Township	DRC	87.6%	12.1%
Chester Township	DRC/NMS	89.3%	14.6%
Lower Chichester Township	DRC/NMS	89.4%	8.3%
Marcus Hook Borough	DRC/NMS	79.1%	6.5%
Trainer Borough	DRC/NMS	82.4%	6.4%
Aston Township	NMS	92.4%	29.2%
Bethel Township	NMS	96.9%	46.4%
Upper Chichester Township	NMS	89.6%	24.8%

* for people 25 years and over
Source: U.S. Census Bureau, 2008-2012 American Community Survey

RACIAL DIVERSITY

There is considerable cultural and racial diversity within the coastal zone communities (refer to Table 2-6). Chester City and Chester Township each have sizeable African American populations, above 75% of the population. These two communities also have the largest Hispanic populations. Tinicum has the least racial diversity, with more than 98% of its residents identifying themselves as white. With the exception of Chester Township, racial and ethnic diversity are less pronounced in the all of the NMS municipalities (refer to Table 2-6).

TABLE 2-6
RACE BY MUNICIPALITY

Municipality	Location	White	African American	Native American	Asian American	Pacific Islander	Other	Two Or More Races	Hispanic Or Latino*
Chester City	DRC	18.1%	76.1%	0.0%	0.6%	0.1%	3.1%	2.0%	8.2%
Eddystone Borough	DRC	82.5%	11.2%	0.0%	0.0%	0.0%	0.0%	6.3%	2.7%
Ridley Township	DRC	90.2%	4.8%	0.4%	2.5%	0.3%	0.6%	1.6%	2.3%
Tinicum Township	DRC	98.1%	1.0%	0.0%	0.6%	0.0%	0.3%	0.0%	3.6%
Chester Township	DRC/NMS	16.6%	80.2%	1.0%	0.0%	0.0%	0.3%	1.8%	6.6%
Lower Chichester Township	DRC/NMS	79.6%	17.0%	0.0%	0.6%	0.0%	0.0%	2.8%	1.7%
Marcus Hook Borough	DRC/NMS	80.9%	14.4%	0.0%	0.0%	0.0%	0.0%	4.7%	3.7%
Trainer Borough	DRC/NMS	80.1%	17.8%	0.0%	0.6%	0.0%	0.0%	1.5%	5.2%
Aston Township	NMS	95.5%	2.6%	0.0%	1.1%	0.0%	0.0%	0.7%	1.3%
Bethel Township	NMS	90.4%	2.0%	0.2%	5.6%	0.0%	0.0%	1.8%	1.4%
Upper Chichester Township	NMS	81.9%	13.7%	0.2%	2.3%	0.0%	0.6%	1.3%	4.0%

* The American Community Survey organizes Hispanic or Latino separately as an ethnic categorization.
Source: U.S. Census Bureau, 2008-2012 American Community Survey

CHAPTER 3
LAND USE CHARACTERISTICS

LAND USE GOAL:
TO MAXIMIZE USE OF CURRENT NATURAL, CULTURAL AND MANMADE RESOURCES TO PROMOTE IMPLEMENTATION OF SUSTAINABLE LAND USE MANAGEMENT STRATEGIES FOR DEVELOPMENT AND REDEVELOPMENT IN THE STUDY AREA

A number of land use themes are common to the DRC communities. Industrial uses tend to be located along the Delaware River, with residential areas located farther inland. There are pockets of mixed-use and commercial areas, which tend to be accessible via transit or, in some cases, on foot or by bicycle. There is limited publicly owned open space in the corridor; however, larger riverfront parks can be found in Marcus Hook, Chester, and Tinicum. The Study Committee expressed a general desire for additional parks in the future.

The landscape of the NMS municipalities varies, depending on location. Along the Interstate 95 corridor, the landscape tends to be industrial with older, more densely populated residential areas and less open space. In the upper portions of the watersheds, specifically in Upper Chichester and Bethel, newer residential developments resemble other new subdivisions in the County, with winding streets and cul-de-sacs, larger single-family homes, and private open space managed by homeowners' associations. Despite the surge in development over the past few decades in the Naamans Creek watershed, there are still pockets of intact woodlands and ecologically significant habitat areas.

LAND USE PLANNING DOCUMENTS

Land use in Pennsylvania is authorized by the Pennsylvania Municipalities Planning Code (MPC), PA Act 247, as amended. This Act is the enabling legislation that authorizes municipalities to plan for and zone land within their boundaries. It is essentially the "rule book" that sets the standards for both county and municipal comprehensive plans, zoning ordinances, subdivision and land development ordinances, and official maps. It sets timetables for official actions and also provides remedies for appeal. It also defines the duties and responsibilities of various entities that control land use, including planning commissions and zoning hearing boards.

Each of the municipalities in the Study Area has a body of ordinances developed in conformance with the MPC. Most municipalities also have additional plans (e.g., open space plan, economic development plan, etc.) and other "free standing" special purpose ordinances regulating specific aspects of development in their communities (e.g., stormwater management ordinance, steep slope ordinance, etc.). Table 3-1 lists the various land use planning documents and ordinances adopted pursuant to the MPC, as well as their adoption dates.

TABLE 3-1
MUNICIPAL LAND USE DOCUMENTS

Municipality	Location	Comprehensive Plan	Zoning Ordinance	Subdivision and Land Development Ordinance
Chester City	DRC	10/10/12	1/1/01 amended 4/28/10	1990
Eddystone Borough	DRC	10/10/11	12/11/95 amended 11/13/06	C
Ridley Township	DRC	9/28/11	12/19/01 amended 4/23/03	5/25/77 amended 12/19/01
Tinicum Township	DRC	1981	5/1/98 amended 7/12/02	1993
Chester Township	DRC/NMS	11/07/02	2/4/93 amended 4/3/14	2/14/93 amended 12/19/07
Lower Chichester Township	DRC/NMS	12/19/05	3/25/68 amended 8/12/10	C
Marcus Hook Borough	DRC/NMS	10/07/02	10/3/05 amended 4/7/14	C
Trainer Borough	DRC/NMS	1978	1/14/88 amended 7/14/11	C
Aston Township	NMS	11/16/05	12/21/11 amended 3/19/14	10/17/90
Bethel Township	NMS	2006	6/10/08	4/12/77
Upper Chichester Township	NMS	10/13/05	8/8/91 amended 6/11/11	1994

Source: DCPD, 2014

C- County Subdivision/Land Development Ordinance

DELAWARE RIVER CORRIDOR

OBJECTIVE LU-1: TO CONTINUE REDEVELOPMENT ACTIVITIES AND CREATE AND ENHANCE EXISTING OPEN SPACES THROUGHOUT THE DELAWARE RIVER COMMUNITIES

EXISTING LAND USE

Perhaps the most definitive characteristic of development in the Delaware River Corridor is its historic industrial development pattern. Even today industrial uses make up the largest percentage of land area (roughly 28%) throughout the DRC. Map 3-1 and Table 3-2 show the great amount of land area devoted to industrial uses. The industries stretch inland in Marcus Hook, Trainer, and Eddystone. The Philadelphia International Airport (PHL) lies at the far eastern end of the Study Area, and comprises the second greatest amount of land area after industrial uses, accounting for almost 22% of the total land in the DRC.

TABLE 3-2
LAND USE – DRC

Land Use	# Of Acres	% Of Land Area
Industrial	2,146.98	28.32
Airport	1,637.47`	21.60
Residential	893.95	11.79
Open Space	991.03	13.07
Commercial	841.38	11.10
Vacant	326.37	4.30
Institutional	198.75	2.62
Railroad	210.04	2.77
Utility	167.75	2.21
Impervious Surfaces	151.83	2.00
Mixed Use	15.49	0.20
Total	**7,582.01**	**100.00%**

Source: DCPD, 2013

The residential neighborhoods in the DRC communities tend to be densely populated, with a mixture of single-family and row-homes. Due to the age of the riverfront communities, development patterns resemble more traditional urban areas, with walkable neighborhoods and access to commercial areas and public transit. As industry left the DRC in the 1960s and 1970s, many of the residents moved to more suburban locations, leaving some neighborhoods less populated. Chester City has half the number of residents that it did during World War II.

Despite the struggles experienced by the riverfront communities, there has been an influx of investment from both the public and private sectors. The former Baldwin Locomotive

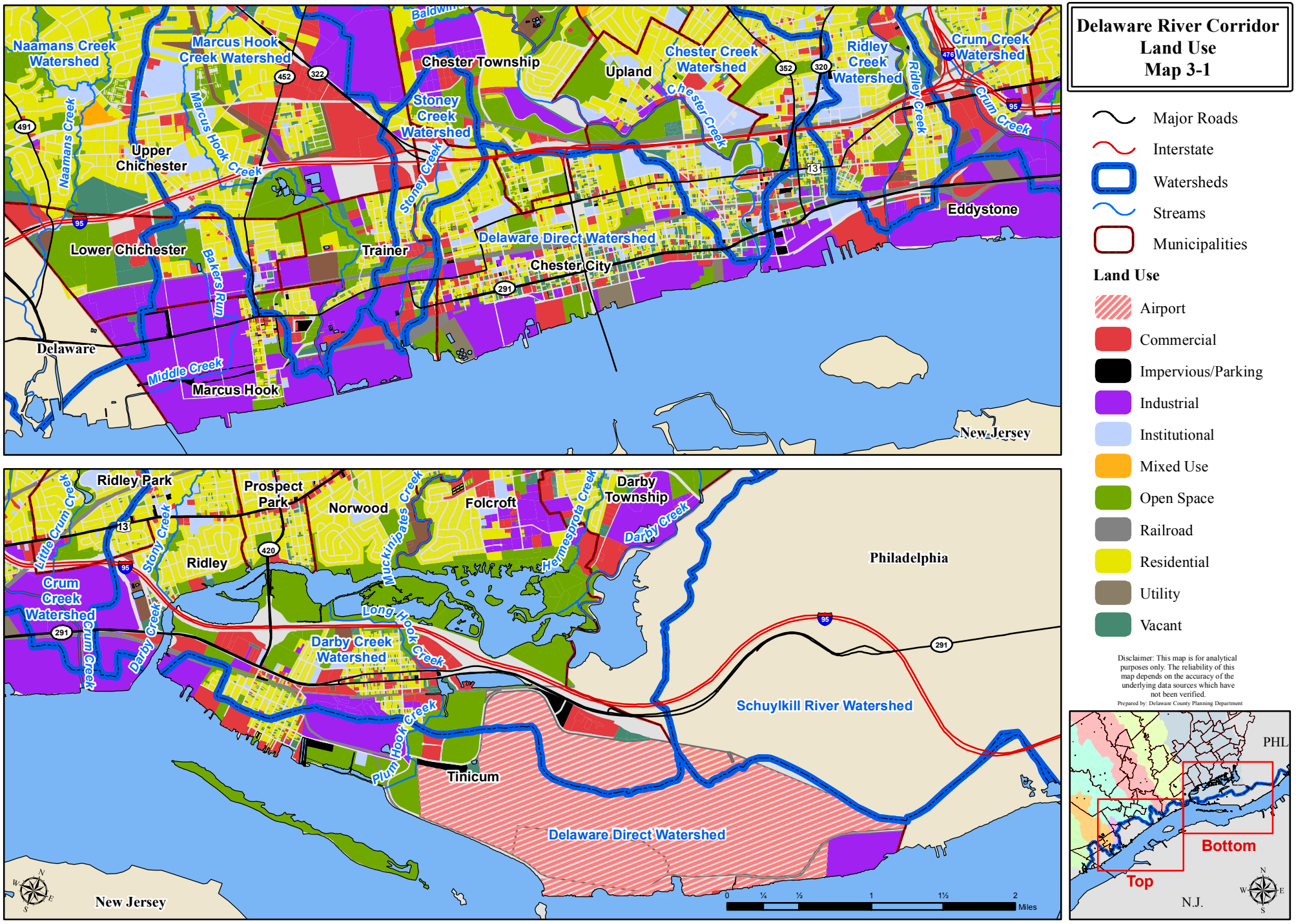
factory in Eddystone was converted to a shopping center at Eddystone Crossing, and the former Baldwin headquarters, Baldwin Tower, was refurbished into office space. Harrah's Philadelphia (formerly Chester) Casino and Racetrack in Chester, which cost $429 million to develop, was completed in 2006. Harrah's also features restaurants and a large parking structure. The Wharf at Rivertown in Chester, a six-story, 400,000 square foot office complex, is the site of the former Delaware County Electric Company power plant and sits on the River near the Philadelphia Union's soccer stadium, PPL Park. There are long-range plans to introduce mixed use development, with housing and retail space, between the Wharf at Rivertown site and the stadium.

Kimberly Clark Corporation Facility along the Delaware River in Ridley Township.

The Philadelphia International Airport takes up much of the land in Tinicum; in fact, two-thirds of the airport resides within the Township. In 2014, Delaware County, Tinicum Township, City of Philadelphia, and airport officials announced a tentative agreement to move forward with airport expansion. The new agreement, which is subject to FAA review, eliminates the need to acquire 72 homes and several businesses or relocate 300 Tinicum residents. The multi-billion dollar expansion is expected to be completed in phases over 12 to 15 years. It is funded through airport revenue bonds, passenger facility charges, federal Airport Improvement Program grants, and other airport revenues.

In recent years, there has been a renewed emphasis on providing open space throughout the riverfront corridor communities. There is relatively little land in public ownership when compared to more suburbanized areas of Delaware County. Although the amount of open space has increased in recent years, the 991 acre total for the entire DRC is less than ideal for an area and populace of its size. While some of the open space is privately owned and maintained, much of it is in public ownership, on school district or municipal land.

Marcus Hook's Market Square Memorial Park, Chester's Barry Bridge Park, and Tinicum's Governor Printz Park are popular recreational areas that provide public access to the riverfront. Farther inland, there are a number of other well used parks, such as Rocco Gaspari, Sr. Park in Lower Chichester, Memorial Park in Chester, and Dom Marion Field in Eddystone. One of the most significant parks is located on Little Tinicum Island, which is located just off shore from the Tinicum waterfront. Although accessing the island can be difficult, its roughly 80 acres contain tidal mud flats and other valuable habitat for unique plants and birds.


Delaware River Corridor
Land Use
Map 3-1
Major Roads
Interstate
Watersheds
Streams
Municipalities
Land Use
Airport
Commercial
Impervious/Parking
Industrial
Institutional
Mixed Use
Open Space
Railroad
Residential
Utility
Vacant
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Naamans Creek Watershed
Marcus Hook Creek Watershed
Chester Township
Upland
Chester Creek Watershed
Ridley Creek Watershed
Crum Creek Watershed
Stoney Creek Watershed
Upper Chichester
Lower Chichester
Trainer
Delaware Direct Watershed
Chester City
Eddystone
Delaware
Marcus Hook
New Jersey
Ridley Park
Prospect Park
Norwood
Folcroft
Darby Township
Ridley
Crum Creek Watershed
Darby Creek Watershed
Philadelphia
Schuylkill River Watershed
Tinicum
Delaware Direct Watershed
New Jersey
0 ¼ ½ 1 1½ 2 Miles
PHL
Bottom
Top
N.J.

ROUTE 291/13 REVITALIZATION

OBJECTIVE LU-2: TO BUILD ON CURRENT EFFORTS TO IMPROVE THE ROUTE 291/13 CORRIDOR THROUGH LANDSCAPING, SIGNAGE, AND INSTALLATION OF THE EAST COAST GREENWAY

Route 291/13, also known as the Industrial Heritage Parkway, passes through the DRC as well as the lower end of the NMS watersheds. There are significant improvements planned for the roadway, including visual enhancements, such as trees, banners, and gateway, wayfinding, and interpretive signage. These improvements will help to enhance quality of life for residents and improve the overall look of the area, making it more appealing to residents, businesses, and visitors.

The roadway has been the focus of several planning studies relating to beautification and signage efforts. The *Delaware County Industrial Heritage Parkway Route 291/13 Beautification and Greenway Plan* (2002) recommended a unified design concept for highway beautification and the East Coast Greenway, a trail that will span from Maine to Florida. The *Delaware County Route 291/13 Industrial Heritage Parkway and Greenway Landscape and Signage Guidelines* (2005) established an identity program for signage and banners, developing street improvements, and supplying design details for implementation. The most recent study, the *Delaware County Industrial Heritage Parkway Interpretive Signage Guidelines* (2013) provides a template for all future interpretive signage in the corridor as well as designs for 12 of the Corridor's major resources. These plans serve the important function of providing a future vision for Route 291/13 and the East Coast Greenway.

In preparation of Route 291/13 revitalization, some municipalities have already begun taking action to beautify the Corridor. Trainer has installed banners along its stretch of the Route 13 and the roadway is striped for the East Coast Greenway. Eddystone recently revised its zoning to include an Industrial Heritage Corridor overlay. The overlay is intended to "provide for a diversity of uses by permitting and encouraging technology-based and waterfront-related uses." While the underlying district still permits heavy industry, the new uses are intended to help revitalize the Route 291/13 Corridor and to create a sustainable economic setting consistent with the needs and requirements of 21st century commerce.

Provisions were also added to encourage the cultural, environmental, and tourist-related features called for in the studies noted above. Ridley amended its Township code to include an Industrial Heritage Corridor District along Route 291/13, while continuing to allow traditional heavy industrial development. Ridley's ordinance contains language similar to Eddystone's, making provisions for technology- and waterfront-based uses, and for cultural, environmental, and tourist-related features.

In 2010, the Delaware County Planning Department (DCPD) received approval from the Pennsylvania Department of Transportation (PennDOT) to apply for Byway status. PennDOT designates Pennsylvania Byways according to cultural, historic, recreational,

archaeological, scenic, and natural qualities. Since a roadway can be significant based on varying qualities, this program does not focus solely on aesthetic features. The Route 291/13 application for Byway status will primarily highlight the corridor's cultural and historic resources, with emphasis on the Corridor's industrial heritage.

Byway status would provide several benefits for the Study Area. During the application period, municipal officials, community groups, citizens, and businesses would be asked to come together to build support for the Byway. They can also help to develop the required strategy for maintaining and enhancing the corridor's resources. Upon approval, PennDOT would work with the Pennsylvania Department of Community and Economic Development (DCED) to promote the Byway on the State of Pennsylvania's official tourism website, www.visitpa.com, and include it on the Transportation and Tourism Map of Pennsylvania. Finally, the local pride in attaining Byway status would serve as a major achievement for a traditionally industrial area that is moving forward with its updated vision for the future.

RIVERFRONT REDEVELOPMENT

OBJECTIVE LU-3: TO ENCOURAGE RESERVATION OF LAND AREA DIRECTLY ON THE DELAWARE RIVER FOR WATER-DEPENDENT, -RELATED, AND -ENHANCED USES AS REDEVELOPMENT OPPORTUNITIES ALLOW

Continued efforts to revitalize the DRC communities have focused on introducing a mixture of land uses, including public access to the River. Such efforts include attracting new development, including businesses and residents, as well as planning for open space and beautification of neighborhoods. This is being accomplished through municipal land use documents, including comprehensive plans and zoning ordinances. The *Comprehensive Plan for the Borough of Marcus Hook* (2002) is an example of a document that specifically discusses land uses in relation to the River. The Borough envisioned a waterfront activity area along its riverfront that would include a mix of recreational, amusement, limited commercial, marina, cultural, and parking uses. The City of Chester also emphasized the importance of the riverfront in its comprehensive plan, *Vision 2020: A City Beautiful Movement* (2012), through its recommendations to, "encourage access to waterfront during redevelopment and connect historic sites, parks, and Riverwalk to other points of interest."

The interaction between land uses and the Delaware River shoreline must balance the needs of existing industries with the desire to attract new public access, recreational, and business redevelopment opportunities. The *Delaware County Coastal Zone Compendium of Waterfront Provisions* (1998) described three levels of water-relatedness (see below). This relationship can be viewed in terms of the level of water dependency. A major factor affecting dependency is the degree to which the use utilizes the riverfront as a functional resource rather than as an amenity.

1. **Water-dependent** – the operation is unable to function unless located on the water or shoreline edge. Examples include a port/shipping facility, shipbuilding,

boat launch, marina, or any industry that requires direct access to the water for processing purposes.

2. **Water-related** – the economic viability of the operation directly relates to a location for delivery of goods and services that may be associated with waterfront uses. Examples include boat storage, sales, supplies, or repairs and nautical or waterfront history museums.

3. **Water-enhanced** – the operation or activity is economically strengthened by the waterfront location or contributes to the public's enjoyment of the water's edge, or improves the overall viability of the area through its inclusion as a waterfront use.

Note: the terms of water-relatedness are for reference only. Municipalities should develop their own categories with clear definitions and associated permitted uses.

The Compendium also listed several options for preserving and encouraging waterfront uses that would apply to the Delaware River, including waterfront zoning districts and waterfront zoning overlays. Additionally, as properties in the DRC redevelop, it is important to re-establish and protect Delaware River viewsheds through reduction of building heights closest to the River and maintaining views at the terminus streets.

Waterfront Zoning Districts

Through the use of conventional zoning, municipalities may create a separate waterfront district (or a series of districts) that designate the specific combination of uses intended for the waterfront area. There are several advantages to establishing a waterfront zoning district, beginning with the ability to include or exclude uses, thereby tailoring the desired mix of permitted waterfront activities. The "Purposes" section of the waterfront district can be written so there is no misconception about the desired character or permitted land uses, thereby minimizing potential legal challenges. Additionally, the provisions relating to the waterfront district, including those relating to water dependency, height restrictions, need for special permits, public access, etc., can be found in one location.

Waterfront Zoning Overlays

Zoning overlays are permitted under Section 605 of the Pennsylvania Municipalities Planning Code (MPC). A zoning overlay is commonly used to establish an additional layer of regulation to an already existing zoning district. For example, a floodplain management overlay district is applied as an overlay to the underlying zoning district. Although the use of an overlay is commonly regulatory in nature, it can also be used to designate an area where additional development options are permitted.

A waterfront zoning overlay is an effective means for encouraging and applying water-dependent standards to industrial, commercial, or residential zoning districts. A municipality should decide in advance which land uses it wants on its waterfront during its initial planning and zoning process. Chester City expanded its list of permitted uses

beyond the industrial uses established by right. The Chester City zoning overlay also established provisions, such as public access and height, which apply when a developer exercises additional land uses within the overlay district.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

OBJECTIVE LU-4: TO CONDUCT DEVELOPMENT AND REDEVELOPMENT ACTIVITIES IN A SUSTAINABLE MANNER SO AS TO MINIMIZE ENVIRONMENTAL IMPACTS TO THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS

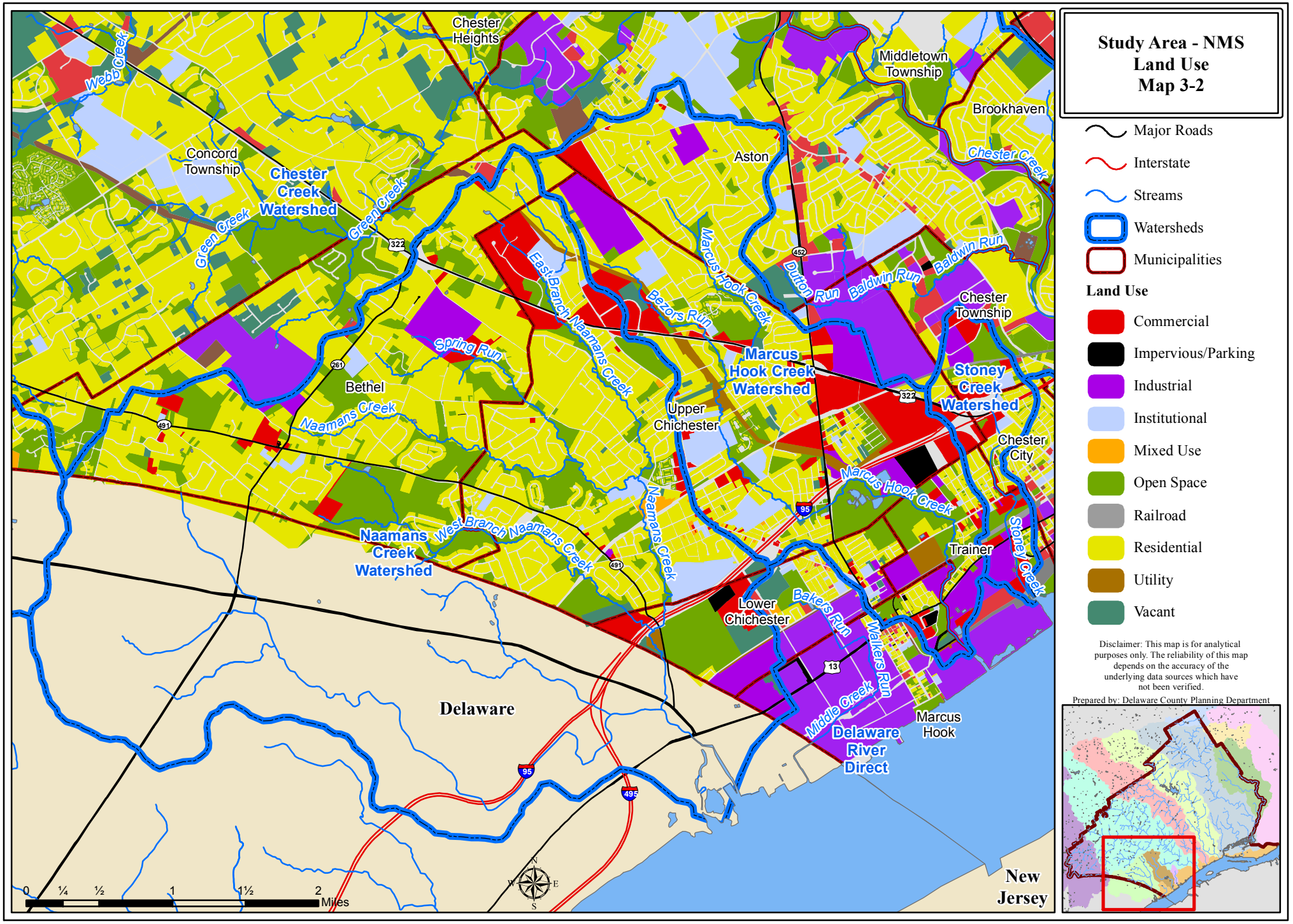
EXISTING LAND USE

The upper portion of the NMS watersheds has a much different land use pattern than that of the DRC. As seen in Table 3-3 and Map 3-2, over half (nearly 51%) of the NMS area consists of residential development. Neighborhoods in the lower portions of the NMS watersheds, such as those found in Lower Chichester and Trainer, tend to have much higher densities, with a mix of older single-family, twin, and row homes. In the upper portions of the watersheds, namely Upper Chichester and Bethel, development more closely resembles that of other new suburban subdivisions, with low density, single-family homes built on wide, winding streets and cul-de-sacs where private homeowners' associations (HOAs) are common.

TABLE 3-3
LAND USE – NMS

Land Use	# Of Acres	% Of Land Area
Residential	3,833.92	51.18
Open Space	1,563.96	20.61
Commercial	805.89	10.62
Industrial	606.53	7.99
Institutional	264.95	3.49
Vacant	207.95	2.74
Utility	137.26	1.81
Impervious Surfaces	54.38	0.72
Railroad	37.09	0.49
Mixed Use	26.18	0.35
Total	**7,501.02**	**100.00%**

Source: DCPD, 2013


Study Area - NMS
Land Use
Map 3-2
Major Roads
Interstate
Streams
Watersheds
Municipalities
Land Use
Commercial
Impervious/Parking
Industrial
Institutional
Mixed Use
Open Space
Railroad
Residential
Utility
Vacant
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Chester Heights
Middletown Township
Brookhaven
Webb Creek
Concord Township
Chester Creek Watershed
Green Creek
Aston
Chester Creek
Marcus Hook Creek
Dutton Run
Baldwin Run
East Branch Naamans Creek
Bezor's Run
Chester Township
Spring Run
Marcus Hook Creek Watershed
Stoney Creek Watershed
Bethel
Naamans Creek
Upper Chichester
Chester City
Marcus Hook Creek
Naamans Creek
West Branch Naamans Creek
Naamans Creek Watershed
Trainer
Stoney Creek
Lower Chichester
Baker's Run
Walkers Run
Middle Creek
Delaware River Direct
Marcus Hook
Delaware
New Jersey
0 ¼ ½ 1 1½ 2 Miles
N
W
E
S

The second most prevalent land use category by land area is open space, which comprises nearly 21% of the NMS communities. Open space is addressed in greater detail later in this chapter. The NMS watersheds also have a much lower percentage of industrial land uses (8% by area, including the DRC/NMS overlap area) than their DRC neighbors. This combination of more open space and less industry differentiates the land development of upper NMS watersheds area from the DRC. Despite the prevailing sentiment among municipalities that their lands are built out, infill development will almost certainly continue. This infill will result in higher densities which, in turn, will increase demand for additional public services. Comprehensive plans, zoning ordinances, and subdivision and land development ordinances (SALDOs) are all tools for guiding growth in a sustainable manner.

BROWNFIELDS

OBJECTIVE LU-5: TO ENGAGE IN EFFORTS TO IDENTIFY, REMEDIATE, AND REDEVELOP KNOWN AND SUSPECTED BROWNFIELD SITES FOR THEIR HIGHEST AND BEST USE

BROWNFIELDS INVENTORY

There is no comprehensive list of brownfields in the DRC. However, EPA manages the Comprehensive Environmental Response, Compensation, and Liability System (CERCLIS), which is a database that lists Superfund sites "where releases may have occurred, need to be addressed, or have been addressed," and indicates whether they are on the NPL. Currently, there are no active NPL sites listed within the DRC (refer to Table 3-4). Additional sites in the DRC include Eddystone Avenue Trailer in Eddystone, and Chester City's Abandoned Drum site (located at Tilghman and West Front Streets), Front Street Tanker (located at Front and Ward Streets), and Morton Street site (located at 1020 Morton Avenue). None of these sites are listed on the NPL.

TABLE 3-4
CERCLIS PROJECTS

Site	Location	Address	NPL Status	Watershed
ABM Wade Site	DRC	1 Flower St., Chester	Deleted from the Final NPL	Direct Drainage
Stoney Creek Technologies	DRC/NMS	3300 West 4th St., Marcus Hook	Not on the NPL	Stoney Creek
East 10th Street (*former American Viscose FMC Corporation factory)*	DRC/NMS	East 10th St., Marcus Hook	Proposed for NPL	Marcus Hook Creek
Metro Container Corporation	DRC/NMS	West 2nd and Price Sts., Trainer	Currently on the Final NPL	Stoney Creek

Source: U.S. EPA, 2014.

Perhaps the most infamous Superfund site in Delaware County was located in Chester City. The ABM Wade Site (also known as the Wade Dump and Drum Site) was the location of a rubber shredding plant, as well as an illegal industrial waste storage and disposal facility. In 1978, a massive fire broke out, with over 200 firefighters responding to the toxic fire that included drums of unknown chemicals. According to an article in the Philadelphia Inquirer, "at least three million gallons of cyanide, PCBs, benzene, toluene, and other chemicals" were present at the scene. The article's researchers found that by the year 2000, at least 45 of the emergency responders to the fire had developed serious illnesses such as cancer, vascular and neuromuscular disorders, and kidney failure. After undergoing significant emergency cleanup efforts led by the EPA, Wade Dump was remediated, capped, and removed from the NPL in 1989. It now serves as a parking lot adjacent to PPL Park.

Another valuable resource for brownfield cleanup is Pennsylvania's Land Recycling and Environmental Remediation Standards Act, also known as Act 2. Passed in 1995, Act 2 provides incentives to encourage the voluntary development and remediation of brownfields. The program provides uniform cleanup standards, liability relief, standardized reviews and time limits, and financial assistance. Cleanup standards and review procedures promote the voluntary cleanup of hazardous sites, while protecting property owners and developers from liability for further remediation of the contamination. The financial assistance helps with site assessment and remediation of environmental contamination.

As industrial properties go up for sale it is important to ensure that brownfield properties are remediated to a level for their highest and best use, whether that be for residential, commercial, mixed, or institutional uses. Furthermore, the creation of open space should be entertained when evaluating adaptive reuse opportunities. There are an increasing number of case studies that document how former industrial sites have been transformed into parks and even community gardens.

With the exception of the industrial development in the area shared with the DRC, the NMS communities do not have a large number of potential brownfields. This is particularly true in the Naamans Creek watershed. Most of these sites are in the DRC. These sites should continue to be monitored for their environmental hazards, along with opportunities for cleanup and redevelopment.

WASTE DISPOSAL FACILITIES

There are no landfills currently operating within the DRC or NMS areas. The Covanta trash-to-steam (also referred to as waste-to-energy) plant in Chester accepts waste from Delaware County, Philadelphia, New Jersey, and New York. Waste is incinerated to heat water to produce steam, which then powers a large turbine to generate electricity. According to the Delaware County Solid Waste Authority, the plant incinerated 352,596 tons of waste from Delaware County transfer stations in 2012. The ash is transported to the Rolling Hills Landfill in Berks County, which is owned by the County of Delaware;

the metals are recycled as permissible. There are also a number of metal and recycling facilities found at various locations in the DRC.

RECOMMENDATIONS

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR AND THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

LU-1 Create additional public access points along Study Area waterways.

LU-2 Complete a brownfields inventory for each municipality in the Study Area.

LU-3 Pursue opportunities for cleanup and redevelopment of known or potentially contaminated sites.

LU-4 Buffer industrial land uses through landscaping, screening, and other mechanisms to preserve the aesthetics in Study Area communities.

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR SHOULD:

LU-5 Protect significant viewsheds of the Delaware River through adoption of local ordinances that require preservation of views.

LU-6 Balance the needs of existing industries with the desire to attract new public access, recreational, and business redevelopment opportunities.

LU-7 Implement waterfront zoning districts or waterfront zoning overlays to preserve the Delaware River shoreline for water dependent and water-enhanced uses.

MUNICIPALITIES IN THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

No additional recommendations.

CHAPTER 4
CULTURAL RESOURCES

CULTURAL RESOURCES GOAL:
TO PRESERVE AND PROMOTE THE STUDY AREA'S CULTURAL RESOURCES, INCLUDING HISTORIC STRUCTURES, ARCHEOLOGICAL SITES, AND HUMAN HISTORY

BACKGROUND

The Study Area has a long history of human settlement. As such, it is fortunate to contain a wide array of unique cultural resources, including historic sites, archeological resources, and records of human settlement and accomplishments. These range from scattered relics of Native American (Lenni Lenape) inhabitance and landmarks of early European settlement, to industrialization, and pastoral farmsteads that have come to define the respective historic character of the Delaware River Corridor (DRC) and Naamans, Marcus Hook and Stoney Creek watersheds area (NMS). In studying this history, it becomes quite evident how the natural landscape has helped to shape human experiences, creating both obstacles and opportunities for its residents – past and present. The reverse is also true, as humans have drastically altered the landscape to suit their needs over the centuries.

While the Delaware River has had a profound impact on the region (and nation) from a number of perspectives, the tributary streams have also driven settlement and commerce. They were first used for drinking water and agriculture, and later used to power the mills and other manufacturing processes that enabled the area to grow into the form we see today. The settlement pattern of the DRC and the NMS communities reflects not only the historic land uses, but also the historic events, people, and cultural and social movements that shaped the fabric of the Study Area.

The National Trust for Historic Preservation defines historic preservation as "…the process of identifying, protecting and enhancing buildings, places, and objects of historical and cultural significance." Historic resources can include any portion of a community's built environment, be it a building, neighborhood, district, or landscape. Archaeological resources are the below ground records relating to former above ground resources. These physical resources are the lasting cultural elements that serve as the "footprints" that tell the stories of the area's people and their accomplishments. All three types of cultural resources should be considered for protection. Opportunities exist to both preserve and capitalize on remaining historic and cultural resources as part of efforts geared toward redevelopment, revitalization, and tourism in the Study Area.

Cultural resources, above and below ground are the physical reminders of community's identifiable character. As such, municipalities should make efforts to promote these

historic places through the implementation of interpretive signage, particularly when they overlap with high visibility areas such as open spaces and trail networks.

HISTORIC RESOURCES

OBJECTIVE CR-1: TO DEVELOP A COMPREHENSIVE STRATEGY TO PROTECT AND CONSERVE THE STUDY AREA'S HISTORIC, ARCHEOLOGICAL, AND CULTURAL RESOURCES

Preservation is most directly effective at the local level, since the municipality is the only body legally allowed to create and mandate preservation regulations. The Pennsylvania Municipalities Planning Code (MPC), or Act 247, explicitly enables municipalities to plan for and regulate historic and cultural resources. Not taking full advantage of this legal authority may result in the Study Area losing its valuable historic character. Municipalities can adopt and/or strengthen a historic preservation ordinance to regulate demolition permit processes for historic properties. These municipalities can also create historic architectural review boards (HARBs) that could assist with this effort. In addition to defining the fabric of a community and telling the story of its past, there are many other reasons for preserving the built environment. These reasons include, but are not limited to, the following:

- Preservation strengthens a sense of place and community pride
- A building can represent the work of a master architect, builder, etc.
- Historic neighborhoods are often attractive places to live and work
- Restoration and rehabilitation can save financial costs over new construction
- Heritage tourism creates economic benefits
- Historic properties tend to have higher property values
- Financial assistance such as grants and tax incentives are available to help offset some costs related to preservation, restoration, and maintenance.

  Source: Delaware County Planning Department, "*Preservation Primer: Understanding the Basics of Historic Preservation.*"

Historic preservation can also be combined with economic development efforts. By working with developers, municipalities can promote the adaptive reuse of historic buildings for commercial, retail, or residential uses. Historic structures could be used to provide local artists with studio and gallery space, which would further enhance the visibility and value of these places within the community. There are also very few bed and breakfasts (B&Bs) in the Delaware River Corridor (DRC) communities. This represents a unique opportunity as the area begins to focus on increasing tourist activity. Tourism provides an opportunity to capitalize on historic resources in the Study Area. Efforts could focus on creating area-specific tours that might touch on topics such as Native American history, early European settlement, the Revolutionary War, the Industrial Revolution, immigration, or World War II manufacturing.

As much as the histories of the DRC and the upland portions of the NMS are inextricably intertwined, they each have had a very different role in helping to shape the region. While

the riverfront communities have a long, well-documented history of great historic moments, monuments, and triumphs, the upland areas of the NMS have a more unsung history of the common people, such as farmers, millers, and craftspeople. Refer to Appendix B of this plan for a list of historically significant sites found within the Study Area. Additionally, the Delaware County Planning Department's Historic Preservation section maintains a series of historic sites surveys for each municipality in the County. These inventories provide a more comprehensive look at each municipality's resources and are available for viewing at the Planning Department. A long-term goal for these records is to convert them to digital format.

In contrast with just any old historic site or resource, National Register resources are at least 50 years old, of documented importance, and have achieved a greater level of recognition as a result of going through a rigorous designation process. The Pennsylvania Bureau for Historic Preservation manages the National Register of Historic Places for the Commonwealth. The program was established by the National Historic Preservation Act of 1966. Properties listed on the Register include districts, sites, buildings, structures, and objects that are significant to American history, architecture, archeology, engineering, and culture. While National Register status is not the "be all and end all" for historic preservation, future efforts should involve development of guidelines to identify and assess sites for municipal preservation efforts and preparation of applications for placement on the National Register.

DELAWARE RIVER CORRIDOR

The Delaware River Corridor contains a wealth of notable historic sites. These resources tell a great deal about the riverfront corridor's history, ranging from the first landing site of William Penn in the City of Chester and the Lazaretto Quarantine Station in Tinicum, to the monumental Philadelphia Electric Company building in Chester. Table 4-1 lists the National Register sites found in the DRC.

Below are brief summaries of each DRC municipality's general history and evolution. While each municipality has its own unique story, their pasts are linked by a common settlement pattern and their ties to the Delaware River.

Chester City (DRC)

The City of Chester, like many of Delaware County's other riverfront communities, was first settled by the Swedes, and later by Quakers. When William Penn arrived in 1682, he planned to make the existing settlement his new capital; however, a jurisdictional boundary dispute forced Penn to move upriver where he established the City of Philadelphia. Chester was one of three markets chartered by Penn in 1699, with the other two being Marcus Hook and Philadelphia. The 1724 Colonial Courthouse, which stands at the southern end of the Avenue of the States, is the oldest public building in continuous use in the United States.

TABLE 4-1
NATIONAL REGISTER HISTORIC SITES – DRC

NAME	LOCATION	MUNICIPALITY	YEAR	DESCRIPTION
Chester Courthouse	DRC	Chester	1724	Constructed in 1724, first as County courthouse and then Chester City Hall. Oldest public building in continual use in United States.
The Wolf Building*	DRC	Chester	1882	Historic structure that housed the Delaware County National Bank.
Old Main*	DRC	Chester	1882	Old Main and Chemistry Building, located at Widener University.
Penn's Landing	DRC	Chester	1682	William Penn's original landing site.
Waterside Station of the Philadelphia Electric Company	DRC	Chester	1916-1918	Built following the increased demand for electricity in Chester, resulting from the buildup of war industries and population (now the Wharf at Rivertown building).
Morton Morton House*	DRC	Norwood	1750	Historic home located at the confluence of Muckinipates and Darby Creeks.
Governor Printz Park	DRC	Tinicum	1643	Site of early Swedish settlement along Delaware River.
The Lazaretto	DRC	Tinicum	1799	Former quarantine station along Delaware River.

*Site is located outside of the Study Area boundary, north of I-95
Source: DCPD, 2013

The Chester Courthouse, constructed in 1724, is the oldest public building in continual use in the U.S.

The City remained a major port and commercial center for the better part of 300 years. In 1850, the County seat was moved from Chester to Media, thus beginning this riverfront community's transformation to more industrial uses. Drawing on the extensive transportation network, mills and other industries, Chester's economy continued to expand. Products ranging from soaps, dyes, and paints, to metal works, building materials, train and ship engines, and even automobiles, were all manufactured in Chester. A huge sign proudly marked the port, proclaiming: "What Chester Makes, Makes Chester." Each successive war effort spurred a new wave of industrial growth.

Today, Chester is going through its most significant transformation since the 1960s and the 1970s, when many industries moved to the Sun Belt. The former Delaware County Electric Company building (later the Philadelphia Electric Company – PECO) is now an

office building known as the Wharf at Rivertown. The building has a major presence on the waterfront and is a prime example of how adaptive reuse of historic buildings can serve as an anchor point for redevelopment. The Wharf is linked to the new PPL Park professional soccer stadium by a riverwalk with commanding views of the Delaware River. Harrah's Philadelphia Casino and Racetrack is also a significant addition to the City's waterfront. Combined with efforts to revitalize the downtown, and with plans to host a major segment of the East Coast Greenway (ECG), the riverfront is reemerging as a destination for mixed-use, recreation, and tourism related redevelopment. This presents a unique opportunity to tie historic preservation and appreciation initiatives to tourism and economic development.

Chester Township (DRC/NMS)

Originally encompassing what is now Chester City, Upland, Parkside, and Brookhaven Boroughs, as well as part of Aston Township, Chester Township and the surrounding area was once known simply as Upland (distinguishing it from the "lowland" settlements in what is now the State of Delaware). During this time, population and commerce began to grow and a new form of government was needed in order to provide sufficient services to support this growth. As such, the City of Chester separated from the Township. Similarly, as the other municipalities (listed above) seceded due to development pressure and the interest of the people living there, the Township began to shrink and eventually came to encompass only those areas not being actively developed.

Chester Township remained an agricultural area until the mid-1800s. Later, as agriculture declined in the region, farms in the Township were subdivided for residential development and industrial business parks.

Eddystone Borough (DRC)

Originally part of Ridley Township, Eddystone was incorporated as a borough in 1880. The town's name was inspired by the Eddystone Lighthouse in Devon, England. In many ways, the Borough can be thought of as a prototypical factory town. Having long been an agricultural community, the town was greatly influenced by the important industries that were located there over the years, including the Belmont Iron Works, Sun Shipbuilding, and the Remington Arms Plant. The Borough's growth and development, however, were driven by two major industries in particular – the Simpson Print Works and the Baldwin Locomotive Works – which had both relocated from the City of Philadelphia.

During its early years, the Borough of Eddystone was owned almost entirely by the Simpsons. They built many amenities for the company's workers, including tenement housing and Lighthouse Hall (which contained a library and meeting room). The company also gave land for a park and for a school. The print works closed in 1963. Remnants of both the Simpson and Baldwin companies remain to this day, with Simpson worker housing (known as "the Village") still occupied by Eddystone families.

In 1909, Baldwin Locomotive Works established a factory in Eddystone. It manufactured thousands of locomotives for domestic and international use. Upon its closing, in 1972, the site sat vacant. In the early 2000s, the former Baldwin Executive Office Building, a cruciform-shaped high rise, was converted to Class A office space (Baldwin Tower), while larger outbuildings were reused for industrial purposes by the Boeing Company in neighboring Ridley Township. A portion of the site now houses Eddystone Crossings shopping center.

Lower Chichester (DRC/NMS)

What is now known as Lower Chichester Township was originally established as "Chichester Liberty" by William Penn in 1683. At that time, it encompassed what are now Marcus Hook and Trainer Boroughs, as well as Upper and Lower Chichester Townships. In 1735, the area was separated into two sections for tax collection purposes, although formal recognition of Upper and Lower Chichester Townships did not occur until 1759.

There have been three major phases of growth in the Township's long history, beginning with the development of a largely agricultural economy consisting of family farms known for their cherry, meat, and milk production. The second phase of growth occurred after the Civil War, as the area's improved transportation network led to the construction of summer homes and hotels, particularly along the crest above Ridge Road. At the onset of the 20th century, the local mills and riverfront industries witnessed a major boom in production. This led to a notable increase in population in the Township and the surrounding areas.

Marcus Hook Borough (DRC/NMS)

Marcus Hook has been an important port ever since Quaker settlement in the 1640s. In 1701, a market chartered by William Penn was erected for trade of food, livestock, and other goods. At the time, it was one of only three in the entire state, along with Chester and Philadelphia. The Borough is also home to the nation's first public works project. The stone ice piers (also referred to as ice-breakers) located in the Delaware River were constructed along the shore to keep the anchorage free of ice in the winter. They are still in use today. Other significant resources near the riverfront include St. Martins Church, thought to be the second oldest church in Pennsylvania (originally constructed in 1702 with successive structures built in 1745 and 1845), and the Plank House, built in 1683, and believed to be the oldest remaining structure in the Borough.

Like Lower Chichester, growth of the inland areas of the Borough were more gradual, but were spurred by the construction of the Great Post Road (now Rt. 13), then the nation's main north-south route, as well as construction of major railroads in the mid-19th century. The location of road, rail, and water attracted major industries, including the Bear Creek Refining (1892) and Sun Oil (1901) companies, as well as the American Viscose Company (1910), which created a model industrial complex that included worker residences, two boarding houses, a general store, and a dining hall and recreation

building. It is one of the finest examples of an early 20th century factory and worker housing community in the region. Most of this complex is still standing today.

The community was denied National Register status due to the exterior modifications made by homeowners over the years. The Delaware County Planning Department's (DCPD) Historic Preservation section has prepared a handbook, entitled *Maintaining Your Historic Home: A Practical Guide for Homeowners in Viscose Village, Marcus Hook, Pennsylvania* (2009), specifically for these Viscose homes. It outlines steps homeowners can take to restore the village's historic character, including brick pointing, sidewalk restoration, and vintage streetlight replacements. The Marcus Hook Community Development Corporation acquired and renovated some homes in an effort to restore them to their original states, while creating affordable housing opportunities for residents.

Ridley Township (DRC)

Although most of the Township is physically located outside of the Study Area, this once largely agricultural community comprised of farmsteads and mills (with taverns along Post Road) remained quiet for around 200 years. Incorporated as a first class township in 1906, the town entered a new age ushered in by the development of newer, larger industries on the Delaware River. Westinghouse Electric Company, located in Tinicum, and Baldwin Locomotive Works, which straddled the Eddystone/Ridley boundary, spurred major residential development in the area. Increased production during World War II caused the population to double in the 1940s; the population rose again in the 1950s.

Today, the most notable land use in the DRC portion of the Township is the Boeing Company, which came to the area in 1960 after acquiring Vertol Aircraft Corporation (formerly Piasecki Helicopter Corporation). The company's facilities feature prominently along the north and south sides of Industrial Highway (Route 291) - a major segment of the ECG. This presents an excellent opportunity for tourism highlighting the area's place in aviation history.

Tinicum Township (DRC)

In 1643, a group of Swedes led by Governor Johan Printz settled in the area. The group established New Gottenburg, the first permanent European settlement in Pennsylvania. Over a century later, Tinicum was crucial for the defense of Philadelphia in the American Revolution, when a series of "chevaux-de-frise" were sunk in the Delaware as an obstruction against the British Naval fleet. In 1799, the nation's first quarantine hospital, the Lazaretto, was built in response to numerous yellow fever outbreaks. The building still stands today, looking out over the river at what was once an extensive marsh system (Tinicum Marsh) that includes Little Tinicum Island. The building is listed on the National Register of Historic Places and plans are underway for a restoration of the building for use as municipal offices.

With the coming of rail and trolley lines, Tinicum emerged as a major recreation and resort area with swanky hotels and prestigious yacht clubs built along the riverfront. During World War I, the river became the home of major government and military uses, including Hog Island Shipyard - the largest shipyard in the world at the time. It was at this time that Tinicum ceased to be a fashionable resort area. Throughout the 20th century, industry - most notably the Westinghouse Electric and Lester Piano Companies, flourished in the Township.

Today, Tinicum is an interesting juxtaposition of the built and natural landscapes. The Township is home to part of the runway system for the Philadelphia International Airport (PHL), and its hotels and restaurants support airport travelers. While Governor Printz Boulevard (Route 291) connects most of the Township's commercial development, it is important to note that the north side of the Township lies within the boundary of the John Heinz National Wildlife Refuge at Tinicum. The river side of the Township is home to the Lazaretto, Governor Printz Park (site of the original Swedish settlement), and several marinas, the most historic of which is the Corinthian Yacht Club, which dates to the group's inception in 1728. The shoreline's considerable open spaces also provide both physical and visual access to the Delaware River and Little Tinicum Island, located just offshore. The island is maintained as a wild plant sanctuary by the Pennsylvania Bureau of Forestry as part of the William Penn State Forest.

Trainer Borough (DRC/NMS)

During the War of 1812, infantry troops were trained and quartered just north of the crossroads of Market Street and Post Road (US-13), continuing into what is now Trainer. The encampment, known as "Camp Gaines," and later "Fort Snyder," had between 5,000 and 10,000 men stationed there from early September 1814 into early 1815. Though incorporated as recently as 1919, Trainer has a long history of industry that can be traced to 18th century saw and grist mills. Trainer, like Marcus Hook, was jumpstarted by the construction of Post Road. Eventually, the mills were converted to or replaced by textiles.

The beginning of the 20th century saw the area's introduction of oil refineries and other chemical manufacturing processes in the area that continues to this day. The original refinery in Trainer, built primarily of wood, began operation in 1900, but it burned down in 1912. Due to the high demand for oil, it was quickly rebuilt. The site has changed ownership numerous times over the years, having most recently been acquired by Monroe Energy, a subsidiary of Delta Airlines. The significant allée of trees in front of the plant on Route 13 is a distinctive visual feature of the Borough's segment of the ECG.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

Though most of the original farms have since been subdivided for the development of residential neighborhoods and commercial centers, many historic homesteads remain. These homes, in some cases, belonged to important local leaders, politicians, and business owners. Homes of influential families like Larkin, Booth, Clayton, McKay,

Broomall, and Pennell remain to this day. These names resound in local place names such as roads, parks, and towns, dedicated to the people who helped shape the early landscape.

In addition to historic homes and farmsteads, there are several historic religious structures scattered throughout the NMS area. Quaker meetings were some of the earliest religious establishments in the area and became anchor points for settlement, transportation routes, and social gatherings. The Chichester Friends Meetinghouse in Upper Chichester was built in 1769; it served as one of the first Quaker meetings in Pennsylvania. Wounded soldiers from the Battle of Brandywine were sheltered and treated there. The Meetinghouse and a nearby caretaker's house still stand today and are open to the public. Table 4-2 lists the National Register locations that are found in the NMS watersheds.

TABLE 4-2
NATIONAL REGISTER HISTORIC SITES – NMS

NAME	MUNICIPALITY	YEAR	DESCRIPTION
Chichester Friends Meetinghouse	Upper Chichester	1769	One of earliest Friends Meetings in Pennsylvania. Wounded soldiers from battle of Brandywine sheltered here. There is a caretaker house nearby.
Thomas Booth Farm	Bethel	1819	Home of early settlers of Bethel. Originally a 150-acre working farm. Part of land has been sold.

Aston Township (NMS)

First settled in 1682, and incorporated as a township in 1688, Aston Township remained a primarily agricultural community for over 200 years. Then, in the late 18th and early 19th centuries, mills of various types began cropping up along Chester Creek as the Township transitioned into a new age of mill and manufacturing based commerce. Though agriculture remained an important staple, supplying the mills with goods to process, the Township became one of the County's early manufacturing centers. Much of this activity was primarily focused along Chester Creek and its tributaries, just outside the Study Area.

The mill villages that formed as a result were accessible by the many winding roads that traversed the hilly landscape of the Township. The crossroads area known as Village Green, which is still an active commercial center, was the hub from which many of the local roads formed. This road pattern is still evident today. As the mills declined, however, the Township took on a more suburban feel. Much of this residential expansion was fueled by the need for worker housing to support the industrial boom along the Delaware River throughout the World War I and II.

Bethel Township (NMS)

Bethel, like Aston, remained an agricultural area for much of its history despite being settled as early as 1682. It was formally established as a township in 1683. Unlike Aston,

however, Bethel lacked the strong running streams to support mills and other manufacturing.

In addition to farms, early crossroads, such as Chelsea (originally known as Corner Ketch), Zebley's Corner, and Booth's Corner, developed around major intersections and featured shops and amenities for local residents. Booth's corner remains an important crossroads to this day, with notable farmer's and antiques markets that draw people from all around the area. Though many important historic homes and remnant farmsteads remain to this day, such as the Larkin Mansion and the Thomas Booth Farm, many more of the early structures in the Township have been lost, likely due to fire or to make room for subsequent development and roadway improvements.

<u>Upper Chichester Township</u> (NMS)

As discussed, Upper Chichester was originally part of "Chichester Liberty", as established by William Penn in 1683. As a result, Quakers had a great influence on the Township and surrounding areas. The first house of worship in the present township was the Old Chichester Friends Meetinghouse, which was built in 1682. The current building, which is listed on the National Register of Historic Places, was built in 1769, after a fire destroyed the original.

The Old Chichester Friends Meetinghouse was built in 1769 and is listed on the National Register of Historic Places.

As with most of the surrounding area, the Township was historically comprised of independent family farmsteads and retained a pastoral setting until well into the 19th century. McCaysville (now known as Boothwyn) was a small crossroads town at the intersection of Chichester and Meetinghouse Roads. It predates the American Revolution and remained the only concentration of structures in the Township for around 200 years. Other major intersections, such as Pennell's and Larkin's Corners, were named for nearby settlers. Transportation continued to shape the community with the coming of the Baltimore and Ohio Railroad in the late 1800s, thus opening newer, additional markets for local farmers. As with many of the Study Area communities, production booms along the Riverfront spurred subdivision of land and residential development that has only recently begun to curtail.

ARCHEOLOGICAL RESOURCES

In addition to its many historic structures, the Study Area also contains a number of significant archaeological resources. Many of these underground resources are still intact under streets, backyards, and open spaces. They provide insight into the history of Native Americans and early settlers, and include industrial archaeological resources and artifacts related to commercial and residential development.

In 1990, DCPD contracted with Cultural Heritage Research Services, Inc. (CHRS) to complete the *Delaware County Archaeological Resource Inventory and Management Plan*. The plan contains an archaeological analysis for each municipality in Delaware County, based upon known resources and predictive archaeological models. The County and municipalities should continue to maintain and improve the archeological survey. Many of the cemeteries throughout the Study Area, such as Lawncroft Cemetery in Lower Chichester, are included as resources of moderate to high significance. However, due to the sensitivity of archeological resources, only general statements can be made about their nature and location. See Table 4-3 for the potential for archeological resources in the Study Area.

TABLE 4-3
ARCHEOLOGICAL RESOURCES IN THE STUDY AREA

MUNICIPALITY	LOCATION	POTENTIAL FOR DISCOVERY OF ARCHEOLOGICAL RESOURCES
Chester City	DRC	Moderate
Eddystone Borough	DRC	Low
Ridley Township	DRC	Low; isolated areas with high potential for archeology
Tinicum Township	DRC	Low
Chester Township	DRC/NMS	Low to moderate
Lower Chichester Township	DRC/NMS	Low to moderate
Marcus Hook Borough	DRC/NMS	Low; isolated areas with high potential for archeology
Trainer Borough	DRC/NMS	Low
Aston Township	NMS	Moderate to high
Bethel Township	NMS	Moderate to high
Upper Chichester Township	NMS	Low to moderate; isolated areas with high potential for archeology

Source: Delaware County Archaeological Resource Inventory and Management Plan, Volume II, 1991.

HUMAN HISTORY

OBJECTIVE CR-2: TO PROTECT AND INTERPRET IMPORTANT HISTORIC AND CULTURAL RESOURCES IN THE STUDY AREA

As described previously, the municipalities of the Study Area have a long and rich history, which is reflected in the many buildings and above and below ground resources found there. Such resources include those left by Native Americans who first inhabited the area, to the immigrant populations that first began arriving here in several waves, beginning in the 1600s. Also important, but often going unrecognized, are the many social and cultural contributions and achievements that can be attributed to the African Americans, farmers, factory workers, and even pirates, that helped to create the fabric of the Study Area communities today.

CULTURAL AND SOCIAL FABRIC

Immigrants

The Swedes were some of the earliest immigrants to inhabit Delaware County. Their first settlement, Printzhof, was located in Tinicum Township; the area later became known as New Sweden. The Swedes also inhabited other areas along the Delaware River between Chester and Marcus Hook, including Upland Borough, a portion of which became the City of Chester. Many Swedish settlements in the Study Area were later taken over by the Dutch. Although there are no longer strong Swedish or Dutch presences in Delaware County, the name names they left behind live on. Later, when William Penn arrived in the City of Chester in October 1682, the Study area began to reflect a more English and Quaker influence.

Over the years, the cultural make-up of the Study Area has changed to reflect the waves of immigrants that continued to settle in the County. Each group brough with them their foods, houses of worship, social organizations, and their traditions that make up the fabric of the Study Area today.

African Americans

African Americans have lived in Delaware County since the time of early settlement by Europeans. The African American population in Delaware County began to grow after the Civil War, when many people left the South for economic and social reasons. The greatest wave of African Americans arriving in Delaware County began during World War II, when they were recruited to move to the North to man the factories in support of the war effort, providing these new residents with jobs and a place in the community.

Today, as noted in the Background chapter of this plan, African Americans have a significant presence in the Study Area, with Chester Township (80%) and the City of Chester (76%), having the highest percentages of the population. African Americans have made significant contributions to the Study Area from both economic and social

standpoints. As noted in this and other chapters, their roles as educators, musicians, and public figures have not gone unnoticed.

PLACES OF WORSHIP

The Study Area's places of worship reflect its history. Going back to the arrival of William Penn, the first Quaker (Society of Friends) meetinghouse was established in the City of Chester in 1675. Several Quaker meetinghouses continue to exist in both the DRC and NMS portions of the Study Area. As various waves of immigrants arrived, both in the past and more recently, places of worship were established to reflect their respective religious beliefs and practices. Today, many denominations have places of worship scattered throughout the Study Area, including churches, mosques, temples, and halls, among other places of worship.

Two of Chester City's most famous religious landmarks are the Chester Theological Seminary and Calvary Baptist Church, both of which had a formative impact on Martin Luther King, Jr. Dr. J. Pius Barbour, a prominent pastor, began mentoring Dr. King Jr., in the fall of 1948 as a member of the Calvary Baptist Church congregation following commencement of King Jr's studies at the Seminary. King would remain in in the community for three years, during which time he not only taught Sunday school at the church, but also led services on occasion.

LAND USE

Industry and Mills

"Factory Towns" of the Delaware River

Most of the DRC municipalities could be considered factory towns, as the major employers, mostly industrial, drove the development pattern. Viscose Village in Marcus Hook, Westinghouse Village in Tinicum, and the worker housing built by the Simpsons in Eddystone, are examples of amenities constructed by the resident industries. Many of the neighborhoods and associated community facilities in Eddystone and Chester sprang up near the mills, factories and ship building facilities. The industries were so important to Chester that they became part of the community's identity, with a large sign posted on Chester Electric Company (now Wharf at Rivertown) stating, "What Chester Makes, Makes Chester." Even though many of the industries that made the DRC a prominent manufacturing area moved to the Sunbelt in the 1970s, they continue to maintain their proud character as industrial communities.

NMS Communities

As noted previously in this report, the land use pattern in the NMS follows a much more suburban pattern. This is due in part to the fact that the area remained agricultural for much longer than the industrial riverfront.

Commercial Centers

As noted above, the commercial centers of the study area grew up around the residential development that supported the industries and farms. During Chester City's heyday as an industrial center, Chester was a major commercial destination for the County. With the decline of the industrial economy, many of the supporting commercial areas began to suffer. Today, efforts to revitalize the DRC communties are providing new opportunities to regain its commercial base.

TRANSPORTATION

Roadways

The Delaware River Corridor's proximity to Philadelphia and the Delaware River has made it an important transportation hub for hundreds of years. Delivering goods from the river ports to nearby towns (and vice versa) required a network of roads, such as those in Marcus Hook and Chester.

Route 13, which is one of the oldest roads in the Study Area, still connects many of Delaware County's communities between Wilmington and the City of Philadelphia. It evolved from a network of Native American paths to a Colonial-era wagon and stagecoach route before becoming a highway for automobiles. It has been known by a number of names, and is part of the Washington-Rochambeau Revolutionary Route, which is a national trail that follows the Route of George Washington from Virginia to Rhode Island in 1781.

Route 291, also known as the Industrial Highway and Governor Printz Boulevard, was constructed in 1928. It begins at Route 13 in Trainer and runs the length of the Delaware River before connecting with Interstate 76 in Southwest Philadelphia. The Delaware County portion of Interstate 95 has essentially replaced Routes 13 and 291 as a major roadway connector between Wilmington and Philadelphia. However, Routes 13 and 291 continue to serve as local arterials connecting the riverfront communities to Delaware River industries and public sites such as PPL Park.

Railroads

Trolley cars, first pulled by horses and later powered by electricity, crisscrossed Delaware County for decades before the automobile became popular. Later, the Union Railway was formed in Chester to connect the city with nearby towns, including Marcus Hook and Eddystone. The Pennsylvania Railroad, Baltimore & Ohio Railroad, and Philadelphia & Reading Railroad all established links to the corridor's riverfront areas. Today, the old Pennsylvania Railroad right-of-way is still in use as Amtrak's route between Philadelphia and points south, and CSX and Conrail continue to operate freight lines through the Delaware River corridor.

Ferries and Bridges

The Commodore Barry Bridge, the longest cantilever bridge in the United States, wasn't constructed until 1969. Before that time, the only way to cross the Delaware River at Chester was to use a ferry. The Chester-Bridgeport Ferry operated between 1930 and 1974. The Ferry landing was located near where PPL Park soccer stadium stands today.

Wilson Line began in 1882 as the Wilmington Steam Boat Company. According to a 1992 article in the Philadelphia Inquirer, the Wilson Line operated between 1929 and 1960, and "…was a commuter-freight business ferrying both passengers and cargo between Wilmington, the line's home port, Philadelphia, and Baltimore." The Old Chester PA website, notes that it later became an excursion line that "...operated boats between Philadelphia, Chester, Penns Gove, Wilmington and Riverview Beach park. For more information refer to:
http://articles.philly.com/1992-10-04/news/25997650_1_steamboat-whistle-trips
http://southjerseyexplorer.com/2013/03/01/riverview-beach-amusement-park/

The future may hold opportunities for ferries and other forms water transportation to supplement highways as a means to travel through the DRC.

Airport

According to the Philadelphia International Airport (PHL) website, the airport began as 125 acre airfield in the City of Philadelphia. It was closed to commercial aircraft during World War II due to security considerations; it was later reopened in 1945. PHL has since been expanded many times, serving as a major regional transporation hub and helping to drive the service economy of Tinicum Township. For more information on the history of PHL.

MUSIC AND CULTURE

The Chester area was a hotbed for musicians and other artists, many of whom became well known in the entertainment world. Famous musicians include:

- Oscar-nominated and Broadway actress, Ethel Waters, whose hits "Stormy Weather," "Dinah," and "Am I Blue?" (all of which were inducted into the Grammy Hall of Fame).
- Bill Haley and his Comets, who gained fame with their hits "Rock Around the Clock" and "Shake, Rattle & Roll."
- The Four Aces, who topped the charts with their hits, "(It's no) Sin," "Tell Me Why," "Bahama Mama," and a rendition of "Mr. Sandman."
- Clamma Dale, an opera singer, who drew acclaim for her portrayal as "Bess" in the Broadway production of "Porgie and Bess."
- Marcus Belgrave, an accomplished trumpet player who played for Ray Charles, the Charles Mingus and Max Roach groups, Ella Fitzgerald, Sammy Davis, Jr., Tony Bennett, and Aretha Franklin.

- Alex North, who gained acclaim for his film scores, of which include: *Death of a Salesman* (1949), *The Innocents* (1950), *Streetcar Named Desire* (1951), *Spartacus* (1960), and *Who's Afraid of Virginia Woolf?* (1966).

INTERESTING FACTS

The following are a few historical items attributed to Delaware County. They may or may not be true, depending on who's telling the story.

Hoagies

Hoagies are said to have originated in more than one location in Delaware County, or not at all. Some believe that the sandwich, comprised of Italian meats and salad on an Italian roll, originated with the workers at the Hog Island Ship Yard, formerly located on the Tinicum Township/City of Philadelphia border (where the Philadelphia Airport stands today). The *Delaware County Waterfront Resources Management Plan* (1992) states that the Hog Island Shipyard was, "…the place where the 'hoagie' was created, reputedly named after the Italian workers', or 'Hoggies,' antipasto sandwiches." According to a 2003 article published in the Philadelphia Inquirer, the Hog Island sandwich was first served in at a restaurant at 20th and Mifflin in Philadelphia in 1931. However, the DiCostanza family is able to document that they were serving the hoagie in their family grocery store at 1212 3rd Street in Chester as early as 1925. Source: http://www.philly.com/philly/food/restaurants/Hoagie_History_Truth_or_a_Lot_of_Baloney_.html

Pirates

A number of books have been written about the pirates that frequented the Delaware Bay during Colonial times. According to the Marcus Hook Preservation Society website (http://www.marcushookps.org/), Marcus Hook was frequented by pirates, the most famous of which was Edward Teach, also known as "Blackbeard." The house located at 221 Market Street, known as the "Plank House," was believed to be the home of Margaret, who was purported to be Blackbeard's mistress. The house is believed to date back to the early 1700s; however, whether or not the story can be documented is sometimes the subject of debate. Even still, the story of Margaret and Blackbeard makes for a good story and is celebrated by the Borough at its annual Pirate Festival.

Amusement Park in Marcus Hook

A number of historical records indicate that there was once a resort and amusement park, called "Lindenthorpe," located on the Delaware River shoreline in Marcus Hook. According to the Marcus Hook Borough website: "The Lindenthorpe Park with 'novelty attractions' such as county fairs and balloon races operated in Marcus Hook from 1897 to 1901." The Chester Traction Company operated a trolley to the park on week-ends." It was reported that the amusement park closed when the property was purchased for what was to become the Sun Refinery.

Source: http://digital.library.temple.edu/cdm/ref/collection/p15037coll3/id/14896

Caverns in Marcus Hook

According to the *Philadelphia Inquirer,* between 1961 and 1978, Sun Company dug four large caverns under Marcus Hook Borough for the purpose of petroleum product storage. They are still used today. According to the Sun Logistics website: "There are approximately 2 [million barrels] of LPG cavern storage…" For more information, refer to: http://articles.philly.com/1995-02-05/news/25704211_1_caverns-butane-shaft

Other Resources

There are a number of other interesting items of note that are identified in historical resources and/or in local lore; they should be further explored and documented. There is an opportunity to further develop this information as part of the Industrial Heritage Parkway Interpretive Signage Program for use as part of a tourism strategy.

PRESERVATION PROTECTION STRATEGIES

Historical societies are among Delaware County's most well-organized citizen groups. The County features a range of historical societies dedicated to preserving local history for municipalities and historic sites. There are also two countywide historic groups that can assist with local cultural and historical preservation efforts: Delaware County Heritage Commission, and the Delaware County Historical Society. Both of these groups work to spearhead and support historical preservation projects throughout the County.

In 2010, Delaware County Planning Department revised, *Maintaining Your Historic Home*, a document originally prepared for Viscose Village in Marcus Hook, and published it as a practical maintenance guide for owners of historic properties. The guide is intended to help people understand how to maintain, repair, and preserve details of their historic houses. The guide helps homeowners maintain the architectural uniqueness of their home and protect it from insensitive alterations by preserving original building materials and design standards. While the manual does not address every issue that owners of historical properties may face, it does serve as a starting point for common practices.

RECOMMENDATIONS

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR AND THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

CR-1 Adopt local policies and programs to preserve historic and cultural assets.

CR -2 Update municipal surveys, as necessary, and convert records to electronic format for use in geographic information systems (GIS).

CR -3 Promote restoration and adaptive reuse of historic buildings.

CR -4 Adopt and/or strengthen historic preservation ordinances and create historic architectural review boards (HARBs) that would assist with municipal preservation programs.

CR -5 Promote historic people, places, and events in open spaces and along trails through the use of interpretive signage.

CR -6 Create a listing of publicly accessible historic resources for future interpretation.

CHAPTER 5
NATURAL RESOURCES

NATURAL RESOURCES GOAL:
TO CONSERVE AND PROTECT THE STUDY AREA'S NATURAL RESOURCES THROUGH IMPLEMENTATION OF STRATEGIES THAT BALANCE ENVIRONMENTAL PROTECTION AND QUALITY OF LIFE WITH SUSTAINABLE DEVELOPMENT AND REDEVELOPMENT

BACKGROUND

The Delaware River Corridor (DRC) and the Naamans, Marcus Hook, and Stoney Creek watersheds (NMS) each have unique land resources. The DRC communities are located in the low-lying areas along the Delaware River at the bottom of the County's watersheds. Years of intensive land development define the DRC's industrial character, particularly along the armored riverfront. This area has limited tree canopy, and most of the land area is covered with impervious surfaces such as roads, parking lots, rooftops, and industrial development. In recent decades, however, planning for this area has focused on revitalization and creating usable open spaces, with an emphasis on bringing people back to the waterfront.

The NMS municipalities are diverse. The area south of Interstate 95 closest to the Delaware River is shared with the DRC. The communities, which include Marcus Hook, Trainer, and Lower Chichester, have a more urban and industrial feel than the municipalities in the upper portions of the watersheds. The upper portions of the NMS watersheds are hillier, and the development pattern in municipalities, such as Upper Chichester and Bethel Townships, is more suburban and residential. Although newer housing developments are being constructed throughout the area, it still contains woodlands, wetlands, and other open spaces. Many of these open areas are owned and managed by homeowners' associations, which creates the need for the municipalities to coordinate with residents to maintain important natural areas.

LAND FEATURES

OBJECTIVE NR-1: TO MANAGE NATURAL FEATURES SUCH AS SOILS, STEEP SLOPES, WOODLANDS, AND WETLANDS IN A MANNER THAT PRESERVES THEIR PRODUCTIVITY AND FUNCTION

OBJECTIVE NR-2: TO MITIGATE THE IMPACTS OF DEVELOPMENT ON ENVIRONMENTAL RESOURCES THROUGH IMPLEMENTATION OF SUSTAINABLE LAND MANAGEMENT PRACTICES

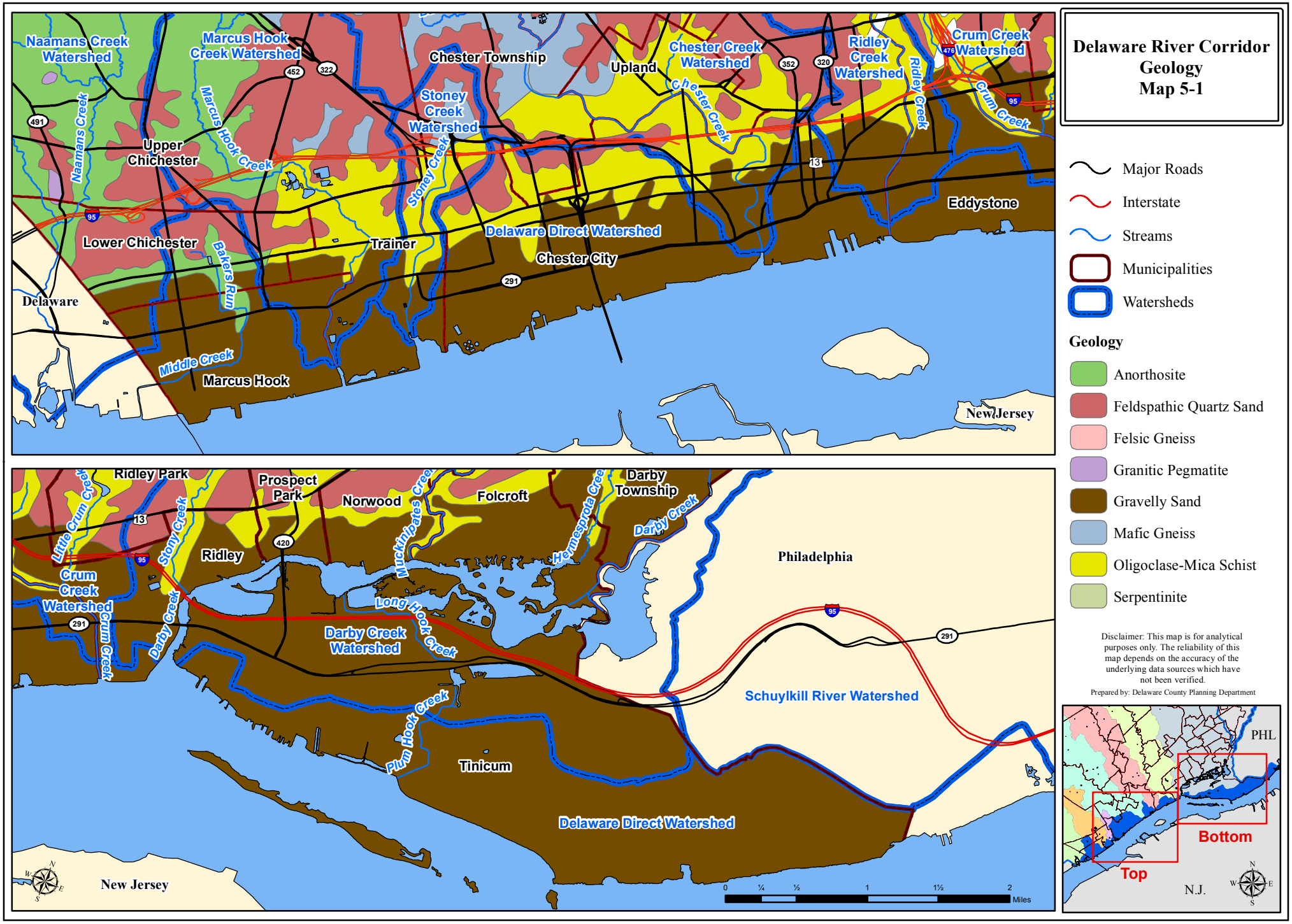
GEOLOGY

The Study Area is located in two physiographic provinces. Figure 5-1 shows the physiographic provinces, while Maps 5-1 and 5-2 show the geology in the DRC and NMS. The DRC and lower NMS areas closest to the Delaware River lie almost completely within the Atlantic Coastal Plain. The middle and upper reaches of the NMS lies within the Piedmont. Each area is characterized by distinctly different geology.

The Atlantic Coastal Plain province is comprised of generally low lying, flat, and poorly drained land that extends the length of the Delaware River shoreline. This area contains sandy, sedimentary bedrock types such as feldspathic quartz sand and gravelly sand. Chester City's upland areas also contain land that is classified as oligoclase-mica-schist, a common metamorphic formation prevalent throughout the Delaware Valley. It is defined by clay soils with low groundwater yields and a strong capacity to form ridges. Portions of the Coastal Plain also contain anorthosite formations.

FIGURE 5-1
PHYSIOGRAPHIC PROVINCES OF THE COUNTY

In contrast, the Piedmont area is comparatively hilly, with steep terrain. It is characterized by rolling uplands and low hills, comprised primarily of anorthosite and mafic gneiss bedrock, which do not have the capacity to absorb much water. Porosity and permeability range from very low to medium, and well yields are generally not very high. Bedrock in the Piedmont is characterized as having stability for building foundations and road construction. Historically, the bedrock in the NMS watersheds was heavily quarried for aggregate and building stone, despite the challenges of excavating these harder rock types native to the area. However, the land within the watersheds was never commercially quarried to any great extent. Table 5-1 provides additional details about the general locations of the drainage areas' major geologic formations.


Delaware River Corridor
Geology
Map 5-1
Major Roads
Interstate
Streams
Municipalities
Watersheds
Geology
Anorthosite
Feldspathic Quartz Sand
Felsic Gneiss
Granitic Pegmatite
Gravelly Sand
Mafic Gneiss
Oligoclase-Mica Schist
Serpentinite
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Naamans Creek Watershed
Marcus Hook Creek Watershed
Chester Township
Upland
Chester Creek Watershed
Ridley Creek Watershed
Crum Creek Watershed
Stoney Creek Watershed
Upper Chichester
Lower Chichester
Trainer
Chester City
Eddystone
Delaware Direct Watershed
Delaware
Marcus Hook
New Jersey
Ridley Park
Prospect Park
Norwood
Folcroft
Darby Township
Ridley
Crum Creek Watershed
Darby Creek Watershed
Philadelphia
Schuylkill River Watershed
Tinicum
New Jersey
Miles
PHL
Bottom
Top
N.J.

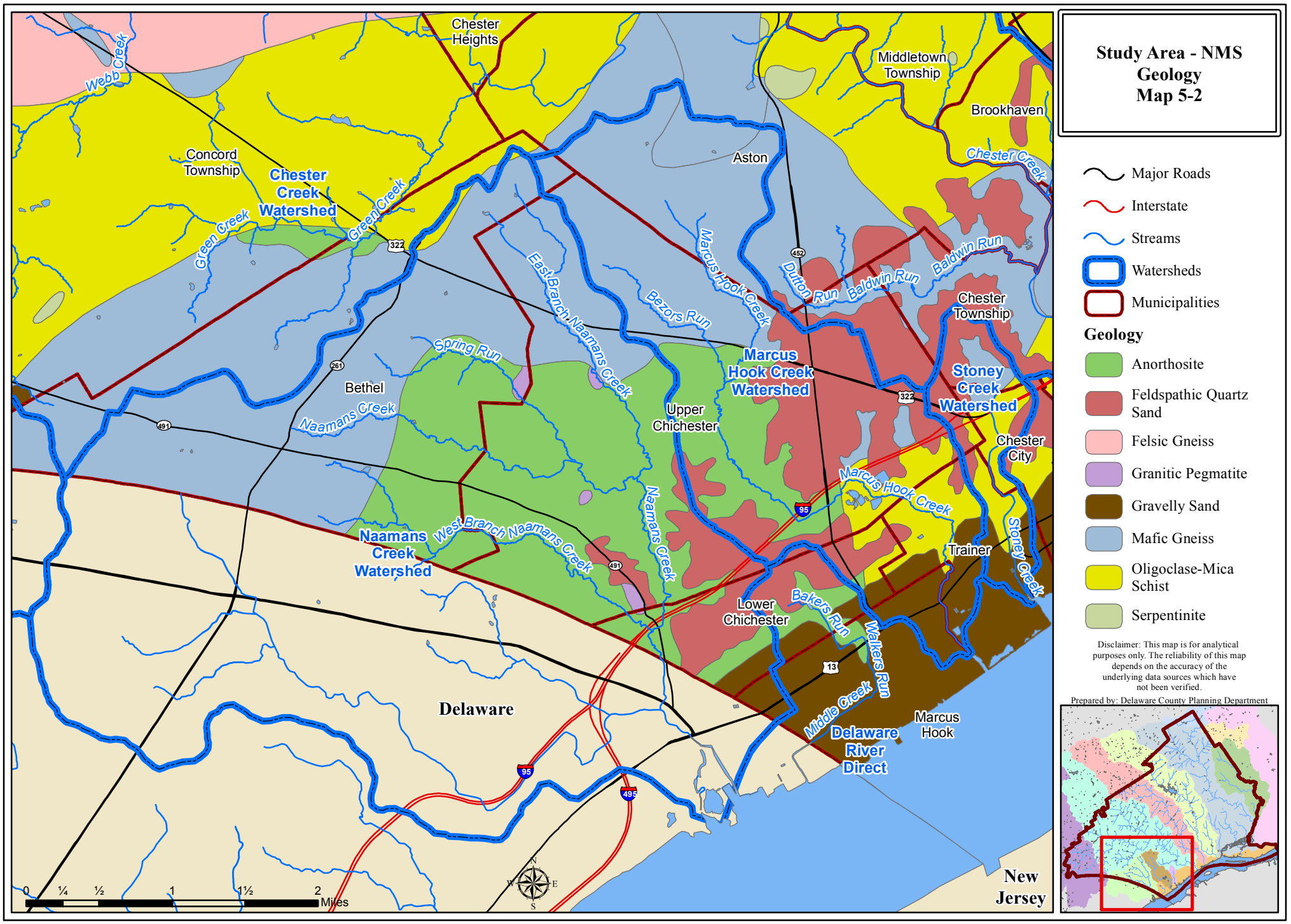

Study Area - NMS
Geology
Map 5-2
Major Roads
Interstate
Streams
Watersheds
Municipalities
Geology
Anorthosite
Feldspathic Quartz Sand
Felsic Gneiss
Granitic Pegmatite
Gravelly Sand
Mafic Gneiss
Oligoclase-Mica Schist
Serpentinite
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Chester Heights
Middletown Township
Brookhaven
Aston
Concord Township
Chester Creek Watershed
Webb Creek
Green Creek
Chester Creek
Marcus Hook Creek
Dutton Run
Baldwin Run
Chester Township
Bezors Run
East Branch Naamans Creek
Spring Run
Bethel
Naamans Creek
Upper Chichester
Marcus Hook Creek Watershed
Stoney Creek Watershed
Chester City
Naamans Creek Watershed
West Branch Naamans Creek
Trainer
Stoney Creek
Lower Chichester
Bakers Run
Walkers Run
Middle Creek
Delaware River Direct
Marcus Hook
Delaware
New Jersey
0 ¼ ½ 1 1½ 2 Miles
N
W
E
S

TABLE 5-1
GENERAL LOCATIONS OF MAJOR GEOLOGIC FORMATIONS

Geologic Formation	Location
Anorthosite	• Upper portion of direct drainage area near Marcus Hook • Middle Naamans and Marcus Hook watersheds
Feldspathic quartz sand	• Upper portions of all drainage areas excluding Tinicum • Lower Naamans, middle Marcus Hook, Upper Stoney Creek watersheds
Granitic pegmatite	• Scattered throughout middle and lower Naamans creek watersheds
Gravelly sand	• Along Delaware River shoreline • Lower portions of Naamans, Marcus Hook, and Stoney Creek watersheds
Mafic gneiss	• Upper portions of Naamans, Marcus Hook, and Stoney Creek watersheds; scattered throughout
Oligoclase-mica schist	• Bordering gravelly sand along Delaware River, near Chester City • Lower Marcus Hook, middle Stoney Creek watersheds

TOPOGRAPHY

Topography is a term that refers to the physical relief (hills and valleys) of a given area. This relief is characterized by its steepness, or degree of slope. Expressed as a percentage, the degree of slope represents the vertical change in elevation over a distance of 100 feet. For example, a 15% slope would be a 15 foot rise or fall in elevation over a 100 foot distance. As noted in the previous section on geology, the Study Area has varying topography depending on the land area in a specific physiographic province.

All of the land area along the Delaware River is in the Atlantic Coastal Plain, and is, therefore, relatively flat. Due to the area's location within the Coastal Plain, much of the DRC sits at elevations that are relatively close to sea level (refer to Map 5-3). The eastern half of the area, in Eddystone and Tinicum, is especially low lying, with elevations of about 20 to 40 feet above sea level. The northern portions of Chester and Marcus Hook sit slightly higher, near 100 feet above sea level. There are no significant steep slopes found within the DRC.

As noted, the topography of the lower NMS reflects its location on the Delaware River in the Coastal Plain. However, higher elevations can be found in the Piedmont province portions of the upper watersheds (refer to Map 5-4). Here, elevations rise significantly, dipping down along stream valleys. The highest elevations can be found in Bethel Township, west of the headwaters of the Naamans Creek tributaries, where they can reach around 300 to 350 feet above sea level. The upper and central portions of the Naamans Creek watershed, more so than the Marcus Hook and Stoney Creek watersheds, contain some notable areas of steep slope. They are located primarily along stream

corridors and in smaller isolated segments. It appears that few homes and businesses in the upper NMS watersheds are located in steep slope areas.

Because of their sensitivity to cut and fill, steep slope development should be restricted. While steep slopes are likely to remain stable when left undisturbed, development on them removes vegetation, which can lead to erosion. Where slopes occur along creek valleys, erosion contributes to the amount of sediment in the creek. The lack of vegetation also increases the volume and rate of stormwater runoff entering a stream, potentially contributing to flooding. Construction on steep slopes can also negatively impact their visual character. The adoption and enforcement of steep slope ordinances can help limit development on such areas. Only five of the eleven Study Area municipalities have steep slope ordinances (refer to Table 5-2).

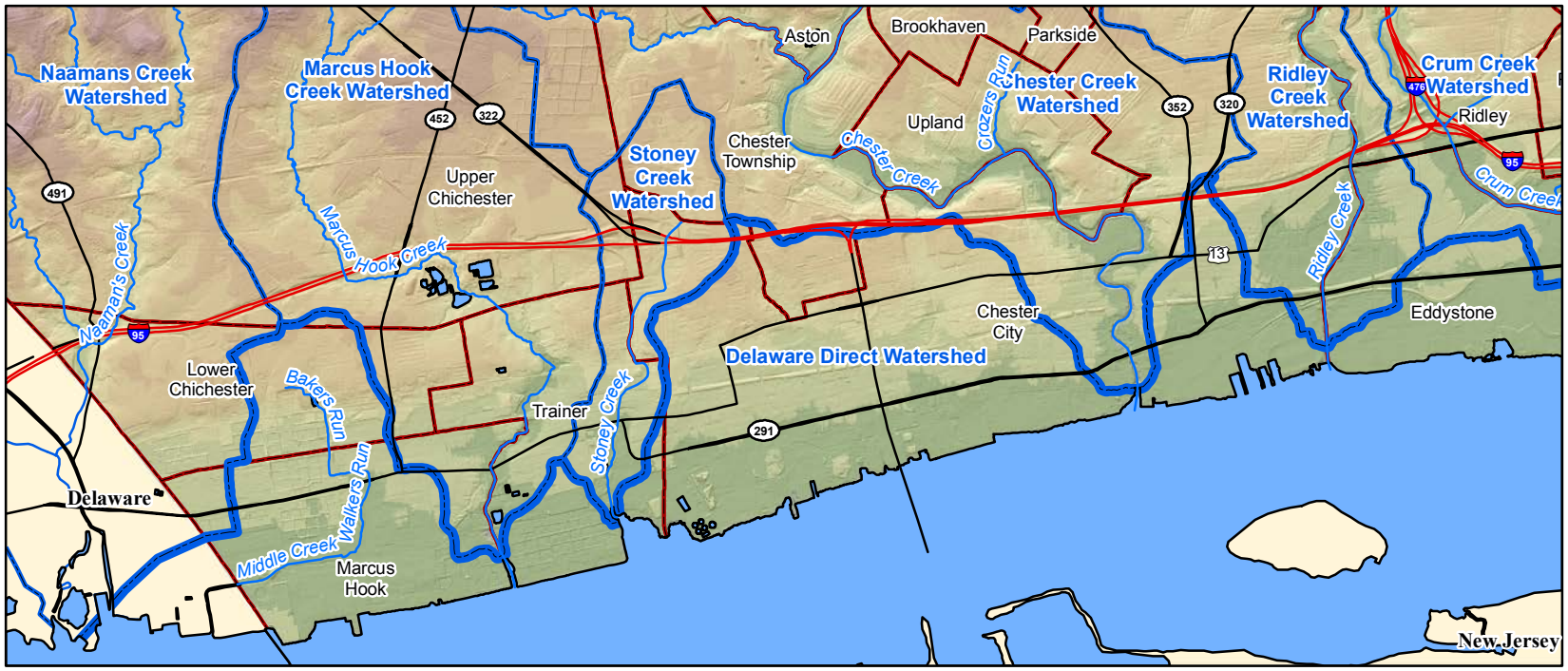
TABLE 5-2
STEEP SLOPE ORDINANCES

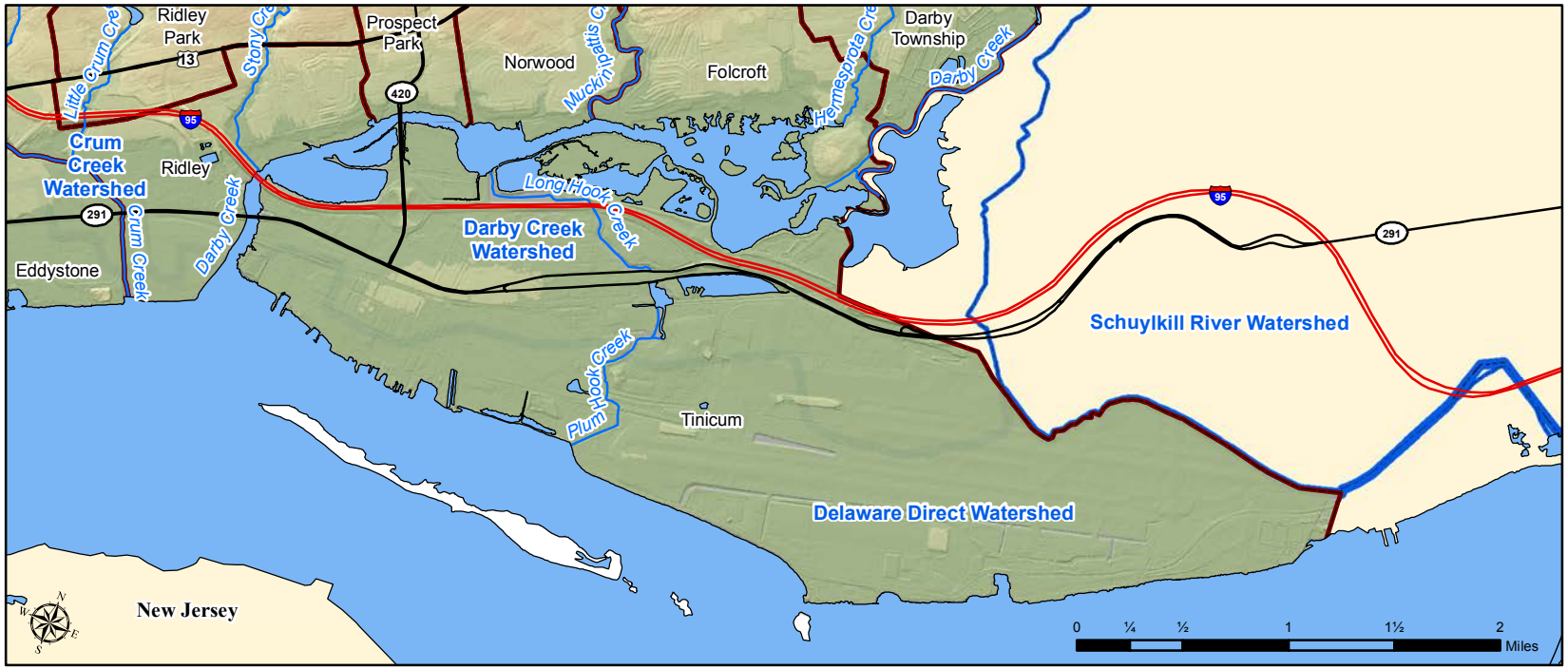
Municipality	Location	Steep Slope Ordinance
Chester City	DRC	Yes
Eddystone Borough	DRC	No
Ridley Township	DRC	Yes
Tinicum Township	DRC	No
Chester Township	DRC/NMS	No
Lower Chichester Township	DRC/NMS	No
Marcus Hook Borough	DRC/NMS	Yes
Trainer Borough	DRC/NMS	No
Aston Township	NMS	Yes
Bethel Township	NMS	No
Upper Chichester Township	NMS	Yes

Source: Delaware County Planning Department, 2014

SOILS

According to the *Soil Survey of Chester and Delaware Counties, Pennsylvania* (1963), much of the Study Area originally contained Beltsville and Butlertown silt loam soils, defined by their deep, silty, or sandy soils on coastal plain sediments. Due to extensive development, much of the native soil has been disturbed, particularly in the DRC. The predominant soil group in these communities is now classified as "Made Land," meaning that these soils no longer contain their natural properties due to human disturbances (refer to Maps 5-5 and 5-6). According to the United States Department of Agriculture, Natural Resources Conservation Service (NRCS) *Urban Soils Primer*, urban fill can consist of any number of different materials, including natural soil brought in from outside locations, construction debris, dredge spoils from waterways, coal ash, and even, in some cases, municipal solid waste.





Delaware River Corridor Topography Map 5-3

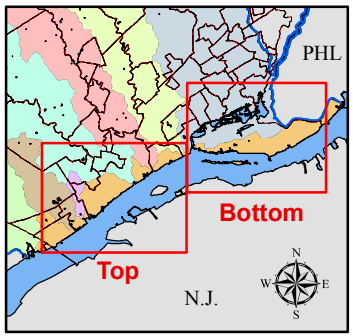
Major Roads
Interstate
Streams
Municipalities
Watersheds

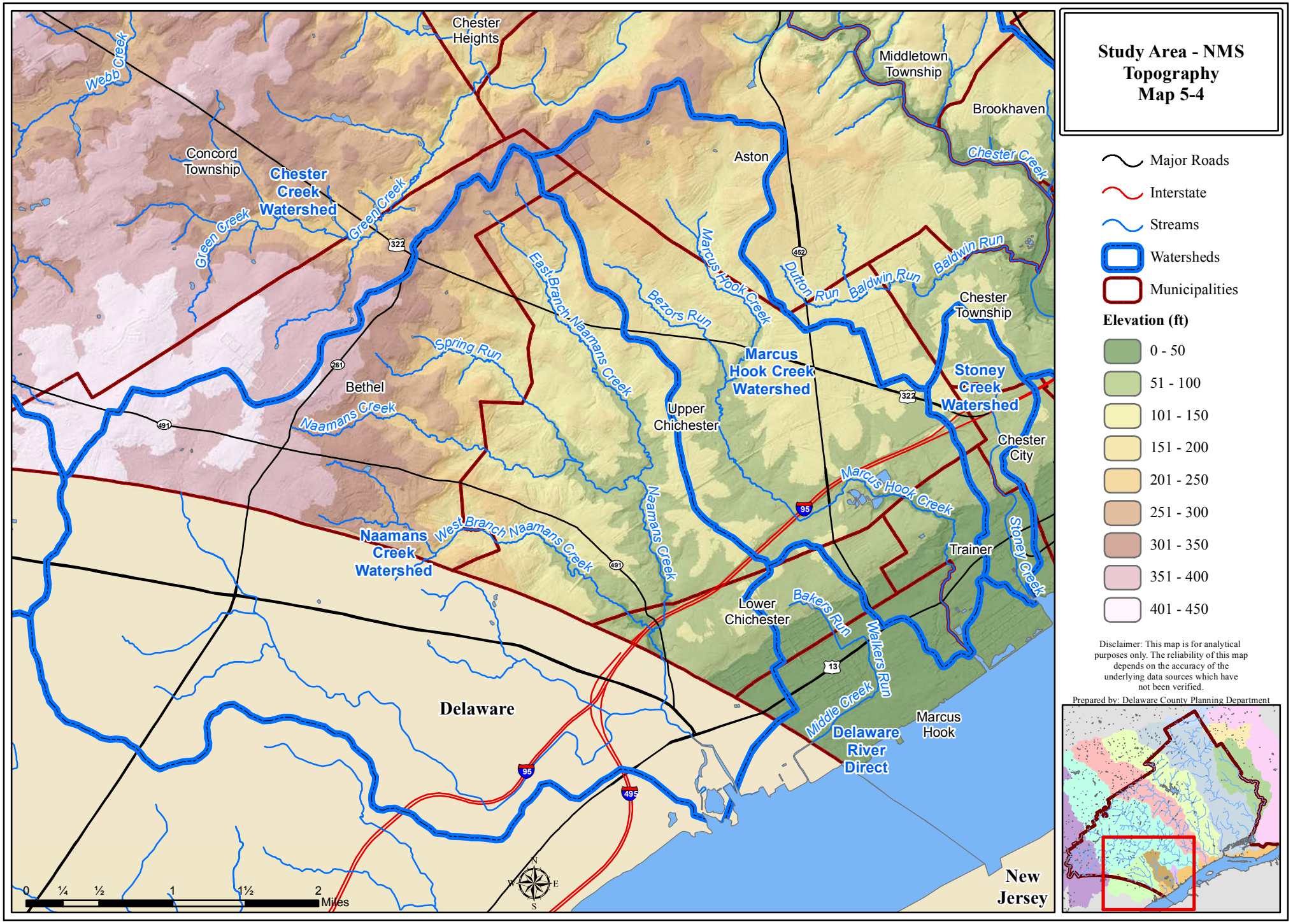
Elevation (ft)

0 - 20
21 - 40
41 - 60
61 - 80
81 - 100
101 - 120
121 - 140
141 - 160
161 - 180
181 - 200
201 - 220

Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.

Prepared by: Delaware County Planning Department




Study Area - NMS
Topography
Map 5-4
Major Roads
Interstate
Streams
Watersheds
Municipalities
Elevation (ft)
0 - 50
51 - 100
101 - 150
151 - 200
201 - 250
251 - 300
301 - 350
351 - 400
401 - 450
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Chester Heights
Middletown Township
Brookhaven
Webb Creek
Concord Township
Chester Creek Watershed
Green Creek
Aston
Chester Creek
Marcus Hook Creek
Dutton Run
Baldwin Run
Chester Township
East Branch Naamans Creek
Bezors Run
Spring Run
Marcus Hook Creek Watershed
Stoney Creek Watershed
Bethel
Naamans Creek
Upper Chichester
Chester City
Naamans Creek Watershed
West Branch Naamans Creek
Trainer
Stoney Creek
Lower Chichester
Bakers Run
Walkers Run
Middle Creek
Delaware River Direct
Marcus Hook
Delaware
New Jersey
0 ¼ ½ 1 1½ 2 Miles
N
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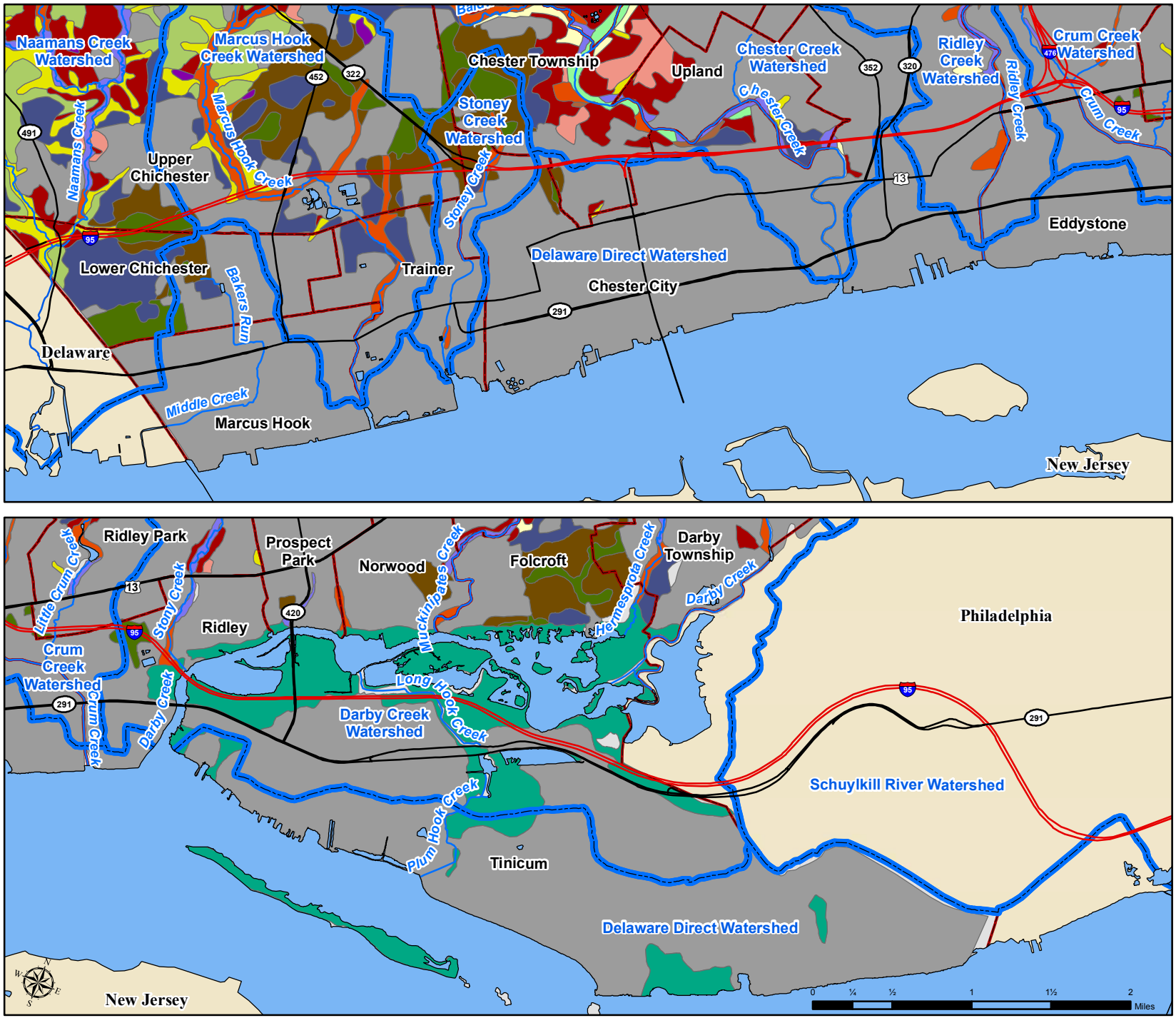


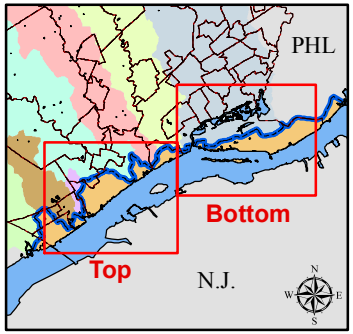
Delaware River Corridor Soils Map 5-5

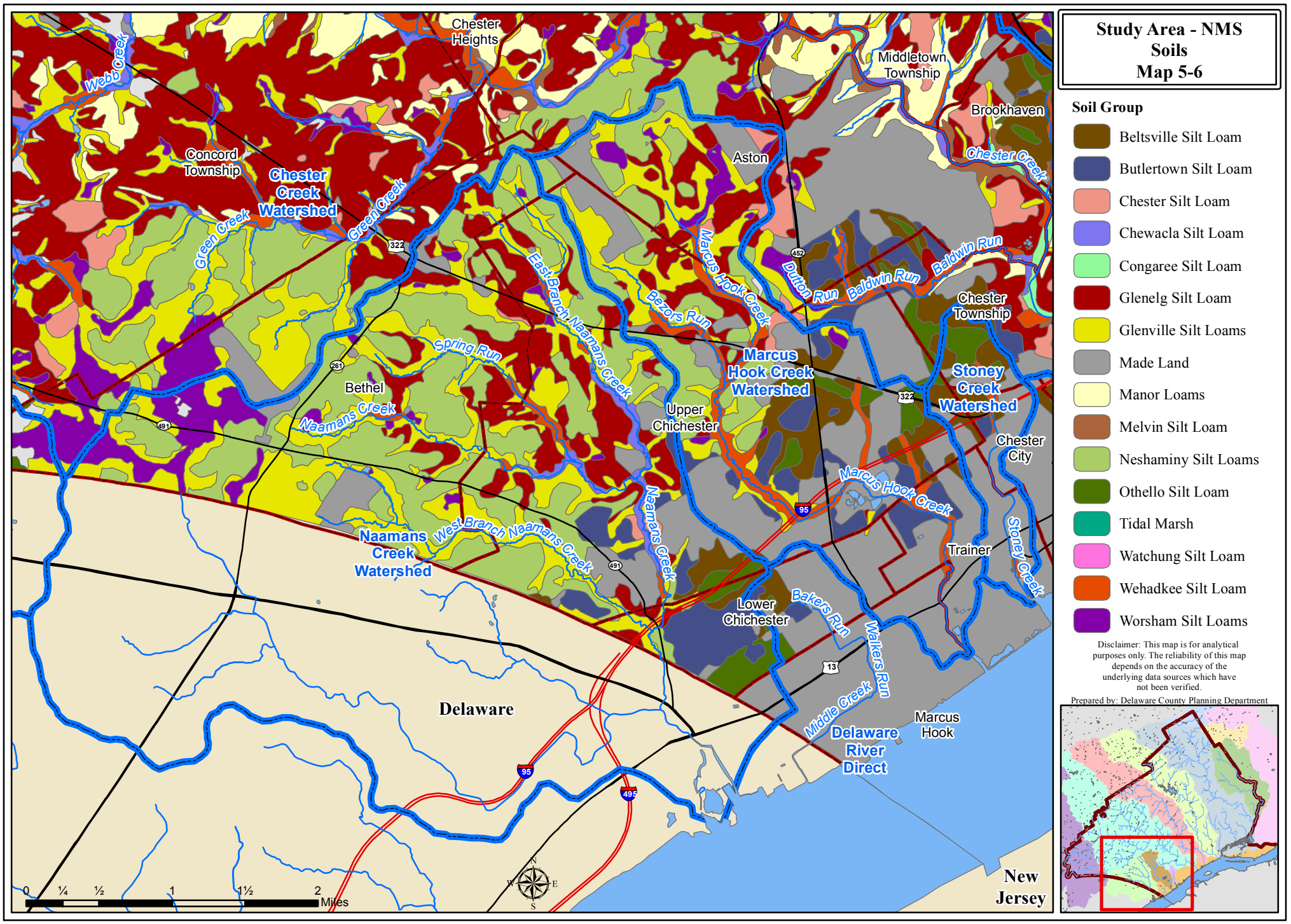
Soil Group

- Beltsville Silt Loam
- Butlertown Silt Loam
- Chester Silt Loam
- Chewacla Silt Loam
- Congaree Silt Loam
- Glenelg Silt Loam
- Glenville Silt Loams
- Made Land
- Manor Loams
- Melvin Silt Loam
- Neshaminy Silt Loams
- Othello Silt Loam
- Tidal Marsh
- Watchung Silt Loam
- Wehadkee Silt Loam
- Worsham Silt Loams

Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.

Prepared by: Delaware County Planning Department




Study Area - NMS
Soils
Map 5-6
Soil Group
Beltsville Silt Loam
Butlertown Silt Loam
Chester Silt Loam
Chewacla Silt Loam
Congaree Silt Loam
Glenelg Silt Loam
Glenville Silt Loams
Made Land
Manor Loams
Melvin Silt Loam
Neshaminy Silt Loams
Othello Silt Loam
Tidal Marsh
Watchung Silt Loam
Wehadkee Silt Loam
Worsham Silt Loams
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Chester Heights
Webb Creek
Concord Township
Chester Creek Watershed
Green Creek
Middletown Township
Brookhaven
Aston
Chester Creek
Marcus Hook Creek
Dutton Run
Baldwin Run
Chester Township
Bezors Run
East Branch Naamans Creek
Spring Run
Bethel
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Upper Chichester
Marcus Hook Creek Watershed
Stoney Creek Watershed
Chester City
Naamans Creek Watershed
West Branch Naamans Creek
Trainer
Lower Chichester
Bakers Run
Walkers Run
Middle Creek
Delaware River Direct
Marcus Hook
Delaware
New Jersey
0 ¼ ½ 1 1½ 2 Miles
N
W
E
S

The amount of Made Land actually present within the Study Area is likely greater than indicated in the *Soil Survey* due to development activities that have taken place since the Survey was prepared. While few places with native soils exist in the DRC, the *Soil Survey* still shows several areas of natural soil, particularly along streams. Additionally, several areas of Tidal Marsh soil continue to exist in Tinicum Township, particularly along Darby Creek and near the Delaware River. Due to the lack of Prime Agricultural and Woodland soils in the DRC, a map has not been included in this plan.

The soils at the headwaters of the NMS watersheds are quite different from the DRC. They consist of once-productive agricultural and woodland soils (refer to Map 5-7). They are comprised mainly of sand, silt, and gravel left by the weathering of material from metamorphic bedrock native to the area. Prime woodland soils exist throughout the Naamans and Marcus Hook Creek watersheds, particularly in the upper portions. These deep soils are suitable for agriculture. However, they have been disturbed to a large extent as a result of early agricultural practices in the area, and more recently due to increasing development and residential expansion. Additionally, the combination of soil composition and land use practices makes these soils very susceptible to erosion, particularly in areas with steep slopes.

WOODLANDS

Woodlands are particularly important to the natural environment because of the functions they perform. Woodlands are critical for absorbing and treating stormwater runoff during heavy rain events and for promoting water quality. Woodland canopy increases evapotranspiration, and slows rainfall before it reaches the ground; tree roots help to absorb large quantities of water produced during a storm event. When located near streams, trees and other woodland vegetation help to stabilize stream banks and prevent erosion and undercutting. The vegetation also filters pollutants from runoff before it enters a waterway.

Vegetation found within woodlands serves as a source of food and habitat for birds, mammals, and other wildlife. Tree canopy over a stream can help shade the water from the sun, which reduces the risk of thermal water pollution. Maintaining cooler water temperatures is important for the survival of many aquatic species because, as water temperature in a stream rises, there is less dissolved oxygen, which results in stress to the stream's fish and macroinvertebrate populations. Woodlands also offer recreational opportunities and enhance the visual character of urban landscapes.

The once expansive, mixed-age forests of pre-colonial Delaware County have been largely removed. Early settlers clear cut much of the forested area for development or agriculture, leaving only isolated pockets of contiguous forest scattered across the landscape. This fragmentation continues into the present day. As remaining natural areas experience development pressure, protection of contiguous woodlands will be crucial to the preservation of the natural landscape.

The DRC's native landscape has been greatly influenced by the development and industrialization that has occurred along the Delaware River. It appears that the only significant woodland area in the DRC portion of the Study Area is located on the border of Upper and Lower Chichester Townships (Marcus Hook Creek) and in the City of Chester, located along Chester Creek, near the Deshong Property. Little Tinicum Island, which is owned and maintained by the Pennsylvania Bureau of Forestry, has the greatest density of tree cover in the DRC (refer to Map 5-8). Most other pockets of woodlands tend to be located throughout the communities' stream valleys and in residential areas.

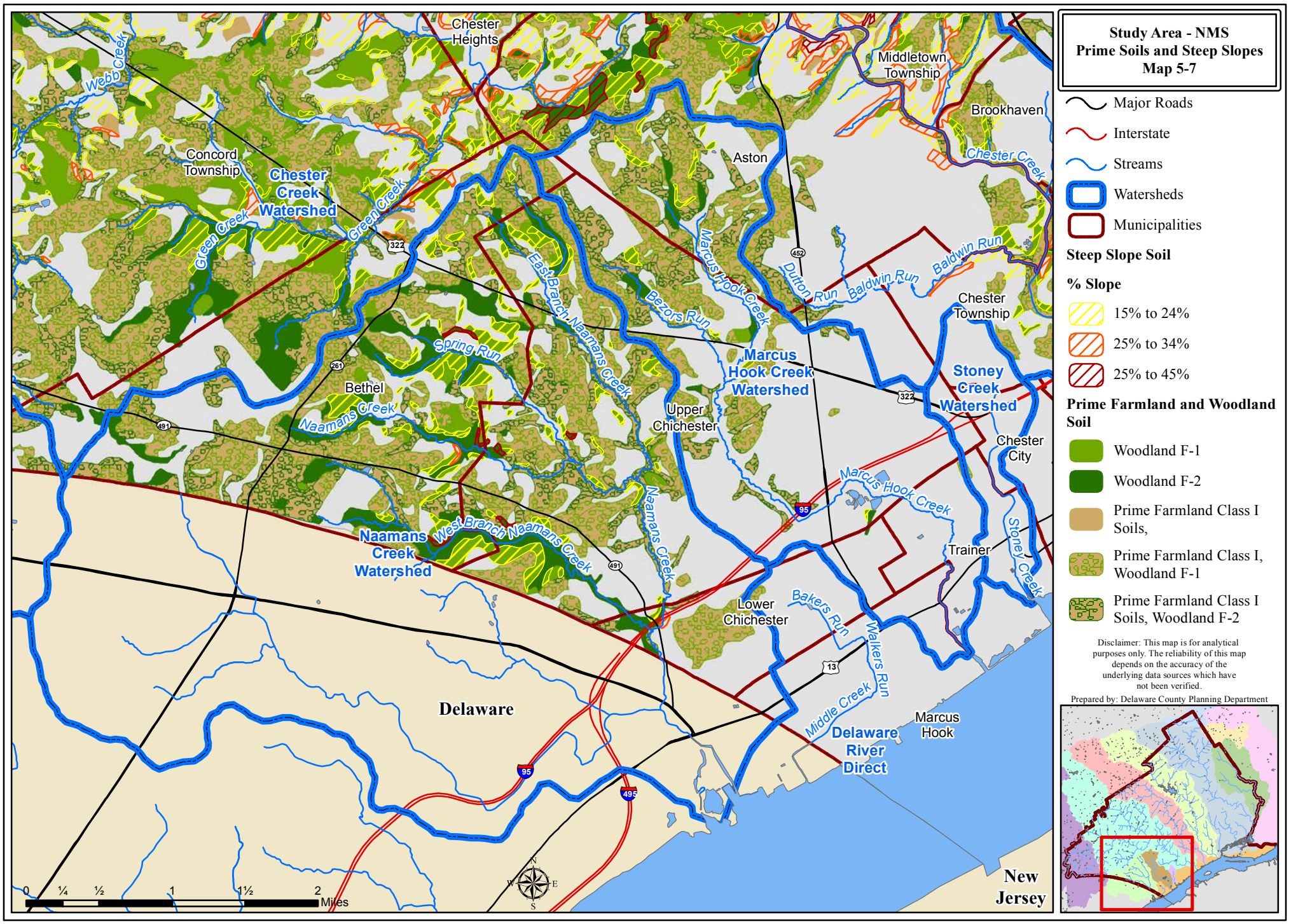
The NMS contains considerably more woodland than the DRC, particularly in the upper watersheds (refer to Map 5-9). The County *Natural Heritage Inventory* (NHI) (2011) identifies three major woodlands in the NMS. They range from notable to exceptional ecological significance. These areas were highlighted in the NHI for how intact or undisturbed they are, and for their relative ecologic value and importance in overall watershed health. A more detailed look at these woodlands and the threats they face can be found in Chapter 6: Biological Resources. In addition to threats from deforestation, invasive tree and plant species also threaten these remaining woodlands by driving out native plant life. Efforts to restore woodlands, particularly in areas of prime soils, are essential for the restoration of the natural, healthy landscapes of the NMS watershed.

TREE CANOPY

The lack of tree canopy is an important issue in many parts of the Study Area, particularly in the more heavily developed municipalities. As noted above, the benefits of trees are wide-ranging. Trees absorb carbon dioxide and provide shade, which can reduce the urban heat island effect in summer. In addition to their effect on temperature, trees can enhance air quality, and the aesthetic provided by trees improves quality of life in a community. A number of studies have also concluded that the presence of trees on a property contributes to higher property values.

Tree canopies can intercept a significant amount of rainfall before it reaches the ground and, through evapotranspiration, return moisture back into the atmosphere. This makes trees particularly important for stormwater management in urban areas where there is a great deal of impervious cover. Tree roots also provide stability along streams and help to filter pollutants. This also makes wooded riparian buffers important along stream corridors.

While there are pockets of tree cover found in residential areas and parks (refer back to Map 5-8), the DRC area as a whole could benefit from additional trees. Therefore, increasing tree canopy should be a priority throughout the DRC. The greatest challenge is to find appropriate types of trees and locations for planting amid the developed neighborhoods, commercial corridors, and industrial properties.


Study Area - NMS
Prime Soils and Steep Slopes
Map 5-7
Major Roads
Interstate
Streams
Watersheds
Municipalities
Steep Slope Soil
% Slope
15% to 24%
25% to 34%
25% to 45%
Prime Farmland and Woodland Soil
Woodland F-1
Woodland F-2
Prime Farmland Class I Soils,
Prime Farmland Class I, Woodland F-1
Prime Farmland Class I Soils, Woodland F-2
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Chester Heights
Webb Creek
Concord Township
Chester Creek Watershed
Green Creek
Middletown Township
Brookhaven
Aston
Chester Creek
Marcus Hook Creek
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Stoney Creek
Lower Chichester
Bakers Run
Walkers Run
Middle Creek
Delaware River Direct
Marcus Hook
Delaware
New Jersey
0 ¼ ½ 1 1½ 2 Miles
N
S
E
W

Delaware River Corridor Study Area Tree Canopy Cover Map 5-8

Major Roads
Interstate
Streams
Municipalities
Watersheds

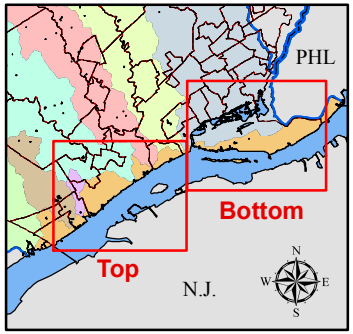
Tree Canopy

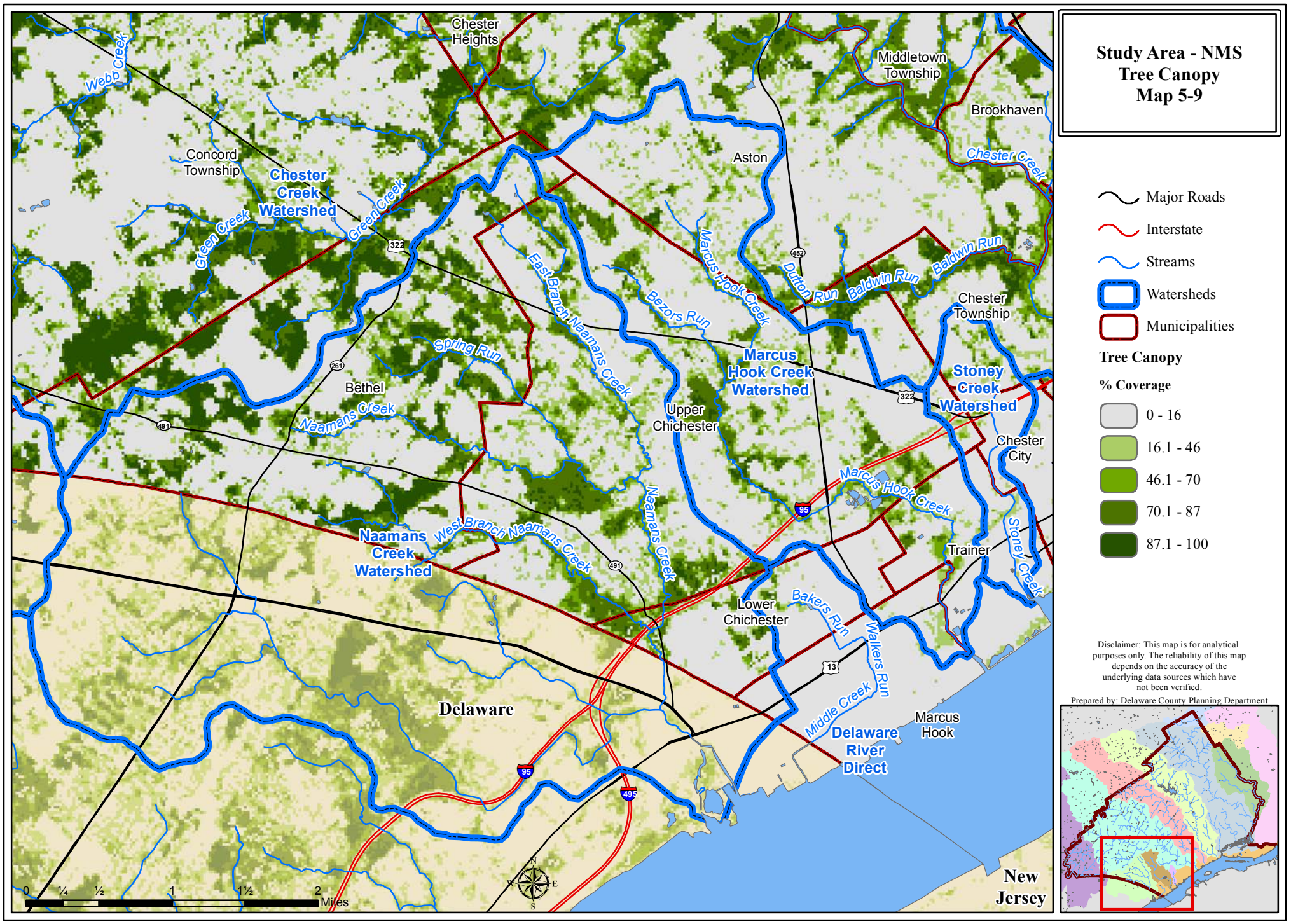
% Coverage

- 0 - 16
- 16.1 - 46
- 46.1 - 70
- 70.1 - 87
- 87.1 - 100

Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.

Prepared by: Delaware County Planning Department




Study Area - NMS
Tree Canopy
Map 5-9
Major Roads
Interstate
Streams
Watersheds
Municipalities
Tree Canopy
% Coverage
0 - 16
16.1 - 46
46.1 - 70
70.1 - 87
87.1 - 100
Chester Heights
Middletown Township
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Chester City
Naamans Creek Watershed
West Branch Naamans Creek
Trainer
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0 ¼ ½ 1 1½ 2 Miles
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Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department

Tree canopy is generally better preserved in the NMS watersheds than the DRC. However, the northern and western portions of the Naamans Creek watershed are facing serious development pressure from expanding residential subdivisions and commercial spaces (refer back to Map 5-9). Fortunately, most of this area's stream valleys still have tree canopy, which can help to protect stream health by providing shade that helps regulate water temperature and dissolved oxygen levels. This canopy also serves as a natural riparian buffer for the filtration of non-point source pollutants entering the creeks from the surrounding lands. The Naamans Creek system has approximately 10.5 miles of (at least) partially shaded streams, whereas the Marcus Hook Creek has about 3.9 miles. Stoney Creek does not contain any significant tree canopy along its banks.

Much of the NMS area's remaining tree canopy and natural areas are found on homeowners' association (HOA) lands connected with residential developments, often near stream headwaters. It is especially important to consider how HOA land is managed, as what happens on these lands is of great importance to overall watershed health.

WATER FEATURES

OBJECTIVE NR-3: TO IMPLEMENT MEASURES THAT PROTECT WATER QUALITY THROUGH COMPLIANCE WITH FEDERAL AND STATE STORMWATER PERMITTING REQUIREMENTS

OBJECTIVE NR-4: TO ADDRESS LOCAL FLOODING ISSUES THROUGH THE ADOPTION OF STORMWATER AND FLOODPLAIN MANAGEMENT ORDINANCES CONSISTENT WITH STATE AND FEDERAL REQUIREMENTS

OBJECTIVE NR-5: TO PROVIDE FOR LONG-TERM TREATMENT OF WASTEWATER GENERATED IN THE STUDY AREA

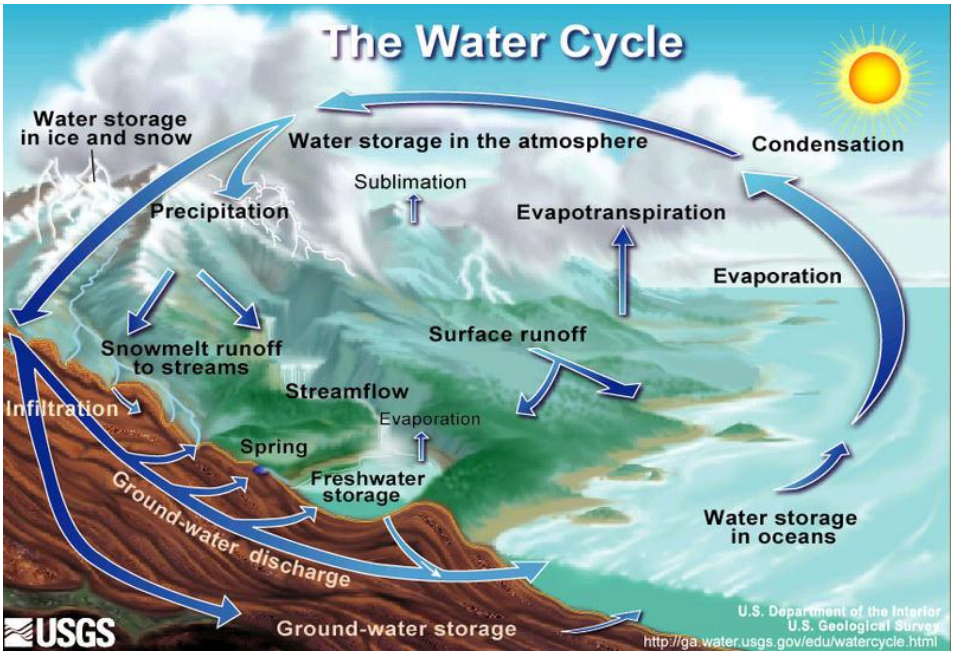
Delaware County receives, on average, 48 inches of precipitation per year, which in most years is plentiful enough to sustain the County's surface and groundwater supplies. All of the County's streams and watershed areas drain to the Delaware River, either directly, or as in the case of Naamans Creek and the Brandywine Creek, through the State of Delaware.

To a large degree, the water resources of the Study Area reflect the differences in the surrounding development pattern and land use composition. The DRC lies at the bottom of the County's north-south watersheds and includes other areas of Delaware River direct drainage. As such, the DRC has general water quantity and quality problems associated with being at the bottom of the watersheds. The upper NMS watersheds' characteristics are more similar to Delaware County's Delaware River tributary streams (Chester, Ridley, Crum, and Darby Creeks), with a series of hierarchical streams converging into one main stem. These watersheds have generally less flooding and higher water quality at their headwaters and more flooding and lower water quality the closer they are to the Delaware River (refer to Maps 1-1 and 1-2 in the Introduction section of this plan).

In order to understand the issues facing watershed resources in the DRC and NMS areas, it is important to understand the complex natural water system at work in the hydrologic cycle (refer to Figure 5-1). As the sun heats the earth, water evaporates from surface waters, such as streams, lakes, and wetlands. Water also evaporates directly from the land and plants, a process known as evapotranspiration. As the water vapor rises upward into the atmosphere, it cools and condenses to form clouds. When clouds reach their capacity, they release precipitation. This precipitation then returns to earth and is either absorbed by the ground or becomes runoff.

Many of the issues addressed in Chapter 3: Land Use Characteristics also have implications on water resources. Riparian buffers, impervious cover, wetlands, and tree cover can affect stormwater runoff, flooding, and water quality. In a natural environment, much of the precipitation is absorbed by the land, where it infiltrates (filters) through soil and bedrock to become groundwater, which later surfaces as a spring or in a stream. Surface runoff, which is also a natural process, occurs when the ground cannot completely absorb the precipitation, if at all, and the water instead flows across the surface of the land. Runoff, while essential to the hydrologic cycle, can be greatly increased with impervious surfaces such a pavement, roofs, and anything else that impedes water's absorption back into the ground. As such, paving can contribute to decreased stream base flow and can deprive subsurface aquifers of essential water recharge. Other hazards caused by stormwater runoff, such as water pollution and flooding are discussed throughout this chapter.

FIGURE 5-2
THE WATER CYCLE



Source: U.S. Department of the Interior, U.S. Geological Survey

SURFACE WATERS

Delaware River Corridor and Direct Drainage Areas

The Delaware River direct drainage areas in the DRC include the Naamans, Marcus Hook, and Stoney Creek watersheds and the pockets of land located between the Chester, Ridley, Crum, and Darby Creek watersheds, which are tributary to the River (Maps 1-1 and 1-2). Within the pockets of Delaware direct drainage, there are very few surface streams, as historic development activities involved filling and piping them into underground municipal storm sewers. The only actual waterways that can still be identified (or exist today) tend to be relatively short in length. They include Bakers Run (0.76 miles) and Middle Creek (0.60 miles) in Marcus Hook, and Plum Hook Creek (0.68 miles) in Tinicum.

According to the Pennsylvania Emergency Management Agency (PEMA), there are no dams located in the Delaware River Corridor, either in direct drainage areas or in the DRC portions of other streams tributary to the Delaware River. The absence of dams allows existing waterways to flow more naturally, which improves water quality, stream habitat, fish migration, and opportunities for water-based recreation.

Naamans-Marcus Hook-Stoney Creek Watersheds

The Naamans, Marcus Hook, and Stoney Creek watersheds are classified by the State of Pennsylvania as part of the Delaware River watershed. However, due to its similarity to the County's other north-south watersheds, this Rivers Conservation Plan treats the NMS watersheds in a manner similar to RCPs prepared for the County's other watersheds. The size of the three watersheds vary greatly, with Naamans Creek being the largest and the only bi-state watershed addressed in the Study Area (refer back to Map 1-3).

The Naamans Creek watershed land area within Pennsylvania covers 7.4 square miles. When combined with land area in the State of Delaware, it has an interstate total of 14.4 square miles. With its headwaters in Bethel Township, Pennsylvania, and its confluence with the Delaware River in Claymont, Delaware, Naamans Creek is one of only five interstate streams in the entire four-state Delaware River Basin (the other interstate streams are the Brandywine, Red Clay and White Clay Creeks, and the Christina River). The watershed contains two main branches, the North and South, respectively. The North and South Branch of Naamans Creek are each about six miles in length. Land area in both branches is comprised primarily of residential and commercial land uses. In addition to the North and South branches, Naamans Creek has three other main tributaries: Spring Run (2.1 miles in length), East Branch (2.7 miles), and West Branch (3.4 miles).

Due to its upstream location, what happens in the Pennsylvania portion of Naamans Creek watershed is of great importance to Delaware residents. The Naamans Creek Watershed Association indicates that it believes development, deforestation, soil disturbances, and increased impervious cover in Delaware County have created issues with flooding, sedimentation, and nutrient overloads in the State of Delaware.

The Marcus Hook Creek watershed covers about 5.2 square miles. The main stem of the creek (5.8 miles in length) and its tributary, Bezors Run (1.5 miles), flow southeasterly from their respective headwaters in Aston and Upper Chichester Townships, through Trainer and Marcus Hook Boroughs, before flowing into the Delaware River. The watershed transitions from larger-lot residential land use in the north to high density development, which includes large expanses of impervious surface and industrial uses near I-95 and the Delaware River Corridor.

Stoney Creek is the smallest of the NMS watersheds, at 0.8 square miles. It flows 1.7 miles south from Chester Township, through the western corner of Chester City and into Trainer Borough where it drains into the Delaware. Despite its intense development, including industrial uses, Stoney Creek is the only watershed in the Study Area that attains its designated use as a warm water fishes (WWF).

According to PEMA, there are no dams found in the NMS watersheds. This is an important consideration for stream health given that many dams statewide are currently being removed for a number of reasons, including structural condition, safety hazards (for swimmers), water quality, and to allow for fish passage.

WETLANDS

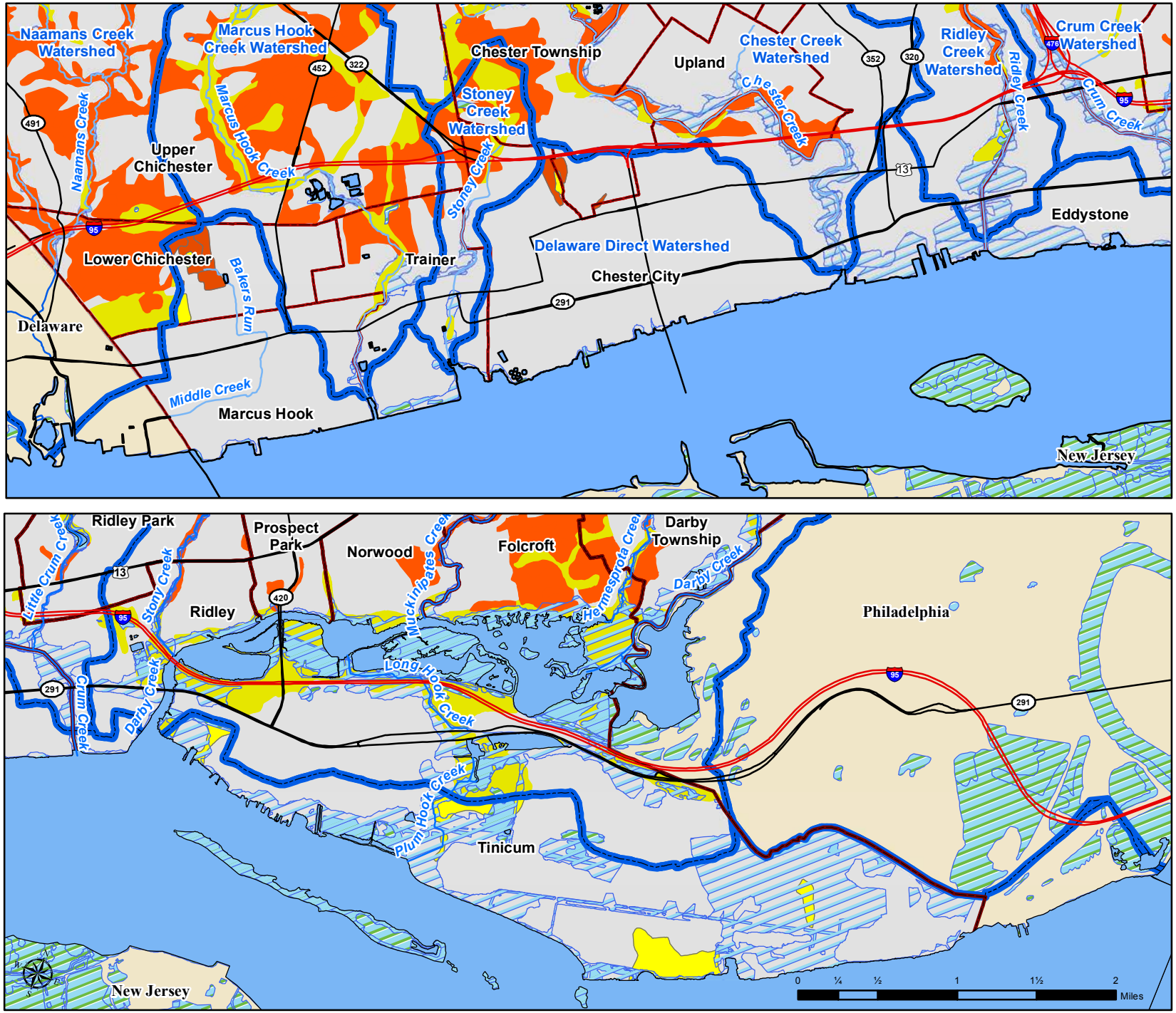
Wetland Function

Wetlands play a crucial role in the function of natural systems, including the ability to reduce flooding, improve water quality, and provide habitat for plants and animals. Wetlands can reduce flooding by intercepting, holding, and gradually releasing water from storm events and snowmelt. As such, wetlands can also act as natural filters that aid in the cleaning and recharging of groundwater, as well as the recycling of nutrients. The biological activity of wetland vegetation can help to treat contaminated water by removing and storing limited amounts of inorganic materials such as nitrogen and phosphorous compounds.

In addition, due to their aesthetic value and species diversity, wetlands offer opportunities for recreation and education. From a biological productivity standpoint, wetlands are productive and valuable habitats that are sensitive to environmental impacts. Disturbances to soil and hydrologic flows can severely limit a wetland's ability to function. Their sensitivity and ecological significance is the reason wetlands are heavily regulated by state and federal agencies.

Wetland Identification

The wetlands and areas with hydric soils in the Study Area are shown on Maps 5-10 and 5-11. The wetland information presented was taken from the National Wetlands Inventory (NWI), and the hydric soils information was taken from the *Soil Survey*.



Delaware River Corridor Floodplains, Wetlands & Hydric Soils Map 5-10

- Major Roads
- Interstate
- Streams
- Municipalities
- Watersheds
- Wetlands

Soil Type

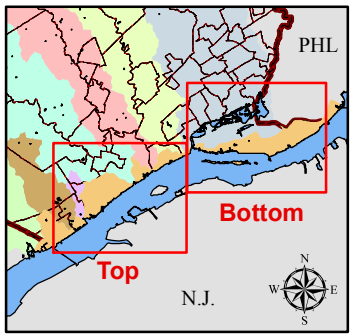
- Hydric Soils
- Soils wtih Hydric Inclusions

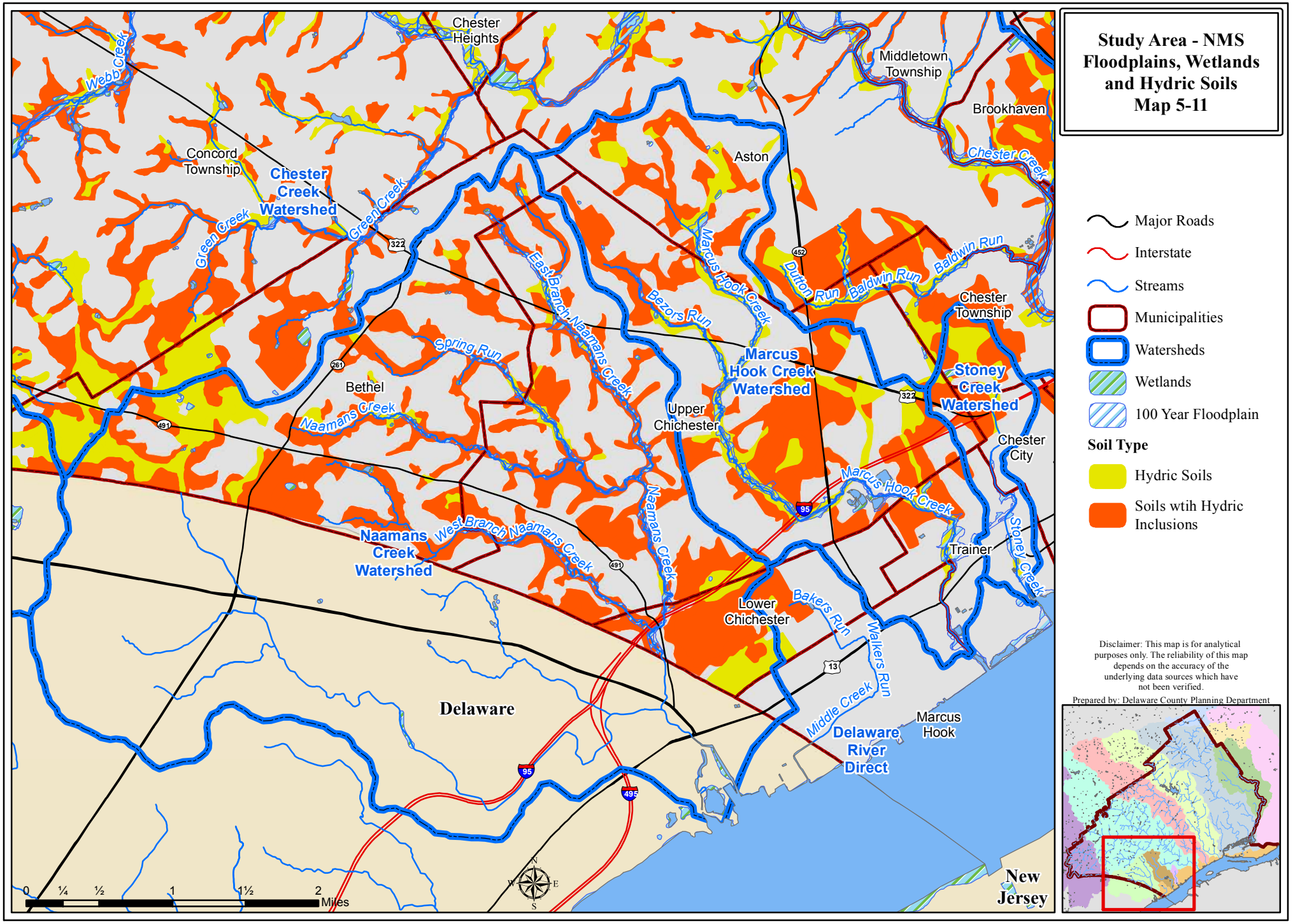
Floodplain

- 100 Year

Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.

Prepared by: Delaware County Planning Department




Study Area - NMS Floodplains, Wetlands and Hydric Soils Map 5-11
Major Roads
Interstate
Streams
Municipalities
Watersheds
Wetlands
100 Year Floodplain
Soil Type
Hydric Soils
Soils wtih Hydric Inclusions
Chester Heights
Middletown Township
Brookhaven
Aston
Concord Township
Chester Creek Watershed
Webb Creek
Green Creek
Chester Creek
Marcus Hook Creek
Dutton Run
Baldwin Run
Chester Township
Bezors Run
East Branch Naamans Creek
Spring Run
Bethel
Naamans Creek
Marcus Hook Creek Watershed
Stoney Creek Watershed
Upper Chichester
Chester City
Naamans Creek Watershed
West Branch Naamans Creek
Trainer
Stoney Creek
Lower Chichester
Bakers Run
Walkers Run
Middle Creek
Delaware
Delaware River Direct
Marcus Hook
New Jersey
0 ¼ ½ 1 1½ 2 Miles
N
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S
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department

National Wetlands Inventory

The NWI is maintained by the U.S. Fish and Wildlife Service, the principal federal agency that provides wetland information to the public. The Inventory consists of a series of topographic maps showing wetlands and deep water habitats. According to the U.S. Fish and Wildlife Service, the NWI is "used by federal, state, and local agencies, academic institutions, and private industry for management, research, policy development, education and planning activities." The NWI is available online at: http://www.fws.gov/wetlands/.

Wetlands shown on the NWI maps are identified through aerial photography, which picks up resources of 3-5 acres or above. Therefore, smaller wetland areas may not appear in this data set (or on the maps in this plan). However, just because the NWI does not show a wetland, it does not mean a wetland area does not exist. For regulation, permitting, and conservation purposes, wetlands are identified on the basis of three parameters: hydric soils (see below), the presence of hydrophytic vegetation, and evidence of hydrology.

Hydric Soils

The presence of hydric soils (where the water table is less than six inches from the surface) is one of the three parameters used to identify a wetland. The *Urban Soils Primer* (2005), states that hydric soils are "formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic (lacking oxygen) conditions in the upper part." This has important implications for plant life, since roots and microorganisms require oxygen in the soil for respiration. Although most of the soil in the DRC can be characterized as Made Land, the area still contains areas with hydric soils and soils with hydric inclusions.

Hydric soils and soils with hydric inclusions constitute approximately 30% of all land in the NMS (refer to Table 5-3). This indicates that there is strong potential for wetlands in these areas, especially along streams. Given that portions of the NMS watersheds, Bethel in particular, have a perched water table, attention should be paid to the prevalence of hydric soils and the activities that take place where they are present.

TABLE 5-3
HYDRIC SOILS – NMS

Watershed	Stream Miles With Hydric Soils	% Of Land With Hydric Soils	% Of Land With Hydric Inclusions
Naamans Creek	13.9	8.3	34.2
Marcus Hook Creek	6.3	11.0	25.9
Stoney Creek	0.3	12.1	26.5

Source: Soil Survey of Chester and Delaware Counties, 1963

Wetlands in the Study Area

Wetlands are among the Study Area's most significant natural resources (refer to Maps 5-10 and 5-11). Many of the larger wetland areas are in Tinicum near Plum Hook Creek and extend north into the John Heinz National Wildlife Refuge at Tinicum. The Heinz Refuge is home to roughly 200 acres of tidal wetlands, which is the largest remaining tidal wetland in Pennsylvania. Although many of the coastal zone's larger wetlands actually lie within the Darby Creek watershed, these tidal wetlands should be preserved due to their ecological importance. Other DRC wetlands can be found near the mouth of Darby Creek, along the Delaware River shoreline, and on Little Tinicum Island.

Despite the limited tidal wetlands in the DRC and along the Delaware River shoreline, the need for wetland restoration is cited in the *Natural Heritage Inventory of Delaware County, Pennsylvania* (2011). The Natural Heritage Inventory (NHI) details specific wetland restoration activities that could be undertaken along each riverfront community's shoreline. In fact, areas with old piers and docks that have fallen into disrepair may offer promising opportunities for restoration by providing habitat for aquatic species. In 2009, Pennsylvania Environmental Council (PEC) announced it would be leading the effort for a regional restoration strategy in the Delaware River Estuary, which may allow for projects to restore riparian buffers and tidal wetlands in the areas that drain directly to the Delaware River.

The NWI shows numerous wetlands within the NMS watersheds, occurring mostly in smaller isolated pockets. Though there are not many large wetlands listed in the NWI, as noted above, this does not mean that others may not exist.

WATER QUALITY

Marcus Hook Creek running through Henry Johnson Park in Trainer Borough.

Section 303(d) of the Clean Water Act requires states to prepare a report containing information concerning "water-quality limited [stream] segments." Pennsylvania's *2012 Integrated Water Quality List* satisfies that requirement and provides an assessment of water quality in the in the State. It identifies streams and other bodies of water that have not attained their designated use(s), and lists them as "impaired." Uses include, among other things, aquatic life, fish consumption, recreation, and potable water supply. The 2012 Integrated Water Quality List (refer to Table 5-4) shows that the Delaware River is listed as impaired for the entire length of the County's riverfront, as are most of the major streams (along with their respective tributaries) in the Pennsylvania portion of the NMS.

TABLE 5-4
2012 INTEGRATED WATER QUALITY LIST

Name*	Assessed Use	Attained Use	Source Cause
Delaware River	Fish consumption	Impaired	Source unknown: PCBs
East Branch Naamans Creek	Aquatic life	Impaired	Urban runoff/storm sewers - siltation
South Branch Naamans Creek	Aquatic life	Impaired	Urban runoff/storm sewers - siltation
West Branch Naamans Creek	Aquatic life	Impaired	Urban runoff/storm sewers - siltation
Spring Run	Aquatic life	Impaired	Urban runoff/storm sewers - siltation
Marcus Hook Creek	Aquatic life	Impaired	Urban runoff/storm sewers - siltation, land disposal – cause unknown, metals
Stoney Creek	Aquatic life	Supporting	

*The main stem of Naamans Creek flows through Delaware; therefore, no designated use was assigned.
Source: PA DEP 2012 Integrated Water Quality List

All of the waterways within the Study Area are classified as WWFs, which do not provide the best habitat for aquatic species. According to DEP Chapter 93 Water Quality Standards, WWFs are required to maintain dissolved oxygen levels at a daily average of at least 5.0 milligrams per liter with a maximum water temperature of 87 degrees during the hottest months of July and August. Stoney Creek is the only waterway in the Study Area that attains its designated use. None of the streams are designated as high quality (HQ) or exceptional value (EV).

According to the State of Delaware's 2012 303(d) List, the Delaware portion of Naamans Creek has water quality issues similar to those found in other Pennsylvania streams. These problems, which include nutrient, bacteria, and habitat impairments, can also be traced back to the impacts of urbanization and non-point source pollution. In 2005, Total Maximum Daily Load (TMDL) restrictions were placed on Naamans Creek in Delaware. The TMDL specifies a numerical amount of a pollutant that can be discharged into the water body. A TMDL analysis showed that each day, Naamans Creek conveys approximately 100 pounds of nitrogen and four pounds of phosphorus south from Pennsylvania into Delaware. It is important to note that, unlike the South Branch of the Naamans Creek, there are no TMDL restrictions currently imposed on any of the NMS watersheds in Pennsylvania.

WATER SUPPLY

Under the guidance of the Water Resources Planning Act 220 of 2002, Pennsylvania developed the *Pennsylvania State Water Plan* (2009), which provides guidance for maintaining sustainable water use in the future. The Plan looks at how much water Pennsylvania has, uses, and needs. It also identifies problem areas where future demand for water may exceed supply.

According to the *Pennsylvania State Water Plan*, the coastal plain area consists of sands and gravels and "has easily rechargeable aquifers that are confined only by clay-based soils that restrict water movement." In Pennsylvania, however, this area is highly developed in Philadelphia and surrounding communities, so recharge is decreased due to the abundance of impervious surfaces that water cannot flow through, such as paved roads, parking lots, rooftops, driveways and sidewalks. Fortunately, the DRC and NMS areas were not identified as critical areas. Precipitation occurs fairly evenly throughout the year and the Study Area is not at great risk of losing its water supply. However, consideration should be given to water consumption, especially for extended dry periods during the summer months.

The Geology of Pennsylvania's Groundwater (1999) ranks Delaware County at the low end of the spectrum for groundwater use, drawing about two million gallons per day (MGD). *Groundwater Resources of Delaware County, Pennsylvania* (1996) cites precipitation as the source of both surface water and groundwater. It further notes that Delaware County has "limited water resources" and that "groundwater occurs mostly in the weathered zone above bedrock and in fractures to depths of about 300 feet below land surface." The geologic formations and limited groundwater resources do not "yield enough water consistently for large public or industrial supplies; however, most wells should produce sufficient quantities for domestic purposes." The groundwater quality is assessed to be "generally suitable for most uses."

The DRC and NMS communities receive their public drinking water supplies from either AQUA Pennsylvania or Chester Water Authority. AQUA draws its water from Ridley and Crum Creeks in Delaware County, while Chester Water draws from Octoraro Creek in Chester County. A small portion of Bethel is also part of the United Water Bethel service area. According to Pennsylvania Groundwater Information System (PaGWIS), Bethel, which has issues with soil percolation in some areas, has at least 18 domestic wells, while Upper Chichester has at least 12. PaGWIS relies on voluntary submissions of well record data by well drillers; therefore, it is not a comprehensive database of all wells. However, it is the only available data set of domestic wells. No information regarding private well usage in the Delaware direct drainage areas was available; however, their existence is highly unlikely due to the availability of public water.

WATER POLLUTION CONTROL

Due to its importance for maintaining the health of humans, animals, and plants, water quality is a key indicator for quality of life. There is a significant amount of research that shows water quality is negatively affected as the level of development and impervious cover increases throughout a watershed.

Sources of urban water pollution are categorized as "point" or "nonpoint." A point source is identifiable because it can be traced to a precise location, such as a pipe that discharges into a waterway from a sewage treatment plant or a factory. Traditionally, point sources have been viewed as the primary contributors to water pollution. However, permitting of

point discharges has greatly improved water quality in recent years. Experts now believe that nonpoint pollution is the leading cause of water pollution today.

Nonpoint pollution sources are generally diffuse and unconfined. They are a result of rain or snow melt picking up and carrying soil, oil, litter, fertilizers, or animal wastes from streets, parking lots, lawns, and farmlands into waterways. One of the greatest contributors to nonpoint source pollution is road salt used during the winter months, which drains into creeks when snow and ice melts.

High volumes of stormwater can also result in excess velocity in a stream channel, which can cause scouring, thereby contributing to an increased sediment load in a stream. The scouring action also results in the destabilization of stream banks. Sediment can enter waterways as a result of construction and land clearing activities as well. Recent federal and state permitting programs now regulate some nonpoint storm sewer discharges as point sources.

Industrial Discharges

The federal government requires industrial facilities to obtain a federal National Pollutant Discharge Elimination System (NPDES) permit for their point and nonpoint stormwater discharges. Industries are required to obtain an industrial stormwater permit every five years, with annual inspections from the U.S. Environmental Protection Agency (EPA). The permitting regulations apply to 11 industrial activities, including manufacturing, hazardous waste treatment, landfills, scrap yards, transportation facilities, and sewage facilities, all of which conduct activities resulting in water or stormwater discharges that could have an effect on water quality if not regulated.

Recently, a business in the Study Area was convicted of violating the Clean Water Act for discharging contaminants into a creek. A federal judge sentenced the company to four years' probation and fined it $75,000, reinforcing the U.S. Department of Justice's commitment to water quality. This should serve as an example of how water pollution is not to be taken lightly. Table 5-5 shows industrial facilities with point discharge permits in the Study Area.

TABLE 5-5
INDUSTRIAL FACILITIES WITH NPDES POINT DISCHARGE PERMITS

Name	Location	Municipality	Notes
DELCORA Western Regional Sewage Treatment Plant	DRC	Chester	Discharge to Delaware River
Evonik DeGussa Corporation	DRC	Chester	Discharge to Delaware River
Harrah's Casino and Racetrack	DRC	Chester	Discharge to Delaware River
Kimberly-Clark	DRC	Chester	Discharge to Delaware River
P.Q. Corporation	DRC	Chester	Chemical manufacturing company; discharge to Delaware River

TABLE 5-5
INDUSTRIAL FACILITIES WITH NPDES POINT DISCHARGE PERMITS (CONT).

PECO Eddystone Station	DRC	Eddystone	Coal-powered electric generating station; discharge to Delaware River
Boeing Corporation	DRC	Ridley	Discharge to Delaware River
Philadelphia International Airport	DRC	Tinicum	Stormwater only (aircraft de-icing operation), discharge to Delaware River
United Parcel Service	DRC	Tinicum	Stormwater only (aircraft de-icing operation), discharge to Delaware River
Sunoco Refinery	DRC/NMS	Marcus Hook	Multiple outfalls; discharge to Delaware River
Monroe Energy (formerly Conoco Phillips)	DRC/NMS	Marcus Hook/ Trainer	Multiple outfalls; discharge to Delaware River
Federal Express World Service Center	DRC/NMS	Lower Chichester	Naamans Creek watershed; stormwater only
Congoleum Industries	NMS	Marcus Hook	Marcus Hook Creek watershed
Alloy Surface Bethel Plant	NMS	Bethel	Naamans Creek watershed; stormwater only
Joseph Silvestri and Sons	NMS	Bethel	Naamans Creek watershed; mushroom farm
Esschem, Incorporated	NMS	Lower Chichester	Naamans Creek watershed; stormwater only
Chichester Citgo	NMS	Upper Chichester	Marcus Hook Creek watershed; groundwater clean-up (pump and treat)
PA Machine Works	NMS	Upper Chichester	Marcus Hook Creek watershed; stormwater only
Sunoco – Read Boyd Farm	NMS	Upper Chichester	Marcus Hook Creek watershed; waste disposal site
Sunoco – Twin Oaks Pump Station	NMS	Upper Chichester	Marcus Hook Creek watershed; stormwater treated through oil-water separator
Total Distribution Services	NMS	Upper Chichester	Marcus Hook Creek watershed; Automotive distribution facility

Source: PA DEP NPDES Permitted Facilities in the Marcus Hook, Naamans, and Stoney Creek Watersheds and Delaware Direct Watershed, 2011.

MS4 Municipal Stormwater Requirements

The Clean Water Act's Water Pollution Control Program requires small, urbanized municipalities to obtain a permit for their municipal separate storm sewer systems (MS4s). This is a mandate of EPA's NPDES Phase II guidelines for MS4s. DEP operates the permitting program, which requires municipalities to implement six minimum control measures (MCMs) designed to reduce pollutants transported in waterways. These include:

- Public education and outreach
- Public participation
- Illicit discharge detection and elimination
- Construction site stormwater runoff control
- Post-construction stormwater management for new development and redevelopment
- Pollution prevention and good housekeeping for municipal operations and maintenance

A municipal environmental advisory council (EAC) or watershed group can assist a municipality with some of the elements of its MS4 permit, particularly public education and public participation.

New Castle County, Delaware has been utilizing low impact development (LID) practices in stormwater management applications for years. LID seeks to work with the environment and its natural features to manage stormwater as close to its source as possible. EPA states that LID "…employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product." LID promotes infiltration, which reduces the amount of stormwater runoff and improves water quality. Site design that minimizes paving and use of rain gardens, green roofs, permeable paving surfaces, and rain barrels are LID practices. Therefore, use of LID practices would be a practical approach for new development and redevelopment in the Study Area.

Wastewater Treatment

With the exception of a few areas in Bethel and Upper Chichester Townships, all sewage generated from within the Study Area is treated at a public wastewater facility. Tinicum Township operates its own treatment plant, and a small portion of Upper Chichester and Aston Townships currently send their flow to the Baldwin Run Pollution Control Plant (BRPCP) in Aston. Most of the Study Area conveys its sewage flow to the Delaware County Regional Water Quality Control Authority's (DELCORA) Western Regional Treatment Plant (WRTP) in the City of Chester. The plant has a treatment capacity of 50 MGD. Treated effluent is discharged directly into the Delaware River. Note: a small amount of flow from the Darby and Muckinpates Creek watersheds is conveyed to the Philadelphia Southwest Water Pollution Control Plant (PSWPCP) for treatment.

Inflow and infiltration (I&I) pose significant challenges to wastewater treatment providers. Inflow comes from water entering sewer pipes from sources such as roof drains or basement sump pumps that have been tied into a property's sewer lateral. Infiltration may result from broken sewer connections (laterals) or cracked pipes, allowing groundwater to seep into the pipes. This is an especially difficult problem to remedy given the condition, scale, and high cost of replacement for this often aging infrastructure. In 2010, DELCORA released a report detailing some of the issues facing Delaware County municipalities regarding the issue of I&I. The report, *Private Lateral*

Inflow and Infiltration Elimination Project: Summary Report (2010) is a helpful resource. It provides background information on the issue and highlights what it means for homeowners, citing private laterals as a huge contributor. The report and associated outreach program is accompanied by an informational video.

I&I problems increase the cost of wastewater treatment and can also lead to sanitary sewer overflows (SSOs), which may cause untreated sewage to back up into homes and businesses. SSOs can also contribute to overflows at manholes and pump stations. Given the aging sewer infrastructure in many portions of the Study Area, there may need to be improvements in the future to reduce I&I.

Delaware River Corridor

With the exception of Tinicum, almost all of the DRC municipalities send their wastewater to DELCORA's WRTP in the City of Chester, or to PSWPCP. Tinicum operates its own sewer authority and wastewater treatment plant to serve its residents. Its plant has an average design flow of 1.4 MGD and a maximum of 2.8 MGD. The effluent is discharged into the Darby Creek. The *Delaware County Act 537 Sewage Facilities Plan Update – Eastern Plan* (2002), and the 2014 revision, note documented problems associated with excessive amounts of I&I. Both reports recommend corrective actions be established to correct the problem.

Chester City still has some areas with combined sewers that date back to the 1930s. Combined sewers collect stormwater runoff and wastewater in the same sewer. During large storm events, sewers can reach their capacity and result in combined sewer overflows (CSOs), with the runoff and wastewater flowing untreated into the nearest water body. DELCORA's Long-Term Control Plan addresses the elimination of some CSOs and the control of flow from others to minimize water quality impacts. Included in the strategy are guidelines for identifying CSO locations, maintaining and monitoring regulators, and educating the public about CSOs.

Naamans-Marcus Hook-Stoney Creek Watersheds

Like most of the DRC area (with the exception of Chester), the communities of the NMS watersheds are served by separate storm and sanitary sewer systems; there are no combined sewers. There also are no package treatment plants in any of the three watersheds; however, a few on-lot systems do remain in parts of Bethel (less than 10%) and Upper Chichester (less than 1%). Due to soil limitations, a perched water table, and proximity to shallow bedrock, most of the land in the NMS is unsuitable for on-lot sewage treatment. If needed, municipalities with on-lot systems should enact an ordinance that regulates maintenance, inspection, disposal, and hauling records. Similarly, failing and antiquated systems should connect to existing sewers when and where feasible. This ensures that the wastewater receives the best treatment possible and can help to eliminate potential problems with groundwater contamination.

There are a total of four sewer authorities that manage wastewater in the NMS watersheds. Two conveyance authorities, Southern Delaware County Authority and

Bethel Township Sewer Authority, cover the majority of the Naamans and Marcus Hook Creek watersheds. Those authorities, in turn, convey their flow to the DELCORA WRTP for treatment. The Southwest Delaware County Municipal Authority (SWDCMA), which serves only a small portion of Upper Chichester and Aston Townships, currently functions as both a conveyance and treatment authority, sending flow to the BRPCP in Aston. A recently approved Act 537 sewage facilities plan calls for a phase out of the plant, and redirection of flow to the DELCORA WRTP in Chester.

KEY ISSUES FOR WATER FEATURES

Stormwater and Flooding

Stormwater

Stormwater, as defined by the Stormwater Management Act of 1978 (PA Act 167), is "drainage runoff from the surface of the land resulting from precipitation, including snow or ice melt." Although stormwater runoff occurs naturally, its quality, quantity, and velocity can be affected by development and construction activities. Typically, the more impervious surface coverage there is within a watershed, the less precipitation is able to percolate into the ground, increasing the amount of stormwater runoff that flows across the ground and directly into streams. This stormwater is a primary source of pollution in Pennsylvania's waterways. As water runs across streets, parking lots, and driveways, it picks up road salts, oil, gasoline, and trash, which are then deposited in waterways.

Act 167 mandates Pennsylvania's counties prepare stormwater management plans for each state-designated watershed within its boundaries. A major objective of Act 167 is to ensure that the maximum rate of stormwater runoff is no greater after development than before. The Act also seeks to manage the quantity, velocity, and direction of stormwater runoff in a manner that protects health and property. Guidance from the Pennsylvania Department of Environmental Protection (DEP) requires stormwater management plans to specifically address the issues of stream bank erosion, groundwater recharge, and water quality through the use of best management practices (BMPs), as well as overbank flooding and extreme event management through other measures.

The Delaware County Planning Department (DCPD) has prepared Act 167 stormwater management plans for the Ridley (1988), Chester (2002), Darby (2005), and Crum Creek (2011) watersheds. Municipalities in these watersheds were required to adopt stormwater management regulations consistent with their respective plans. Portions of DRC and NMS municipalities containing the tributaries noted above apply the respective watershed ordinance municipality-wide. However, there is currently no Act 167 stormwater management plan for the areas that drain directly to the Delaware River, including the NMS watersheds.

It should be noted that DEP's permitting program that implements the National Pollution Discharge Elimination System (NPDES) Phase II Program, also known as the Municipal Separate Storm Sewer System (MS4) Program, requires municipalities to adopt a post

construction stormwater management ordinance. Although Act 167 stormwater management ordinances can satisfy this requirement, DEP will not accept ordinances from plans approved before 2005. This means that municipalities (i.e., Bethel and Upper Chichester, which use the Chester Creek ordinance) will need to update their ordinances to satisfy the MS4 requirement. The County recommends use of the Crum Creek plan model ordinance because it is the most recent.

In conducting background research for this plan, DCPD solicited stormwater and flooding information from municipal managers and engineers via stormwater surveys. In the past, these surveys have been used by the Planning Department to prepare Phase I scopes of study for Act 167 stormwater management plans. The information from these surveys could be used to help justify funding to prepare an Act 167 plan for the NMS watersheds. Such a plan would require an engineer to model the hydrology of the watersheds. Appendix C includes a table with survey information about stormwater problem areas, along with a description of location, cause(s), and frequency.

Flooding

Flooding is a natural process. As flooding events occur repeatedly over time, natural overflow areas called "floodplains" are created. Floodplains play an important role in maintaining water quality and supply. They can store runoff from floodwaters, provide wildlife habitat, and support vegetation. Any alteration of a floodplain, such as damming, stream diversion, or development, will disrupt natural flow and drainage patterns. Such disturbances are likely to increase the magnitude of flooding and thus, threaten the health and safety of residents.

Floodplain areas in the DRC are generally found along the banks of the Delaware River tributaries (including the NMS watersheds), as well as the Delaware River itself. What is commonly referred to as the 100-year floodplain is an area that has a 1% annual chance of flooding during a 100-year storm event. While flooding is a naturally occurring process, steps can be taken to mitigate the adverse effects it has on life and property by locating development outside the floodplain boundary.

Floodplains are the most common natural feature regulated by municipalities. Congress passed the National Flood Insurance Act in 1968, providing federally subsidized flood insurance for structures that lie within floodplains. This was followed by Act 166, enacted by the State General Assembly in 1978. It requires flood-prone communities to regulate uses and activities in the floodplain through local ordinances meant to prevent loss of life and property.

Floodplain development in the Study Area is regulated through individual municipal ordinances that mandate how structures in the floodplain are to be built, relocated, constructed, or altered. These ordinances comply with state and federal requirements, qualifying them for the National Flood Insurance Program (NFIP), which allows property owners in floodplain areas to purchase federally backed flood insurance.

The Federal Emergency Management Agency (FEMA) approved new floodplain maps for Delaware County municipalities in November 2009. New coastal hazards mapping will be effective September 2015. As with the 2009 map updates, municipalities affected by map changes will be required to revise their ordinances to reflect the revised maps.

The Community Rating System (CRS) is a voluntary program operated by the NFIP. By participating in the CRS, municipalities are eligible for reduced flood insurance rates while reducing risks to property, infrastructure, and the local economy. To meet CRS requirements, municipalities must complete activities under the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparation

None of Delaware County's municipalities currently participate in the CRS Program. Given the long history of flooding events in the County and Study Area municipalities, participation would provide tangible benefits.

In addition to structures and other types of property in the floodplain, several utility corridors lie in or intersect the 100-year floodplain. Though many rails and power lines are raised above identified flood levels, this raises important questions about hazard mitigation and emergency preparedness. Such structures should be inspected to ensure that they can withstand floods and minimize risks to public safety.

Delaware River Corridor

The effects of human intervention and development throughout the Study Area are well documented. The construction of roads, buildings, and industrial facilities along the riverfront corridor has impeded the ability of floodplains to absorb and treat stormwater naturally. The Delaware River shoreline has transitioned over time from a linear swath of tidal wetlands and naturally vegetated floodplain areas to an armored corridor better suited for industry. Although the threat of riverine flooding and storm surges to industries has been decreased through armoring, opportunities may exist in certain areas, such as riverfront parks, to restore the shore to a natural state, allowing the river and its floodplain to function as nature intended.

The floodplains in the DRC are located along the Delaware River shoreline and along major tributaries to the Delaware River, including the lower portions of the NMS streams. A review of municipal stormwater surveys and existing plans did not identify many flooding areas along the Delaware River, most likely due to fill and bulkheading. What they did note is that Chester, Ridley, and Tinicum's flooding problems occur along larger tributaries such as Chester, Ridley, Crum, and Darby Creeks, where the timing of downstream flow, combined with tidal effects, can create additional flooding problems.

In Trainer and Marcus Hook Boroughs, issues related to flooding seem to stem most often from their downstream locations combined with tidal fluctuations in the Delaware

River. When combined with intensive land uses, expansive impervious surfaces, and insufficient stormwater runoff controls in upstream locations, these boroughs are especially vulnerable to flooding. Stormwater problem areas are well documented and flooding occurs with enough regularity to create frequent challenges for the municipalities. Marcus Hook noted that the residential area along West Fourth Street from Green Street to Market Street, and then north to Fifth Street, experiences flooding due to stormwater volume. Specialized, site-specific studies for such flooding problem areas may help to identify potential solutions.

Naamans-Marcus Hook-Stoney Creek Watersheds

Floodplains in the NMS watersheds conform tightly to well-defined stream valleys. There are very few expansive floodplains in Marcus Hook and Stoney Creeks. There are a number of properties in the 100-year floodplain in each watershed, but they comprise a relatively low proportion of land area when considering that development has taken place up to and along the stream banks in many instances. In the Naamans Creek watershed, 408 parcels intersect the 100-year floodplain, compared to 328 and 65 parcels in the Marcus Hook and Stoney Creeks watersheds, respectively. As a result, many, if not all, of these properties are located within the federally designated floodplain. Banks require these residents to obtain flood insurance in order to hold a mortgage on the property. It is important to note that flooding also occurs in low-lying or poorly drained areas of a municipality.

Most of the major stormwater related issues in the NMS area are related to flooding caused by excessive volumes and velocities of stormwater flows. Obstructions such as bridges and undersized pipes were also listed as major contributors to stormwater problems. Upper Chichester noted significant issues with accelerated erosion and sedimentation resulting from these excessive flows. This is due not only to the hilly topography of the area, but also to land development activities there. Soil disturbances caused by the construction of new homes and other structures have led to increased runoff. During heavy rainfall events, periodic formation of sinkholes and even the settling of entire residential lawns have caused swimming pools and building foundations to become compromised in Aston. The Township also faces issues with undersized and obstructed culverts, resulting in the back-up of surface water and increased flooding.

Impervious surfaces

Much of the Study Area is highly developed, especially in the riverfront communities, where much of the land is covered by roads, parking lots, industrial uses, and buildings. Such impervious cover prevents rain and stormwater from entering the ground. Instead of being intercepted by trees and other vegetation, or infiltrated through the ground, it runs across the surface of the land and into storm sewers before entering the nearby streams. As stormwater runoff travels across these surfaces, it picks up oil, sediment, pet waste, chemicals, and other pollutants that impair water quality.

When assessing the land cover of the DRC, one of the most striking features is the disproportionate amount of impervious surface coverage (refer to Map 5-12). Its location at the bottom of the County's other watersheds makes it the recipient of stormwater from upstream, leaving portions of the riverfront communities prone to both flooding and water quality problems.

Redevelopment in the DRC provides an opportunity to reduce impervious cover and reintroduce a more natural water regime. State and federal stormwater management regulations now require development and redevelopment to control both the quantity and quality of stormwater runoff. Many of the required techniques include infiltration of stormwater through replacement of impervious surfaces with pervious asphalt or paving blocks, and the installation of stormwater basins and landscaping, including rain gardens. On small residential properties, redirection of downspouts to rain barrels can also help to reduce the volume of stormwater runoff while protecting water quality. These stormwater management measures are required in all upstream municipalities that drain to the DRC (including the NMS). To encourage these best management practices (BMPs), a stormwater BMP initiative to encourage use of green stormwater infrastructure should be established.

As shown in Map 5-13, the landscape of the upper NMS communities is significantly less disturbed and has far less impervious coverage than the coastal DRC. While the southern (DRC) portions of these watersheds face the challenges of flooding and water quality, the northern and western portions remain less impaired by the effects of development. However, areas of extensive impervious cover can still be found in Upper Chichester, along the ridge between the Naamans and Marcus Hook Creek watersheds. The Stoney Creek watershed has the highest percentage of impervious cover, whereas Naamans Creek watershed in Bethel Township has very few expanses of impervious cover.

Waterway Stewardship

Riparian Buffers

A streamside, or riparian, buffer is a vegetated area often comprised of plants, shrubs, trees, and native grasses that exists alongside a stream bank or other body of water. Riparian buffers play an integral role in regulating the flow of stormwater into streams, stabilizing the banks, and shading waterways. They can help to prevent nonpoint source pollutants from entering waterways by slowing the flow of water across the land, allowing for infiltration. In addition to their water resource benefits, riparian buffers also attract birds and wildlife, and offer relief from the built environment. The optimal width for a riparian buffer depends greatly on the location of the water body. First order streams at the top of a watershed should have the widest possible buffer, as much as 100 feet, or more if it is a Special Protection waterway (exceptional value or high quality). In more developed downstream areas, stormwater regulations developed for the County's Act 167 stormwater management plans recommend or require a minimum of 50 feet.

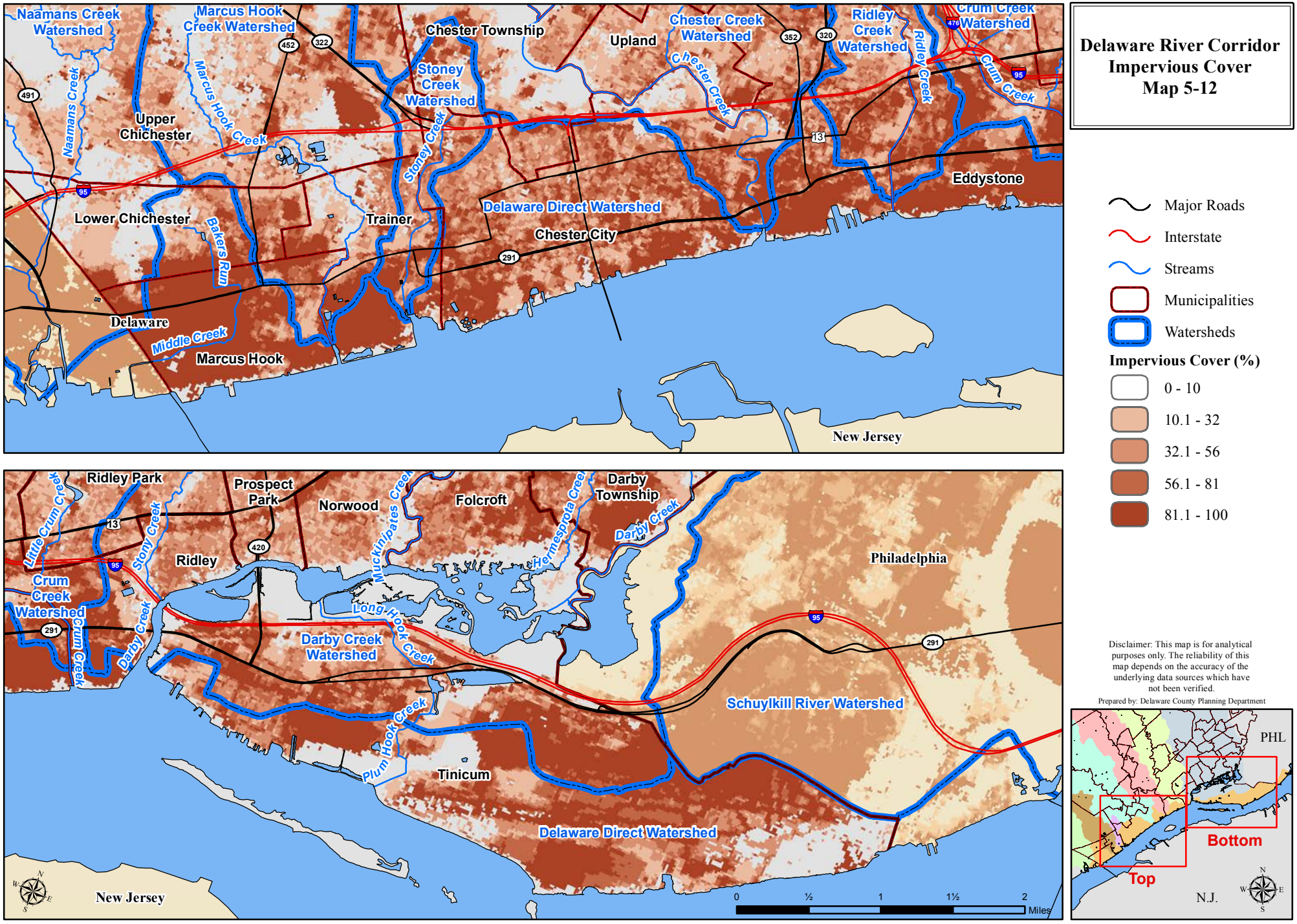
reintroduction of riparian buffers along the heavily armored Delaware riverfront will be difficult to achieve, there are still opportunities to plant and increase buffers in riverfront parks and at the mouth of streams tributary to the Delaware River.

Stream Naming

Another means of creating awareness about water resources within the NMS watersheds is to participate in the stream naming program. According to a Chester Ridley Crum Watersheds Association brochure, *You Can Name a Stream*, most of Pennsylvania's 64,000 streams are unnamed. These smaller streams in a river system make up the largest number of stream miles, and are essential for supporting a watershed's health. It is difficult for residents to identify with an unnamed stream, making the promotion of stewardship programs more difficult. Operated by the U.S. Geographic Survey's Board on Geographic Names (BGN), the stream naming program allows watershed organizations, municipalities, schools, and other community or service groups, to assign a name to unnamed tributaries. The BGN web site lists a variety of resources available for assistance with naming efforts.

Given the number of unnamed tributaries in the NMS areas, there is a unique opportunity to advocate for watershed stewardship by naming them. Some of these streams may already have local names that were not formally assigned by the BGN. While these local names may be a place to start, it is suggested that distinctive names tied to the area's history, folklore, topography, and natural environment also be considered.

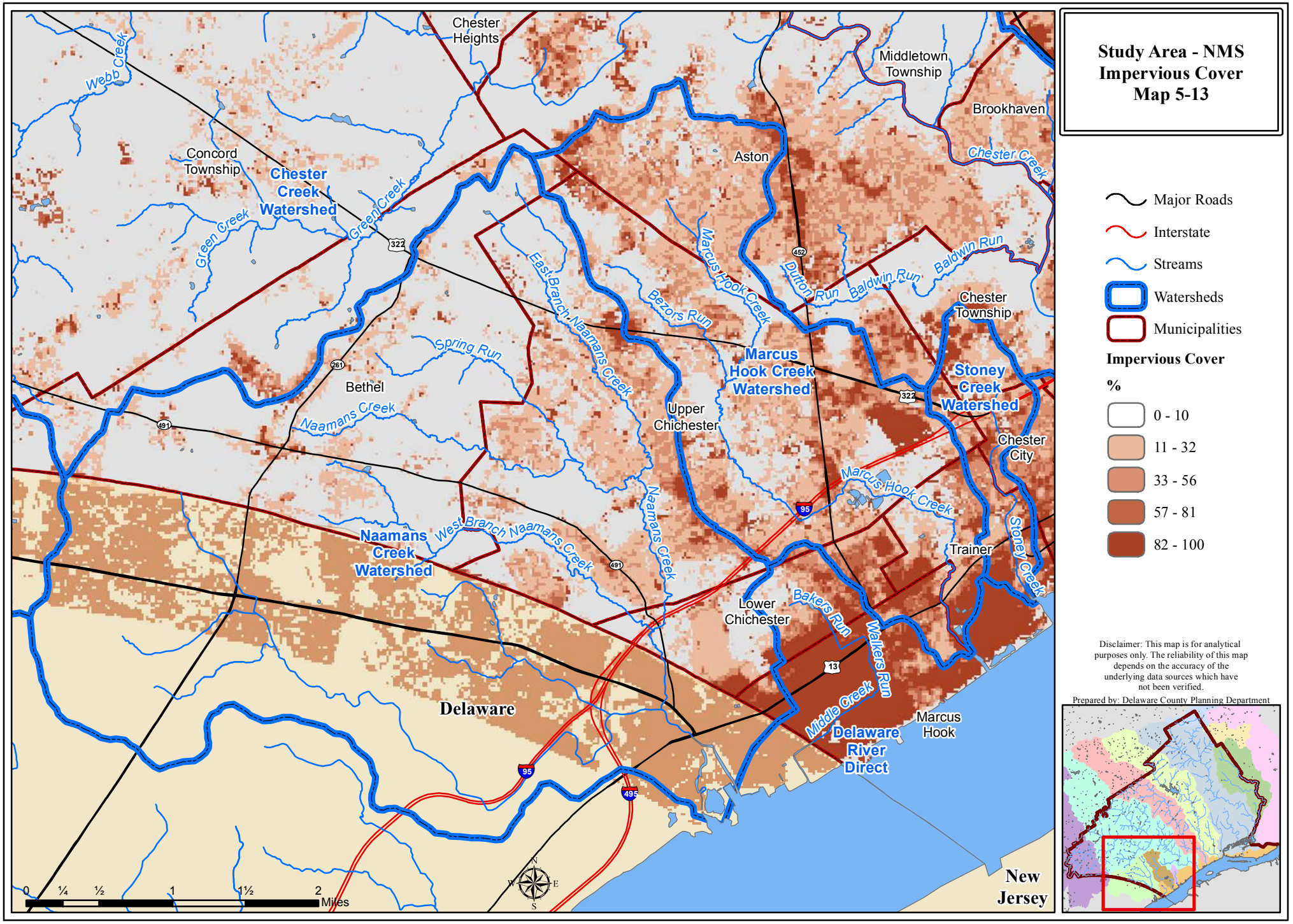
An EAC or a watershed group would be an ideal body to help lead stream naming efforts. The EAC or watershed group could also serve in the role of organizer by engaging other key stakeholders and service groups, such as historical societies, scouting groups, and schools in their efforts.



Delaware River Corridor Impervious Cover Map 5-12

Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.

Prepared by: Delaware County Planning Department


Study Area - NMS
Impervious Cover
Map 5-13
Major Roads
Interstate
Streams
Watersheds
Municipalities
Impervious Cover
%
0 - 10
11 - 32
33 - 56
57 - 81
82 - 100
Chester Heights
Middletown Township
Brookhaven
Webb Creek
Concord Township
Chester Creek Watershed
Green Creek
Aston
Chester Creek
Baldwin Run
Dutton Run
Marcus Hook Creek
East Branch Naamans Creek
Bezors Run
Chester Township
Spring Run
Bethel
Marcus Hook Creek Watershed
Stoney Creek Watershed
Naamans Creek
Upper Chichester
Chester City
Trainer
Stoney Creek
Naamans Creek Watershed
West Branch Naamans Creek
Lower Chichester
Bakers Run
Walkers Run
Middle Creek
Delaware
Delaware River Direct
Marcus Hook
New Jersey
0 ¼ ½ 1 1½ 2 Miles
N
W
E
S
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department

RECOMMENDATIONS

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR AND THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

NR-1 Maintain and enhance environmental ordinances, including those dealing with stormwater and floodplain management and the protection of riparian buffers, woodlands, wetlands, and steep slopes.

NR-2 Promote the use of low impact development (LID) techniques for new development and redevelopment.

NR-3 Maintain a stringent stormwater management ordinance that minimizes impacts to water quality and quantity in order remain in compliance Act 167 and the requirements of the municipal MS4 stormwater management permit.

NR-4 Participate in the Community Rating System through the National Flood Insurance Program to help reduce the risk of flood damage and to lower the cost of flood insurance premiums.

NR -5 Implement a public education program to address inflow and infiltration (I&I).

NR -6 Establish a stormwater best management practice (BMP) initiative to encourage retrofit of properties with green infrastructure, such as rain gardens, bioswales, and pervious paving.

NR -7 Develop a program, possibly in conjunction with an environmental advisory council (EAC), schools, or a watershed group, to promote awareness to residents and businesses about stormwater and water quality issues.

NR -8 Conduct site-specific studies for flooding.

NR -9 Work with watershed organizations and other community groups to educate the public about the importance of riparian buffers.

NR -10 Identify locations for stream bank and riparian buffer restoration, and undertake implementation projects throughout the Study Area.

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR SHOULD:

NR -11 Identify and prioritize opportunities to increase tree cover in residential neighborhoods, commercial street corridors, and in industrial areas.

NR -12 Work with regional and local organizations to reintroduce freshwater tidal wetlands along the Delaware River and at the mouths of tributary streams.

MUNICIPALITIES IN THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

NR -13 Implement conservation ordinances, sustainable development practices, and other tools to protect woodlands with the largest blocks of contiguous forest.

NR -14 Work with HOAs to develop management plans for their sensitive natural areas and protected open space.

NR -15 Implement a stream naming program in order to encourage better stewardship of local waterways.

NR -16 Connect failing and antiquated on-lot septic systems to existing sewers when and where feasible.

NR -17 Prepare an Act 167 plan for the NMS watersheds.

CHAPTER 6
BIOLOGICAL RESOURCES

BIOLOGICAL RESOURCES GOAL:
TO PRESERVE AND PROTECT THE UNIQUE NATIVE HABITATS, PLANTS, AND ANIMALS FOUND IN THE STUDY AREA

NATURAL HERITAGE INVENTORY

In 2011, the Western Pennsylvania Conservancy completed the *Natural Heritage Inventory of Delaware County* (NHI)*, Pennsylvania*, which was an update of the *Natural Areas Inventory* (1992, revised 1998). The 2011 document is a comprehensive report that documents the County's unique plant and animal species, as well as its sensitive natural habitats. The NHI contains a wealth of information and makes recommendations regarding how to manage these resources. The inventory, from which text contained in this chapter was directly taken, can serve as a valuable tool to assist in planning efforts at both the county and municipal levels. The NHI is hosted online by the Pennsylvania Natural Heritage Program at:
(http://www.naturalheritage.state.pa.us/CNHI.aspx)

As identified in the NHI, the Study Area contains a great deal of biological diversity, ranging from the tidal marshes near the Delaware River and its tributaries, to pockets of forested uplands with large maple and oak trees in the Naamans Creek watershed. As such, both portions of the Study Area contain ecologically important lands. Despite the fact that the Delaware River Corridor (DRC) is largely built out, with limited habitat for diverse plant and animal communities, the DRC and tidal tributaries contain some of the rarest landscapes in the State of Pennsylvania, hosting a number of important plant and animal species of concern. The Naamans, Marcus Hook, and Stoney Creek watersheds area (NMS) is less densely developed, with several large areas containing unique ecosystems with plant species of concern.

NATURAL COMMUNITIES

OBJECTIVE BR-1: TO CONSERVE THE NATURAL COMMUNITIES FOUND IN THE STUDY AREA, WITH EMPHASIS ON REINTRODUCTION OF NATIVE AND REMOVAL OF INVASIVE PLANTS.

The term *natural communities*, often used interchangeably with *plant* or *vegetation communities*, describes a grouping of plant species that share a common ecology, interacting with other plant species, animal species, and the physical environment. Communities are often defined by the dominant plant species and provide a valuable framework for organizing biological information.

The NHI identified several important natural communities in the Study Area, including upland forest, coastal plain forest, floodplain forest, grasslands and meadows, and freshwater tidal marsh. However, over the years, these communities have become highly fragmented. The remains of these resources provide a glimpse of what Delaware County was like before it was densely developed. Due to the scarcity of such areas and the various species they contain, their protection is important. It is also important to maintain existing native plants essential for wildlife species that depend on them for food and habitat. Therefore, municipalities should encourage sustainable development patterns to minimize and mitigate potential negative impacts on natural communities through municipal zoning and ordinances.

FORESTS

Upland Forest

The Study Area's upland forest habitat was once defined by its mix of oaks (*Quercus spp.*) and hickories (*Carya spp.*). However, over time, timber harvesting, deer browsing, and development have limited its growth. Today, remaining forested areas in the NMS tend to be dominated by red oaks (*Quercus rubra*), red maples (Acer rubrum), and tulip trees (*Liriodendron tulipifera*), a fast growing, deer resistant species that has established itself through successive cycles of clearing and regrowth.

Bethel Springs Elementary School trail running through an existing area of upland forest.

Though these areas have become highly fragmented, and are generally limited to creek valleys in the Naamans and Marcus Hook Creek watersheds, notable thickets exist along Spring Run in Bethel Township, around the Boothwyn Elementary School, and on various lands left over from residential development. The level of biological diversity within even a small swatch of preserved forest makes them an important conservation priority. In addition to development pressure and the prevalence of invasive species, one of the greatest threats to upland forests is the overpopulation of deer, which devour the understory of local woodlands, limiting the ability for new trees and other species to reestablish. Restoration and regeneration of this forest type will take generations of active management.

Coastal Plain Forest

The Atlantic Coastal Plain physiographic province in Pennsylvania covers only a narrow strip, approximately 1 to 5 miles in width, along the lower portion of the Delaware River

shoreline. Coastal plain forest habitat as well as freshwater tidal wetlands once covered portions of the DRC and areas farther inland. Both of these natural communities thrive on the wet, sandy soils along the River and were found in close proximity to one another prior to settlement. Coastal plain forests are marked by sweet-gum (*Liquidambar styraciflua*), oaks (*Quercus spp.*), and America beech (*Fagus grandifolia*), with an understory of small broadleaved evergreen trees and shrubs, such as American holly (*Ilex opaca*).

Today, only a few pockets of this forest type exist within the DRC, the most notable of which are within the John Heinz National Wildlife Refuge at Tinicum (Heinz Refuge) and the Tinicum Woods (see Areas of Significance section below). The remaining areas are in need of active restoration and face threats similar to the upland forests of the NMS watersheds.

Floodplain Forest

Floodplain forests are characterized by the presence of woodland areas in close proximity to floodplains and areas that receive periodic flooding. The tree species that thrive in the floodplain are adapted to the specific composition of the soils found there. Areas experiencing the most frequent flooding might contain sycamore (*Platanus occidentalis*), silver maple (*Acer saccharinum*), black walnut (*Juglans nigra*), and box elder trees (*Acer negundo*). Backwater areas can support swamp white oak (*Quercus bicolor*), pin oak (*Quercus palustrus*), and red maple trees (*Acer rubrum*), while areas along the river could have black willow (*Salix nigra*), river birch (*Betula nigra*), and smooth alder (*Alnus serrulata*), among others.

Once a common forest type in the County and Study Area, extensive development in the 100- and 500-year floodplains in both the NMS and DRC communities have made floodplain forests quite scarce, particularly along the River. Areas of floodplain forest continue to exist within the John Heinz National Wildlife Refuge and in small pockets along streams in the NMS. Areas currently maintained as lawn, particularly in the active floodplain of the streams in the Naamans and Marcus Hook Creek watersheds could be restored to native floodplain forest.

GRASSLANDS AND MEADOWS

Before Delaware County was colonized, non-forested portions of the NMS's landscape contained pockets of grasslands, meadows, and open fields. These habitats supported grass, wildflower, and other species similar to those found in the vast grasslands and meadows of the Midwest**.** Though naturally occurring, there is evidence that Native Americans maintained these meadows through controlled burning to prevent them from reverting to woodlands. This provided them with foraging and hunting grounds. Later, as the forests were cleared for fuel and agriculture by settlers, fields and meadows would have been common.

Today, there are a few small meadow and "old field" areas (successional habitats in transition from field back to forest) scattered throughout the NMS watersheds and in the Heinz Refuge that are comparable to this grassland habitat. These are found primarily along utility rights-of-way and on homeowners' association open space, often in the form of well-groomed lawns. Opportunities exist to convert these lawns to a more natural state.

FRESHWATER TIDAL MARSH AND MUDFLATS

Freshwater tidal marsh and mudflat areas occur in the zone between low and high tide on tidally-influenced water bodies. Of the estimated 10 to 20 square miles (6,400 to 12,800 acres) of freshwater tidal marsh that once covered Delaware County's lowlands along the River, only around 300 acres (2%-5%) remain. These areas are limited to the Heinz Refuge, Little Tinicum Island, and areas at the mouth of tidal tributaries to the Delaware River. Together, they comprise all that is left of the Tinicum Marsh. There is also a remnant tidal marsh located between S. Stewart and S. Sellers Avenues, across from the Boeing complex in Ridley Township.

Over the years, the Study Area's wetlands were drained and filled for agricultural, and later, industrial uses. Though much of the Delaware River shoreline is now armored to protect the industries, large expanses of flooded grasslands, dominated by wild rice and other aquatic and emergent species, once acted as a huge sponge, absorbing storm surges from the tidal Delaware, while also receiving and releasing waters from its inland tributaries. The remaining marsh areas continue to serve this important natural function (though to a much lesser degree), while providing crucial habitat and breeding grounds for a wide range of bird, mammal, and fish species. These marsh areas also serve as important rest stops for migratory birds along the Atlantic Flyway.

Freshwater mudflat areas are exposed at low tide and submerged at high tide, making the species that inhabit them uniquely adapted to the cyclical inundation. Generally, these wetlands are populated by rushes, sedges, and grasses, including various species of concern at the state level, such as annual wild rice (*Zizania aquatica*), beggar-ticks (*Bidens spp.*), broadleaf arrowhead (*Sagittaria latifolia*), hemlock water parsnip (*Sium suave*), jewelweed (*Impatiens capensis*), river bulrush (*Schoenoplectus fluviatilis*), salt-marsh water-hemp (*Amparanthus cannabinus*), and spatterdock (*Nufar lutea*), among others. Mudflats contain little-spike Spike rush (*Eleocharis parvula*), Wright's spike rush (*Eleocharis obtusa*), multi-flowered mud plantain (*Heteranthera multiflora*), subulate arrowhead (*Sagittaria subulata*), and long-lobed arrowhead (*Sagittaria calycina* var. *spongiosa*).

Today, these species are threatened by the expansion of suburban and industrial land uses and by the spread of invasive species, such as purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), and narrow leaf cattail (*Typha angustifolia*). Identifying areas that could accommodate the reestablishment of these wetland communities is very important. Restoration of riparian buffers to minimize the effects of pollution, sedimentation, and nutrient runoff will also help to strengthen their resiliency.

Efforts within the region to restore these vital habitats have yielded positive results and should be pursued as opportunities arise.

Though freshwater tidal marshes and mudflats are considered some of the highest priority habitats at the state level, other important wetland types, including spring seeps, occur in pockets throughout the Study Area. This is especially true in the NMS, along stream valleys and in areas where hydric soils exist.

AREAS OF SIGNIFICANCE

Specific sites identified within the NHI were ranked and prioritized by their ecological significance. This was done by analyzing the number, rarity, and ecological characteristics of all species of concern at a site, while considering the contiguousness and connectivity of the site. Among the highest priority habitats listed in the inventory are the freshwater tidal marshes and tidal mudflat areas of the Tinicum Marsh, which are home to a variety of species, found nowhere else in Pennsylvania. Though marsh areas have experienced increasing development pressure over the years, efforts to preserve, protect, and re-naturalize these areas have taken hold. The NHI also lists several important woodland areas in the NMS. The NHI recommends that these sites be preserved, and that special care taken to ensure that nearby development does not adversely affect them. Municipalities should utilize the NHI as a reference guide for preservation and land management techniques.

DELAWARE RIVER CORRIDOR

Exceptional Significance

With the exception of the Heinz Refuge, all of the significant natural areas in the Delaware River Corridor are located along the riverfront (refer to Map 6-1) Three of these areas are classified as being of "exceptional significance," which is the highest designation for resources identified in the NHI. By definition, these areas are important due to their biological and ecological integrity and the fact that they contain one or more species of concern or a rare natural community.

The **Darby Creek Mouth Mudflat**, located in Ridley and Tinicum Townships, consists of remnant freshwater tidal marsh and tidal mudflats near the confluence Darby Creek and the Delaware River (opposite Little Tinicum Island). Although mostly armored, there are still pockets of undeveloped shoreline among the various marinas located along the Essington (Tinicum) waterfront. Early successional vegetation has taken hold where abandoned or underutilized piers exist. Similarly, small mudflat areas have begun to form near the base of the retaining walls along the shoreline.

Little Tinicum Island is owned and managed by the Pennsylvania Department of Conservation and Natural Resources (DCNR), Bureau of Forestry, as part of the William Penn State Forest. It is surrounded by a freshwater intertidal mudflat community that supports numerous plant and animal species of concern, many of which are also found in the Darby Creek Mouth Mudflat. The marsh plants also include several species of concern that were unnamed in the NHI due to their sensitivity. Flora thrives more on the northern shore. The southern side experiences erosion from wave action caused by ships passing along the Delaware River. Little Tinicum Island also suffers from an accumulation of debris that washes up from storms and tidal inundation. Given the scarcity of freshwater tidal marshes and mudflats, protecting Little Tinicum Island is highly important.

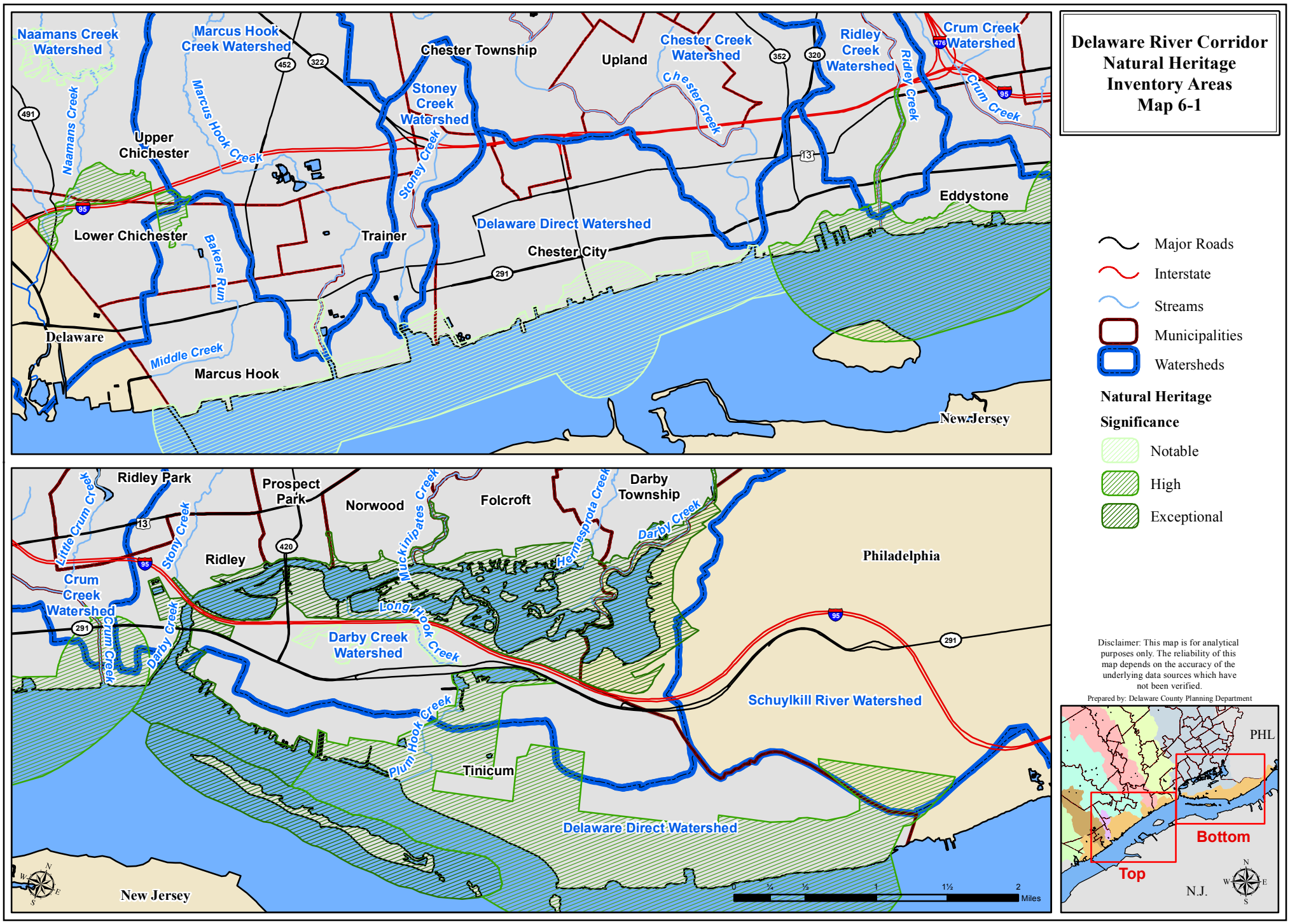
Intertidal mudflat on the north side of Little Tinicum Island. Image Source: Andrew Strassman (PNHP)

The **Heinz Refuge** was established by Congressional legislation in 1972 to protect the last remaining 200 acres of freshwater tidal marsh in Pennsylvania. Today, the Refuge covers approximately 1,000 of the 1,200 acres within its approved acquisition boundary, and is home to a variety of habitats that include open water (145 acre impoundment on Darby Creek), forests (upland and coastal plain), grasslands, wet meadows, and both tidal and non-tidal wetlands.

The Heinz Refuge is considered to be of "exceptional significance" based on the scarcity and remarkable biodiversity of this remaining tidal marsh habitat. The Refuge is also home to over 20 species of concern at the state level, several of which are unnamed in the NHI at the request of the jurisdictional agency responsible for their protection. These species are similar to those found at the Darby Creek Mouth Mudflat and on the north side of Little Tinicum Island. The *John Heinz National Wildlife Refuge at Tinicum Comprehensive Conservation Plan* (2012) contains a wealth of information about the Refuge and outlines direction for its strategic management.

High Significance

Sites classified as having "high significance" in the NHI contain species of concern or natural communities that are large and undisturbed enough that they may have strong potential for protecting important ecological resources.


Delaware River Corridor
Natural Heritage
Inventory Areas
Map 6-1
Naamans Creek Watershed
Marcus Hook Creek Watershed
Chester Township
Upland
Chester Creek Watershed
Ridley Creek Watershed
Crum Creek Watershed
Stoney Creek Watershed
Upper Chichester
Lower Chichester
Trainer
Chester City
Eddystone
Delaware
Marcus Hook
Delaware Direct Watershed
New Jersey
Ridley Park
Prospect Park
Norwood
Folcroft
Darby Township
Ridley
Crum Creek Watershed
Darby Creek Watershed
Philadelphia
Schuylkill River Watershed
Tinicum
Delaware Direct Watershed
New Jersey
0 ¼ ½ 1 1½ 2 Miles
Major Roads
Interstate
Streams
Municipalities
Watersheds
Natural Heritage Significance
Notable
High
Exceptional
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
PHL
Bottom
Top
N.J.

The **Airport Tidal Wetlands**, which stretch east from Tinicum to Philadelphia, contain fragments of freshwater tidal marsh. Although much of the Delaware River shoreline is armored in this area, the wetlands provide suitable habitat for numerous species of concern. Much of this wetland area has been altered (diked, walled, and filled) as a result of construction at the Philadelphia International Airport (PHL). However, the remaining wetlands still possess some aspects of the original tidal marsh, and thus remain biologically significant.

There are numerous species of concern found within the Airport Tidal Wetlands. The marsh wren (*Cistothorus palustris*) can be found in this area, while the least bittern (*Ixobrychus exilis*), Virginia rail (*Rallus limicola*), and northern harrier (*Circus cyaneus*) have been documented at this location in the recent past. The plants found in the freshwater marsh and mudflat areas strongly resemble those found in the Darby Creek Mouth Mudflat and Heinz Refuge. Like the Refuge, the area also supports several species of concern that are not listed, due to their sensitivity to human impacts and their breeding grounds.

The **Ridley Creek to Crum Creek Mouth Tidal Wetlands** site includes tidal marsh remnants found along the shoreline of the Delaware River. Like the Darby Creek Mudflats, this corridor is highly industrialized. The NHI documents areas of deteriorating, industrialized shoreline that may provide opportunities for successional vegetation to grow. Additionally, abandoned pilings, piers, and ramps serve as a buffer from waves, and may help to promote reestablishment of tidal mudflats. A number of species of concern can be found here, including ospreys (*Pandion haliaetus*), peregrine falcons (*Falco peregrinus*), and wild rice (*Zizania aquatica*).

Notable Significance

The area of freshwater tidal marsh and mudflats along the Delaware River shoreline from **Marcus Hook to the Commodore Barry Bridge in Chester** is classified as "notable significance." Areas falling within this category contain species of lower ranking concern, habitats that are not as critically impaired as higher ranked areas, or are compromised by activity or disturbance. This area is similar to the other marsh and mudflat areas previously discussed in terms of species, threats, and opportunities for reestablishment of vegetation. It is worth noting that peregrine falcons nest on the structural supports of Chester's Commodore Barry Bridge, while ospreys can be found in areas where shallow waters and nesting support structures are available. This is a testament to the ability of these animals to survive despite extensive habitat modification by humans.

Tinicum Woods consists of a series of small patches of fragmented woodlots and open fields located between I-95 and Route 291, near Westinghouse Village in Tinicum Township. These lots are representative of the coastal plain forest type once common to the area. These areas, though still recovering from past clearing, are marked by sweetgum (*Liquidambar styraciflua*) and pin oak (*Quercus palutris*), as well as southern red oak (*Quercus falcata*) and willow oak (*Quercus phellos*), both species of concern. Open wet

fields are populated by shrubby camphorweed (*Pluchea odorata*) and common reed (*Phragmites australis*), an invasive species. The greatest threats to Tinicum Woods are the introduction of invasive species and the alteration of site hydrology by nearby activity because of the plant species' preference for soggy conditions. Much of this habitat area is owned and managed as public open space by Tinicum Township.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

The NHI identified several important sites in the Naamans Creek watershed (refer to Map 6-2). Despite the fact that many of them have been disturbed by recent development activities, they still feature a range of habitats that support a variety of plant and animal species of concern.

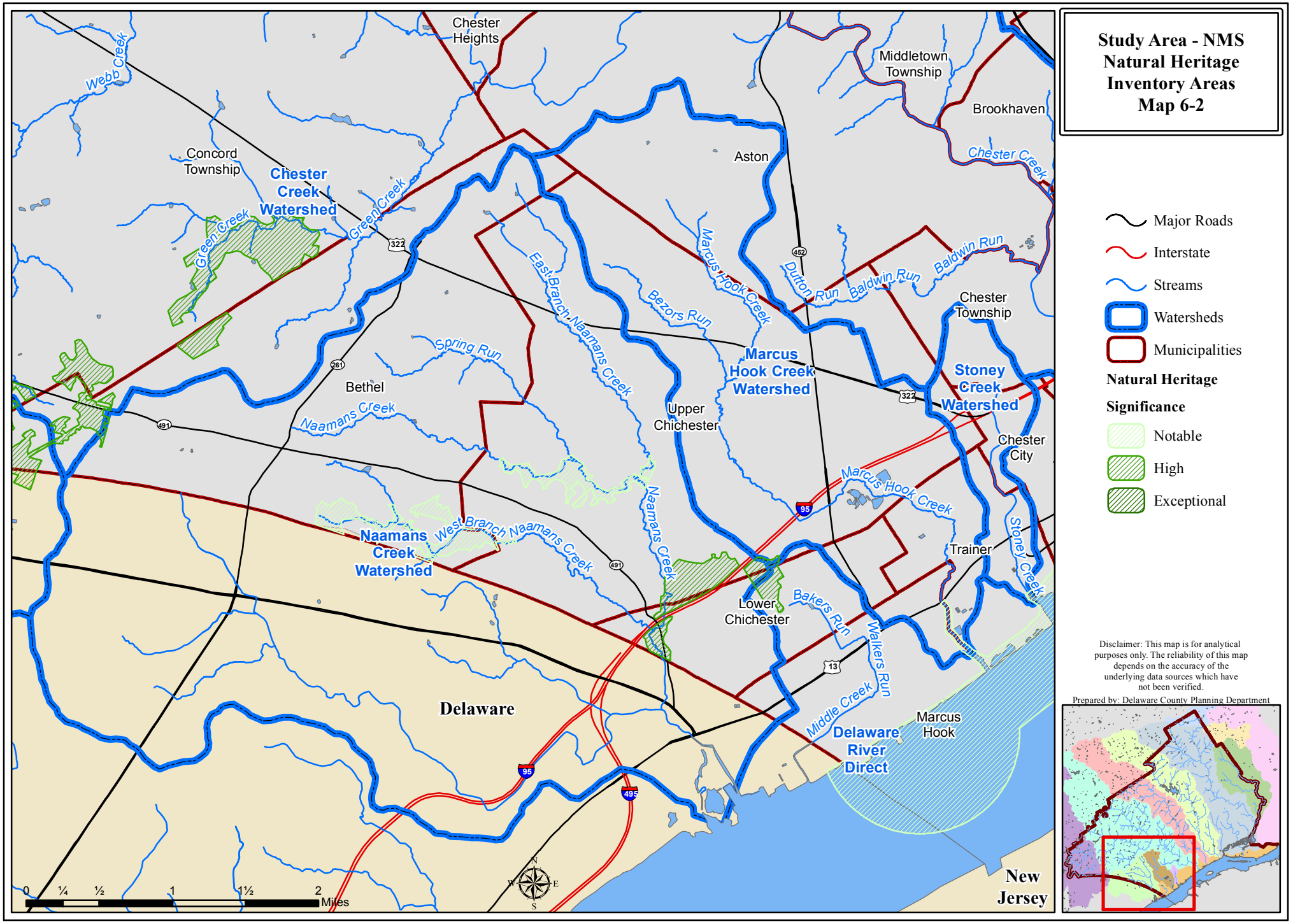
High Significance

Johnsons Corner/Naamans Creek Road is listed in the NHI as an area of high significance loosely bounded on the west by Route 202, on the north by Shavertown Road, on the east by Ebright Road, and on the south by the Delaware State Line. This area is at the drainage divide of three watersheds and hosts the headwaters of two tributaries of the West Branch Chester Creek and one tributary of Beaver Creek. Considered one of the top sites of statewide significance in the *Delaware County Natural Areas Inventory* (1992, 1998 update), the site has since been severely impacted by accelerated development over the past 20 years. Despite this, its remnants continue to contain 17 species of concern.

Naamans Creek Woods constitutes fragmented woodlots and fields that straddle Interstate 95 at the Pennsylvania-Delaware state line. It contains a mosaic of small patches of upland forest, forested wetlands, open wetlands, spring seeps, successional old fields and utility rights-of-way. Recent construction of a new school on the north side of I-95 has eliminated much of the available habitat for the species of concern known from this site. The remaining habitat should be set aside as essential habitat for species of concern and can be compatible with passive recreation. Among the noted species of concern are grass-leaved goldenrod (*Euthamia tenuifolia*), and small-flowered false-foxglove (*Agalinis paupercula*), both of which are critically imperiled at the State level.

Notable Significance

The **Naamans Creek near Ogden** site is a disturbed upland forest riparian corridor located along Naamans Creek, just north of Naamans Creek Road in Upper Chichester. Residential development has reduced riparian buffer widths and impacted habitat value. However, the site still contains autumn bluegrass (*Poa autumnalis*), a species of concern that tends to grow in moist deciduous forests, spring seeps, and along stream banks. Much of this area is maintained as homeowners' association open space and as Township-owned open space.


Study Area - NMS
Natural Heritage
Inventory Areas
Map 6-2
Major Roads
Interstate
Streams
Watersheds
Municipalities
Natural Heritage
Significance
Notable
High
Exceptional
Chester Heights
Middletown Township
Brookhaven
Aston
Concord Township
Chester Creek Watershed
Webb Creek
Green Creek
Chester Creek
Marcus Hook Creek
Dutton Run
Baldwin Run
East Branch Naamans Creek
Bezors Run
Chester Township
Spring Run
Marcus Hook Creek Watershed
Stoney Creek Watershed
Bethel
Naamans Creek
Upper Chichester
Chester City
Marcus Hook Creek
Naamans Creek Watershed
West Branch Naamans Creek
Naamans Creek
Trainer
Stoney Creek
Lower Chichester
Bakers Run
Walkers Run
Middle Creek
Delaware
Delaware River Direct
Marcus Hook
New Jersey
0 ¼ ½ 1 1½ 2 Miles
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Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department

Sun Oil Woods lies along the border of Bethel and Upper Chichester Townships, adjacent to the Delaware state line. Once a strong example of a coastal plain forest community, residential and commercial development have altered and fragmented the forested and open field habitats to the point where they are no longer a truly functional natural area. Despite this, an unnamed species of concern may still be found at the site.

NATIVE VEGETATION

Site conditions such as soil type, proximity to water, and amount of sun are all variables that dictate the types of plants found on a particular site. Development has drastically altered many woodlands, meadows, wetlands, and floodplains of the Study Area, and significantly decreased the diversity of plant species. While a comprehensive area-wide native plant inventory was not conducted, the United States Department of Agriculture's National Resource Conservation Service maintains a state-specific database of native plants.

LANDSCAPING WITH NATIVE PLANTS

In recent years, the movement toward landscaping with native plants has steadily gained momentum. Native plants can be used in habitat and riparian buffer restoration efforts, as well as in landscaping projects. In addition to their aesthetic benefits, native plants are valuable sources of food and habitat for native animals. Since native plants are adapted to the ecosystem, they are able to endure extreme climate conditions more readily than non-native plants. Due to their popularity, an increasing number of local nurseries have started propagating and selling native plants.

For more information about native plants, refer to the PA DCNR user-friendly guide, *"Landscaping with Native Plants in Pennsylvania,"* available for download at: http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_003304.pdf .

INVASIVE PLANTS

Invasive plants pose a significant threat to the ecological well-being of the Study Area. As the name suggests, invasive species are not native to the area and typically propagate by aggressively spreading seeds, runners, and rhizomes to compete with native plant species. Most invasive plants, which can include trees, shrubs, herbs, and vines, arrive from outside of North America. Additionally, non-native plants are frequently used for landscaping. This particular issue continues to challenge land managers and property owners.

Japanese knotweed (*Polygonum cuspidatum*) along Marcus Hook Creek in Trainer.

Due to their ability to grow and spread aggressively, invasive plants compete with native species and are capable of displacing them from natural communities. Additionally, they offer little to no habitat or food for native animals and birds. Consequently, they contribute to displacement of local wildlife. Disturbed sites are also vulnerable to invasive plant proliferation. This poses a significant threat to managing environmentally sensitive lands, particularly in important habitat areas.

There are many invasive plants located in the Study Area. Some of the most common species found locally include garlic mustard (*Alliaria petiolata*), common reed (*Phragmites australis*), multiflora rose (*Rosa multiflora*), tree of heaven (*Ailanthus altissima*), Japanese knotweed (*Polygonum cuspidatum*), mile-a-minute (*Polygonum perfoliatum*), and purple loofestrife (*Lythrum salicaria, L. virgatum*). The DCNR brochure, *Invasive Plants in Pennsylvania*[1], offers a thorough inventory of invasive plants found throughout the Commonwealth, available for download at: http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_003492.pdf .

Land management efforts should be undertaken to remove invasive species and replace them with native plants, especially near habitats of concern and other natural areas. Tables 6-1 through 6-5 outline some of the most serious threats to southeastern Pennsylvania's native communities. Pennsylvania also has a noxious weed law that prevents the propagation, sale, or transport of several weed species. Due to their ongoing introduction; however, this list will change as the number of invasive plants continues to grow.

TABLE 6-1
INVASIVE FLOWERS

SCIENTIFIC NAME	COMMON NAME	PA NOXIOUS WEED
Alliaria petiolata	Garlic mustard	
Carduus nutans	Musk thistle	✓
Cirsium arvense	Canada thistle	✓
Cirsium vulgare	Bull thistle	✓
Datura stamonium	Jimsonweed	
Galega officinalis	Goatsrue	✓ (also federal noxious weed)
Lythrum salicaria, L. virgatum	Purple loosestrife	✓
Polygonum cuspidatum	Japanese knotweed	
Trapa natans	Water chestnut	

Source: PA DCNR, *Invasive Plants in Pennsylvania,* 2006

[1] To view the brochure *Invasive Plants in Pennsylvania*, published by the Pennsylvania Department of Conservation and Natural Resources, visit: http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_003492.pdf .

TABLE 6-2
INVASIVE GRASSES

SCIENTIFIC NAME	COMMON NAME	PA NOXIOUS WEED
Bromus tectorum	Cheatgrass	
Microstegium vimineum	Japanese stilt grass	
Miscanthus sinensis	Maiden grass	
Phragmites australis	Common reed	
Sorghum bicolor ssp. *drummondii*	Shattercane	✓
Sorghum halepense	Johnson Grass	✓

Source: PA DCNR, *Invasive Plants in Pennsylvania,* 2006

TABLE 6-3
INVASIVE SHRUBS

SCIENTIFIC NAME	COMMON NAME	PA NOXIOUS WEED
Elaeagnus umbellata	Autumn olive	
Euonymus alatus	Winged euonymus	
Lonicera maackii	Amur honeysuckle	
Lonicera morrowii	Morrow's honseysuckle	
Lonicera standishii	Standish honeysuckle	
Lonicera tatarica	Tartarian honeyuckle	
Rosa multiflora	Multiflora rose	✓
Spiraea japonica	Japanese spiraea	
Viburnum opulus var. *opulus*	Guelder rose	

Source: PA DCNR, *Invasive Plants in Pennsylvania,* 2006

TABLE 6-4
INVASIVE TREES

SCIENTIFIC NAME	COMMON NAME	PA NOXIOUS WEED
Acer platanoides	Norway maple	
Acer pseudoplatanus	Sycamore maple	
Alainthus altissima	Tree of heaven	
Paulownia tomentosa	Empress tree	
Pyrus calleryana	Callery pear	

Source: PA DCNR, *Invasive Plants in Pennsylvania,* 2006

TABLE 6-5
INVASIVE VINES

SCIENTIFIC NAME	COMMON NAME	PA NOXIOUS WEED
Celastrus orbiculatus	Oriental bittersweet	
Lonicera japonica	Japanese honeysuckle	
Polygonum perfoliatum	Mile-a-minute	✓
Pueraria lobata	Kudzu	✓

Source: PA DCNR, *Invasive Plants in Pennsylvania,* 2006

WILDLIFE

OBJECTIVE BR-2: TO PROTECT WILDLIFE THROUGH IMPLEMENTATION OF SUSTAINABLE LAND AND WATER CONSERVATION PRACTICES THAT PRESERVE AND PREVENT FRAGMENTATION OF IMPORTANT HABITAT AREAS

Despite the highly developed nature of the Study Area, the DRC and NMS continue to host a variety of mammals, birds, and aquatic wildlife. In general, the Delaware River Corridor is better suited for bird and aquatic species, while the less urbanized areas of the NMS are more likely to provide habitat for native mammals.

MAMMALS

Delaware County was once home to many mammals, including cougars, wolves, and seals. They are no longer found due to the effects of overhunting or displacement resulting from development, and urbanization. Today, the most visible mammal in the Study Area is the white tailed deer (*Odocoileus virginianus*), which overpopulates many of the remaining woodlands and other habitats, devouring the understory and inhibiting regrowth. Other common mammals in the Study Area include the raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), grey squirrel (*Sciurus carolinensis*), Virginia possum (*Didelphis virginiana*), and chipmunk (*Tamias striatus*). The meadows and grasslands in the NMS also provide habitat for the eastern cottontail rabbit (*Sylvilagus flordianus*), groundhog (*Marmota monax*), and meadow jumping mouse (*Zapus hudsonius*). According to the NHI, none of these animals are at risk of disappearing from the landscape.

While the NMS area has managed to retain certain mammal species, the same cannot be said for DRC. Large scale disturbance of this highly urbanized area has pushed many species farther inland, away from the River. However, more adaptive, scavenger species such as raccoons, possums, and even feral cats remain, and seemingly thrive, in these areas. Despite the general lack of habitat, many of the same common mammals noted above, and others such as river otters (*Lontra canadensis*), beavers (*Castor canadensis*), and muskrats (*Ondatra zibethicus*), can be found in the Heinz Refuge and on Little Tinicum Island. Additionally, deer and other animals have been known to swim across the back channel of the river and onto the shores of the Island.

BIRDS

Due to the Study Area's location along the Atlantic Flyway, many migratory birds are found there. The number and types of species varies depending on the time of year. Additionally, species vary depending on the specific habitat (e.g., urban, forested, grassland, wetland, open water).

Common bird species found throughout the Study Area include various types of warblers, flycatchers, swallows, and orioles. Additionally, different species of herons, egrets, cormorants, and gulls can also be found along the riverfront. The NHI notes that peregrine falcons (*Falco peregrinus*) have been seen nesting on the Commodore Barry Bridge and that osprey (*Pandion haliaetus*) can be found nesting along the Delaware River in Tinicum. A great egret (*Ardea alba*) rookery, perhaps commandeered by red-tailed hawk (*Buteo jamaicensis*), has been spotted on Little Tinicum Island. Great horned owl (*Bubo virginianus*) and wild turkey (*Meleagris gallopavo*) have also been seen on the island.

The Heinz Refuge is a haven for birds and birdwatchers, attracting more than 300 species, including great blue heron (*Ardea Herodias*), American bittern (*Botaurus lentiginosus*), least bittern (*Ixobrychus exilis*), and even American bald eagles (*Haliaeetus leucocephalus*).

AQUATIC SPECIES

As with other animal species, there is a difference between the aquatic wildlife found in the Delaware River and wildlife in inland waterways. Table 6-6 provides an overview of fish that can be found in the Delaware River. It also indicates anadromous species that migrate from the Atlantic Ocean to spawn in the fresh water of the Delaware Estuary. Table 6-7 lists fish that are more common in warm water fishes (WWF), like those of the NMS watersheds.

TABLE 6-6
DELAWARE RIVER FISH SPECIES

SCIENTIFIC NAME	COMMON NAME	ANADROMOUS SPECIES
Alosa sapidissima	American shad	✓
Alosa aestivalis	Blueback herring	✓
Ameiurus catus	White catfish	
Dorosoma cepedianum	Gizzard shad	✓
Fundulus diaphanus	Banded killifish	
Hybognathus regius	Eastern silvery minnow	
Ictalurus punctatus	Channel catfish	
Morone americana	White perch	
Morone saxatilis	Striped bass	✓

Source: Delaware County NHI, 2011

TABLE 6-7
WARM WATER COMMUNITY FISH SPECIES

SCIENTIFIC NAME	COMMON NAME
Ambloplites rupestris	Rock bass
Anguilla rostrata	American eel
Cyprinella analostana	Satinfin shiner
Cyprinella spiloptera	Spotfin shiner
Cyprinus carpio	Common carp
Etheostoma olmstedi	Tessellated darter
Lepomis spp.	Sunfish
Luxilus cornutus	Common shiner
Micropterus dolomieu	Smallmouth bass
Micropterus salmoides	Largemouth bass
Notropis hudsonius	Spottail shiner
Notrpopis procne	Swallowtail shiner
Percina peltata	Shield darter
Pimephales notatus	Bluntnose minnow

Source: Delaware County NHI, 2011

REPTILES AND AMPHIBIANS

A number of reptiles and amphibian species are commonly found throughout Delaware County, particularly near waterways. According to the NHI, these species include the eastern garter snake (*Thamnophis sirtalis*), bull frog (*Lithobates catesbeianus)*, green frog (*Lithobates clamitans*), red-spotted newt (*Notophthalmus viridescens)*, painted turtle (*Chrysemys picta)*, and snapping turtle (*Chrysemsys serpentine*).

Other species found along the Delaware River include the map turtle (*Graptemys geographica*), southern leopard frog (*Lithobates sphenocephalus)*, a State endangerd species, and eastern redbelly turtle (*Pseudemys rubriventris*), a State threatened species. The eastern box turtle (*Terrapene carolina*) may still be found in woodlands of the NMS, but sightings are very rare.

INVASIVE ANIMALS

Just as invasive plants compete with native plants, invasive animals also pose negative impacts to native animal populations. Unfortunately, invasive animals are often released into the ecosystem for hunting or fishing. Pets released into the wild can also be a type of invasive animal. Invasive animals can include mammals, bird, fish, and reptiles, as well as invertebrates like mussels and crayfish.

Among the Study Area's more recognizable invasive animals are the Norway rat (*Rattus norvegicus)*, house mouse (*Mus musculus*), red eared slider turtle (*Trachemys scripta*), European starling (*Sturnus vulgaris*), common carp (*Cyprinus carpio*), house sparrow (*Passer domestricus*), and zebra mussel *(Dreissena polymorpha*). Continued proliferation of these species will threaten native fish and wildlife communities, further impacting the

Study Area's environmentally sensitive areas. A more detailed discussion of invasive animal species and their threats to Delaware County's natural resources can be found in the NHI, along with recommendations for dealing with these species.

The Pennsylvania Fish and Boat Commission (PFBC) also maintains a list of banned aquatic species that prohibits their sale, barter, possession, or transportation (refer to Table 6-8).

TABLE 6-8
AQUATIC SPECIES BANNED IN PENNSYLVANIA

SCIENTIFIC NAME	COMMON NAME
Channa argus	Snakehead
Dreissena bugensis	Quagga mussel
Dreissena polymorpha	Zebra mussel
Gymnocephalus cernuus	Ruffe
Hypophtalmichtys molitrix	Silver carp
Hypophtalmichtys nobilis	Bighead carp
Mylopharyngodon piceus	Black carp
Neogobius melanostomus	Round goby
Orconectes rusticus	Rusty crayfish
Proterothinus marmoratus	Tubenose goby
Scardinius erythropthalmus	European rudd

Source: PFBC

PENNSYLVANIA NATURAL DIVERSITY INVENTORY SPECIES

The Pennsylvania Natural Diversity Inventory (PNDI) is a tool that identifies threatened, endangered, or rare plants, animals, natural communities, and geologic features. As an environmental review function of the Pennsylvania Natural Heritage Program, the PNDI is used during the PA Department of Environmental Protection (DEP) permitting process to identify potential adverse impacts associated with a project. As a function of this plan, PNDI submissions were sent to:

- DCNR's Bureau of Forestry, Ecological Services Section
- Pennsylvania Game Commission (PGC), Bureau of Wildlife Habitat Management
- PFBC, Natural Diversity Section
- U.S. Fish and Wildlife Service (USFWS)

The USFWS report stated that "no federally listed species under its jurisdiction is known or likely to occur in the Project Area." It added that if additional information on listed species becomes available, the determination may be reconsidered.

The PNDI analysis completed by DCNR's Bureau of Forestry screened the Project Area for "potential impacts to species and resources of concern under DCNR's responsibility,

which includes plants, terrestrial invertebrates, natural communities, and geologic features." The Delaware River Corridor provides habitat for a wide variety of plants, many of which are found in tidal wetland areas. In fact, the PNDI designated the freshwater intertidal mudflat community as a "community of concern." PNDI species identified by DCNR, the Pennsylvania Fish and Boat Commission, and the Pennsylvania Game Commission (PGC) can be found in Tables 6-9 through 6-11.

TABLE 6-9
PNDI SPECIES DESIGNATED BY THE PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

SCIENTIFIC NAME	COMMON NAME	POTENTIAL HABITAT	LOCATION	DIRECT DRAINAGE	NAAMANS CREEK	MARCUS HOOK CREEK	STONEY CREEK
Agalanis paupercula	Small-flowered false-foxglove	Moist, sandy fields, rocky shores, and serpentine barrens	DRC/NMS	V	D	V	
Aletris farinose	Colic root	Moist clearings			V		
Amaranthus cannabinus	Waterhemp ragweed	Uppermost zone of freshwater intertidal marsh	DRC/NMS	D		V	V
Amelanchier canadensis	Service berry	Moist woods and swamps	NMS		V		
Aristida dichotoma var. *curtissii*	Three-awned grass	Dry, open, or sterile soil	DRC/NMS	D			
Baccharis halimifolia	Eastern baccharis	Native to tidal marshes	DRC/NMS	D	D		
Bidens bidentoides	Swamp beggar-ticks	Tidal shores and mudflats	DRC	D			
Bidens laevis	Beggar-ticks	Wet meadows and stream or pond edges	DRC	D			
Cuscuta pentagnoa	Field Dodder		DRC	V			
Dichanthelium scoparium	Velvety panic-grass	Moist meadows and swales	DRC	D			
Echinochloa walteri	Walter's barnyard-grass	Tidal marshes and mudflats in coastal plain areas	DRC	D			
Eleocharis obtuse var. *peasei*	Wrights spikerush	Tidal shores and mudflats	DRC	D			
Eleocharis parvula	Little spike spikerush	Tidal shores and mudflats	DRC	D			
Eupatorium rotundifolium	Roundleaf thoroughwort	Sandy or clayey fields and open thickets	DRC/NMS	D	D	V	
Euthamia tenuifolia	Grass-leaved goldenrod	Most, sandy, or clayey fields	DRC/NMS	D	D	V	
Gentiana saponaria	Soapwort gentian	Moist, open woods, roadsides, and wetlands	DRC/NMS	V	D	V	
Heteranthera multiflora	Multi-flowered mud plantain	Tidal shores and mudflats	DRC	D			
Juncus biflorus	Grass-leaved rush	Moist, open woods, boggy fields, gravel pits, and ditches	DRC/NMS	V	D	V	
Juncus dichotomus	Forked Rush		DRC	V			
Leucothoe racemosa	Swamp dog-hobble	Wet woods and thickets	DRC/NMS	V	D	V	
Lobelia puberula	Downy lobelia	Moist, sandy soil of old fields, gravel pits, and serpentine barrens	NMS		D		
Lycopus rubellus	Bugleweed	Bogs, river banks, pond margins, and wet ditches	DRC	D			
Lyonia mariana	Stagger-bush	Dry woods and serpentine barrens	DRC	D			
Oxypolis rigidior	Stiff cowbane	Wetlands, bogs, sedge meadows, sandy shores, and abandoned railroad beds	NMS		V		
Poa autumnalis	Autumn bluegrass	Moist woods	NMS		D	V	
Pluchea odorata	Shrubby camphor-weed	Tidal mudflats, wet ditches, and railroad ballasts	DRC	D			
Polygala cruciata	Cross-leaved milkwort	Boggy pastures	NMS		V		
Quercus falcata	Southern red oak	Dry to moist woods	DRC	V			
Quercus michauxii	Swamp chestnut oak	Moist to wet woods	NMS		V		
Quercus phellos	Willow oak	Moist to wet woods	DRC/NMS	D	D	V	
Sagittaria calycina var. *spongiosa*	Long-lobed arrowhead	Tidal mudflats	DRC	D			
Sagittaria subulata	Subulate arrowhead	Tidal shores and mudflats	DRC	D			
Schoenoplectus fluviatilis	River bulrush	Moist, sandy shores and marshes (tidal and non-tidal)	DRC/NMS	D		V	V
Schoenoplectus smithii	Smith's bulrush	Freshwater intertidal marshes	DRC	D			
Senna marilandica	Wild Senna		DRC	V			
Spiranthes vernalis	Spring ladies' tresses	Moist, open, sandy soils and serpentine barrens	NMS		V		
Tipularia discolor	Cranefly orchid	Deciduous forests and stream banks	NMS		D		
Triplasis purpurea	Purple sandgrass	Dry, open, sandy soils	DRC	D			
Zizania aquatic	Indian Wild Rice		DRC	D			

Note: "D"=indicates that the species occurs directly inside the watershed; "V" indicates that the species is known within a half-mile of the watershed.
Source: DCNR

TABLE 6-10
PNDI SPECIES AS DESIGNATED BY THE PENNSYLVANIA FISH AND BOAT COMMISSION

SCIENTIFIC NAME	COMMON NAME	PA STATUS
Anaxyrus fowleri	Fowler's toad	Species of concern
Enneacanthus obesus	Banded sunfish	Endangered
Gasterosteus aculeatus	Threespine stickleback	Endangered
Lithobates sphenocephalus	Southern leopard frog	Endangered
Pseudemys rubriventris	Eastern redbelly turtle	Threatened
Umbra pygmaea	Eastern mudminnow	Candidate

Source: PFBC

TABLE 6-11
PNDI SPECIES AS DESIGNATED BY PENNSYLVANIA GAME COMMISSION

SCIENTIFIC NAME	COMMON NAME	PA STATUS
Ardea alba	Great egret	Endangered
Ardea herodias	Great blue heron	Special concern
Asio flammeus	Short-eared owl	Endangered
Casmerodius albus	Great egret	Endangered
Cistothorus palustria	Marsh wren	Special concern
Falco peregrinus	Peregrine falcon	Endangered
Ixobrychus exilis	Least bittern	Endangered
Pandion halaetus	Osprey	Threatened

Source: PGC

RECOMMENDATIONS

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR AND THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

BR-1 Amend zoning and subdivision land development ordinances to promote sustainable land development practices to minimize or mitigate potential impacts of development on natural communities.

BR-2 Preserve and enhance sensitive natural communities and wildlife areas through proactive planning and land management.

BR-3 Utilize the Natural Heritage Inventory (NHI) to prioritize preservation areas and land management techniques.

CHAPTER 7
OPEN SPACE AND RECREATION RESOURCES

OPEN SPACE AND RECREATION GOAL:
TO PRESERVE, ENHANCE, AND CAPITALIZE ON THE STUDY AREA'S OPEN SPACE AND RECREATIONAL OPPORTUNITIES

OPEN SPACE VALUES AND TYPES

OPEN SPACE VALUES

Open space includes developed or undeveloped and public or private protected land that is used for recreational, scenic, and environmental purposes. The presence of open space plays an important role in how residents perceive their communities, and it benefits quality of life in many ways. Open space offers a place to connect with nature, interact with other community members, and engage in physical activities. It also enhances an area's livability by offering a place for people to come together, and provides psychological and visual relief from the built environment. From an ecological perspective, open space provides several benefits. Open space can absorb floodwaters, assist with groundwater recharge, and provide valuable habitat for wildlife. There is also a notable cooling effect associated with open space, helping to reduce ambient temperatures, which are often elevated by the urban heat island effect that results from the presence of large expanses of paving or impervious cover, typically associated with dense development.

The Delaware Valley Regional Planning Commission's (DVRPC) study, *Return on Environment - The Economic Value of Protected Open Space in Southeastern Pennsylvania* (2010), further details the economic, environmental, and public health benefits of open space. Among the study's findings were that open space increases the value of southeastern Pennsylvania's housing stock, provides relief from costs associated with environmental services (such as flood protection), and reduces public health costs due to the recreation that takes place on the open space. There is also data that ties the provision of open space into job creation, particularly in areas with economic development and tourism opportunities.

Related to open space is the issue of public access to natural and cultural resources, which includes three interrelated aspects. *Waterfront Revitalization for Small Cities* (1990) lists three separate means of access: 1) *physical* access to and along the water's edge; 2) *visual* access to and from viewpoints or through view corridors and easements; and 3) *interpretive* access through programs and signage that provide information about an area's historic, cultural, and natural resources. While most people are familiar with physical and interpretive access, visual access can be overlooked. There is an emerging trend of preserving viewsheds, which are visible areas of land, water, or other

environmental features that are visible from a specific vantage point. A viewshed could also include a unique historic or cultural feature.

Considering the highly developed nature of the Delaware River Corridor (DRC) and private landholdings along waterways in the Naamans-Marcus Hook-Stoney Creek watersheds (NMS) municipalities, public access to creeks and other waterways is very limited within the Study Area. Aside from providing a means for boating or other water-based recreational activities, access to the water is essential for building a greater sense of watershed stewardship. The greater the access people have to their streams and rivers, the more likely they will be to engage in efforts to conserve and protect them.

OPEN SPACE TYPES

The term open space generally refers to all undeveloped land. Different ownership type, accessibility, and available facilities determine the various subcategories. These include public (government-owned) and private open space (owned by individuals or businesses). School and institutional fields, playgrounds, and natural lands, could fall under a sub-category of "quasi-public." Members-only clubs with open space and recreational facilities are technically private open space.

Most public open spaces are referred to as a "park" or "parkland" except in some cases where there are natural spaces that do not contain trails or other access. Generally speaking, parks are public open spaces that exist for the enjoyment and benefit of all residents. A parks system is often a key element in local and regional revitalization initiatives in that they can be a very effective draw for new residents and businesses. This is particularly true in older urban areas where blighted or underutilized buildings can be razed and the land reused for recreation or a pocket park. By incorporating public open space into redevelopment projects, municipalities are able to not only restore jobs and property values, but also enhance community aesthetics and residents' sense of place and pride in where they live.

The following are several categories of public open spaces and/or parks highlighted in the DRC and NMS sections of this chapter. Appendix D of this plan contains an inventory of the open space and recreation facilities identified in the Study Area. It should be noted that some parks contain multiple facilities that fall under more than one category. Municipalities in both Study Areas should continue to encourage all types of recreation in municipal park systems.

Active Recreation/Parkland

Active parks and recreation facilities generally include parks with play fields such as ball fields, basketball courts, tennis courts, and playgrounds. Athletic fields sometimes, but not always, meet specifications for league play.

Passive Parkland

Amenities in passive parks are often limited to walking/running trails, picnic and pavilion areas, interpretive signage displays, and other basic features. Walking, running, picnicking, fishing, and enjoying nature are typical activities enjoyed in these parks.

While active and passive uses can occur in the same park, it is also important to have designated passive wooded and other natural areas that can be used as an escape from the built environment. Passive parkland is often set aside during the development process and dedicated to the municipality. However, it can also be created through the redevelopment process or through conversion of vacant lots in urbanized areas.

Pocket Parks

Pocket parks are generally found on small lots within urban and residential neighborhoods. They often have trees to provide shade, benches, and sometimes playground equipment. A pocket park can serve as a visual amenity, a place to stay cool in the summer heat, and a location for the community to interact and for children to play.

Urban Gardens

As seen in recent years throughout Philadelphia and its outlying areas, vacant and underutilized properties are now being utilized as public gardens. They have become increasingly popular places for residents to grow healthy, local food, while creating a strong sense of community.

Homeowners' Association Land

Land use in the upper portions of the NMS generally follows a more suburban pattern than the lower end of the area. Many of the residential areas were developed relatively recently on larger lots, and include community open space owned and managed by a respective development's homeowners' association (HOA). The land reserved for open space often includes steep slopes, wooded areas, and floodplains, all of which are best suited for passive use. In some cases, these areas contain many of the NMS' most valuable natural resources, including woodlands, groundwater recharge areas, and plant and wildlife habitats. HOA properties often include nature trails that wind through the open space and/or connect to homes within the development.

Private Clubs

Private clubs generally provide recreational facilities or programs on a "members-only" basis. Typical examples of private clubs include swim, archery, golf, gymnasium, and similar types of facilities.

Commercial Recreation

Commercial recreation facilities are private indoor and outdoor open spaces and recreation areas that are generally open to the public for a fee versus requiring a membership. While not part of the conventional open space or recreational network, such establishments should not be overlooked, given their popularity and contribution to the overall recreational inventory of a community. However, it should be noted that they are not permanent, as they tend to come and go based on local market demand and their success as a business.

OPEN SPACE IN THE STUDY AREA

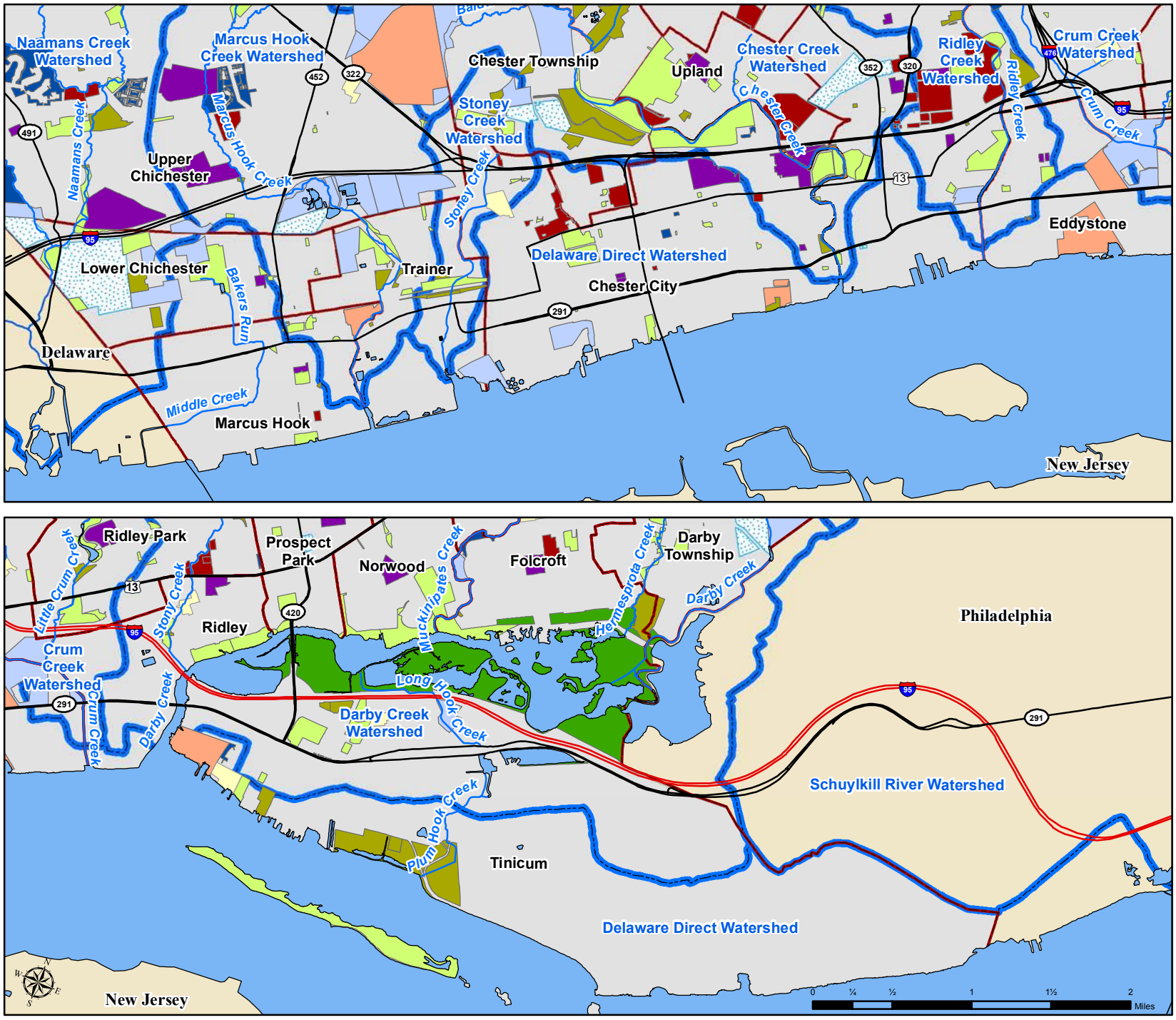
OBJECTIVE OS-1: TO INCREASE THE AMOUNT OF OPEN SPACE IN THE STUDY AREA, WITH AN EMPHASIS ON PRESERVING WOODLANDS, AGRICULTURAL LAND, AND PUBLIC ACCESS TO WATERWAYS

DELAWARE RIVER CORRIDOR

In the past, intensive industrial development along the Delaware River disconnected the DRC communities from the shoreline, and associated residential development in the area limited available acreage for open space (refer to map 7-1). Today, riverfront redevelopment is providing opportunities for the DRC communities to acquire land for open space. There are several major riverfront parks, as well as a number of smaller open spaces in the communities. Such green space is an integral component of the DRC's plans for revitalization.

Major riverfront parks in the DRC include Market Square Memorial Park in Marcus Hook, Barry Bridge Park in Chester, and Governor Printz Park in Tinicum. The John Heinz National Wildlife Refuge at Tinicum (Heinz Refuge), located just outside the Study Area on Darby Creek, as well as Little Tinicum Island, located in the Delaware River just offshore from Tinicum Township, are premier natural areas. Many of these parks are well-used and serve as the few public places in Delaware County where people can take in expansive views of freshwater tidal wetlands or the River. Since 2003, the Delaware riverfront and Darby Creek municipalities, along with the Heinz Refuge and other stakeholders, have organized a popular annual riverfront festival to bring more people to the riverfront.

There are a limited number of parks with active recreation facilities in the DRC. They generally include ball fields, basketball courts, and playgrounds, all of which experience heavy use. With the exception of the large riverfront parks, the DRC has relatively little passive parkland. Although the area is highly developed and land area for parks is limited; redevelopment provides an opportunity to create new open space, and generally "re-green" the area. There are a number of pocket parks located throughout the DRC portion of the Study Area.



Delaware River Corridor Open Space Map 7-1

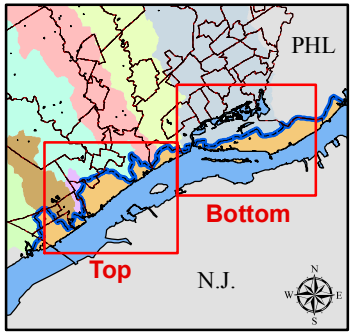
- Major Roads
- Interstate
- Streams
- Municipalities
- Watersheds

Open Space

- Commercial Open Space
- Federal
- Institutional Open Space
- Passive Public Parkland
- Active Public Parkland
- Private Open Space
- Homeowners' Association
- Private Outdoor Rec. Facility
- School Grounds/Ballfields
- Cemeteries

Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.

Prepared by: Delaware County Planning Department



The Planning Department does not have any records of any urban gardens in the Study Area. The DRC communities have an opportunity to make productive use of some of its vacant properties for the purposes of both pocket parks and public urban gardens.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

As previously noted, the northernmost NMS communities developed more recently than the DRC communities. Land use in this area tends to follow a more suburban and less compact development pattern, and is still experiencing a great deal of development pressure. However, with an increasing population comes a greater demand for recreational amenities.

Parks comprise a key piece of the NMS watersheds' green infrastructure, and with various municipally-owned parklands set aside, residents of the three watersheds have fairly good access to recreational facilities. The types of open space in the NMS are quite different from the DRC (refer to map 7-2). A great deal of open space has been preserved as part of new housing developments; it is generally controlled by an HOA. School districts and religious organizations control open space on their institutional land. Municipalities generally control many of the larger public open spaces, although many have smaller parks as well. Private clubs, such as the Delaware County Archery Association in Bethel also control recreational property.

Fortunately, there are significant opportunities to not only expand the recreational network of the NMS municipalities, but also to increase regional connectivity to other parks and open space outside the Study Area via trails and greenway networks. Several utility rights-of-way exist within the NMS area parks. Much like abandoned rail beds, these undeveloped corridors represent great opportunities for expanding local and regional trail networks, linking parks and open space to schools, residential neighborhoods, and other regional amenities (see Appendix E: Open Space Toolkit, for a list of tools useful in open space planning). In doing so, residents gain the greatest access to recreation and other amenities without the use of an automobile.

The majority of recreational facilities in the NMS watersheds are focused around active recreation. School district and municipally-owned athletic fields are a great resource for local residents and are generally open to the public when not in use for school activities. They experience very heavy usage from nearby residents, and are particularly well-used by local youth and adult baseball organizations. Municipalities can partner with "friends of" groups to help maintain and improve these parks and other natural areas.

There are several mini-parks (under five acres) and neighborhood playgrounds in the NMS. These parks are very well-used by nearby residents. Many feature some combination of playground equipment, swing sets, basketball courts, picnic tables, and small wooded areas.

There are no County parks in the Study Area; however, Clayton Park lies just outside the Naamans Creek watershed in western Bethel and Concord Townships. This 170-acre park

contains both active and passive recreation, and includes a nine-hole golf course, several baseball fields, and shaded picnic grounds. It provides NMS residents with a valuable recreational resource and contains several utility rights-of-way that could be used to connect the park to other local resources via trails.

PARKS AND RECREATION FACILITIES IN THE STUDY AREA

OBJECTIVE OS-2: TO DEVELOP A LONG-TERM STRATEGY FOR MANAGING AND MAINTAINING EXISTING MUNICIPAL PARKS IN THE STUDY AREA

DELAWARE RIVER CORRIDOR

The DRC is home to a number of park and recreation facilities (refer to Map 7-3). Appendix D contains a list of the facilities. Several of the more notable parks and recreation facilities are discussed below.

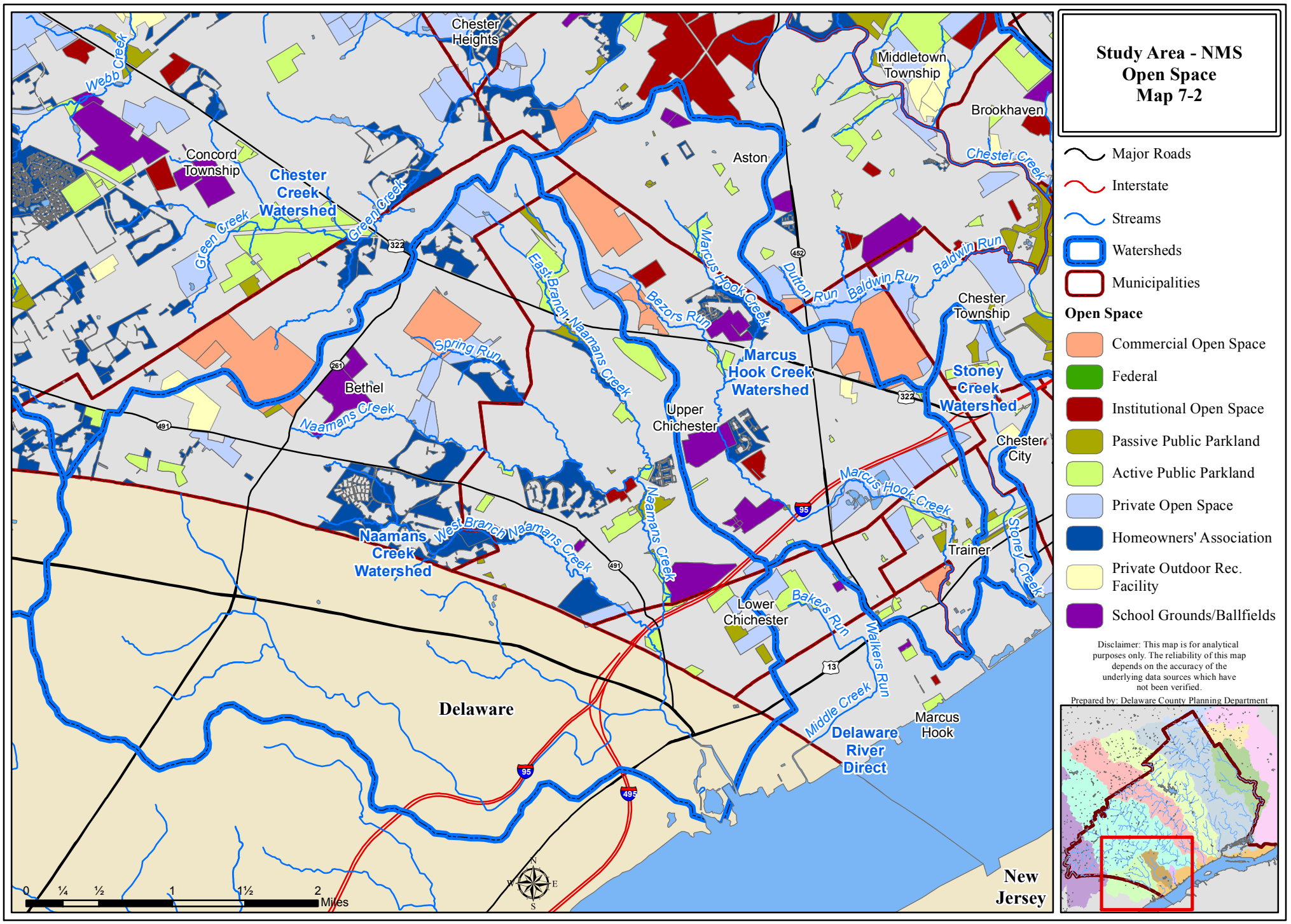
Chester City (DRC)

The City of Chester has a multitude of parks, as well as public and private recreation facilities. Many of its parks are small basketball courts or playgrounds. However, there are some notable larger public open spaces. Sun Village Park, on Ridley Creek, contains athletic fields, ball courts, and a community center. Veterans Memorial Park features a public swimming pool, athletic fields, and Martin Luther King Memorial Plaza, which is a landscaped sitting area with a monument. A large area of parkland along Chester Creek between the Avenue of the States and Chester High School encompasses the historic Deshong Park and the adjacent Eyre Drive Recreation Area (ballfields).

Barry Bridge Park, a premier City park, offers benches for people to enjoy river views. It also includes a fishing pier and a boat launch. The Chester Riverwalk is a scenic trail along the Delaware River that connects PPL Park, home to Major League Soccer's Philadelphia Union, to the Wharf at Rivertown office building. This area is currently the site of the City's riverfront festival, held every September.

Chester Township (DRC/NMS)

Chester Township contains about 13 acres of contiguous public open space located near the northern tip of the Stoney Creek watershed. It is comprised of Jacks Park and Feltonville Recreation Area. These parks contain a mixture of active recreation and wooded open spaces. The Township also contains three playground and game court parks south of I-95.


Study Area - NMS
Open Space
Map 7-2
Major Roads
Interstate
Streams
Watersheds
Municipalities
Open Space
Commercial Open Space
Federal
Institutional Open Space
Passive Public Parkland
Active Public Parkland
Private Open Space
Homeowners' Association
Private Outdoor Rec. Facility
School Grounds/Ballfields
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
Chester Heights
Middletown Township
Brookhaven
Aston
Concord Township
Chester Creek Watershed
Webb Creek
Green Creek
Chester Creek
Marcus Hook Creek
Dutton Run
Baldwin Run
Chester Township
East Branch Naamans Creek
Bezors Run
Spring Run
Bethel
Naamans Creek
Marcus Hook Creek Watershed
Stoney Creek Watershed
Upper Chichester
Chester City
Naamans Creek Watershed
West Branch Naamans Creek
Trainer
Stoney Creek
Lower Chichester
Bakers Run
Walkers Run
Middle Creek
Delaware River Direct
Marcus Hook
Delaware
New Jersey
0 ¼ ½ 1 1½ 2 Miles
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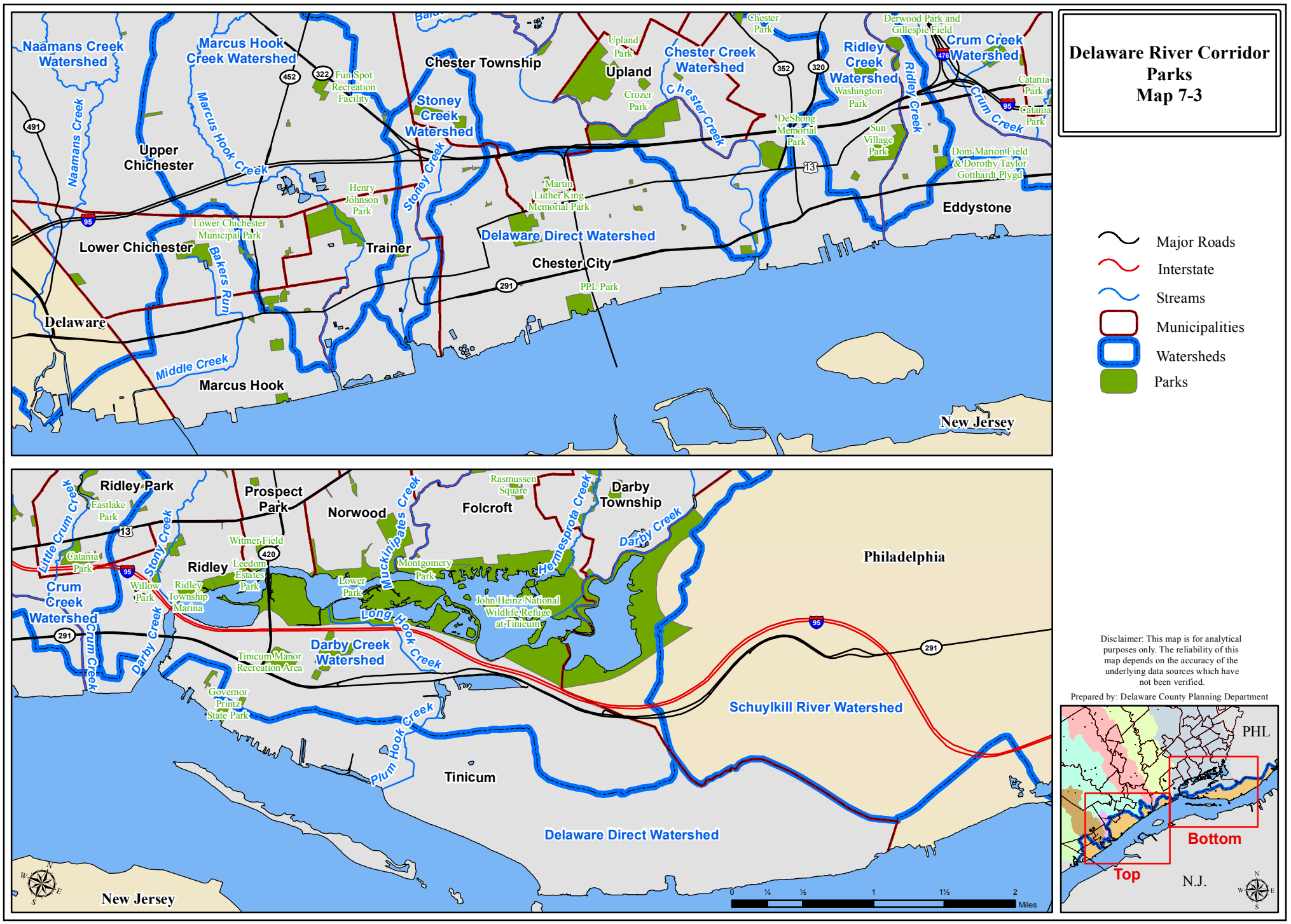

Delaware River Corridor Parks Map 7-3
Naamans Creek Watershed
Marcus Hook Creek Watershed
Chester Township
Upland
Chester Creek Watershed
Ridley Creek Watershed
Crum Creek Watershed
Upper Chichester
Lower Chichester
Trainer
Chester City
Eddystone
Delaware
Marcus Hook
Delaware Direct Watershed
Stoney Creek Watershed
Darby Creek Watershed
Ridley Park
Prospect Park
Norwood
Folcroft
Darby Township
Ridley
Crum Creek Watershed
Philadelphia
Schuylkill River Watershed
Tinicum
Delaware Direct Watershed
New Jersey
Major Roads
Interstate
Streams
Municipalities
Watersheds
Parks
Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department
PHL
Bottom
Top
N.J.
Miles

Eddystone Borough (DRC)

Eddystone has relatively few public open space facilities. Dom Marion Field/Dorothy Gotthardt Playground is the largest park in the Borough. It is heavily used by local residents. The Borough has had a long-standing interest in acquiring land for a park along the Delaware River. The former Foamex property in Eddystone, which has been the subject of potential redevelopment proposals over the past few years, contains riverfront land area that would make a prime location for a new park. Municipal officials should continue to negotiate with future developers of the site to obtain public access to the river. The Borough should also continue to look for other places where land could be purchased for parkland creation, particularly as properties go up for sale.

Lower Chichester Township (DRC/NMS)

Lower Chichester Township's, Rocco Gaspari, Sr. Park is located in both the DRC and NMS portions of the Study Area. The park is a sprawling municipal complex with ball fields, playground equipment, basketball courts, and a shelter area. The Township has three smaller parks with playgrounds. Aniline Village Park contains ample lawn space for games, while Anne R. Stevens Memorial Park contains a roller-hockey rink and basketball courts, in addition to playgrounds and a picnic area.

Marcus Hook Borough (DRC/NMS)

Marcus Hook has several parks and open spaces of varying size and facilities. Mickey Vernon Park, which is next to Marcus Hook Elementary School and is one of the most popular, is heavily used in the spring and summer for softball games and tournaments. It also includes a picnic pavilion.

The most notable of all of Marcus Hook's parks is Market Square Memorial Park and the adjacent Marcus Hook Community Center, which is located on the site of the former US Army reserve facility. The waterfront activity area was expanded to eight acres with the inclusion of the former Army Reserve facility, as well as a small piece of the adjacent Sunoco property. The Borough comprehensive plan calls for a mix of recreational uses that would include boat docking or a marina. The *Market Square Memorial Park Marina Feasibility Study and Development Plan* (2008) further explores the possibility of creating a public marina using the existing pier. This would greatly increase access to the river for residents of Marcus Hook and the surrounding communities.

Market Square Memorial Park in Marcus Hook is a popular riverfront destination.

Besides the facilities listed above, The Borough has two other active parks and two passive pocket parks. One of the pocket parks, Robert E. Haebel Plaza, is the centerpiece of the Viscose Village historic company housing section of town.

Ridley Township (DRC)

Ridley Township is a very large municipality with a number of open space and recreational resources. However, most of the Township's land area lies outside of the Study Area, and there is very little, if any, non-industrial or commercial land south of Interstate 95. The most notable open spaces lie just outside of the Study Area on the west side of Darby Creek, stretching from I-95 northeastward to the Township's boundary with Prospect Park Borough. The area includes a number of smaller open space parcels as well as the larger Leedom Estates Park and Ridley Township Municipal Marina. The Marina property includes a restaurant and boat launching facilities. The area is an official stop on the Tidal Delaware Trail.

Tinicum Township (DRC)

Tinicum Township's Governor Printz Park covers about seven acres of land along the Delaware River. The municipal park, which was once owned by the State of Pennsylvania, features sweeping river views and interpretive signage for people to learn about Native American history and the early Swedish settlers that once resided here.

The Township recently acquired an approximately 164-acre tract of land on the Delaware River that was once part of the Westinghouse Corporation turbine factory. The Township developed a master plan for the site which includes passive recreation amenities and a walking trail with interpretive signage. The site plan also shows a proposed airport parking lot.

Although it is actually classified as a state forest, Little Tinicum Island was acquired by the State of Pennsylvania in 1982 to preserve its unique ecology. The island, which is only accessible by watercraft, consists of over 200 acres of land and is one of the few remaining tidal mudflats in Pennsylvania. Visitors are most attracted to Little Tinicum Island to observe waterfowl and uncommon plants. Volunteer groups occasionally conduct litter cleanups due to flooding events that leave debris on the island.

Trainer Borough (DRC/NMS)

Henry Johnson Park, located in Trainer, lies in both the DRC and the NMS. It is a popular recreational resource within the riverfront corridor. The park features walking trails, wooded picnic areas, and ball fields. The boulders found along Marcus Hook Creek serve as a locally significant landmark. The Borough also contains several playgrounds and some undeveloped public open spaces which provide opportunities for new park development.

Parks comprise a key piece of the NMS watersheds' green infrastructure. With the municipally-owned parklands, the residents of the three watersheds have fairly good access to recreational facilities. However, with increasing development comes greater demand for recreational amenities. Fortunately, there are significant opportunities to not only expand the recreational network of the NMS municipalities, but also to increase regional connectivity to other parks and open space outside the Study Area via trails and greenway networks. Several utility rights-of-way exist within the NMS area parks. Much like abandoned rail beds, these undeveloped corridors represent great opportunities for expanding local and regional trail networks, linking parks and open space to schools, residential neighborhoods, and other regional amenities. In doing so, residents gain the greatest access to recreation and other amenities without the use of an automobile. The parks within the NMS portion of the Study Area can be seen on Map 7-4. Refer to Appendix D for a list of parks within the Study Area.

In addition to public park resources noted below, the NMS municipalities have a great deal of open space owned and managed by local HOAs. It is important for these organizations to develop maintenance plans that incorporate sound environmental management practices, including riparian buffer protection, wildlife management, and environmental education. Municipalities are also encouraged to work with HOAs to make trail connections between developments, along streams, and to schools, shopping areas, and other public facilities within the community.

Aston Township

The portion of the Study Area in Aston Township contains three public parks. Weir Park is situated at the headwaters of the Marcus Hook Creek and features numerous ball fields, tennis courts, and a playground area.

Concord Square Park and North Lamp Post Lane Park in Aston are prime examples of open space created as part of residential development being incorporated into a municipal parks system. Each park contains basketball courts, playgrounds, and wooded areas.

Bethel Township

Bethel Township has several passive municipal parks in the Study Area, all of which were created when developing the adjacent residential subdivisions. Jack King Park and John T. Adkinson Park both contain popular walking trails. Adkinson Park contains a lake with a large gazebo. Also, Bethel Springs Elementary School has woods on its property with nature trails and interpretive signage for environmental education.

The Penn Del Archers, a non-profit members club, owns and operates a 51-acre archery range along Naamans Creek Road in Bethel. The property was originally a farm, but was acquired by members in 1959 for the purpose of recreational archery. The group holds archery tournaments and weekly events on a lighted course. While no hunting takes place

on the property, the organization provides a safe environment for practice of archery related activities and safety education to members. If portions of the property become underutilized, Bethel Township should explore opportunities to partner with the organization to use it as parkland or open space.

The Maple Zone Sports and Fitness Complex is a commercial facility that offers indoor and outdoor formal athletic and training facilities for baseball, softball, lacrosse, field hockey, football and soccer. There is also a field house and miniature golf course on site.

Upper Chichester Township

The Upper Chichester Furey Road Municipal Park complex is made up of a combination of passive and active recreation areas, including walking trails through the woods, memorial garden, fishing pond, skateboard park, baseball and softball fields, and indoor basketball and volleyball courts. The Chichester Baseball League fields comprise a large athletic complex. Besides two other playground parks (Kingsman Road and Twin Oaks), the Township owns a number of other passive or undeveloped open spaces along Naamans Creek and its tributaries.

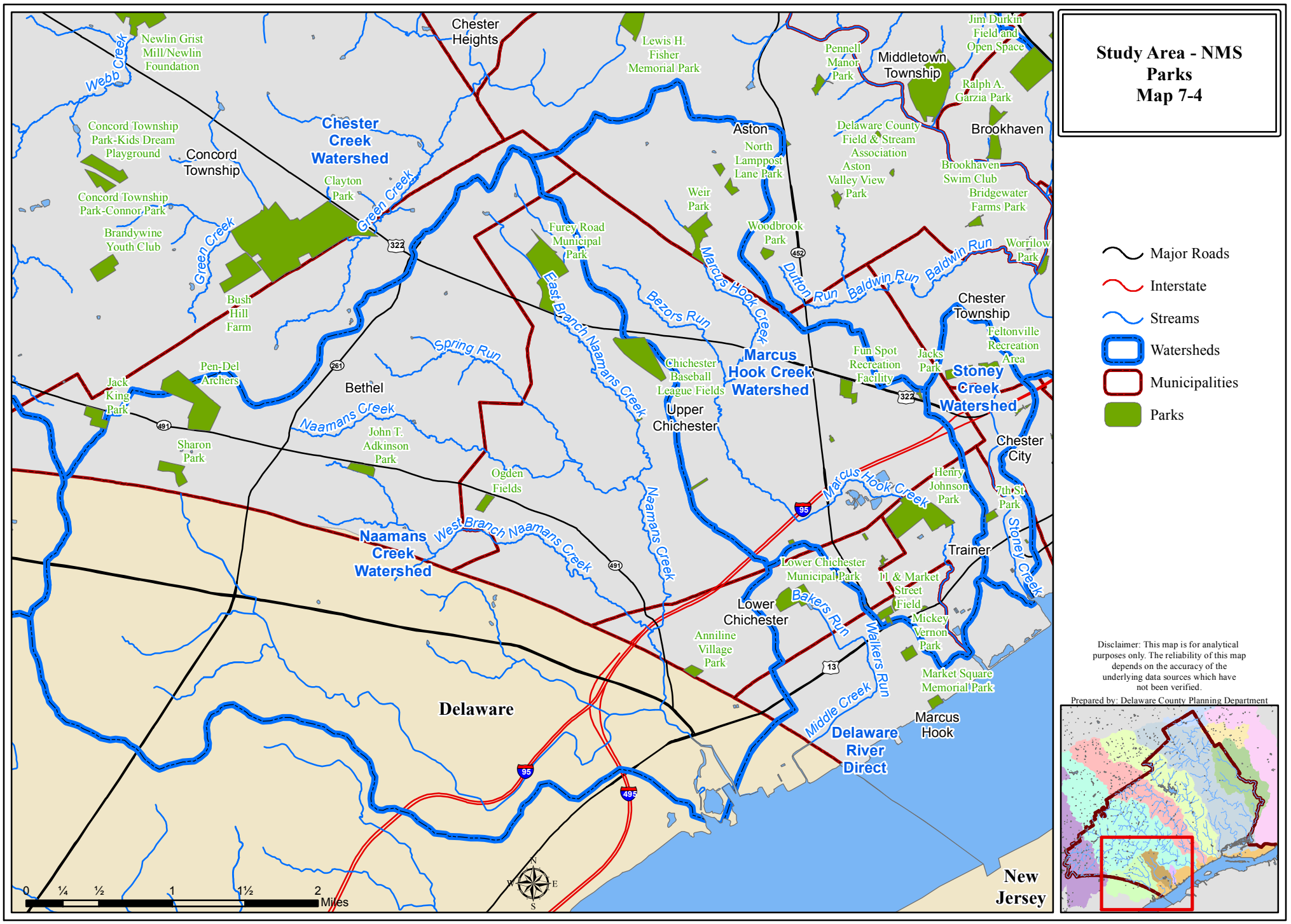
The Maple Zone Bat Works is currently under construction, to be located next to the Walmart. Trails are proposed as part of the development.

WATER-BASED RECREATION

Both the DRC and NMS communities have opportunities to provide water-based recreation; however, obstacles to access exist in each portion of the Study Area. There are a number of private marinas along the Delaware River, mostly in Tinicum Township, with only one public launch in the City of Chester. There is another public launch upstream along Darby Creek in Ridley Township (Ridley Township Municipal Marina). The NMS municipalities have a number of waterways that would be suitable for canoeing or kayaking, yet there are no known public points of access.

DELAWARE RIVER CORRIDOR

Marinas have been an important component of the Delaware County riverfront for over 125 years. Notable facilities include The Corinthian Yacht Club (established in 1886) and the West End Boat Club (1898). The marinas concentrated along the Delaware River in the Essington section of Tinicum provide a means for many recreational boaters to access the Delaware River (refer to Table 7-1 for a full list of boating facilities). However, there is significant demand for public boating access. Currently, only Chester's Barry Bridge Park and the Ridley Township Municipal Marina offer public boating access. Marcus Hook completed a marina feasibility study in 2009, but the decision was made not to move forward with a marina at the present time. If a riverfront park is ever developed in Eddystone Borough, consideration should be given to providing boat slips or ramps to encourage greater public access to the Delaware River.


Study Area - NMS Parks Map 7-4
Major Roads
Interstate
Streams
Watersheds
Municipalities
Parks
Chester Heights
Newlin Grist Mill/Newlin Foundation
Webb Creek
Lewis H. Fisher Memorial Park
Pennell Manor Park
Middletown Township
Jim Durkin Field and Open Space
Ralph A. Garzia Park
Brookhaven
Concord Township Park-Kids Dream Playground
Concord Township
Chester Creek Watershed
Aston
North Lamppost Lane Park
Delaware County Field & Stream Association
Aston Valley View Park
Brookhaven Swim Club
Bridgewater Farms Park
Clayton Park
Green Creek
Concord Township Park-Connor Park
Brandywine Youth Club
Weir Park
Woodbrook Park
Furey Road Municipal Park
Marcus Hook Creek
Dutton Run
Baldwin Run
Worrilow Park
Chester Township
Feltonville Recreation Area
Bush Hill Farm
Bezors Run
East Branch Naamans Creek
Spring Run
Pen-Del Archers
Chichester Baseball League Fields
Marcus Hook Creek Watershed
Fun Spot Recreation Facility
Jacks Park
Stoney Creek Watershed
Jack King Park
Bethel
Upper Chichester
Naamans Creek
John T. Adkinson Park
Sharon Park
Chester City
Ogden Fields
Henry Johnson Park
7th St Park
Marcus Hook Creek
Naamans Creek Watershed
West Branch Naamans Creek
Naamans Creek
Trainer
Lower Chichester Municipal Park
JL & Market Street Field
Stoney Creek
Lower Chichester
Bakers Run
Mickey Vernon Park
Anniline Village Park
Walkers Run
Market Square Memorial Park
Middle Creek
Delaware River Direct
Marcus Hook
Delaware
New Jersey
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Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.
Prepared by: Delaware County Planning Department

TABLE 7-1
BOATING FACILITIES IN THE STUDY AREA

Name	Municipality	Description
Commodore Barry Bridge Park	Chester	Public boat launch
Ridley Township Municipal Marina	Ridley	Public marina and boat launch
Anchorage Marina, Inc.	Tinicum	Private marina
Corinthian Yacht Club	Tinicum	Private marina
The Deck at Harbor Pointe	Tinicum	Private marina
Fox's Grove Marina	Tinicum	Private marina
Golden Point Marina and Yacht Club	Tinicum	Private marina
Island Marina	Tinicum	Publicly owned marina at the Lazaretto site; not currently in operation
Riverside Yacht Club	Tinicum	Private marina
West End Yacht Club	Tinicum	Private marina
Westinghouse Site	Tinicum	Public boat launch; not currently in operation

Source: DCPD, 2012

Many of the marinas in the DRC are working together to address problems associated with siltation in the channel located between the Essington waterfront and Little Tinicum Island. Maintenance dredging was conducted along the Tinicum waterfront near some of the marinas' boat slips during the fall of 2011. Tinicum Coastline Partnership, which assisted with the marinas' dredging applications, expressed the need for continued dredging in the future to ensure they can provide recreation and riverfront access, as well as to support the local economy. There is a need to address siltation issues and the role that dredging may play for the long-term viability of these marinas.

There is currently an effort to increase non-motorized recreational boating along the Delaware River. The Tidal Delaware Water Trail, an effort led by the Pennsylvania Environmental Council (PEC), runs 56 miles from Trenton, New Jersey down to Marcus Hook.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

Despite the wealth of waterways flowing throughout the NMS communities, there are no known public access points for stream-based recreation, such as kayaking/canoeing or fishing, in any of the three watersheds. There are some artificial ponds used for fishing, such as those next to the Furey Road Municipal Park in Upper Chichester and John T. Adkinson Park in Bethel.

TRAILS

OBJECTIVE OS-3: TO CREATE A TRAIL NETWORK THAT CONNECTS LOCAL TRAILS, PARKS, HISTORIC AND CULTURAL DESTINATIONS, SCHOOLS, AND OTHER AREAS OF INTEREST TO THE EAST COAST GREENWAY AND OTHER REGIONAL TRAILS

Trails are increasingly important assets to community infrastructure and quality of life. They provide places for popular activities, such as walking, running, and cycling. Trails can create connections within communities, linking neighborhoods, transit centers, and shopping areas. Trails offer relief from more heavily traveled transit corridors and provide visual access to landscapes that cannot be accessed from roadways. Municipalities should work together to create regional and local trail networks that link neighborhood amenities with the regional trail network. Recent studies have also presented data that link trails with increased property values.

The *Delaware County Open Space, Recreation, and Greenway Plan* (under development) will include a component focusing on potential greenways in the western portion of the County, which may identify trail opportunities for the future. Despite the many benefits that trails offer, planning, engineering, and construction can be a lengthy, expensive process. Additionally, establishing access points and getting easements for trails provides challenging barriers for trail efforts.

DELAWARE RIVER CORRIDOR

The East Coast Greenway (ECG) is an urban trail that will span over 3,000 miles from Maine to Florida. Its proposed route, which passess directly through the riverfront communities along the Route 291/13 Corridor, includes a number of trail spurs. Although each municipality is responsible for implementing its own section of the trail, the County Planning Department has developed common landscaping and signage guidelines that can be used to create a seamless look for the Corridor. As the municipalities install sections of the trail, the ECG could become a magnet to attract new visitors and businesses to the area. These businesses could include support services for cyclists traveling the ECG who are seeking food, lodging, and other accomodations related to long-distance bicycling.

Installation of the ECG in the DRC, and subsequent connections to other trails in the region, represent signficant opportunities for the future of the area. Possible future expansion of the Chester Riverwalk will provide additional access to the Delaware River. Spur trails from the ECG to other riverfront parks, such as Market Square Memorial Park in Marcus Hook and Governor Printz Park in Tinicum, as well as to downtown Chester, have the potential to enhance the enjoyment of the ECG experience while helping the local economy. The Fort Mifflin Trail in Philadelphia, which is part of the ECG, also provides a link to Cobbs Creek Park. The trail presents an opportunity to link the ECG to existing trails within the Heinz Refuge.

Upon construction, the Chester Creek Rail Trail will extend from Middletown Township to Chester Township. There are no current plans to extend it through Chester Township to Chester City and the ECG; however, there is potential to do so.

The *Delaware County Renaissance Program Planning Area 1 Action Plan* (2003) proposed a feasibility study for a Marcus Hook Creek Greenway that would extend two miles, from Township Line Road in Trainer to Market Square Memorial Park in Marcus Hook.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

John T. Adkinson Park in Bethel Township hosts a popular walking trail

As compared to the DRC, the NMS communities have a number of trails located in parks or in neighborhoods. Many of the parks, such as John T. Adkinson Park in Bethel, Furey Road Park in Upper Chichester, and Wier Park in Aston, have public walking paths. Chichester Middle School has a walking path that links the school grounds to an adjacent neighborhood. The Bethel Springs Elementary School trail also abuts nearby neighborhoods and features interpretive signage that offers information about watersheds and native plant species. However, many of the other existing trails are found on HOA property within residential developments, and are restricted for use by residents of the respective development. Unfortunately, at this time, the trails in the NMS do not connect to the regional trail system. It is hoped that future greenway and other trail planning efforts will identify opportunities to make such connections.

As mentioned above, desire has been expressed to extend the Marcus Hook Creek greenway northward into Upper Chichester. Upper Chichester completed a trail feasibility project that mapped future opportunities for trails. There are several utility rights-of-way that could link the communities throughout the upland areas, both to one another and to the river corridor communities. In doing so, residents could gain access to all that the region has to offer, be it recreational opportunities, tourism and natural areas, or historic resources.

RECOMMENDATIONS

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR AND THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

OS-1 Continue to preserve land and develop parks and other public open space, as appropriate, along the Delaware River and other Study Area waterways.

OS-2 Create local trail networks that link neighborhood trails, parks, historic resources and other destinations in the Study Area with the regional greenway network, including the East Coast Greenway.

OS3 Establish new trails along streams, open corridors, and along road and utility rights-of-way.

OS-4 Partner with "friends of" groups to help maintain and improve park and natural area resources, while encouraging community stewardship.

OS-5 Promote a variety of recreational activities in municipal parks, as appropriate, in order to meet the needs of an active, diverse community.

OS-6 Partner with educational groups, including schools, to promote environmental education activities in parks.

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR SHOULD:

OS-7 Explore opportunities to increase passive open space as part of the revitalization process.

OS-8 Explore opportunities to develop pocket parks and community gardens in urban areas, especially on vacant lots and brownfields.

OS-9 Participate in the development of the Delaware River Water Trail for recreational canoeists and kayakers.

OS-10 Increase both physical and visual riverfront access opportunities by providing viewing areas and boat launch facilities.

MUNICIPALITIES IN THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

OS-11 Maximize opportunities for creating connectivity through the use of trails in new development.

CHAPTER 8
SPECIAL ISSUES AND TOPICS

SPECIAL ISSUES AND TOPICS GOAL:
TO ADDRESS SPECIALIZED ISSUES OF IMPORTANCE TO THE STUDY AREA SUCH AS TOURISM AND CLIMATE CHANGE RESILIENCY

TOURISM

OBJECTIVE 8-1: TO MARKET THE STUDY AREA'S RESOURCES IN AN EFFORT TO INCREASE VISITORS AND PROVIDE THEM WITH INFORMATION ON TOURISM-RELATED ACTIVITIES AND SERVICES.

While the Study Area has not traditionally been thought of as a major tourism destination, a great deal of effort has been focused on enhancing the area's appeal to people from other parts of Delaware County, as well as from the Philadelphia area and beyond. Identified marketable assets in the DRC include the area's industrial heritage, parks, marinas, and cultural resources. It should be noted that the NMS also has resources worth considering as part of a tourism program. Additional assets for tourism in both the DRC and NMS include historic homes, natural areas, scenic landscapes, and more. The key to success in promoting tourism in the river corridor and in the upland portions of the NMS watersheds will be to develop a unified vision for each area, backed by long-range planning and strong coordination with the Brandywine Conference and Visitors Bureau.

DELAWARE RIVER CORRIDOR

The most publicized investments in the DRC's recreation infrastructure have been along the City of Chester's revitalizing waterfront area. The new ramps from I-95 to/from Route 291 make access to the Chester riverfront easier than in years past. This area of Chester will also be the site of a new welcome center that will include information about Chester and the rest of Delaware County.


PPL Park in Chester City.

Harrah's Philadelphia [formerly Chester] Casino and Racetrack opened for harness racing and slot machine play in 2006; the facility began offering table games in 2010. Today, the facility contains several restaurants, bars, and meeting spaces; it is also a venue for

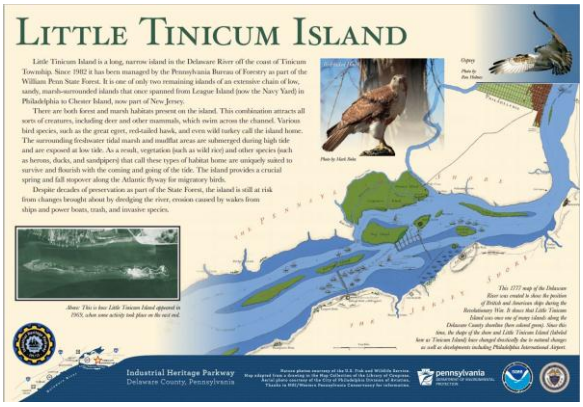
events, concerts and live shows. Harrah's is an important fixture on the Delaware, with its commanding views of the river from the restaurants and racetrack seating.

Opening in 2010, and costing approximately $120 million to construct, PPL Park is home to the Philadelphia Union professional soccer team. With its picturesque views of the Delaware River and Commodore Barry Bridge, and easy access from Interstate 95, the stadium serves as a major draw to bring people to the riverfront. In addition to Union games, the stadium also hosts soccer, lacrosse and rugby championships, and has expanded its programming to include concerts and other events. This represents the great potential of the riverfront communities' ability to attract visitors.

As noted in previous chapters of this RCP, the East Coast Greenway bikeway will become both an important transportation link as well as a major attraction in the future, potentially bringing a number of bicyclists to and through the Route 291/13 corridor.

PPL Park and Harrah's Casino in the City of Chester, the natural resource areas such as Little Tinicum Island and the Heinz Refuge, and boating opportunities at the Ridley and Tinicum Township marinas, have the potential to attract thousands of visitors, including dedicated sports fans, concert-goers, bicyclists, history buffs, and naturalists, to the DRC.

Although Tinicum Township has a wealth of hotels/motels and several restaurants, most of which support the Airport travelers, additional support services, such as hotels, restaurants, and bicycle-related facilities will be needed throughout the DRC to support tourism in the future. Proposed landscaping and signage for the Industrial Heritage Corridor and the ECG would enhance the look of the corridor, and wayfinding signage will be needed to direct visitors to the riverfront corridor's many resources. Recently developed interpretive signage for important cultural and natural resources (see below) should also be expanded so as to enhance the visitor experience.



While PPL Park, Harrah's Casino and Racetrack, and the ECG are the most visible elements of the DRC's tourism infrastructure, other lesser-known cultural, historic, and natural sites should not be overlooked. The *Industrial Heritage Parkway and Greenway Landscape and Signage Guidelines* (2005), was funded with a federal Coastal Zone Management (CZM) grant provided by the Pennsylvania Department of Environmental Protection (DEP) Coastal Resources Management Program. The document includes design specifications for landscaping and gateway and wayfinding signage in the Route291/13 Industrial Heritage Corridor.

The recently completed *Industrial Heritage Parkway Interpretive Signage Guidelines* (2013), also funded through a Coastal Resources Program grant, contains a standardized

template for interpretive signs in the Corridor as well as a listing of potential sign-worthy sites in the DRC. The interpretive signage project included development of a template, and design and manufacture of 12 signs for the Corridor.

The DRC municipalities have an opportunity to work together to help market their popular sites. Municipal cooperation is essential for preparation of the application to the Pennsylvania Department of Transportation (PennDOT) for Route 291/13 Industrial Heritage Corridor Byway status. Byway status could help to boost the DRC communities' efforts to attract visitors by listing the Corridor at www.visit.pa.com, the Pennsylvania Travel Guide, and the Transportation and Tourism Map of Pennsylvania.

Route 291/13 and the ECG are not the only transportation-related resources in the DRC. The Philadelphia International Airport and mass transit make the riverfront, as well as the many other parts of the County, very accessible. First identified in the *Delaware County Waterfront Resources Management Plan* (1992), the use of water taxis could someday provide a means for people to experience the riverfront in an entirely new way. Eventually, it may also be a way to get people to PPL Park for Philadelphia Union matches. "Ducks," waterfront tour boats similar to those that operate on the Delaware River in Philadelphia, would be another popular amenity to bring people both land- and water-based resources

Marketing the riverfront was identified as a significant need, in order to attract visitors to this unique area. By incorporating "Trail Towns" principles promoted by DCNR the area will be better able to cater to the needs of visitors. With assistance from the Brandywine Conference and Visitors Bureau, there are many opportunities to promote the riverfront for day trips and long weekends, especially when the Philadelphia Union has home games. Future efforts should attempt to identify tourists' needs, such as reason for and length of stay, and level of familiarity with the area. Expanding promotional efforts through the use of the Internet, perhaps through social media such as Facebook, an online interactive map which shows visitor services and attractions, or a web-based coastal zone application ("app"), could provide extensive information about the riverfront corridor.

The municipalities can build on existing efforts that are taking place already. Museums, such as the one at Eddystone Borough Hall, can display historic art work, photographs, and other significant memorabilia. Trainer hosts a Civil War re-enactment at its Henry Johnson Park. Marcus Hook residents convene the Plankhouse Crew, a living history group of individuals that honor the local legacy of Blackbeard and his pirates. Conducting ghost- or industrial heritage-themed tours of the area could generate a greater appreciation of the riverfront corridor's history and cater to tourists.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

Tourism amenities in the NMS watersheds are more limited when compared to the riverfront corridor. This is not to say, however, that there are not opportunities yet to be examined. If municipalities wish to promote tourism in their communities, **careful** planning should be undertaken to explore which assets are suitable for attracting people

from surrounding areas. Trail-based tourism and bed & breakfasts can be a great way to encourage destination tourism and highlight the historic nature of the area. Perhaps the best action a municipality can take to promote tourism is to be proactive about preserving remaining natural areas and historic resources, as these are non-renewable resources. Then, using these resources as the basis, create a plan that suits the community**.**

CLIMATE CHANGE RESILIENCE AND ADAPTATION

OBJECTIVE 8-2: TO DEVELOP ADAPTATION STRATEGIES TO INCREASE THE STUDY AREA'S RESILIENCE TO THE POSSIBLE EFFECTS OF CLIMATE CHANGE ON RESIDENTS, INFRASTRUCTURE, AND COMMERCE

DELAWARE RIVER CORRIDOR

The Partnership for the Delaware Estuary's collaborative work with a prediction team led by Dr. Raymond Najjar from the Pennsylvania State University, developed projections for areas of the Delaware Estuary that might be impacted by climate change. The median projections of 14 different climate models forecast that sea level will increase between 0.5 and 1.5 meters by the year 2100, which will thereby result in larger tidal volumes of water entering the Estuary.

The Partnership for the Delaware Estuary's publication, *Climate Change and the Delaware Estuary* (2010), lists several threats associated with sea level rise to the Delaware River Estuary's coastal wetlands areas. These risks include storm surge susceptibility, change of marsh land, and increased tidal range, sediment accretion, and rate of channel scouring. Additionally, saltwater intrusion into fresh water habitats of the Delaware River could disrupt the Estuary's delicate ecosystem. The report also predicts that there could be more extreme heat days that could pose a threat to area citizens, especially the elderly and those with special needs.

During the fall of 2010, Pennsylvania Sea Grant collaborated with the National Oceanic and Atmospheric Administration (NOAA) to conduct a two-day workshop to address coastal hazards for Delaware County. The workshop, which brought together municipal officials, engineers, planners, and other stakeholders, resulted in the development of a report, *Delaware County, Pennsylvania: Roadmap for Adapting to Coastal Risk* (2011), which discussed the potential effect of sea level rise and increased storm surges on communities along the Delaware River and its tributaries.

While vulnerabilities exist for coastal communities and wetland areas along the Delaware River, so do opportunities for adaption. The 2010 Coastal Hazard Workshop attendees agreed that there was a significant opportunity to restore some of the armored shoreline areas into tidal marshes. Restored tidal wetlands can help to absorb flood water and storm surges, while also providing wildlife habitat and enhancing the river's scenic views. The opportunity for riverfront wetland restoration and returning the shoreline to a more natural vegetative condition was also addressed in the NHI.

As mentioned, most of Delaware County's riverfront is has an armored versus a natural shoreline; however, it is still vulnerable to the effects of storm surge. Despite the modified shoreline, the riverfront communities need to assess their dikes and levees to ensure their adequacy to handle flooding events and storm surges. This holds especially true in Tinicum, where there are 12 levees; there are seven on the Delaware River, four on Long Hook Creek, and one on Darby Creek. Trainer also has a levee on the Delaware River, and Chester City has one on Chester Creek.

As a result of the 2010 Coastal Hazard Workshop noted above, Pennsylvania Sea Grant received funding from NOAA to undertake a program for the City of Chester to examine potential impacts associated with climate change. Pennsylvania Sea Grant partnered with the City of Chester, the Delaware Valley Regional Planning Commission, the Delaware County Planning Department, US Environmental Protection Agency, and the Partnership for the Delaware Estuary to prepare a climate adaptation element for Chester City's comprehensive plan, *Vision 2020: A City Beautiful Movement* (2012). The element discusses possible effects on the community from climate change, including potential impacts on the City's infrastructure. The plan identifies seven major strategies, each of which contains a number of recommended actions, to make the City more resilient:

1. Create an Environmental Advisory Council
2. Engage in Post-Storm Redevelopment Process
3. Develop a Heat Emergency Plan
4. Seek Certification in the National Flood Insurance Program Community Rating System
5. Improve Floodplain Management
6. Expand Vegetated Buffers, Restore Wetlands and Streams, and Protect Open Space
7. Develop a Plan to Implement Green Stormwater Infrastructure (GSI)

Although much of the mapping analysis in Chester's climate adaptation element is City specific, many of the recommendations could be adapted for use in other coastal zone communities, as well as the remainder of the County. The Study Area municipalities should partner with the County, the Coastal Zone Task Force, and Pennsylvania Sea Grant to evaluate the applicability of Chester City's adaptation recommendations for use in other portions of the Study Area.

NAAMANS-MARCUS HOOK-STONEY CREEK WATERSHEDS

Despite being located farther inland, the NMS communities still need to monitor potential impacts of climate change, particularly with regard to existing infrastructure, such as roadways and bridges. Flooding that occurs within the area could become worse with increased annual rainfall and the more frequent occurrence of heavy storms.

RECOMMENDATIONS

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR AND THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

SI-1 Partner with the Brandywine Conference and Visitors Bureau (BCVB) to promote the coastal zone corridor through social media and interactive mapping.

SI-2 Promote heritage tourism and other cultural activities, including historic house and village tours, mill and farm tours, ghost tours, and war reenactments.

SI-3 Evaluate the applicability of Chester City's Climate Adaptation element for use in other Study Area communities.

MUNICIPALITIES IN THE DELAWARE RIVER CORRIDOR SHOULD:

SI-4 Implement the East Coast Greenway as a mechanism to promote trail connection to Study Area attractions.

SI-5 Work with Delaware County Planning Department, the County Commerce Center, and the Brandywine Conference and Visitors Bureau to develop tourism support services, such as hotels, restaurants, and bicycle-related facilities.

SI-6 Develop a marketing campaign for the Corridor using the Internet and social media techniques nfor navigation through the area and interpretation of heritage resources.

SI-7 Pursue State Byway Status for Route 291/13.

SI-8 Work with regional entities to identify a strategy to protect and restore tidal wetlands and shorelines along the Delaware River and its tributary streams.

SI-9 Identify and plan for potential risks to riverfront infrastructure associated with possible storm surges or sea level increase.

SI-10 Evaluate existing levees and tide gates for structural integrity and adequacy to handle storm surges.

MUNICIPALITIES IN THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

SI-11 Explore assets in the Study Area for potential tourism value and regional appeal.

CHAPTER 9
IMPLEMENTATION

IMPLEMENTATION GOAL:
To provide a strategy and associated mechanism for the timely implementation of the recommendations presented in the plan

ACTION PLAN

This chapter of the Rivers Conservation Plan (RCP) summarizes the recommended actions presented in earlier chapters and identifies a strategy and mechanism for their implementation. Implementation of the recommended actions will help to ensure the conservation and enhancement of the Study Area's resources.

IMPLEMENTATION STRATEGY

The implementation activities listed in Table 9-1 reflect the wide variety of issues, needs, and opportunities identified in the Study Area. Each action contains information concerning the Study Area (i.e., DRC or NMS), timing, lead organization, partners, technical support, and a reference to the page number the action can be found on. The actions do not appear in any particular order, except by chapter.

Successful implementation of the actions will require additional site-specific local information, technical assistance, and most importantly, a coordinated effort among the municipalities, local citizens groups, non-profit organizations, and other community stakeholders. These groups may be able to work with the Delaware County Planning Department (DCPD) and other agencies to develop and implement common projects and watershed initiatives, as well as apply for related grants. Possible projects include restoration efforts, trails planning, and public education activities.

INSTITUTIONAL CAPACITY FOR IMPLEMENTATION

Based on experiences in Delaware County's other watersheds, there are several opportunities to engage municipalities, citizens, and other stakeholders in the DRC and NMS watersheds areas. The following text describes entities that could be responsible for implementing the recommendations contained in this plan.

MUNICIPAL PARTNERSHIPS

Many of the municipalities in the Study Area have undertaken collaborative planning activities in the past. In fact, the Pennsylvania Municipalities Planning Code (MPC) encourages intermunicipal planning (Article XI). Ridley and Eddystone adopted a joint

comprehensive plan in 2011, while Aston, Lower Chichester, and Upper Chichester adopted a multi-municipal comprehensive plan in 2005. Many of the municipalities also have worked on plans through the Delaware County's Revitalization Program (formerly known as the Renaissance Program), in which they worked together to identify projects, many of which were of a multi-municipal nature**.** By establishing relationships and maintaining a dialogue with one another, the municipalities will be much better prepared to address issues addressed within the Rivers Conservation Plan.

ENVIRONMENTAL ADVISORY COUNCILS

Pennsylvania municipalities are authorized to establish Environmental Advisory Councils (EACs) through Act 148 of 1973, as amended by Act 177 of 1996. Pennsylvania Environmental Council originally formed the EAC Network. Since late 2013, it has been administered by the Pennsylvania Land Trust Association. The EAC Network's website states the following: "…environmental advisory councils (EACs) are officially created, appointed arms of municipal government that focus exclusively on environmental conservation and improvement. EACs act as advisors to the governing boards that appoint them, and to the local planning commissions, giving municipal governments a pool of 'hometown talent' to draw upon when they make decisions affecting the environmental resources in their communities. EACs undertake a wide variety of projects and information-gathering tasks, providing energy and objective, in-depth analysis about environmental resource issues."

Rather than specifying a list of projects or programs, Act 148 provides a framework for an EAC to follow at the discretion of the local officials. An EAC can advise a municipality on topics relating to the protection, conservation, management, and promotion of a municipality's natural resources. The flexible nature of an EAC allows it to address many environmental issues that are of concern to the community (or in the case of a joint EAC, multiple municipalities). Depending on the responsibilities granted to an EAC, it may assist in efforts to better educate elected officials, municipal staff, or citizens about watersheds. It could also play a role in organizing tree plantings, stream clean-ups, developing informational materials, or implementing recommendations from this RCP.

Delaware River Corridor

With the exception of the Ridley Township and the joint EAC between Marcus Hook, Trainer, and Lower Chichester, none of the other DRC municipalities has its own EAC. Chester City also has an environmental committee. Chester City, Chester Township, Eddystone, and Tinicum are encouraged to create EACs so that they can address environmental concerns in their portions of the Study Area. Future opportunities may include working on beautifying the Route 291/13 corridor, installation of the East Coast Greenway, implementation of byway programs, public education regarding water quality issues, and promotion of heritage- and eco-tourism.

TABLE 9-1
IMPLEMENTATION STRATEGY FOR THE DELAWARE RIVER CORRIDOR AND THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS AREA

Timing Key:
*High Priority - whether completion is long or short term, these items get top consideration.
LG = Laying the Groundwork - Actions that set up other actions. These must be done first, so should begin immediately.
S = Short Range (1-2 years / ASAP)
M = Medium Range (2-5 years)
L = Longer Range (5-10 years or more)
O = Ongoing

ID #	Recommended Action	Study Area	Timing	Lead Organization	Partners	Technical Support	Reference Page
LU-1	Create additional public access points along Study Area waterways.	DRC/NMS	O	GB ,CD	DCNR, DVRPC	DCNR, DVRPC	3-8, 3-9
LU-2	Complete a brownfields inventory for each municipality in the Study Area.	DRC/NMS	S	GB, CD	DCCC, DCED, PADEP	PADEP, USEPA	3-13
LU-3	Pursue opportunities for cleanup and redevelopment of known or potentially contaminated sites.	DRC/NMS	O	GB, DCCC	DC, PADEP, USEPA	PADEP, USEPA	3-14
LU-4	Buffer industrial land uses through landscaping, screening, and other mechanisms to preserve the aesthetics in Study Area communities.	DRC/NMS	O	GB, I/B	DC, I/B	DC	3-7
LU-5	Protect significant viewsheds of the Delaware River through adoption of local ordinances that require preservation of views.	DRC	S	GB	DC	DC	3-9
LU-6	Balance the needs of existing industries with the desire to attract new public access, recreational, and business redevelopment opportunities.	DRC	O	GB	BCVB, DC, DCCC	DC, DCED	3-8
LU-7	Implement waterfront zoning districts or waterfront zoning overlays to preserve the Delaware River shoreline for water dependent and water-enhanced uses.	DRC	S	GB	DC	DC	3-9
CR-1	Adopt local policies and programs to preserve historic and cultural assets.	DRC/NMS	S	GB	DC, HG	DC, HG, PHMC	4-2
CR-2	Update municipal surveys, as necessary, and convert records to electronic format for use in geographic information systems (GIS).	DRC/NMS	M	DC	GB, HB	PHMC	4-3
CR-3	Promote restoration and adaptive reuse of historic buildings.	DRC/NMS	O	GB	DC, HG	PHMC	4-2
CR-4	Adopt and/or strengthen historic preservation ordinances and create historic architectural review boards (HARBs) that would assist with municipal preservation programs.	DRC/NMS	S	GB	HG	DC, PHMC	4-2
CR-5	Promote historic people, places, and events in open spaces and along trails through the use of interpretive signage.	DRC/NMS	M	BCVB	DC, GB, HG	DC, HG	4-2
CR-6	Create a listing of publicly accessible historic resources for future interpretation.	DRC/NMS	M	DC	GB, HG	BCVB, PHMC	4-11
NR-1	Maintain and enhance environmental ordinances, including those dealing with stormwater and floodplain management and the protection of riparian buffers, woodlands, wetlands, and steep slopes.	DRC/NMS	O	EAC, GB	DC	DC, LT	5-8,
NR-2	Promote the use of low impact development (LID) techniques for new development and redevelopment.	DRC/NMS	O	EAC, ED, GB	DCCC	DVRPC, PADEP, USEPA	5-39
NR-3	Maintain a stringent stormwater management ordinance that minimizes impacts to water quality and quantity in order remain in compliance Act 167 and the requirements of the municipal MS4 stormwater management permit.	DRC/NMS	O	GB, EAC	DC, PADEP	DC, PADEP, USEPA	5-42
NR-4	Participate in the Community Rating System through the National Flood Insurance Program to help reduce the risk of flood damage and to lower the cost of flood insurance premiums.	DRC/NMS	O	GB	DC, FEMA	DC, DCED, FEMA	5-43

ID #	Recommended Action	Study Area	Timing	Lead Organization	Partners	Technical Support	Reference Page
NR-5	Implement a public education program to address inflow and infiltration (I&I).	DRC/NMS	S	GB	DC, DELCORA	DC, DELCORA	5-40
NR-6	Establish a stormwater best management practice (BMP) initiative to encourage retrofit of properties with green infrastructure, such as rain gardens, bioswales, and pervious paving.	DRC/NMS	M	DC	EAC, GB, WO	DVRPC, PADEP, USEPA	5-45
NR-7	Develop a program, possibly in conjunction with an environmental advisory council (EAC), schools, or a watershed group, to promote awareness to residents and businesses about stormwater and water quality issues.	DRC/NMS	S	DC	EAC, Schools, WO	PADEP, USEPA	5-39
NR-8	Conduct site-specific studies for flooding.	DRC/NMS	M	GB	FEMA, PADEP	FEMA, PADEP	5-44
NR-9	Work with watershed organizations and other community groups to educate the public about the importance of riparian buffers.	DRC/NMS	O	DC	EAC, GB, LT, WO	DCNR, PADEP, WO	5-45
NR-10	Identify locations for stream bank and riparian buffer restoration, and undertake implementation projects throughout the Study Area.	DRC/NMS	M	GB, WO	EAC, DC, LT, R, Schools	DC, PADEP	5-45
NR-11	Identify and prioritize opportunities to increase tree cover in residential neighborhoods, commercial street corridors, and in industrial areas.	DRC	S	DC	GB, R, STC, TV	DC, TV	5-18
NR-12	Work with regional and local organizations to reintroduce freshwater tidal wetlands along the Delaware River and at the mouth of tributary streams.	DRC	L	GB	CZTF, DC, DCNR, WO	DC, PADEP, USEPA	5-34
NR-13	Implement conservation ordinances, development practices, and other tools to protect woodlands with the largest blocks of contiguous forest.	NMS	S	GB	EAC, DC, DCNR, LT	DC, DCNR, LT	5-17
NR-14	Work with HOAs to develop management plans for their sensitive natural areas and protected open space.	NMS	M	GB	DC, LT, WO	DC, LT, WO	5-25
NR-15	Implement a stream naming program in order to encourage better stewardship of local waterways.	NMS	O	WO	GB, HG	DC, LT	5-46
NR-16	Connect failing and antiquated on-lot septic systems to existing sewers when and where feasible.	NMS	S	GB	DELCORA	PADEP	5-40
NR-17	Prepare an Act 167 plan for the NMS watersheds.	NMS	L	DC	GB, WO	PADEP	5-42
BR-1	Amend zoning and subdivision land development ordinances to promote sustainable land development practices to minimize or mitigate potential impacts of development on natural communities.	DRC/NMS	S	GB	DC, EAC, LT	DC, LT	6-2
BR-2	Preserve and enhance sensitive natural communities and wildlife areas through proactive planning and land management.	DRC/NMS	O	DC	GB, LT, R	DCNR, LT	6-2
BR-3	Utilize the Natural Heritage Inventory (NHI) to prioritize preservation areas and land management techniques.	DRC/NMS	O	GB	DC, LT, WO	DCNR	6-5
OS-1	Continue to preserve land and develop parks and other public open space, as appropriate, along the Delaware River and other Study Area waterways.	DRC/NMS	O	DC, GB	CZTF, DC, GB	DCNR, LT, PADEP	7-4
OS-2	Create local trail networks that link neighborhood trails, parks, historic resources and other destinations in the study area with the regional greenway network, including the East Coast Greenway.	DRC/NMS	M	GB	BCVB, DC. DVRPC, R	DC, DCNR, DVRPC	7-20
OS-3	Establish new trails along streams, open corridors, and along road and utility rights-of-way.	DRC/NMS	M	GB	DC, LT, R	DC, DCNR, DVRPC	7-20

ID #	Recommended Action	Study Area	Timing	Lead Organization	Partners	Technical Support	Reference Page
OS-4	Partner with “friends of” groups to help maintain and improve park and natural area resources while encouraging community stewardship.	DRC/NMS	O	GB	EAC, R	DC, DCNR	7-7
OS-5	Promote a variety of recreational activities in municipal parks, as appropriate, in order to meet the needs of an active, diverse community.	DRC/NMS	S	GB	EAC, R	DC	7-2
OS-6	Partner with educational groups, including schools, to promote environmental education activities in parks.	DRC/NMS	M	GB	Schools, WO	DC	7-15
OS-7	Explore opportunities to increase passive open space as part of the revitalization process.	DRC	O	GB	DC, DCCC	DCNR	7-4
OS-8	Explore opportunities to develop pocket parks and community gardens in urban areas, especially on vacant lots and brownfields.	DRC	O	GB	DC, DCCC, R	DCNR, USEPA	7-7
OS-9	Participate in the development of the Delaware River Water Trail for recreational canoeists and kayakers.	DRC	O	PEC	DC, DVRPC, GB	DCNR	7-19
OS-10	Increase both physical and visual riverfront access opportunities by providing viewing areas and boat launch facilities.	DRC	O	GB	DC, CZTF, PFBC	DC, DCNR, PFBC	7-4, 7-19
OS-11	Maximize opportunities for creating connectivity through the use of trails in new development.	NMS	O	GB	EAC, R	DC, DCNR	7-15
SI-1	Partner with the Brandywine Conference and Visitors Bureau (BCVB) to promote the coastal zone corridor through social media and interactive mapping.	DRC/NMS	S	DC	BCVB, CZTF, DCCC, HG	PADEP	8-3
SI-2	Promote heritage tourism and other cultural activities, including historic house and village tours, mill and farm tours, and ghost tours, and war reenactments.	DRC/NMS	M	HG	DC, GB, R	BCVB, DC, DCNR	8-3
SI-3	Evaluate the applicability of Cheste rcity's Climate Adaptation element for use in other Study Area Communities	DRC/NMS	S	DC	CZTF, GB, I/B		8-5
SI-4	Implement the East Coast Greenway as a mechanism to promote trail connection to Study Area attractions.	DRC	L	GB	CZTF, DC, DVRPC	DC, DVRPC, PEC	8-2
SI-5	Work with County Planning, the County Commerce Center, and the Brandywine Conference and Visitors Bureau to develop tourism support services, such as hotels, restaurants, and bicycle-related facilities.	DRC	L	DC	DVRPC, GB	DCNR	8-2
SI-6	Develop a marketing campaign for the Corridor using the Internet and social media techniques nfor navigation through the area and interpretation of heritage resources.	DRC	M	DC	DCNR, GB		8-3
SI-7	Pursue State Byway Status for Route 291/13.	DRC	S	DC	CZTF, GB	PennDOT	8-3
SI-8	Work with regional entities to identify a strategy to protect and restore tidal wetlands and shorelines along the Delaware River and its tributary streams.	DRC	L	DC	DCNR, GB, NPO, PADEP	DVRPC, NPO, PADEP, USEPA	8-4
SI-9	Identify and plan for potential risks to riverfront infrastructure associated with possible storm surges or sea level increase.	DRC	M	GB	DC, DVRPC, I/B, PennDOT	DVRPC, NPO, USEPA	8-4
SI-10	Evaluate existing levees and tide gates for structural integrity and adequacy to handle storm surges.	DRC	M	GB	ACE, FEMA	ACE, FEMA	8-5
SI-11	Explore assets in the study area for potential tourism value and regional appeal.	NMS	S	DC	BCVB, GB, HG	DCNR, DVRPC, PEC	8-3

ID #	Recommended Action	Study Area	Timing	Lead Organization	Partners	Technical Support	Reference Page
I-1	Initiate joint planning activities and revitalization programs through the promotion of municipal partnerships.	DRC/NMS	O	DC	GB, LT, WO	DCED, DVRPC	9-2
I-2	Utilize the full range of planning tools and programs to implement the recommendations listed in the RCP.	DRC/NMS	O	GB	DC	DC	9-16, 9-17
I-3	Form joint or individual environmental advisory councils (EACs) to address recommendations in the Rivers Conservation Plan.	DRC/NMS	S	GB	PEC, R	DC, PEC	9-2
I-4	Coordinate with County and municipal historic groups on watershed projects to gather local cultural and historic information, and to implement preservation and educational programs that raise awareness about the Study Area's history.	DRC/NMS	O	GB	BVCB, DC, HG, WO, R	DC, HG	9-12
I-5	Partner with local school districts and universities to maximize opportunities for collaboration to create awareness about watershed issues.	DRC/NMS	S	GB	EAC, R, Schools, WO	DC, LT	9-13
I-6	Work with area universities to identify technical assistance and service learning opportunities and additional community activities.	DRC/NMS	O	GB	DC, R, Schools	DC	9-14
I-7	Partner with the Darby Creek Valley Association (DCVA) and Chester-Ridley-Crum Watersheds Association (CRC) to assist with watershed issues that exist within the Delaware River drainage areas.	DRC	O	GB	DC, EAC, WO	DC	9-11
I-8	Participate in the Delaware County Coastal Zone Management Task Force to share information about riverfront corridor issues and to participate in coastal zone planning efforts.	DRC	O	GB	BCVB, DC, HG, I/B, WO	DC	9-12
I-9	Form a watershed organization to address water resource and other related issues that exist within the NMS watersheds.	NMS	S	R	DC, GB, WO	DC, PEC	9-11
I-10	Identify opportunities to work with local homeowners' associations to address restoration of riparian buffers, maintenance of open space, and reforestation.	NMS	O	GB	DC, R, WO	DC, PADEP	9-12

ACE	Army Corps of Engineers
BCVB	Brandywine Conference and Visitors Bureau
CZTF	Delaware County Coastal Zone Task Force
DC	County of Delaware (Planning Department, Conservation District, Parks Department, etc.)
DCCC	Delaware County Commerce Center
DCED	Pennsylvania Department of Community and Economic Development
DCNR	Pennsylvania Department of Conservation and Natural Resources
DELCORA	Delaware County Regional Water Quality Control Authority
PADEP	Pennsylvania Department of Envronmental Protection
DVRPC	Delaware Valley Regional Planning Commission
EAC	Environmental Advisory Council
USEPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency (FEMA) (or Pennyslvania Emergency Management Agency (PEMA))
GB	Governing Body (municipal and consultant staff)
HG	Historical Group
I/B	Industry and/or Businesses
LT	Land Trust (i.e., Natural Lands Trust, Brandywine Conservancy, etc.)
NPO	Non-Profit Organization
PEC	Pennsylvania Environmental Council
PennDOT	Pennsylvania Department of Transportation
PFBC	Pennsylvania Fish and Boat Commission
PHMC	Pennsylvania Historic and Museum Commission
R	Residents and Civic Organizations (friends groups, civic organizations, homeowners associations)
Schools	Schools, school districts, colleges, universities, etc.
STC	Shade Tree Commission (municipal)
TV	TreeVitalize
WO	Watershed Organization (e.g., CRC, DCVA, NCWA)

Naamans, Marcus Hook, and Stoney Creek Watersheds

As mentioned above, a joint EAC could help to draw attention to environmental issues of concern in a municipality. Marcus Hook, Trainer, and Lower Chichester formed a joint EAC to keep track of air quality issues related to local industries, although they could also work together to help promote watershed conservation. Aston, Bethel, Chester Township, and Upper Chichester do not have municipal EACs. The opportunity exists to form individual or joint EACs in those municipalities.

WATERSHED ORGANIZATIONS

As noted previously, all of Delaware County's other watersheds benefit from efforts by local stakeholders who engage in efforts to improve the health of their waterways. Non-profit organizations, such as the Darby Creek Valley Association (DCVA), Chester-Ridley-Crum Watersheds Association (CRC), and Naamans Creek Watershed Association (NCWA) in Delaware play important roles in helping with stewardship activities, such as stream clean-ups, restoration events, and public education for local residents and municipalities. Unfortunately, while most of the DRC municipalities benefit from the watershed organizations operating on the tributaries to the Delaware River, the NMS municipalities do not.

Delaware River Corridor

Although the DRC area does not have its own watershed organization, many of the riverfront communities work closely with DCVA or CRC on municipality-wide watershed issues. The length of the DRC and fragmentation of its sub-basins makes the prospect of having its own watershed group challenging.

Naamans, Marcus Hook, and Stoney Creek Watersheds

There is no active watershed organization in the NMS portion of the Study Area. However, the NCWA based in New Castle, Delaware, is very active, focusing its efforts on cleanups, flooding issues, and general watershed awareness. Establishing a similar citizen-based watershed group on the Pennsylvania side could be a valuable tool for increasing watershed capacity and implementing many of the recommendations listed in this plan. Therefore, consideration should be given to forming a joint watershed organization. Such a watershed group could engage the public, and even collaborate with municipalities, schools, service groups, and other non-profit organizations, to take on watershed projects that best suit the needs of the NMS communities. Just as NCWA does in Delaware, a watershed group in the NMS could conduct public education activities and water testing, host volunteer stream clean-ups, and even undertake tree plantings and riparian buffer restoration projects. It could also partner with NCWA for Naamans Creek watershed events.

There is a documented need for promoting environmental stewardship to the homeowners' associations (HOAs). Given their prevalence in the NMS portion of the Study Area, a watershed group could provide information to HOAs and other residents

about environmentally friendly lawn maintenance, planting with native species, maintaining riparian buffers, and other best management practices for maintaining protected open space.

DELAWARE COUNTY PLANNING DEPARTMENT

The mission of the Delaware County Planning Department (DCPD) is "…to promote the sound development and redevelopment of the County through the application of contemporary planning principles and smart growth concepts, while maintaining and enhancing the cultural, economic and environmental livability of the County." DCPD staff have expertise in a number of issues relating to the recommendations contained in this plan. Sections of the office that could provide direct support for implementation include Environmental, Historic Preservation, Transportation, and Community Assistance.

DELAWARE COUNTY CONSERVATION DISTRICT

The Delaware County Conservation District (DCCD) is a subdivision of state government, but is also service provided by the County of Delaware. Along with a board of volunteer directors appointed by Delaware County Council, DCCD "evaluates problems, implements programs, and advocates for effective solutions dealing with natural resource protection and conservation." Among DCCD's focus areas are: erosion and sedimentation pollution control, floodplain management, stormwater and nutrient management, waterway protection, and environmental education. It also participates in a variety of partnerships with stakeholders, such as EACs, watershed groups, non-profit organizations, and school districts, to further the effectiveness of its programs. DCCD has played a central role in facilitating workshops and events that address stormwater education (including rain barrels), energy efficiency, riparian buffers, and tree canopy.

DELAWARE COUNTY COASTAL ZONE TASK FORCE

Delaware County's federally-designated coastal zone area consists of 13 municipalities. All of the DRC municipalities and a small portion of Upper Chichester (NMS) are located within the coastal zone boundary. Delaware County Coastal Zone Task Force (CZTF), which was first convened in 1995 by DCPD, is comprised of municipal officials, staff from state agencies, local industry stakeholders, non-profit representatives, and concerned citizens. The CZTF meets five times annually to focus on common issues facing the coastal zone communities, and to share information regarding planning activities, revitalization efforts, and other important projects.

HISTORICAL GROUPS

Historical societies are among Delaware County's most well-organized citizen groups. The County has a number of historical societies dedicated to preserving local history for municipalities and historic sites. The following groups are active within the Study Area:

- Aston Historical Society
- Bethel Township Historical Society
- Chester Historic Preservation Society
- Chichester Historical Society
- Marcus Hook Historical Commission
- Plankhouse Crew
- Sun Ship Historical Society
- Tinicum Township Historical Society

There are also two countywide historic groups that can assist with local cultural and historical preservation efforts. The Delaware County Heritage Commission consists of 11 members who have been appointed by County Council. The mission of this group is to "…oversee the rich heritage of Delaware County and to support those organizations within the County that are promoting and preserving our cultural legacy. Commission members accomplish this mission through outreach to the historic communities of Delaware County, as well as providing a resource base for these organizations and individuals." The Delaware County Historical Society seeks "to acquire, preserve and make available documentation of Delaware County history; to provide and support educational programs on the history of Delaware County; and to publish materials relevant to this history."

Depending on the nature of the project or initiative, these historic groups could provide support for implementation initiatives that relate to historic and cultural resources. One possible option would be to complete detailed municipality-specific historic resource inventories. They may be available to assist with site or building preservation and management, museum curation, researching culturally significant resources to develop interpretive signage, and promoting heritage tourism.

SCHOOL DISTRICTS

There are six school districts in the Study Area (refer to Table 9-2). By engaging young students in lessons about watershed education, there is a greater likelihood that they will take part in conservation actions as adults. Incorporating lesson plans about watershed conservation can be challenging, especially since each watershed has different attributes and issues. The state-funded Pennsylvania Center for Environmental Education serves as a clearinghouse for environmental information and resources that could enhance efforts to address watershed issues and complement state requirements for environmental education in school curricula. If there were a local watershed group, it could provide assistance by providing watershed lessons in the classroom and in the field to enhance student learning.

School districts are increasingly requiring their students to complete community-based service projects. Reaching out to local schools for possible service learning projects can provide another effective means for promoting watershed health. Service learning activities are an effective tool for getting students involved with watershed issues, such as testing water samples, planting trees, or cleaning up streams. In addition to providing

benefits to watershed health, such activities also enrich learning experiences and encourage civic engagement.

TABLE 9-2
STUDY AREA SCHOOL DISTRICTS

SCHOOL DISTRICT	MUNICIPALITIES
Chester-Upland	Chester City, Chester Township
Chichester	Lower Chichester, Marcus Hook, Trainer, Upper Chichester
Garnet Valley	Bethel
Interboro	Tinicum
Penn Delco	Aston
Ridley	Ridley, Eddystone

Source: DCPD, 2014

Schools can also promote watershed awareness by participating in the Delaware County Envirothon. This annual event is organized by the DCCD with assistance from the Pennsylvania Department of Conservation and Natural Resources (DCNR), the Pennsylvania Department of Environmental Protection (DEP), and the Delaware County Environmental Network. Students are tested in five topic areas, including:

- Soils and land use
- Aquatic ecology
- Forestry
- Wildlife
- Environmental issues

The winner of the Delaware County Envirothon goes on to compete against other counties at the Pennsylvania Envirothon, where contestants are eligible to compete for $10,000 in scholarships and prizes. Penn Delco's Sun Valley High School, located in Aston, is the only school in the Study Area that has entered recent Envirothons. Increasing participation in the Envirothon provides students with a fun way to learn, while fostering a sense of environmental stewardship.

COLLEGES AND UNIVERSITIES

With the significant number of colleges and universities in Delaware County, opportunities to partner with institutions of higher learning should not be overlooked. While there are not any colleges located directly in the Study Area, there are several within a few miles. The closest colleges are Widener University (Chester City) and Neumann University (Aston Township). Additional colleges that may be able to offer support for watershed-based initiatives include: Cheyney University (Thornbury Township), Delaware County Community College (Marple Township), Penn State Brandywine (Middletown Township), and Swarthmore College (Swarthmore Borough). There are also a number of large universities in the region, including Villanova, Drexel, Temple, and the University of Pennsylvania, that may be able to provide technical assistance. By reaching out to professors that teach biology, environmental science,

environmental studies, and even civil engineering, there may be an opportunity for creating research-based or interactive projects that address watershed needs and provide student learning opportunities.

BRANDYWINE CONFERENCE AND VISITORS BUREAU

The Brandywine Conference and Visitor's Bureau (BCVB) is the County's designated agency that promotes corporate meetings, group tours, and day trips to the many places to visit in Delaware County. The organization promotes recreational, cultural, and historic sites and events through its magazine and website. It also supports heritage tourism efforts. Municipalities should work with BCVB to develop and promote eco-tourism and related activities geared toward the environmental and historic values of the area. Utilizing resources like the Delaware River, the Heinz Refuge, riverfront parks, various historic sites, and the regional pull from Philadelphia International Airport (PHL), destination tourism opportunities should be explored for greater utilization of existing amenities and resources.

OTHER POTENTIAL PARTNERS

There are many other organizations in Delaware County and throughout the region that may be potential partners or can assist with the watershed goals and recommendations in this RCP. The Brandywine Conservancy and Natural Lands Trust, both of which are based in Delaware County, are conservation-minded organizations that may be able to provide technical support for the preservation of land in the Study Area. They can help partners manage and preserve land, as well as provide technical assistance to municipalities for conservation design, zoning, and educational outreach regarding topics such as land stewardship and water resources.

The Partnership for the Delaware Estuary, which focuses on regional efforts throughout the Delaware River basin, has been active with the City of Philadelphia and other Delaware River communities since 1996. In addition to conducting scientific research, the Partnership supports watershed stewardship efforts for communities, schools, and businesses.

The Pennsylvania Sea Grant Program (Sea Grant) is a partnership between Penn State University, the Commonwealth of Pennsylvania, and the National Oceanic and Atmospheric Administration (NOAA). The organization, which has an office in Chester, "promotes the ecological and economic sustainability of Pennsylvania's coastal resources through research and outreach." Sea Grant's activities include science-based extension, education, applied research, and communication focusing on Delaware River drainages of Pennsylvania. Their efforts include education for students of all ages and for municipalities, as well as enhancing coastal tourism and sustainable land use practices.

Sea Grant has undertaken several programs in the Study Area, including a two-day workshop, "Delaware County Roadmap for Addressing Coastal Hazards," in 2010, a Clean Marinas Program for boaters, and most recently Climate Adaptation work for the City of Chester. Sea Grant works closely with NOAA's Coastal Services Center that can provide additional assistance for municipalities within the coastal zone by supporting "the

environmental, social, and economic well-being of the coast by linking people, information, and technology." It offers a variety of resources for coastal planning and development, the use of green infrastructure, and several tools that use geospatial data.

LAND USE DOCUMENTS AND PLANNING TOOLS

Many of the recommendations listed in this RCP can be integrated into existing and future land and water planning activities conducted by the County of Delaware and its municipalities. Land use planning efforts that seek to strengthen the local communities and the economy, while also protecting the resources documented in this Plan, will provide lasting benefits for future generations. The following overview lists some of the more common tools that can be used by the Study Area municipalities to protect their land and water, biological, historic and cultural, and recreational resources. DCPD can provide technical assistance to municipalities seeking to update their comprehensive plans, revise their zoning or subdivision and land development ordinances (SALDOs), or develop special purpose ordinances.

COMPREHENSIVE PLANS

Article III of the Pennsylvania Municipalities Code (MPC), Act 247, requires municipalities to define community goals through a comprehensive plan. A comprehensive plan is a strategic guide that helps to shape a municipality's physical development. By establishing goals, objectives, and actions, a municipality can use a comprehensive plan to develop policies for future community growth. The following are several, but not all, of the elements that are typically found in a comprehensive plan.

- An inventory of important environmental features, including wetlands, floodplains, natural heritage inventory sites, etc.
- Existing and proposed infrastructure
- Important housing resources
- Community facilities, including parks, libraries, community centers, etc.

The MPC also authorizes multi-municipal comprehensive plans. The Ridley-Eddystone and Aston-Lower Chichester-Upper Chichester plans are examples in the Study Area.

The recently adopted *Delaware County 2035* is a Comprehensive Policy Framework Plan for the County that establishes an overall vision for the future of the County through the year 2035. It also sets policies for development, redevelopment, conservation, and economic initiatives. The Plan provides the County's 49 municipalities with a framework for the strategic use of public resources to improve the quality of life for all its residents.

ZONING ORDINANCES

Authorized by Article VI of the MPC, and based on guidance from the comprehensive plan, a municipal zoning ordinance specifies allowable land uses and their location(s)

within different zoning districts in a municipality. The zoning ordinance includes statements of purpose and intent, and provides area and bulk, as well as other standards for development. The MPC also enables municipalities to regulate and protect important environmental resources, such as wetlands, and historic sites through their zoning ordinances.

As noted in Chapter 3, every Study Area municipality has its own zoning ordinance. Study Area municipalities should consider updating their zoning ordinances and municipal maps to incorporate provisions that will help further the goals of this plan and other plans affecting the Study Area. Current examples of plan recommendations being reflected in zoning ordinances include Eddystone's Industrial Heritage Corridor overlay along Route 291/13 and Chester City's waterfront overlay.

SUBDIVISION AND LAND DEVELOPMENT ORDINANCES

The subdivision and land development ordinance (SALDO), authorized by Article V of the MPC, is another tool that a municipality can use to regulate development. The *Transportation and Land Use Toolkit* (2007), states that a SALDO, "addresses the division or re-division of a lot, tract, or parcel and changes in existing property lines, and the improvement of public and private property, including the layout and dedication of new streets." Furthermore, "it establishes reasonable and acceptable design standards, coordinates public infrastructure, such as roadways and utilities, with development, and ensures suitable areas for development and public use." The SALDO provides standards for land development plan content, roads, sidewalks, parking, trees and landscaping, as well as for the installation of infrastructure, such as streets, sidewalks, and water and sewer facilities.

Therefore, municipal SALDOs could be amended to require developers to set aside open space or easements for trails as part of new development or redevelopment. Requiring sidewalks in residential areas can also help to encourage walking. Additionally, as mentioned in Chapter 6, requiring municipalities to refer to the *Delaware County Natural Heritage Inventory* (2011), in their respective SALDOs can ensure that land is developed in such a way that it accounts for the potential to impact sensitive habitats.

OFFICIAL MAPS

Article IV of the MPC authorizes municipalities and counties to adopt and implement an official map. An official map formally identifies the location of future municipal improvements or acquisitions, which enables a municipality to acquire land for the designated public purpose. As listed in Section 401, public lands and facilities that can be designated on an official map include, but are not limited to: existing and proposed streets, parks and open space; pedestrian and transit rights-of-way; and flood and stormwater management areas and easements. If the owner of land identified on an official map choses to build, subdivide, or develop the land, written notice must be submitted to the municipality. From the point when the owner submits written notice of intent, the municipality has one year to acquire the property or begin condemnation

proceedings to acquire the property. If the municipality fails to or chooses not to do so in the time period, the reservation for public ground shall lapse and become void.

Additionally, the official map can be a valuable resource when applying for grant funds due to its ability to reinforce long range plans for an area. While official maps have been adopted in other parts of the state, including 16 in Chester County, no municipality in Delaware County has adopted an official map at this time.

ENVIRONMENTAL ORDINANCES

Stormwater Management Ordinances

As mentioned in Chapter 5: Natural Resources, Act 167 requires municipalities with Act 167 plans to adopt and comply with the respective stormwater ordinances. Stormwater ordinances help to ensure that runoff from future development and redevelopment activities is managed in compliance with federal and state stormwater regulations. By using the most current stormwater standards and best management practices, municipalities can reduce the amount of stormwater runoff that enters storm sewers and waterways. This can help to reduce flooding and stream bank erosion, and subsequent sedimentation, while promoting infiltration and water quality.

Floodplain Management Ordinances

Floodplain ordinances can be one of the most effective ways for communities to reduce property damage and other impacts of flooding (refer to Chapter 5). In order for residents to receive flood insurance, municipalities are required by the Federal Emergency Management Agency (FEMA) to have ordinances that dictate permissible uses within floodplain areas. The Pennsylvania Department of Community and Economic Development (DCED) also mandates that municipalities have floodplain ordinances, or risk losing state funds. If municipalities go beyond the minimum ordinance requirements required by FEMA, they may be eligible for Community Rating System (CRS) credits to help reduce National Flood Insurance Program (NFIP) premiums.

Other Environmental Ordinances

Municipalities can enact or revise several other types of stand-alone ordinances to protect riparian buffers, steep slopes, and shade trees, as well as to minimize other environmental impacts.

SPECIAL PURPOSE PLANS AND PROGRAMS

Municipalities are encouraged to prepare special purpose plans for open space and recreation, trails, habitat protection, historic and cultural resource preservation, and for flooding and stormwater problems. Such plans can further identify issues and recommend programs for the protection of resources as well as prevent hazards associated with flooding and stormwater.

FUNDING SOURCES

The RCP contains many recommendations for ways to improve stream habitat, promote recreation and public access, conserve open space, and build stakeholder capacity in the Study Area. Locating, applying for, and securing grant funding can be a major obstacle for implementing these recommendations. Due to variability in the programs that administer grants, a comprehensive list of funding sources has not been included for the RCP's specific recommendations. However, given the nature of these recommendations, DEP's Coastal Resources Management (CZM) Program and DCNR's Community Conservation Partnership Program (C2P2), which can be used as "match" for one another, are two sources of grant funding well suited for implementation of the RCP.

Additionally, DCPD's County and Regional Planning section maintains the *Urban Revitalization Resource Guide*, which can assist communities in identifying grant opportunities to implement local and regional revitalization projects. The Guide contains detailed information on local, state, and federal funding programs including contact information, funding cycles, eligible activities, and grant amounts, as well as sources of technical assistance. The Guide is updated annually.

Although private foundation and other forms of public funding for municipalities are available, the list varies from year to year and program to program. Therefore, they will not be discussed in detail in this document. The following are several of the most commonly used public funding programs in the Study Area.

COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM

The Delaware County Community Development Block Grant (CDBG) Program offers a high level of flexibility in choosing activities that best meet the needs of the local communities. The program is operated by the Federal Department of Housing and Urban Development (HUD), and administered locally by the Delaware County Office of Housing and Community Development. This program offers a wide range of eligible activities, including acquisition, rehabilitation of residential and nonresidential structures, and construction of public facilities. Chester City is the only municipality in the Study Areas not eligible for the County program because it receives direct funding from HUD.

COASTAL ZONE RESOURCES PROGRAM

Given that most of the Study Area's municipalities reside in the federal coastal zone, Coastal Zone funding administered from NOAA via DEP's Coastal Resources Management Program (CRM) could provide a source of grant monies for projects that advance the Program's mission. The mission of the CRM is to "protect and enhance fragile natural resources by reducing conflicts between competing land and water uses while representing a comprehensive approach to managing the impacts of development

and other activities on coastal areas." CRM focus areas emphasize a range of activities, including: reducing coastal flooding, protecting wetlands, creating public access for recreation, increasing intergovernmental coordination, and preserving historic sites and structures.

COMMUNITY CONSERVATION PARTNERSHIP PROGRAM (C2P2)

DCNR manages C2P2, which includes several sub-categories that could provide potential funding sources for a variety of local recreation and conservation initiatives. Overviews of the applicable C2P2 grants are listed below; additional information about these programs can be obtained from DCNR.

Rivers Conservation

When an RCP is placed on the state's Rivers Registry, implementation projects recommended in the plan may become eligible for C2P2 Rivers Conservation grants. Eligible projects include stream restoration and bank stabilization efforts, habitat restoration, and landscaping. Additionally, funding may be provided for projects seeking to promote river access, create recreational opportunities, such as greenways and water trails, and provide recreational support facilities. Archeological and historical restoration and protection projects are also eligible for funding under this program. Applicants can include municipalities, counties, municipal authorities, and non-profit organizations, such as watershed groups. As such, the Rivers Conservation Program is a good source of funding for implementing this RCP.

Community Recreation and Conservation

This C2P2 funding stream, open to municipalities and non-profit organizations, is designated for recreation, park, and acquisition projects. Development awards are given for the rehabilitation and development of new parks and recreation facilities, as well as for acquiring land that will be used for passive park and conservation purposes. Planning for activities such as feasibility studies, trail studies, conservation plans, and site plans are also eligible for funding.

Land Acquisition

C2P2's Land Acquisition program provides funding to eligible land trusts and conservancies for acquiring critical habitat, open space, and natural areas. Priority is given to projects in critical habitat areas.

Partnerships

The C2P2 Partnerships program assists with efforts to build professional capacity, and educate the public on the benefit and value of recreation, conservation and heritage in Pennsylvania. It also funds projects seeking to develop and manage recreational facilities, and promote the conservation of natural and heritage resources. Eligible applicants

include municipalities, counties, non-profit organizations, and institutions of higher learning.

Recreational Trails

The C2P2 Pennsylvania Recreational Trails program is designed to help develop and maintain recreational trails and trail facilities. The program is open to public agencies, non-profit organizations, and for-profit organizations.

Peer-to-Peer

Peer-to-Peer grants are awarded to municipalities seeking to improve their park, recreation and conservation services through a collaborative process. By engaging individuals from park, recreation, and conservation backgrounds with local leaders, these grants are intended for activities such as assessing recreational facilities, forming an intergovernmental recreation agency, or for training purposes.

RECOMMENDATIONS

MUNICIPALITIES IN THE DELAWARE DIRECT DRAINAGE AREAS AND THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

I-1 Initiate joint planning activities and revitalization programs through the promotion of municipal partnerships.

I-2 Utilize the full range of planning tools and programs to implement the recommendations listed in the RCP.

I-3 Form joint or individual environmental advisory councils (EACs) to address recommendations in the Rivers Conservation Plan.

I-4 Coordinate with County and municipal historic groups on projects to gather local cultural and historic information, and to implement preservation and educational programs that raise awareness about the Study Area's history.

I-5 Partner with local school districts and universities to maximize opportunities for collaboration to create awareness about watershed issues.

I-6 Work with area universities to identify technical assistance and service learning opportunities and additional community activities.

MUNICIPALITIES IN THE DELAWARE DIRECT DRAINAGE AREAS SHOULD:

I-7 Partner with the Darby Creek Valley Association (DCVA) and Chester-Ridley-Crum Watersheds Association (CRC) to assist with watershed issues that exist within the Delaware River drainage areas.

I-8 Participate in the Delaware County Coastal Zone Management Task Force to share information about riverfront corridor issues and to participate in coastal zone planning efforts.

MUNICIPALITIES IN THE NAAMANS, MARCUS HOOK, AND STONEY CREEK WATERSHEDS SHOULD:

I-9 Form a watershed organization to address water resource and other related issues that exist within the NMS watersheds.

I-10 Identify opportunities to work with local homeowners' associations to address restoration of riparian buffers, maintenance of open space, and reforestation.

REFERENCES

1. Aston Township, *Comprehensive Parks and Open Space Plan for Aston Township,* prepared by Vollmer Associates LLP. Aston, Pennsylvania: May 2006.

2. Aston Township, Lower Chichester Township, and Upper Chichester Township, *Aston, Lower Chichester, and Upper Chichester Multi-Municipal Comprehensive Plan,* prepared by Delaware County Planning Department. Media, Pennsylvania: 2005.

3. Borough of Marcus Hook, *Comprehensive Plan: Borough of Marcus Hook,* prepared by Delaware County Planning Department. Media, Pennsylvania: October 2002.

4. Borough of Marcus Hook, *Market Square Memorial Park Marina Feasibility Study and Development Plan,* prepared by Urban Partners. Marcus Hook, Pennsylvania: July 2008

5. Chester-Ridley-Crum Watersheds Association, *Crum Creek Watershed Conservation Plan,* prepared by Natural Lands Trust. Media, Pennsylvania: June 2005.

6. Chester-Ridley-Crum Watersheds Association and GreenSpace Alliance, *Ridley Creek Conservation Plan,* prepared by Natural Lands Trust. Media, Pennsylvania: February 1997.

7. Chester-Ridley-Crum Watersheds Association and Pennsylvania Environmental Council, *Chester Creek Conservation Plan,* prepared by Natural Lands Trust. Media, Pennsylvania: June 2001.

8. City of Chester, *City of Chester Comprehensive Plan,* prepared by CHPlanning. Chester, Pennsylvania: October 2012.

9. Darby Creek Valley Associates, *Darby Creek Watershed Conservation Plan,* prepared by Cahill Associates and Campbell Thomas & Company, Drexel Hill, Pennsylvania: November 2004.

10. Delaware County Commerce Center, Largest Employers. Retrieved from http://www.delcopa.org/top-employers.php

11. Delaware Department of Natural Resources and Environmental Control, *2012 Combined Watershed Assessment Report (305(b)) and Determination for the Clean Water Act Section 303(d) List of Waters Needing TMDLs*. Dover, Delaware: April, 2013.

12. Delaware County Planning Department, *Darby-Cobbs Watershed Act 167 Stormwater Management Plan.* Media, Pennsylvania: May 2005.

13. Delaware County Planning Department, *Delaware County Act 537 Sewage Facilities Plan Update – Eastern Plan*, prepared by Weston Solutions, Inc. Media, Pennsylvania: 2002.

14. Delaware County Planning Department, *Western Delaware County Act 537 Sewage Facilities Plan Update*, prepared by Weston Solutions Inc. Media, Pennsylvania: April, 2012.

15. Delaware County Planning Department, *Delaware County Archaeological Resource Inventory and Management Plan.* Media, Pennsylvania: 1990.

16. Delaware County Planning Department, *Delaware County Archaeological Resource Inventory and Management Plan, Volume II.* Media, Pennsylvania: 1991.

17. Delaware County Planning Department, *Delaware County Coastal Zone Compendium of Waterfront Provisions.* Media, Pennsylvania: June 1998.

18. Delaware County Planning Department, *Delaware County Industrial Heritage Parkway: Route 291/13 Beautification and Greenway Plan,* prepared by Menke & Menke, Landscape Architects and Planners. Media, Pennsylvania: March 2002.

19. Delaware County Planning Department, *Delaware County Renaissance Program Planning Area 1 Action Plan*, prepared by Heyer, Gruel + Associates. Media, Pennsylvania: March 2003.

20. Delaware County Planning Department, *Delaware County Renaissance Program Planning Area 2 Action Plan*, prepared by EDAW. Media, Pennsylvania: March 2003.

21. Delaware County Planning Department, *Delaware County Renaissance Program Planning Area 3 Action Plan*, prepared by PP&MG. Media, Pennsylvania: March 2003.

22. Delaware County Planning Department, *Delaware County Route 291/13 Industrial Heritage Parkway and Greenway Landscape and Signage Guidelines,* prepared by Menke & Menke, Landscape Architects and Planners. Media, Pennsylvania: September 2005.

23. Delaware County Planning Department, *Delaware County Waterfront Resources Management Plan.* Media, Pennsylvania: August1992.

24. Delaware County Planning Department, *Industrial Heritage Parkway Interpretive Signage Guidelines*. Media, Pennsylvania: May 2013.

25. Delaware County Planning Department, *Maintaining Your Historic Home: A Practical Guide for Homeowners in Viscose Village, Marcus Hook, Pennsylvania.* Media, Pennsylvania.

26. Delaware County Planning Department, *Natural Heritage Inventory of Delaware County,* prepared by Western Pennsylvania Conservancy. Media, Pennsylvania: June 2011.

27. Delaware County Planning Department, *Preservation Primer: Understanding the Basics of Historic Preservation.* Media, Pennsylvania.

28. Delaware County Planning Department, *Ridley Creek Act 167 Stormwater Management Plan.* Media, Pennsylvania: September 1988.

29. Delaware County Planning Department and Chester County Planning Commission, *Chester Creek Act 167 Stormwater Management Plan.* Media, Pennsylvania: June 2002.

30. Delaware County Planning Department and Chester County Planning Commission, *Crum Creek Act 167 Stormwater Management Plan.* Media, Pennsylvania: December 2011.

31. Delaware County Regional Water Quality Control Authority, *Private Lateral Inflow and Infiltration Elimination Project: Summary Report,* prepared by Weston Solutions, Inc. Chester, Pennsylvania: June 2010.

32. Delaware Valley Regional Planning Commission, *Regional, County, and Municipal Population Forecasts, 2010-2040*, Philadelphia, Pennsylvania: February 2013.

33. Delaware Valley Regional Planning Commission and GreenSpace Alliance, *Return on Environment: The Economic Value of Protected Open Space in Southeastern Pennsylvania.* Philadelphia, Pennsylvania: November 2010.

34. Good, J.W. and Goodwin, R.F. *Waterfront Revitalization for Small Cities.* Oregon Extension Service. Corvallis, Oregon: March 1990.

35. Maritime Exchange for the Delaware River and Bay, *Vessel arrival Statistics 01/01/12-12/31/12*. Philadelphia, Pennsylvania: June 2014.

36. National Oceanic and Atmospheric Administration, *Delaware County, Pennsylvania: Roadmap for Adapting to Coastal Risk.* Chester, Pennsylvania: 2011.

37. Partnership for the Delaware Estuary, *Climate Change and the Delaware Estuary: Three Case Studies in Vulnerability Assessment and Adaptation Planning.* Wilmington, Delaware: May 2010

38. Pennsylvania Department of Conservation and Natural Resources, *Groundwater Resources of Delaware County, Pennsylvania.* Harrisburg, Pennsylvania: 1996.

39. Pennsylvania Department of Conservation and Natural Resources, *Invasive Plants in Pennsylvania.* Harrisburg, Pennsylvania: 2006.

40. Pennsylvania Department of Conservation and Natural Resources, *The Geology of Pennsylvania's Groundwater (3rd Ed.)*, prepared by Fleeger, G.M. Harrisburg, Pennsylvania: December 1999

41. Pennsylvania Department of Environmental Protection, *2012 Pennsylvania Integrated Water Quality Monitoring and Assessment Report: Clean Water Act Section 305(b) Report and 303(d) List*. Harrisburg, Pennsylvania: 2012

42. Pennsylvania Department of Environmental Protection, NPDES Permitted Facilities in the Marcus Hook, Naamans, and Stoney Creek Watersheds and Delaware Direct Watershed, prepared by D. Burke, PADEP. January 2011.

43. Pennsylvania Department of Environmental Protection, *Pennsylvania State Water Plan.* Harrisburg, Pennsylvania: March 2009.

44. Pennsylvania Department of Transportation, *The Transportation and Land Use Toolkit.* Harrisburg, Pennsylvania: March 2007.

45. Pennsylvania Fish and Boat Commission Banned Aquatic Species. Retrieved from http://fishandboat.com/ais.htm.

46. Philadelphia International Airport, *PHL Statistics*.

47. Stranahan, S. and King, L. (2000, April 30). Beyond the Flames. *The Philadelphia Inquirer.*

48. United State Census Bureau, *2008-2012 American Community Survey*. Retrieved from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_12_5YR_S1702&prodType=table. Accessed June 9, 2014

49. United States Department of Agriculture, *Soil Survey of Chester and Delaware Counties, Pennsylvania.* Washington, D.C.: May 1963.

50. United States Department of Agriculture, *Urban Soil Primer*, prepared by Scheyer, J.M., and K.W. Hipple. Lincoln, Nebraska: 2005.

51. United State Environmental Protection Agency, Superfund Site Information. Retrieved at http://cumulis.epa.gov/supercpad/cursites/srchrslt.cfm?Start=1&sortby=city. Accessed June 9, 2014

52. United States Fish & Wildlife Services, *John Heinz National Wildlife Refuge at Tinicum Comprehensive Conservation Plan*. Hadley, Massachusetts: August 2012.

53. United States Fish & Wildlife Service, National Wetlands Inventory. Retrieved from http://www.fws.gov/wetlands/.

Appendix A
Public Participation

PLANNING MEETINGS

A series of planning meetings were held in order to engage the communities and gather information. These meetings generally focused on one or two chapters or elements (land, water, biological, cultural, recreational resources) of the plan per meeting. Meeting attendees, such as municipal managers and engineers, as well as governing body members and local residents, were given a brief overview of what the Planning Department had been able to learn in their preliminary research and mapping phase and were asked to supplement the information and provide suggestions of additional resources and issues. These meetings were very helpful in identifying contacts and making connections to existing planning efforts throughout the study area.

In order to account for the two distinct, yet overlapping study areas, the Planning Team held separate meetings (see list below) for the Delaware River Corridor (DRC) and Naamans, Marcus Hook, and Stoney Creek (NMS) watersheds. Meetings regarding topics specific to the DRC communities were held in conjunction with (bimonthly) Delaware County Coastal Zone Task Force (CZTF) meetings. This group served as a great resource given the pool of expertise already focused on riverfront issues. NMS-specific meetings were held at municipal buildings throughout the study area.

- **Rivers Conservation Plan Kickoff Meeting**
  May 26, 2010 - 7:00 p.m.
  Marcus Hook Community Center

- **Delaware County Coastal Zone Task Force Meeting**
  DRC Land & Water Resources
  November 17, 2010 - 9:30 a.m.
  Tinicum Township Municipal Building

- **Rivers Conservation Plan Meeting**
  NMS Land Resources
  November 16th, 2010 - 9:00 a.m.
  Upper Chichester Municipal Building

- **Rivers Conservation Plan Meeting**
  NMS Water & Biological Resources

December 16th, 2010 - 9:00a.m.
Bethel Township Municipal Building

- **Delaware County Coastal Zone Task Force Meeting**
  DRC Cultural, Historic, & Recreational Resources
  February 24, 2011 - 9:30 a.m.
  Chester City Hall

- **Rivers Conservation Plan Meeting**
  NMS Historic, Cultural, & Recreational Resources
  February 9, 2011 - 10:00a.m.
  Upper Chichester Twp. Municipal Building

- **Rivers Conservation Plan Meeting**
  NMS Draft Recommendation Review
  March 31, 2011 - 10:00a.m.
  Upper Chichester Twp. Municipal Building

- **Delaware County Coastal Zone Task Force Meeting**
  DRC Draft Recommendations Review
  April 14, 2011 - 8:00 a.m.
  Drexelbrook Corporate Events Center

- **Rivers Conservation Plan Meeting**
  Municipal Information Meeting
  August 21, 2014 - 9:00 a.m.
  Marcus Hook Community Center

- **Delaware County Coastal Zone Task Force Meeting**
  Public Presentation
  September 24, 2014 - 9:00 a.m.
  Marcus Hook Community Center

See below for a compilation of meeting summaries from each of these meetings. Also included are attendees and key resources, issues, and recommendations identified during the meeting (where applicable).

Rivers Conservation Plan Kickoff Meeting
Marcus Hook Community Center
Wednesday May 26, 2010 - 7:00 p.m.

Shaun Bollig **(SB)** gave an introduction to the Rivers Conservation Program and provided an overview of the scope for the Rivers Conservation Plan (RCP) that the Delaware County Planning Department (DCPD) will be undertaking for the (sub)watershed areas that drain directly into the Delaware River and the Naamans, Marcus Hook, and Stoney Creek watersheds.

Timothy Lucas **(TL)** provided some context for the Plan and study area. The Naamans, Marcus Hook, and Stoney Creek watersheds are currently a "big unknown' due to the limited number of studies previously completed. This, combined with considerable residential growth in the last decade, makes the study a timely one.

Discussion:

Bruce Dorbian **(BD)** asked how the Plan will differ from the Stormwater Management Plan. **(SB)** responded that the plan would be a less technical and focus more on natural features, resource conservation, and recreational amenities, such as trails, rather than highly technical run-off calculations, etc.

Thomas Imburgia **(TI)** asked if the plan would involve any type of construction activity, such as a diversion of a creek or building of a dam. Karen Holm **(KH)** replied that the diverting and damming of streams is no longer a common management practice and that, if anything, a plan such as this would more likely call for removal of the dams, as they provide a safety and environmental hazards in many locations.

(BD) asked if and how the plan would relate to other plans and studies, such as a comprehensive plan.

(SB) stated that the Planning Department will be using the various plans as a starting point and work to align the content and recommendations made in other plans with those in the RCP.

(BD) asked whether the plan would involve any public participation. **(KH)** replied yes and this meeting is a part of that process. There will also be other opportunities for reaching out and involving the public.

William Cox **(WC)** asked kind of problems will this plan would address. **(TL)** told the group that the plan would cover a wide range or land, water, and cultural resources and the issues that affect them (i.e. water quality, erosion & sedimentation, riparian buffers, etc.). This is where planning meetings will come into play. Community stakeholders, such as those in attendance, can help to identify and address the strengths, opportunities, and weaknesses of the communities and help to develop the vision for the plan.

(BD) informed the group that Chichester High School is right next to Marcus Hook Creek and that the science club has performed small studies and experiments there. Activities such as this can go a long way toward encouraging stewardship of the local creeks.

(TI) explained that it would be helpful to have some sort explanation in laymen's terms, something that municipal officials can look at and understand so they can participate in the process.

Attendees:

Zachary Barner	Intern, Delaware County Planning Department
Steven Beckley	Senior Planner, Delaware County Planning Department
Shaun Bollig	Senior Planner, Delaware County Planning Department
William Cox	Councilmember, Marcus Hook Borough
Bruce Dorbian	Manager, Marcus Hook Borough
Karen Holm	Manager, Delaware County Planning Department
Thomas Imburgia	Council Member, Marcus Hook Borough
Ryan Judge	Intern, Delaware County Planning Department
Richard D. Lehr	Manager, Aston Township
Timothy Lucas	Planner, Delaware County Planning Department

Delaware County Coastal Zone Task Force Meeting
Land & Water Resources
Tinicum Township Municipal Building
November 17, 2010 - 9:30 a.m.

Old Business

Coastal Zone Task Force (CZTF) Chairman William Payne **(WP)** thanked everyone for coming to Tinicum Township for the group's first meeting since May. Following introductions, **WP** introduced Paul Racette **(PR)** from the Pennsylvania Environmental Council (PEC).

PR discussed PEC's Regional Restoration Strategy for the urban Delaware River estuary, which will look at urban waterfront case studies and seek to develop a comprehensive registry of ecosystem-based restoration approaches. The types of habitats include upland river banks, back channel aquatic habitats, and intertidal shorelines. A series of restoration factors, including habitat, type of ownership, environmental stewardship, and recreation, will be used to rank the various sites.

Karen Holm **(KH)** asked if there would be a program geared toward armored shorelines. **PR** said that there would be an opportunity to partner with and perhaps engage the Partnership for the Delaware Estuary, particularly in tidal areas. Carolyn Wallis **(CW)** added that since there is currently more State funding available for trail projects, perhaps these restoration efforts could be combined. Shaun Bollig **(SB)** said that PR would be invited to offer greater detail about the restoration project at a CZTF meeting in early 2011.

Ann Faulds **(AF)** discussed a two-day workshop in September that was facilitated by the National Oceanic and Atmospheric Administration (NOAA) to address coastal hazards. Many CZTF members attended both days of the event. Next steps include presenting the workshop's findings to the municipalities and making the workshop's resources and data available to area groups.

New Business

SB reintroduced the Rivers Conservation Plan (RCP) that the Delaware County Planning Department (DCPD) is completing for the areas that drain directly into the Delaware River and the Naamans, Marcus Hook, and Stoney Creek watersheds. Over the past few months, DCPD has collected data about the watersheds and created draft maps to display features such as impervious surfaces, tree cover, trails, land use, and geology. Over the

coming months, additional meetings will be held to get public input about land, water, and cultural and recreational resources, as well as more specific topics such as revitalization and tourism. The deadline for completing the RCP is December 2011.

SB asked the group to identify what they perceive to be the major issues in the Delaware Direct watersheds. Marty Milligan **(MM)** stated that public access to the riverfront is an issue. **AF** added that this was a major issue brought up at the coastal hazards workshop in September. Tom Reeves **(TR)** mentioned the high volume of traffic that passes through this area as a problem. **CW** listed the need for identifying tourism destinations, including historic and cultural resources, as well as the need for Trail Towns along the East Coast Greenway. **SB** talked about the possibility of using Google Maps to display the area's resources and tourist amenities as a promotional tool, perhaps by partnering with the Brandywine Conference and Visitors Bureau (BCVB).

TR brought up the need for wheelchair accessibility. **AF** said that paved trails tend to get used more than unpaved trails. Brian Vadino **(BV)** discussed the opportunity to create connections between natural areas.

CW discussed gauging the needs and issues for business development and industry in the area. Scott Maits **(SM)** talked about how interpretive signage along the East Coast Greenway could contribute to way-finding, tourism, and revitalization efforts.

BV talked about tree planting opportunities throughout the riverfront areas. **AF** mentioned a training conducted by UC Green at Widener University and a tree planting event held at Chester High School. **CW** listed the benefits of increasing tree canopy to decrease impervious cover, improve stormwater management, and enhance community aesthetics.

SB said that, at a previous meeting, there was talk of establishing partnerships with local businesses and industries to promote various conservation projects. In regard to tourism, **MM** mentioned that Harrah's Casino in Chester is an important destination for increasing visitors to the area and for employing local workers.

SB said that Chester and Tinicum do not have environmental advisory councils (EACs) to work on various issues at the discretion of their respective municipal elected officials. **AF** discussed how grassroots efforts can help with community-based initiatives concerning issues like educational awareness. **SM** added that "friends" groups can assist with project efforts and help coordinate with different groups. **CW** mentioned the Urban Waterfront Action Group (UWAG), and **KH** mentioned the CZTF as key stakeholders to assist various types of Delaware Direct projects.

In regard to trail efforts, **CW** listed the Chester Creek Rail Trail as an important connection to Delaware Direct areas, including the East Coast Greenway.

In a brief discussion about the boundaries of the RCP and the project area, **KH** talked about how these areas have not previously been addressed in other RCPs. However, this RCP would look at integrating important resources that fall outside the boundaries as applicable to the Plan. DCPD is also assessing the relevance of previous recommendations as they relate to the riverfront areas.

After bringing up levees, David Schreiber **(DS)** confirmed that Tinicum does have some concerns about its levees near the Heinz Refuge. **AF** said that attendees discussed the vulnerable nature of levees during the coastal hazards workshop, including the levee behind Chester High School. Perhaps wetland restoration projects could be included with any efforts addressing levees. She also recommended talking to Pat Quigley for additional information.

When discussing brownfields, Kevin Hess **(KeH)** noted that legacy contaminant issues are always a problem. There needs to be a budget for dealing with such issues when working with redevelopment projects. Kevin Gallagher **(KG)** said that brownfields redevelopment was going well until the recession hit. Banks are not currently loaning as much money for such projects. The government still has some money to offer for redevelopment. **KG** added that if it is an old industrial site, it is probably a brownfield.

CW brought up the issue of sea level rise and how it could impact restoration and redevelopment efforts. **AF** said that this was another topic of discussion during the coastal hazards workshop. There were discussions about tidal wetland restoration projects along the Delaware River and its inland tributaries, as well as creating "living bulkheads," and perhaps teaming up with PEC on its restoration efforts.

SM asked about community tie-in for the RCP and whether colleges would be asked to participate. **AF** said she might be able to contact Widener professors to assist with the project.

Listing other water quality issues, **AF** said that there are sewage problem in the creek at Chester High School. **SM** talked about nonpoint sources such as trash and debris, as well as the lack of environmental awareness and recycling levels. **KH** said that because of the tidal nature of the Delaware River, nonpoint sources could include things coming upstream in the river, too. **BV** mentioned how ecological improvements at various sites could also help manage stormwater.

Information Sharing

MM said that travel writers would be touring the riverfront on the Northwind ship and looking at the Lazaretto and some other areas along the riverfront. There will be a sailing weekend hosted by the Anchorage Marina. He also mentioned new renovations at the Walbers/Lagoon site in Tinicum.

SM announced that Darby Creek Valley Association would be hosting a visioning exercise on Saturday November 19th. **MM** added that DCVA would have its annual cleanup on April 30, 2011, with more information to follow in the coming months.

KH stated that the Darby Creek Greenway Plan had been completed and that DCPD had just received a DCNR grant to conduct a countywide open space plan. **MM** mentioned that there was just a study completed by DVRPC that looks at the economic value of open space. **CW** said that DCNR would host its annual grant workshops in January and that there will be money to fund projects.

KH noted that **WP** had recently received the Planning Leadership Award from Pennsylvania's chapter of the American Planning Association for his career achievements.

TR informed the group that the Heinz Refuge recently put a link on its web site for visitors to view the eagle's nest.

Next Meeting & Adjournment

The next meeting will be held on Wednesday January 26th. Location to be determined.

Key Points and Recommendations pulled from discussion:

RCP Land Issues Identified:

- Public access to parks and the riverfront
- Need for recreation, trails (including Delaware River water trail)
- Traffic along 291/13 corridor
- Identify tourist destinations and opportunity for "trail towns" concepts
- Create an inventory of resources (cultural, historic, natural, and recreational)
- Use the Internet to market the area's tourist destinations
- Create connections among natural areas
- Link trails to the area's regional network

- Establish public/private partnerships with local industries and businesses
- Establish partnerships with community groups, schools, watershed associations, etc.
- Engage the BCVB in marketing the riverfront communities
- Evaluate the needs and issues for economic development in the area
- Design interpretive signage to identify significant resources
- Install way-finding signage
- Increase tree canopy
- Engage the public in tree planting opportunities
- Engage municipal EACs to promote watershed health
- Use "green streets" concepts to aid in beautification and stormwater management efforts
- Address durability of levees in Tinicum and Chester
- Encourage redevelopment of brownfields
    - Address potential obstacles regarding legacy sediments, funding
    - Create an inventory of the area's brownfields

Water Issues Identified:

- Explore possible effects of sea level increase
    - Restore tidal wetlands along Delaware River and upstream wetland areas
- Identify areas where sewage enters streams
- Identify dumping locations along streams
- Address non-point source pollution throughout the watershed
    - Address tidal waters that enter inland areas from the Delaware River
- Increase public awareness about water quality issues
- Adopt a watershed approach to manage stormwater management locally
- Engage municipalities and environmental advisory councils to address stormwater issues
- Identify combined sewer overflow (CSO) problems
- Develop streamside restoration projects to promote water quality

Attendees:

Eileen Baker	Councilmember, Norwood Borough Council
Zachary Barner	Associate Planner, Delaware County Planning Department
Steven Beckley	Senior Planner, Delaware County Planning Department
Shaun Bollig	Senior Planner, Delaware County Planning Department
Ann Faulds	Associate Director, Delaware Estuary Office of PA Sea Grant
Kevin Gallagher	Local Govt. Liaison, PADEP

Kevin Hess	Program & Technical Assistance Planner, PADEP
Karen Holm	Manager, Delaware County Planning Department
Scott Maits	Member, ECG/DCVA
Marty Milligan	Director of Corp. Development, Brandywine Convention & Visitors Bureau
Paul Ong	Code Enforcement Officer, Ridley Township
William Payne	Director of Planning, Chester City Planning
Paul Racette	Manager of Watershed Programs, Pennsylvania Environmental Council
Tom Reeves	Member, DCVA Watersheds Association
Rebecca Ross	Senior Planner, Delaware County Planning Department
David Schreiber	Manager, Tinicum Township
Brian Vadino	Watershed Specialist, Delaware County Conservation District
Carolyn Wallis	Regional Supervisor, PADCNR

Rivers Conservation Plan Meeting
Land Resources
Upper Chichester Municipal Building
November 16th, 2010

Summary:

Zachary Barner **(ZB)** introduced the Pennsylvania Department of Conservation and Natural Resources' (DCNR) Rivers Conservation Plan (RCP) and offered an explanation of the Rivers Registry. The Registry is intended to promote river conservation by recognizing rivers and streams in communities that complete a river conservation plan (RCP). The Registry also functions as a means to endorse local initiatives. In order for a river to be placed on the Registry, a plan must be developed, approved, and supported by the associated municipalities. Registry status qualifies the municipalities for both technical and financial assistance opportunities. Also discussed was how the program differs from other, more ordinance-based plans, such as an Act 167 Stormwater Plan. There will be no ordinance that comes directly out of this plan.

Shaun Bollig **(SB)** stated that the initial mapping phase is complete but that the Delaware County Planning Department (DCPD) is still in the process of collecting data about the study area. The study area includes Naamans, Marcus Hook, and Stoney Creeks. A second study area encompasses several smaller watersheds that drain directly into the Delaware River. This study area has a separate focus group.

ZB emphasized that relatively little is known about this particular part of the County due to the limited number of studies completed here. He cited the increase in residential development over the past decade as an additional reason for the lack of data. Karen Holm **(KH)** explained that part of the municipal role in the planning process will be to review information and to develop recommendations for the plan.

Judy Lizza **(JL)** asked which municipalities are included in the study area. **ZB** indicated that Upper Chichester, Lower Chichester, and Bethel Townships, Marcus Hook and Trainer Boroughs, as well as parts of Chester and Aston Townships make up the study area.

Frank Sill **(FS)** asked for clarification on the background and scope of the RCP.

KH explained that DCPD obtained funding from the State to complete the plan and that all of the other watersheds in the County have RCPs in place, each with an associated watershed group. **KH** also mentioned that DCPD has acquired grant money to complete an open space and greenway plan for the County.

John Iannotti **(JI)** cited the overall lack of awareness and access to the streams as one of the greatest obstacles to their preservation. He also asked whether or not there would be an organization like the Chester Ridley Crum (CRC) Watershed Association to come out of this plan. **KH** replied that the provisions of the plan depend on the municipalities and what they feel are the priorities. In this sense, the plan is flexible.

Bruce Dorbian **(BD)** explained that activities such as this bring communities together.

BD then asked about identifying ownership along the creek valleys and whether it would be possible to get a map with the type of ownership (public or private) for every parcel along the creeks. **ZB** explained that DCPD's GIS section should be able to create a map showing ownership along stream corridors.

JL noted that there is often a perception that the municipalities are completely built out, whether true or not. She asked if upstream municipalities really contribute to downstream flooding, and if so, to what extent? **JL** also asked how zoning and other planning tools can be incorporated into this process.

FS stated that development along a creek is easier to manage than stormwater. Coordination with volunteer groups and an emphasis on stewardship will be essential in promoting watershed health. He reiterated the importance of forming a watershed group and some of the benefits of such a group. **FS** also asserted that there are lots of existing volunteer groups to be utilized, and that they just need to be unified and organized.

ZB added that the formation of a watershed group or a watershed-wide environmental advisory council (EAC) will most likely be a major priority of the plan, depending on municipal input. There are strengths and limitations to each which can be discussed in more depth at a later meeting. **JL** proposed that an inventory of existing volunteer groups, projects, and resources be compiled. **KH** suggested the possibility of working with County of Delaware Community Service to assist in stewardship efforts.
Thomas Imburgia **(TI)** asked how to involve places like Marcus Hook, where much of the land along the creeks is on private or industrial properties?

JL said that the plan should include educational opportunities or a list of best management practices (BMPs) for stream management for use by municipalities and the public. **JL** added that this could also be part of the role of a watershed-wide group or EAC. The County can assist with organizational and coordination efforts; Pennsylvania Environmental Council (PEC) could help with the formation of a joint EAC.

JL also emphasized the importance of approaching the area as a contiguous unit in the regional planning process.

The following are some of the key points pulled from our discussion that we will be examining in greater detail:

Key Points and Recommendations pulled from discussion:

Major Issues / Concerns:

- Awareness and access to the streams
- Stormwater management
- The perception that municipalities are built out
- Infill development threatening open space
- Dumping along stream valleys
- Identifying old mill races
- Industrial land uses and their impacts on land and water
- Aging infrastructure
- Superfund/ brownfields
- Overcoming the "Not In My Back Yard (NIMBY)" mentality

Opportunities:

- Water quality still quite good in upstream areas
- Numerous volunteer groups

Considerations:

- Creation of watershed group or watershed-wide EAC
- Educating the public as well as officials
- Engaging homeowner's associations throughout process
- Formulating a list of BMPs for municipalities and for the public
- Work with local businesses to encourage "green practices"
- How to enhance tree canopy
    - especially on private property
    - work with Conservation District and/or TreeVitalize
    - engage "tree tenders"
- Develop an inventory of possible stream projects
    - both minor and major undertakings
- Partnership with PA Cleanways (and other conservation / community groups)
- Document and preserve historic trees

Attendees:

Zachary Barner	Associate Planner, Delaware County Planning Department
Jean Beck	Councilmember & EAC, Trainer Borough
Shaun Bollig	Senior Planner, Delaware County Planning Department
William Cox	Councilmember, Marcus Hook Borough
Bruce Dorbian	Planning Director, Marcus Hook Borough
Karen Holm	Manager, Delaware County Planning Department
John Iannotti	Resident, Upper Chichester Township
Thomas Imburgia	Councilmember, Marcus Hook Borough
Judy Lizza	Manager, Upper Chichester Township
Frank Sill	Resident /& Business Owner, Upper Chichester Township
Brian Vadino	Watershed Specialist, Delaware County Conservation District

Rivers Conservation Plan Meeting
Water & Biological Resources
Bethel Township Municipal Building
December 16th, 2010 – 9:00a.m.

Summary:

Zachary Barner **(ZB)** of the Delaware County Planning Department (DCPD) reviewed the Pennsylvania Department of Conservation and Natural Resources' (DCNR) Rivers Conservation Program and offered an explanation of the Rivers Registry. The Registry is intended to promote river conservation by recognizing rivers and streams in communities that complete a rivers conservation plan (RCP). The Registry also functions as a means to endorse local initiatives. In order for a river to be placed on the Registry, a plan must be developed, approved, and supported by the associated municipalities. Registry status qualifies the municipalities for both technical and financial assistance opportunities.

Also discussed was how the program differs from other, more ordinance-based plans, such as an Act 167 Stormwater Plan. There will be no ordinance that comes directly out of this plan. **ZB** recapped some of the key themes pulled from the previous meeting on November 16th, 2010. These themes include the possible formation of a watershed group, the lack of access and awareness to stream valleys in the area, the effects of infill on open space, and opportunities for volunteer efforts and public/private partnerships.

ZB and Shaun Bollig **(SB)** provided an overview of the mapping and information gathering done to date, including a map suggested at the previous meeting showing ownership type along stream corridors. **ZB** noted that the map currently focuses on tax-exempt parcels as a proxy for ownership, but that the map could be geared toward any number of parcel specific considerations. Other mapping includes issues such as impervious surfaces, topography, steep slopes, open space, and geology among others. Lisa Catania **(LC)** suggested looking at, and eventually mapping, specific land uses, such as "improved versus unimproved" and uses such as railroad beds and utility rights of way.

LC reminded the group that there have been several plans completed recently within the study area, and that these plans could be very useful in gathering information for the RCP.

ZB highlighted of some of the key issues involved in the water resources portion of the plan including water quality and quantity considerations, flood-prone areas, stormwater

management practices, point and non-point source pollution, and riparian buffer opportunities among others.

Karen Holm **(KH)** suggested the use of Phase I stormwater surveys in gathering information from municipal engineers concerning stormwater management issues. **LC** proposed that DCPD wait until after the Community Development Block Grant (CDBG) applications are completed for calendar year 2011 before sending out the Phase I surveys since many municipal engineers will be committing a majority of their time to these application over the coming weeks. **LC** also added that the majority of flooding and stormwater management issues in the area, particularly in Upper Chichester, come as a result of the lack of storm sewers in the area.

When asked which areas of the watersheds experience considerable flooding, Mike George **(MG)** replied that given Bethel's relatively high elevation and positioning toward the headwaters of the streams, there are not many areas with severe flooding. He did cite a specific intersection along Goodley Road as one example. **LC** made reference to a particular culvert in Boothwyn at the intersection of Bethel and Larkin Roads where frequent flooding occurs during 25-year storm events. The resultant flooding creates a considerable hazard at the intersection and even required an emergency rescue during a large storm in October of 2010.

SB added, in regards to obtaining stormwater management information from the various stakeholders, DCPD will be in contact with New Castle County, Delaware concerning their approach to stormwater management along with other information related to the scope of the RCP. **KH** asked **MG** of Bethel whether it had worked with any watershed groups from northern Delaware in the past. **MG** replied that they had not. **KH** suggested that this would be yet another benefit of forming a watershed group or joint environmental advisory committee (EAC) in the area, in that it creates an opportunity for inter-governmental dialogue.

ZB asked the group where the majority of people living in the study area obtain their drinking water and whether or not there were a large number of homes drawing from wells. **MG** answered that primary sources of water are United Water and the Chester Water Authority (CWA), which draws from the Octoraro Creek in Chester County. He also added that there are a few homes in Bethel that use wells and that, in certain areas, there are issues with soil percolation.

Brian Vadino **(BV)** of the Delaware County Conservation District (DCCD) included that there is a symbiotic relationship between watershed groups and stream valley trails, in that often one cannot exist without the other. He also added that beginning with a trail

can often lead to increased awareness and appreciation of the water resources in an area, thereby fostering support for a watershed group. **BV** also proposed looking into the benefits of engaging landowners along stream valleys as a means of targeting tree canopy cover and stewardship opportunities. **ZB** added that DCPD will be exploring opportunities for homeowner's associations (HOA) to participate in conservation and protection efforts as a result of the large plots open space they control along stream corridors. The mapping phase of the project revealed that HOAs are not only some of the largest landholders in the area, but that many of them are located on or along stream valleys and contain considerable tree canopy resources.

In regard to trails, John Iannotti **(JI)** proposed that when mapping and planning trail networks, it might be important to include smaller neighborhood trails, regardless of whether they link in directly to the larger networks. He also added that trails can be a great way to promote a positive view of wildlife.

LC informed the group that Upper Chichester mapped its trail network in the late 1990's. She also suggested the possibility of a historic trails theme in the area given the historic nature of many of the properties, particularly those along stream corridors. This could be done by use of interpretive signage along the trails.

ZB introduced the Natural Heritage Inventory (NHI) being completed for the County by the Western Pennsylvania Conservancy. The project was undertaken in conjunction with the Pennsylvania Natural Heritage Program (PNHP) with the goal of identifying, mapping, and prioritizing the various natural resources that exist within the County. These resources range from specific wildlife species (plants, animals, natural ecological communities, etc.) to habitat types and areas of concern (key woodlands and meadows, health of specific streams, etc.). The project is intended to educate the public as well as elected officials about the living heritage that exists within their communities by identifying these resources based on global, national, state, and local significance. The NHI allows for educated decision making regarding planning goals and land use determinations within a community. The project also allows for more precise environmental information early on in the planning process and emphasizes regional and state resource planning.

In regard to the RCP, the NHI is a tool for identification and prioritization of key preservation and conservation initiatives (recommendations) within the watershed. Using this tool, the group will be able to more accurately identify the projects they feel are the most important.

KH said that many of these key habitat areas closely follow stream corridors, and that their identification helps to make the case for cluster development and conservation by design strategies. **MG** responded by saying that Bethel has been using small, clustered lot designs for years as a means of preserving open space. **KH** added that conservation easements can also be a great way to preserve habitats in certain areas.

JI asked to what extent New Castle County, Delaware will be involved in this project and whether or not the County has worked with them before. **ZB** explained that DCPD has contacted New Castle County about the RCP and that over the coming months, DCPD will be working with them more closely on trying to determine their role and how the two counties can work together. New Castle County is downstream from the Pennsylvania portions of the watershed, so it is in their best interest to work together on the various issues. **LC** mentioned that Upper and Lower Chichester have met with New Castle regarding railroad rights of way and that there is a strong rapport between them.

In regard to the NHI and other wildlife considerations in the RCP, **BV** suggested contacting several organizations, including PA Department of Environmental Protection (DEP), the PA Fish and Boat Commission, the Audubon Society, and the PA Game Commission.

LC informed the group that Sun Oil Company (Sunoco) has performed remediation on waste lagoons at Reed Boyd Farms. Stormwater on the site is now treated before discharge. Also discussed were other possible waste sites and brownfields. **LC** mentioned a recent Academy of Natural Sciences study on water quality as a possible source of information in the RCP.

ZB adjourned the meeting and set a tentative, mid-January date for the next meeting. The meeting will focus on cultural, historic, and recreational resources in the area.

Key Points and Recommendations pulled from discussion:

Water Resources:

- Form watershed group or environmental advisory committee
- Contact New Castle County in regards to stormwater management and other RCP issues
- Engage streamside landowners for stewardship opportunities
- Create streamside, heritage-themed trails highlighting the historic nature of the area using interpretive signage

Biological Resources:

- Obtain wildlife information by contacting PA Department of Environmental Protection (DEP), the PA Fish and Boat Commission, the Audubon Society, and the PA Game Commission
- Create nature-themed trails highlighting indigenous plant and wildlife species in the area using interpretive signage

General Recommendations:

- Mapping of specific land uses along stream (railroad beds, utility rights of way, vacant properties)
- Engage homeowner's associations in conservation and stewardship efforts
- Include smaller neighborhood trails as a part of greater trails network
- Utilize cluster development and conservation by design strategies to preserve open space and habitat
- Use trails and parks as educational resources through local schools
- Engage historic and environmental groups for volunteer efforts

Attendees:

Zachary Barner	Associate Planner, Delaware County Planning Department
Shaun Bollig	Senior Planner, Delaware County Planning Department
Lisa Catania	Engineer, Chester, Lower Chi, Marcus Hook, Upper Chichester
Mike George	Director of Operations, Bethel Township
Karen Holm	Manager, Delaware County Planning Department
John Iannotti	Resident, Upper Chichester Township
Brian Vadino	Watershed Specialist, Delaware County Conservation District

Rivers Conservation Plan Meeting
Historic, Cultural, & Recreational Resources
Upper Chichester Twp. Municipal Building
February 9, 2011 – 10:00a.m.

Summary:

Zachary Barner **(ZB)** of the Delaware County Planning Department (DCPD) reviewed the Pennsylvania Department of Conservation and Natural Resources' (DCNR) Rivers Conservation Program and offered an explanation of the Rivers Registry. The Registry is intended to promote river conservation by recognizing rivers and streams in communities that complete a rivers conservation plan (RCP). The Registry also functions as a means to endorse local initiatives. In order for a river to be placed on the Registry, an RCP must be developed, approved, and supported by the associated municipalities. Registry status qualifies the municipalities for both technical and financial assistance opportunities. Also discussed was how the program differs from other, more ordinance-based plans, such as an Act 167 Stormwater Plan. There will be no ordinance that comes directly out of the RCP.

ZB and Shaun Bollig **(ShB)** provided an overview of the mapping and information gathering done to date. Mapping includes features such as impervious surfaces, topography, steep slopes, open space, and geology among others. **ShB** also stated that DCPD is still in the data collection stage and that the team has begun forming some draft text on the background sections of the plan.

ZB highlighted some of the various topics to be covered in the cultural and historic sections of the plan, and offered a quick overview of some of the general historic trends in the area including the Native American and European heritage. Also discussed was the long history of the agricultural, mill, and shipping industries. **ZB** then asked the group what they viewed as their greatest historical resources and what they feel gives their communities a unique historic character.

Thomas Imburgia **(TI)** stated that Viscose Village is one of Marcus Hook's greatest historical resources and that the neighborhood was denied National Register status due to the exterior modifications made homeowners over the years. DCPD's historic preservation section has prepared a handbook specifically for these Viscose homes, which outlines a few steps homeowners can take to restore the village's historic character. Steps include brick pointing, sidewalk restoration, and vintage streetlight replacements. The local Marcus Hook Community Development Corporation (CDC) has begun trying to buy back houses in an effort to restore them to their original states.

Additionally, **TI** informed the group that the Pennsylvania Department of Environmental Protection (DEP) has expressed interest in performing water quality testing in Marcus Hook in order to determine just what exactly can be found in the groundwater there and where pollutants are coming from. A few wells have already been drilled on the FMC property.

Karen Holm **(KH)** mentioned that there are clusters of historic resources in Marcus Hook, and elsewhere in the study area, that could be targeted for historic tourism. Ann Faulds **(AF)**, of Pennsylvania Sea Grant, said that there is a history of speakeasies in Marcus Hook, and that exploring these as an historical asset might be very interesting, and would relate well to the Delaware River heritage theme. **KH** also proposed ghost tours as a possible tourist attraction in the area.

Judy Lizza **(JL)**, manager in Upper Chichester Township, said that there is great interest and need for preserving historic resources in the area. She proposed to compile historic photographs of the area and integrate them into a GIS data layer. This could also be done with oral histories and geocaching opportunities. Interpretive signage could be used to link the various historic resources such as old mill races, Native American heritage sites, farmsteads, etc. She also posed the question of how to document and preserve historic village and colloquial names. Along these same lines, **AF** suggested the possibility of historic village / neighborhood tours and developing an inventory of historic images to be placed in a database. An advertisement in the local newspaper could solicit scanned or digital images for inclusion.

Eileen Nelson **(EN)**, municipal engineer representing Trainer Borough and Aston Township, made mention of the Civil War reenactments that have been planned at Henry Johnson in Trainer and in Bethel. She suggested that this type of event might be very successful in other municipalities as well.

JL said that it would be interesting to look at the various place names in the area, such as those assigned to roads, and learn the story behind the name.

Marianne Cinaglia **(MC)**, director of the Naamans Creek Watershed Association in Delaware, suggested the creation of connections with the Delaware portion of the Naamans Creek watershed, possibly using trails to the link various recreational and historic resources of the area. She stated that there needs to be stronger cooperative efforts between the two states in terms of water resources planning. She also suggested looking at the often overlooked history of the “ordinary people” in the area.

JL suggested exploring the formation of school districts and the history of education in the area. She noted how people now identify so closely with their school districts and it would be interesting to look at how these one room school houses evolved into the districts we have today. She also suggested looking at the religious resources in the area and how they came to shape the social structure of the area.

ZB asked the group what they feel are the greatest recreational resources in area, be it parks, athletic fields, trails, marinas, etc. The group responded with a list of heavily used parks in the area, many of which are looking to expand or make improvements. Projects such as these are right in line with the goals of the RCP. (see list)

ShB stated that the East Coast Greenway will be a very influential resource and could serve as a launching point from which to link other trails and parks projects. Similarly, Marcus Hook has completed a greenway feasibility study for a proposed network running through the Borough.

TI asked where the funding would come from for projects outlined in this plan. **KH** replied that the majority of the funding for projects would come from DCNR once the creeks are listed on the rivers registry, but that funds are often cobbled together from a variety of sources.

TI and William Cox **(WC)** also mentioned that the United States Coast Guard has expressed interest in establishing a base near Marcus Hook. They said this presents an interesting issue. Though the station would be welcome in many ways, it does not necessarily fit with the vision outlined in the comprehensive plan for the riverfront.

AF observed that a significant amount of open space exists on homeowners association lands. **ZB** explained that this open space also corresponds very closely with large amounts of remaining tree canopy cover, critical habitats, headwaters of streams, stream corridors, and soils with hydric inclusions in the area. Finding a way to somehow include these organizations in conservation efforts would be beneficial. This could be anything from simple landscaping and property management techniques to actual riparian buffer restorations or trail easements.

KH made reference to the Natural Heritage Inventory (NHI) being completed for the County by the Western Pennsylvania Conservancy. The project was undertaken in conjunction with the Pennsylvania Natural Heritage Program (PNHP) with the goal of identifying and prioritizing the various natural resources that exist within the County. These resources range from specific wildlife species (plants, animals, natural ecological

communities, etc.) to habitat types and areas of concern (key woodlands and meadows, health of specific streams, etc).

ZB mentioned the USGS Stream Naming program as a way to increase awareness, and thereby stewardship, of local streams (unnamed tributaries) and a way to tie historic preservation to environmental conservation by using historic names from the area. Steven Beckley **(StB),** of DCPD, provided some background information on the program and the naming process. **JL** suggested the use of Lenni Lenape Indian names..

ZB said that a goal of this plan could be to expand the trails network in the area, not only through the development of new trails, but by targeting smaller, existing trails, possibly even neighborhood trails.

AF asked if there are railroad rights of way in the area that could be targeted for trail opportunities. **ZB** responded by saying that utility line rights of way seem to be more readily available, but that there would still be the question of not only who owns the right of way, but also what type of ownership is it? In some places, owners have begun leasing for specific land uses on rights of way (ex. storage facilities beneath high tension lines)

ZB asked the group what they view as the greatest obstacles to the expansion of recreational resources in area, be it political, financial, or a matter of public interest. The majority of the group pointed to financial issues being the greatest obstacle.

KH told the group that there is currently no watershed organization in the NMS area on the Pennsylvania side, as there is in Delaware and other neighboring watersheds. This makes it very difficult to coordinate across municipal lines since such an organization would normally function as a coordinator among the various stakeholders. **EN** noted that the Chester-Ridley-Crum organization (CRC) coordinates among two counties, which presents enough issues, and that two states, such as in the case of the Naamans Creek could present even more difficulties.

ShB made mention of the Countywide Hazard Mitigation Meeting being held on March 31, 2011. All municipalities are required to attend at least one of the three meetings and other various stakeholders are encouraged to participate as well.

ZB closed the meeting and said that the County will be holding a March meeting (date to be announced) which will focus mainly on some of the administrative considerations, follow up on information gathered from previous meetings, and a summary of the various recommendations gathered to date.

Highlights from Discussion:

Recreation Resources:

- Weir Park (Aston)
    - active little league
    - headwaters of Marcus Hook Creek
    - extreme stream erosion, old culvert needs replacing
- Henry Johnson Park (Trainer)
    - highly utilized
    - active sports leagues
    - in need of continual upgrades
- Linwood Park (Lower Chichester)
    - numerous sports fields/courts
    - always looking to improve/ expand
- Mickey Vernon Park (Marcus Hook)
- Market Square Memorial Park (Marcus Hook)
- North Lamp Post Lane Park (Aston)
- Concord Square Park (Aston)
- Possible connections to, or extensions from:
    - East Coast Greenway
    - Kings Highway (Rt. 13)
    - Proposed Marcus Hook Greenway
    - Washington- Rochambeau Revolutionary Route (W3R)

Recreation Recommendations:

- Include smaller neighborhood trails as a part of greater trails network
- Expand and upgrade park facilities
- Encourage fishing activity along streams and in parks

Historical Resources:

- Tryen's House (Aston)
- Thatcher House (Aston)
- Williams Farm House (Aston)
- Log Cabin rebuilt by Doc Schaffer (Bethel)
- Siloam Methodist Church, Cemetery, and adjacent brick homes (Bethel)
- Widow Price House (Trainer)
- Immaculate Heart Cemetery (Lower Chichester)
- Presbyterian Church on Chichester Ave. (Upper Chichester)
- Ogden Inn (Upper Chichester)

- St. Martins Church (Marcus Hook)
- Viscose Village (Marcus Hook)
- Various homes along N. Creek and Meetinghouse Roads

Historic Recommendations:

- Create streamside, heritage-themed trails highlighting the historic nature of the area using interpretive signage
- Preserve historic and otherwise significant viewsheds
- Consider historic documentation in demolition process
- Engage historic and environmental groups for volunteer efforts
- Highlight alternative histories (Native Americans and ordinary people)
- Preserve and further research historic and colloquial place names
- Explore Opportunities for historic tourism and other events
    - Historic Home & Village tours
    - War Reenactments
    - Historic Mill and Farm tours
    - Speakeasies
    - Ghost tour
- Create an inventory/ database of significant historic resources to create an interactive map
    - Pictures
    - Oral stories
    - Trails
    - Homes and other Structures

Other

- Engage homeowner's associations in conservation and stewardship efforts
- Create a watershed group for coordination activities

Attendees:

Yinka Adesubokan	Intern, Delaware County Planning Department
Zachary Barner	Associate Planner, Delaware County Planning Department
Steven Beckley	Senior Planner, Delaware County Planning Department
Shaun Bollig	Senior Planner, Delaware County Planning Department
Lisa Catania	Engineer, Chester, Lower Chi, Marcus Hook, Upper Chichester
Marianne Cinaglia	Executive Director, Naamans Creek Watershed Association
William Cox	Councilmember, Marcus Hook Borough
Ann Faulds	Associate Director, PA Sea Grant
Rachelle Green	Senior Planner, Delaware County Planning Department

Alan Higgins	Senior Planner, Delaware County Planning Department
Karen Holm	Manager, Delaware County Planning Department
Thomas Imburgia	Council Member, Marcus Hook Borough
Richard D. Lehr	Manager, Aston Township
Judy Lizza	Manager, Upper Chichester Township
Eileen Nelson	Stantec (engineers), Aston & Trainer
Frances West	Naamans Creek Watershed Association & NCC League

Delaware County Coastal Zone Task Force Meeting
Cultural, Historic, & Recreational Resources
Chester City Hall
February 24, 2011 - 9:30 a.m.

Rivers Conservation Plan Data Gathering

Coastal Zone Task Force (CZTF) Chairman William Payne **(WP)** welcomed the group to the first meeting of 2011. Following introductions, **WP** introduced Shaun Bollig **(SB)** and Zach Barner **(ZB)** who are working on the Rivers Conservation Plan (RCP) for the areas that drain directly into the Delaware River and the Naamans, Marcus Hook, and Stoney Creek (NMS) watersheds. These areas are the only watersheds in Delaware County that do not yet have an RCP.

Upon completion, the RCP will focus on conserving and enhancing the watershed resources throughout the study area. The Delaware County Planning Department (DCPD) has completed a lot of its mapping and started writing the RCP's draft chapters. **ZB** recently began organizing draft recommendations for the NMS area based on input from their meetings.

SB said that the focus of today's meeting would be on cultural, historic, recreational, and tourism resources. Beginning with historic resources, Scott Maits **(SM)** noted the original Chester Court House, which is on the National Register of Historic Places. Marty Milligan **(MM)** mentioned the Lazaretto quarantine station in Tinicum. Thom Iannacci **(TL)** brought up Eddystone Village, which is an important example of tenement houses built around 1899. He also mentioned Lighthouse Hall and the original Eddystone School. **WP** talked about the Ruth Bennett House, which is eligible for the National Register, but not listed yet. There are many other locations along the Route 291/13 corridor that would also be deserving candidates for listing on the National Register. Carolyn Wallis **(CW)** listed Viscose Village in Marcus Hook, the planned residential development for the American Viscose Factory. Eileen Baker **(EB)** mentioned the Morton Morton House in Norwood.

Other resources that were listed include the historic industries, such as Baldwin Locomotive and Boeing, as well as the John Heinz National Wildlife Refuge, which is the only urban refuge in the country. **SM** added that the Heinz Refuge is the largest remaining tract of Pennsylvania's freshwater tidal wetlands. Paul Ong **(PO)** also included Governor Printz Park in Tinicum.

SB asked if people had suggestions on how to conserve and enhance these resources. **WP** replied that it is important to identify the resources; after which, they can be prioritized for preservation and tied into economic development and tourism efforts. **CW** added that "Trail Towns" have tremendous support across Pennsylvania. There is a need for destinations to visit along the East Coast Greenway. An analysis should be conducted to determine what each site needs and what it would take to access those sites.

Greg Piasecki **(GP)** suggested looking to those that already provide services, such as the marinas in Essington, and what it would take to maintain those facilities. **SB** mentioned that Brian Vadino **(BV)** compiled a useful inventory of the riverfront's public and private boating facilities. **GP** added that some of the marinas, such as West End Boat Club (1898) and Corinthian Yacht Club (1886), date back to the 1800's.

Richard Linderman **(RL)** discussed how, prior to development, the riverfront was made up of tidal wetlands. As the riverfront became industrialized, the shore was armored and the wetlands were destroyed. There should be efforts to preserve remaining wetlands. **SB** brought up previous meetings that identified opportunities to restore armored areas to tidal wetlands and restore the riverfront. **AF** said that an effort to determine which wetlands to restore should be conducted and to restore the shoreline to a more natural state. Lisa Catania **(LC)** has designed some developments along the river, adding that DEP is interested in restoring the banks of the river. There needs to be a balance between efforts to protect the shoreline with port activities. Shipping along the river reduces congestion on Route 291/13. **LC** added that the rail infrastructure along the corridor should be considered for inclusion in the RCP.

Fred Cummings **(FC)** noted Fort Mifflin, which lies just beyond the Delaware Direct boundary in Philadelphia, as an important historic resource. **SM** stated that it was important to look at the heritage of the Route 291/13 corridor and opportunities for interpretive signage, as well as the historic bombardment at Marcus Hook.

In relation to other historic preservation efforts, **TI** talked about the creation of a museum at the Borough Hall. Eddystone also has a strong online presence, with videos and photos among the borough's web search results for Baldwin Locomotive. The Borough also has a Facebook page with historic information, including the story of Margaret Matson, also known as "the Witch of Ridley Creek," who was one of two Pennsylvania women to be tried for witchcraft. Eddystone also was home to Remington Arms, which manufactured many of the rifles used in World War I.

AF brought up the idea of having water transportation along the river, which would add another dimension to tourism efforts. **CW** stated that historical reenactments would

represent another opportunity for tourism and historic preservation. **SM** said that these could perhaps be integrated into the annual riverfront festival. **MM** talked about how Marcus Hook has embraced its pirate heritage. **GP** suggested looking at the old speakeasies that operated in Marcus Hook and Essington.

PO asked why the Brandywine Conference and Visitors Bureau (BCVB) did not have a name that relates more to Delaware County. **MM** replied that the BCVB is moving to a new office in Upper Providence and is undergoing rebranding efforts. It is also completing a new tourism guide for Delaware County.

WP said that Chester is updating its Vision 2000 Plan. The new ramps that link Route 322 and I-95 to PPL Park will be opening soon. This will be very important for visitors from outside of the state, especially since many Major League Soccer fans travel with their clubs for road games. A new welcome center will open near the off-ramps, too. This will help to promote Chester, as well as Delaware County. **SB** also recalled a previous Coastal Zone Management Program grant application that would use online mapping and GIS data to put together a guide listing the coastal zone's cultural, historic, recreation, and tourism-related industries.

RL mentioned how Amtrak does not have any stops in Delaware County, and that a stop in Chester would be beneficial. **TI** noted that the Wilmington/Newark regional rail line has heavy ridership on Philadelphia Union game days. A new regional rail line stop closer to the stadium might also help. **WP** said that there is a study looking at different options on station relocation and parking for the stadium. **SM** said that Amtrak may be routed through the Philadelphia Airport (PHL) with its expansion efforts.

Jessica Anderson **(JA)** stated that the National Park Service is conducting a study to look at the tidal Delaware area as the first step of getting it designated as a National Recreation Area. **MM** said that BCVB is focusing on PHL as an economic reason for coming to Delaware County. There will also be a feature written about the waterfront area and its fishing sites. Additionally, the Deck at Harbor Pointe in Essington recently completed a $2 million renovation. **KH** suggested the possibility of working with the BCVB to develop "four hour tour" itineraries for shorter day trips throughout the area. These might have a niche with business travelers and others who might only have a short stay.

LC, citing the existence of bed and breakfasts in other parts of the county, noted the opportunity for B&B's in the riverfront areas. She also discussed the need for more information about where people and visitors could ride bicycle, or places that rent and service bicycles. **SB** brought up the "Trail Towns" concept and how municipalities may have opportunities for businesses and services that support trail activities, particularly in

regard to the East Coast Greenway. Referring back to the B&B idea, **KH** said that the coastal zone's historic resources like the Lazaretto could be used for B&Bs. Rachelle Green **(RG)** suggested looking at the Morton Morton House in Norwood, which offers education opportunities and a canoe launch, could be used as a small historic museum site.

WP, noting the diverse nature of the riverfront, said that there are zoning requirements that restrict certain uses along the water. He said an overlay district, such as the riverfront overlay that Chester adopted, could guide additional uses while also protecting existing resources. **TI** said that Eddystone completed an overlay district along Route 291, which allows hotels and mixed use development. Eddystone is also working with Eastern Metal Recycling on a possible riverfront park that would provide public access to the river. **TI** added that possible trail connections to the East Coast Greenway, Heinz Refuge, and Harrah's Casino should be explored.

SM discussed the need for the Industrial Heritage Parkway to be thoroughly researched, given its historic nature. He also stated that there should be signage to direct people to the important cultural and historic sites. **RL** said that the coastal communities should have common zoning. **AF** added that model ordinances go a long way for improving coastal communities. **LC** replied that such ordinances tend to be created at the request of a municipality, not pushed on them by the state or county. **WP** discussed how overlay districts "float" over established zoning districts and how they permit additional uses while not changing the underlying zoning.

MM offered the idea of using water taxis to transport people to PPL Park from Philadelphia. **GP** also included the idea of using duck boats to show visitors the coastal communities by land and on the river. **PO** said that Ridley looked at water transportation in some of its municipal plans.

GP asked about how an overlay district would protect the riverfront's existing industries. **WP** replied that it allows a property to undergo other types of uses without going through the lengthy zoning change process. An overlay district would not, for example, change an industrial district. Uses can coexist without creating negative impacts on each other.

Moving on to recreation, **CW** brought up the East Coast Greenway and the desire to move it to an off-road alignment over time. She said that the gaps and needs for the East Coast Greenway should be highlighted. **KH** discussed the potential for tours at some of the riverfront factories. **AF** suggested making maps available for download to GPS units; another idea was mentioned for a coastal zone "app" for visitors to the area to use.

WP stated that Chester had just finished creating wayfinding signage for the city. **TI** discussed the need for maintenance and upgrades, such as soccer fields, at Dom Marion Field and Eddystone School Park. **GP** talked about the underutilized resource of Little Tinicum Island, which **CW** said has access issues. **BV** mentioned that access to the riverfront is also an important for recreational anglers, adding that Marcus Hook, Ridley, and Chester all have good fishing areas available to the public. **WP** brought up the Chester Riverwalk, which is another important recreational amenity along the Delaware.

Kate Zaidan **(KZ)** discussed the Tinicum-Fort Mifflin Trail that would connect the East Coast Greenway to Cobbs Creek and the trail network within the Heinz Refuge. **WP** said that Chester had been fortunate in its dealings with developers to get trail easements. **KR** inquired about whether pavilions were available at any of the riverfront parks. **KH** stated that Marcus Hook's Memorial Square Park has them, as do the ballfields at Mickey Vernon Park. **CW** said that Little Tinicum Island and the Westinghouse property in Tinicum could be possible lunch stops, as well. **SM** suggested other trail connections, including the Chester Creek Rail Trail. He also stressed the importance of conserving a swath of tidal wetlands in Ridley Township just beyond the Delaware Direct boundary.

SB outlined the next steps for the RCP process, which included organizing recommendations for initial review. Future efforts will address biological resources and additional tourism suggestions. There will also be a meeting held during the evening to encourage additional public participation.

Information Sharing

SB reminded the group that the second meeting for the County's hazard mitigation plan update would be held on March 31st from 5pm to 7pm in the County Council room in Media. **JA** discussed a program to take kids out on Darby Creek from the Ridley Marina, similar to kayaking Penn's Landing. **GP** talked about the Essington marinas' efforts to dredge the channel so that they can continue operations. **SM** said that there is a Keep America Beautiful event on April 2 at Cobbs Creek Park to benefit the Cobbs Creek Connector Trail. (Going back to the RCP, he suggested looking into Underground Railroad history along the riverfront communities.)

AF said that PA Sea Grant is launching a shrink wrap boat wrap recycling effort, as well as a clean marinas certificate program, and will be following up on the climate adaptation workshop for one specific community (possibly Chester). **KR** announced that the Delaware County Transportation Management Agency's (DCTMA) would be hosting the next CZTF meeting on Thursday, April 14th. **CW** said that the DCNR funding deadline is on April 20th.

BV mentioned the joint "We All Live Downstream" workshops offered by the Conservation District and Pennsylvania Resources Council. There will be five workshops from April through June that address water quality and water conservation issues for property owners. **MM** said that this year's annual Darby Creek Valley Association cleanups would be held on Saturday April 30th at various locations. Rebecca Ross **(RR)** announced that County is offering municipal energy grants for municipal facilities. Meetings would be held at various locations to follow up on letters about the program that were sent to each municipality.

Next Meeting & Adjournment

The next meeting will be held on Thursday, April 14th at the Drexelbrook Conference Center in conjunction with the Delaware County Transportation Management Agency's annual conference and tradeshow.

Key Points and Recommendations pulled from discussion:

Cultural/Historic Issues:

- Conserve important sites, including those that are not on the National Register of Historic Places.
- Develop guidelines to identify and assess historic resources' opportunities and needs.
- Tie historic preservation into economic development efforts by working with municipalities and developers.
- Install interpretive signage for cultural and historic resources.
- Create museums to preserve history of area (e.g. Eddystone's collection at Borough Hall).
- Honor heritage through historic reenactments (Penn's Landing, Civil War, etc.)
- Develop historically themed tours.

Recreational Issues:

- Integrate recreation opportunities with John Heinz National Wildlife Refuge.
- Install East Coast Greenway segments
- Identify additional trail opportunities and gaps, especially those that would connect to the East Coast Greenway (high priority for completion in PA).
- Work with developers to get trail easements.
- Install wayfinding and interpretive signage along trails (especially East Coast Greenway).
- Increase riverfront access to the public.

- Expand recreational opportunities for riverfront activities (fishing, boating, etc.).
- Expand information available about parks, trails, recreational opportunities.
- Increase access to Little Tinicum Island.
- Make available information about the riverfront's marinas (historic significance, siltation issues).

Tourism Issues:

- Promote cultural and historic resources of the riverfront corridor.
- Use "Trail Towns" concepts for the riverfront to accommodate visitors.
- Assess visitors' needs (length of stay, reason for visit, level of familiarity with the area, etc.).
- Use social media (e.g. Facebook) to promote the area. Possibility of developing coastal zone app?
- Create online, interactive map to show recreational, cultural, historic, and tourism resources.
- Use water transportation (water taxis, ducks) to move people to PPL Park, other destinations.
- Focus tourism efforts specifically for riverfront areas.
- Put together itineraries for short stays ("four-hour tours") and weekend getaways.
- Integrate Philadelphia Union into promotional efforts.
- Promote PHL into tourism and business relocation efforts.
- Study the feasibility of bed and breakfasts in riverfront areas.
- Expand signage efforts, including gateways, to assist visitors.
- Complete Byway application for and management plan for the Heritage Parkway corridor.

Land Issues:

- Address possibility of de-armoring shoreline areas and restoring into tidal wetlands. Establish criteria for areas with greatest potential/need for restoration.
- Explore climate change implications of sea level rise and impacts on riverfront areas.
- Balance industry needs with redevelopment goals.
- Increase rail access for out-of-area visitors (Amtrak, Wilmington regional rail line).
- Use overlay districts (if applicable) to allow for more uses along riverfront.

Attendees:

Yinka Adesubokan	Intern, Delaware County Planning Department
Jessica Anderson	Communications Manager, Pennsylvania Environmental Council
Eileen Baker	Councilmember, Norwood Borough
Zachary Barner	Associate Planner, Delaware County Planning Department
Steven Beckley	Senior Planner, Delaware County Planning Department
Shaun Bollig	Senior Planner, Delaware County Planning Department
Lisa Catania	Engineer, Catania Engineering Associates
Fred Cummings	Airport Planner, Philadelphia International Airport
Ann Faulds	Associate Director, Delaware Estuary Office of PA Sea Grant
Rachelle Green	Senior Planner, Delaware County Planning Department
Jill Hall	Senior Planner, Delaware County Planning Department
Alan Higgins	Senior Planner, Delaware County Planning Department
Karen Holm	Manager, Delaware County Planning Department
Thom Iannacci	Eddystone Borough
Scott Maits	Member, ECG/DCVA
Marty Milligan	Director of Corporate Development, Brandywine Convention & Visitors Bureau
Paul Ong	Code Enforcement Officer, Ridley Township
William Payne	Planning Director, Chester City Planning
Greg Piasecki	Piasecki Aircraft Corporation
Kara Rahn	Project Coordinator, DCTMA
Rebecca Ross	Senior Planner, Delaware County Planning Department
Brian Vadino	Watershed Specialist, Delaware County Conservation District
Carolyn Wallis	Regional Supervisor, PADCNR
Kate Zaidan	Green Ports Initiative Coordinator, Clean Air Council

Rivers Conservation Plan Meeting
Draft Recommendation Review
Upper Chichester Twp. Municipal Building
March 31, 2011 – 10:00a.m.

Minutes:

Zachary Barner **(ZB)** of the Delaware County Planning Department (DCPD) discussed the Pennsylvania Department of Conservation and Natural Resources' (DCNR) Rivers Conservation Program and offered an explanation of the Rivers Registry. The Registry is intended to promote river conservation by recognizing rivers and streams in communities that complete a rivers conservation plan (RCP). The Registry also functions as a means to endorse local initiatives. In order for a river to be placed on the Registry, an RCP must be developed, approved, and supported by the associated municipalities. Registry status qualifies the municipalities for both technical and financial assistance opportunities. Also discussed was how the program differs from other, more ordinance-based plans, such as an Act 167 Stormwater Plan. There will be no ordinance that comes directly out of the RCP.

ZB and Shaun Bollig **(ShB)** provided an overview of the mapping and information gathering done to date. Mapping was done for features such as impervious surfaces, topography, steep slopes, open space, and geology among others. **ShB** also stated that DCPD is still in the data collection stage and that the team has begun forming some draft text on the background sections of the plan. This meeting will cover the review of the draft recommendations by the municipalities.

Lisa Catania **(LC)** asked if a recommendation could be to strengthen county-wide model ordinances for riparian buffers, steep slopes, and tree canopy cover protection, among others. She also made mention of a new viewshed ordinance being worked on by Thornbury Township. The suggestion was made to include possible grants and funding streams in the implementation/capacity building section of the Plan.

Brian Vadino **(BV)**, of the Delaware County Conservation District (DCCD), informed the group of a riparian buffer guidance document available through the Pennsylvania Department of Environmental Protection (PADEP). The document describes how to establish, plant, and maintain riparian buffer projects.

John Ianotti **(JI)** suggested that the Plan include a marketing/public relations element to help guide public outreach and education efforts. Possible avenues for outreach include web pages, newspapers, newsletters, and local television channels. **LC** added that

reaching out to school districts and youth councils in an effort to integrate environmental education initiatives into their curriculum or class projects could be helpful in implementing some of the recommendations found in the RCP. The group also agreed that reaching out to the various universities in the area could be beneficial (Widener, Penn State Brandywine, Delaware County Community College, Villanova, & Swarthmore)

When asked for insight on getting a watershed group off the ground, Marianne Cinaglia **(MC)**, director of the Naamans Creek Watershed Association (NCWA) in Delaware, replied that diversifying your stakeholders is crucial. NCWA teamed with New Castle County's conservation district, civic organizations, elected officials, and local businesses to form strong partnerships. She also asked how brownfields will be addressed in the Plan. **ZB** replied that brownfields, though not explicitly referenced in the draft recommendations sent out for review, will be covered in the land use chapter. There will also most likely be a recommendation to explore alternative reuse strategies.

Also discussed was the notion of completing an Act 167 Stormwater Management Plan for the municipalities included in the three NMS watersheds. The municipal stormwater surveys used to gather input from the municipal engineers about flooding areas could be used as the first step in getting the plan underway. Surveys were completed by all the NMS and DD municipalities as part of the data collection process for the RCP.

ZB discussed with the group that this RCP is not intended to be highly technical and would focus on action and capacity building, including recommendations for EACs and watershed groups, as previously discussed. Along these lines, potential partnerships and funding sources could be explored and included in the plan appendix. The other aspect of the Plan that differs from some other RCPs is the emphasis on recreation and tourism.

Eileen Nelson **(EN)** suggested working with Delaware County's Brandywine Conference and Visitors Bureau (BCVB) to prepare and distribute promotional materials regarding the plan and the various topics discussed within. **JI** reiterated that public relations and outreach should be a priority.

In regard to recreation, **LC** added that there is a need for "pack in, pack out" trails. Steve Beckley **(StB)** made reference to the Countywide Open Space Plan being worked on at current by the County. The plan will include greenway feasibility studies for the western portion of the county which could be included in the RCP.

Attendees:

Zachary Barner	Associate Planner, Delaware County Planning Department
Shaun Bollig	Senior Planner, Delaware County Planning Department
Lisa Catania	Engineer, Chester, Lower Chi, Marcus Hook, Upper Chichester
Marianne Cinaglia	Executive Director, Naamans Creek Watershed Association
Karen Holm	Manager, Delaware County Planning Department
John Iannotti	Upper Chichester Township
Judy Lizza	Manager, Upper Chichester Township
Eileen Nelson	Engineer, Aston & Trainer
Brian Vadino	Watershed Specialist, Delaware County Conservation District

Delaware County Coastal Zone Task Force Meeting
Draft Recommendations Review
Drexelbrook Corporate Events Center
April 14, 2011 – 8:00 a.m.

Delaware Direct Rivers Conservation Plan

Following introductions, Coastal Zone Task Force (CZTF) Chair, William Payne (**WP**), welcomed everyone to the Delaware County Transportation Management Agency (DCTMA) Annual Conference and Trade Show. Shaun Bollig (**SB**) offered a brief overview of the Rivers Conservation Plan (RCP) for the areas that drain directly into the Delaware River. Over the past several months, the Delaware County Planning Department (DCPD) facilitated meetings to solicit input to help identify issues concerning these drainage sub-basins. Topics included land, water, cultural, historic, recreational, and other watershed-specific issues. Based on the input from attendees, DCPD staff developed a list of draft recommendations for inclusion in the RCP.

Sandy Walton (**SW**) discussed the need for tree cover in the Study Area. He suggested looking at Haddon Heights, New Jersey's 100-year tree plan for ideas, as well as recommending the use of native trees.

SB discussed how the issue of community gardens at brownfield sites was brought up at the Environmental Protection Agency's National Brownfields Conference. Thom Iannacci (**TI**) said that there is interest in community gardening in Eddystone. **WP** added that Chester is working with the Penn State University Extension and community groups to address community gardens. Richard Linderman (**RL**) noted that many vacant lots may have contaminated soils. Kevin Gallagher (**KG**) said that the Pennsylvania Department of Environmental Protection's (DEP) Act 2 program can help with testing and cleanup efforts at brownfields. **WP** discussed other challenges, including cutting the grass at such sites and removing debris. Jason Dorney (**JD**) stated that garden socks, which are filled with compost, help plants grow above existing (and contaminated) soil, not in it. His company, MCS, Inc., specializes in such eco-friendly solutions.

SB inquired about stormwater flooding areas, which were also addressed in surveys sent out to Study Area municipalities. He added that Eddystone listed stormwater problem areas in its new comprehensive plan. **WP** said that Chester has very little flooding from the Delaware River, although there are combined sewer overflow (CSO) problems, and flooding in Chester and Ridley Creeks.

SB asked about any opportunities regarding capacity building, an issue which is receiving attention in the portion of the RCP for the Naamans, Marcus Hook, and Stoney Creek (NMS) watersheds. **WP** inquired whether there would be recommendations for riparian buffers. He noted that private property owners may oppose such efforts due to access issues. **SB** replied that the RCP would address riparian buffers due to their importance for improving water quality and controlling stormwater runoff.

In response to a question from **SW, SB** said that the RCP would include an appendix with a list of potential funding sources. **RL** then inquired about the impacts of road salt runoff and how to handle it. **KG** said that PennDOT offers booklets and guidelines for how to handle salt. Zach Barner (**ZB**) said that this issue would be addressed in the RCP. Continuing to discuss stormwater management, **ZB** added that DCPD would be updating its Act 167 stormwater management plans with the Crum Creek model ordinance to be used Countywide.

After discussing the overall importance of expanding riverfront access to the public, the discussion turned to trails. Steven Beckley (**SBe**) talked about the Greenway Plan for the Darby Creek Watershed and how it eventually may connect to the East Coast Greenway through the Heinz Refuge connector trails. **SB** also brought up the Tidal Delaware effort, which would allow recreational boaters to access many of the riverfront areas addressed in the RCP. **SW** stated that the Morton-Morton House in Norwood, which lies just outside of the Study Area's boundaries, has an underutilized canoe launch.

SB also discussed DCPD's intention to proceed with a state Byway application for Route 291/13. **WP** said that all along the riverfront corridor, tourism blends in with the historic nature of the sites. He said that the RCP effort is in line with the CZTF's objective of bringing communities together to support each other, as well as identifying grant opportunities and addressing their common issues.

RL asked if economic opportunities as they relate to trails would be addressed. **SB** said that "Trail Towns" principles would be included in the RCP, highlighting the need to accommodate bicyclists that pass through the Study Area on the ECG.

SW noted that marinas are also important to the riverfront communities. **SB** said that there would be a list of current marinas, including both public and private boating facilities in the Study Area. **TI** added that Eddystone has interest in possibly building a marina along its riverfront in the future.

SB said that the next steps for the RCP include writing the text of the RCP, along with its recommendations. DCPD expects to have a draft of the RCP available by the end of summer 2011, with a final draft at the end of 2011.

Information Sharing

Tom Reeves (**TR**) stated that there are two eagle chicks at the John Heinz National Wildlife Refuge. This is the first active eagle nest in Delaware County in 200 years. He added that there are 200 eagle nests in Pennsylvania.

Brian Vadino **(BV)** discussed the Delaware County Conservation District (DCCD) and Pennsylvania Resource Council's (PRC) education program. Funded through a DEP grant, they will host the "We All Live Downstream" and "Bringing Green Energy Home" workshops to address homeowner techniques for stormwater management and energy conservation practices, respectively. They will be held on five dates throughout May and June.

WP announced that the I-95 ramps in Chester would be opening up during summer 2011. The ramps will help bring new visitors to the Chester riverfront area, which was previously bypassed along I-95. He also said that the addition of interpretive and wayfinding signage would be beneficial for those unfamiliar with the riverfront communities.

Next Meeting

The next meeting will be held at the Marcus Hook Community Center on Wednesday, May 25 at 9:30 a.m.

Adjournment & Adjournment

Attendees:

Zachary Barner	Associate Planner, Delaware County Planning Department
Steven Beckley	Senior Planner, Delaware County Planning Department
David Biloon	Engineer, Tinicum Township
Shaun Bollig	Senior Planner, Delaware County Planning Department
Danielle Bower	Philadelphia International Airport
Kevin Boyle	District Technician, Delaware County Conservation District
Fred Cummings	Airport Planner, Philadelphia International Planner
Jason Dorney	MCS Inc. Eco-Friendly Solutions

Kevin Gallagher	Community Revitalization Consultant, PA DEP
Jill Hall	Senior Planner, Delaware County Planning Department
Thom Iannacci	Eddystone Borough
Richard Lindermann	Principal Architect, Linderman Group Architects, Inc.
Christopher Linn	Senior Planner, DVRPC
Peter O'Keefe	Park and Recreation Manager, Ridley Township
William Payne	Planning Director, Chester City
Tom Reeves	Member, DCVA Watersheds Association
David Schreiber	Manger, Tinicum Township
Brian Vadino	Watershed Specialist, Delaware County Conservation District
Peg Whelan	Park and Recreation Manager, Ridley Township
Greg Windsor	Marcus Hook Borough

Rivers Conservation Plan: Municipal Information Meeting
Marcus Hook Community Center
August 21, 2014

Minutes:

Karen Holm (**KH**) of the Delaware County Planning Department (DCPD) welcomed everyone and thanked them for coming. **KH** started the discussion by stating that the purpose of the meeting was to inform municipalities of what is included in the Rivers Conservation Plan (RCP) that DCPD is currently finishing. **KH** discussed the background of the Rivers Conservation Program that DCNR leads and the guidelines given by DCNR to develop an RCP. **KH** provided a summary of previous RCPs developed in the County. The Delaware River Corridor (DRC), including Naamans, Marcus Hook, and Stoney Creek watersheds (NMS) are the only areas in the County that do not have an RCP. DCNR approached Delaware County about developing an RCP for the DRC and NMS areas.

KH provided a presentation on the status of the RCP to the attendees. The presentation reviewed the reasoning behind the boundaries of the two sub-study areas. The planning process included significant public participation. Involved organizations and groups included municipal officials, environmental organizations, and the Delaware County Coastal Zone Task Force, as well as the Naamans Creek Association in Delaware. A preliminary draft plan was sent to DCNR in June, 2014 and received positive feedback. A final public meeting will be held on September 24, 2014, at the Marcus Hook Community Center.

KH continued the presentation by reviewing the main resources identified in the plan. Land use in DRC generally consists of riverfront industrial and commercial. Land use in the lower portion of the NMS watersheds is similar to the DRC while the upper portions of the watersheds are much more residential. Primary Land Use recommendations focus on increasing public access too and trails along waterways, developing a brownfield inventory, and protecting viewsheds of the Delaware River. **KH** pointed to the Executive Summary document and Implementation Matrix for a list of the recommendations with timing, lead and support organizations, and study area listed for each.

John McMullan **(JM)** asked for more explanation on the Coastal Zone program. **KH** stated it is a federal program by National Oceanic and Atmospheric Administration (NOAA) that is administered through the state. The program is intended to address issues specific to coastal zones (areas along the great lakes or tidal shore line). Pennsylvania's coastal zones include the Delaware River from Bucks County down through Delaware County and the Lake Erie shoreline. Parts of municipalities that are in coastal zones are eligible for coastal zone program funding. Delaware County Coastal Zone Task Force meets frequently for information sharing and to address common concerns. Currently, there is an opportunity to expand the Coastal Zone further inland in Delaware County. Linda Hill **(LH)** inquired if this was requested by the State or County. **KH** clarified that

the state is requesting input from the counties for its application to expand the Coastal Zone.

KH then discussed various chapters and recommendations of the RCP. The primary recommendations of Cultural Resources chapter include examining policies/plans to preserve these resources and promoting the reuse of these resources. The Natural Resources chapter look at the various woodlands, streams, and other natural resources and suggested methods to preserve these, such as promoting low-impact development. The chapter on Biological Resources references areas called out in the Delaware County Natural Heritage Inventory. Primary recommendations for this chapter revolve around protecting and enhancing these significant areas.

The Open Space and Recreation Resources chapter discusses the various riverfront parks, ballfields, and municipal park complexes covered across the DRC and NMS. **KH** pointed out the significant amount of HOA lands in the upper NMS watersheds. The Open Space and Recreation recommendations aim to preserve public open space along waterways and connecting communities through trail systems. Another recommendation is to perform local analyses on the recreational facilities and programs within a community to examine if local needs are being served. The Special Issues chapter covers concerns unique to the Study Area. **KH** mentioned the potential for tourism, as well as the possible benefits of implementing the trails and greenway plans for the area, particularly the East Coast Greenway. Recommendations for this chapter included working closely with the Brandywine Conference and Visitors Bureau to promote the area. **KH** also brought up the Chester City Climate Adaptation Plan and the possibility of examine how the findings relate to the Study Area.

Bruce Dorbian **(BD)** brought up the Riverfront Days/Riverfront Ramble. It was the only time where the municipalities along the river truly worked together. It was a great chance to get everyone together and get to meet other people. **BD** stated it would be great to bring it back. **KH** agreed and said it can be added as a recommendation to the plan.

KH summarized the Implementation chapter as a various methods that can be used to implement the recommendations. These methods include land use documents and planning tools, as well as various funding options. **KH** referenced the Implementation Matrix that was discussed earlier as a summary of recommendations for implementation of this plan. One of the primary items should be to form an EAC, particularly in the NMS. There are no watershed organizations to steward the implementation of these recommendations and an EAC could help with that. **BD** suggested there could be someone who acts as a 'Watershed Coordinator' to keep the various organizations working together and focus on implementation of these plans. **KH** reference Brian Vadino of the County Conservation District who acts as a Watershed Specialist and helps many of these organizations with implementation of various plans.

KH asked for any comments regarding the plan to be sent to her by Friday, August 29th. The next steps are for the County to make any final edits and have County Council pass a resolution adopting the plan. The RCP will then be presented to the Coastal Zone Task

Force on September 24th before being submitted to DCNR for final approval and to go on the Pennsylvania Rivers Registry. **KH** closed the meeting by thanking everyone in attendance for their time and discussion.

Attendees:

Karen Holm	Manager, Delaware County Planning Department
Linda Hill	Director, Delaware County Planning Department
Ginny McIntosh	Planner, Delaware County Planning Department
Ryan Judge	Associate Planner, Delaware County Planning Department
Bruce Dorbian	Manager, Marcus Hook Borough
John McMullan	Manager, Upper Chichester Township
Bill Cox	Council Member, Marcus Hook Borough
Latifah Griffin	Planner, City of Chester

Delaware County Coastal Zone Task Force Meeting
Rivers Conservation Plan Final Public Meeting
Marcus Hook Borough Community Center
September 24, 2014 – 9:00 a.m.

Public Meeting Flyer:

PUBLIC MEETING
Delaware River Watershed Conservation Plan
for the
Delaware River Corridor and Naamans, Marcus Hook & Stoney Creek Watersheds

Wednesday,
September 24, 2014

9:00 a.m.
Marcus Hook Community Center
7 W. Delaware Avenue
Marcus Hook, Pennsylvania 19061

You are invited to attend a presentation on a Rivers Conservation Plan for Delaware County's areas of direct drainage to the Delaware River. The plan will be presented at a regular meeting of the Delaware County Coastal Zone Task Force, to be held on September 24, 2014.

The primary purposes of an RCP are to address concerns and threats to the river resources by identifying river [watershed] resources, and to serve as a vision plan by making recommendations to guide future efforts for watershed conservation.

The Rivers Conservation Plan was prepared by the Delaware County Planning Department in conformance with the requirements of the Pennsylvania Rivers Program. The areas of study addressed in the plan include:

The **Delaware River Corridor** (DRC) encompasses the land area between I-95 and the Delaware River, and includes land areas at the mouths of Delaware County streams, as well as the pockets of land between them that drain directly to the Delaware River.

The **Naamans, Marcus Hook, and Stoney Creek watersheds area** (NMS) encompasses the land area within the three watersheds located in the southwest corner of Delaware County that drain directly to the Delaware River.

This project is funded in part by a grant from the Community Conservation Partnerships Program, Keystone Recreation, Park and Conservation Fund, under the administration of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

Any questions should be directed to the Delaware County Planning Department at:

610-891-5200
Planning_Department@co.delaware.pa.us

A final public information meeting was held on September 24, 2014 at Marcus Hook Community Center. The plan was presented at a regular meeting of the Delaware County Coastal Zone Task Force. A public meeting flyer was sent to each Study Area municipality with the request to post in their municipal building and/or on the municipal website. Invitations were also mailed out to the Coastal Zone Task Force, which includes a mailing list of over 200 residents and area stakeholders. The presentation included an overview of the primary purposes of an RCP and inventory of significant cultural, natural, biological, and open space resources in the Study Area. The presentation also covered the major recommendations of the RCP, which were favorably received.

Attendees:

Karen Holm	Manager, Delaware County Planning Department
Ginny McIntosh	Planner, Delaware County Planning Department
Ryan Judge	Associate Planner, Delaware County Planning Department
Steven Beckley	Senior Planner, Delaware County Planning Department
Justin Dula	Manager, Delaware County Planning Department
Rebecca Ross	Principal Planner, Delaware County Planning Department
Jessica Dunford	Intern, Delaware County Planning Department
Latifah Griffin	Assistant City Planner, City of Chester
Brian Byrnes	Director, Chester Ridley Crum Watersheds Association
Gabriel Ingram	Vice Chairman, Chester Township Council
John Furth	Member, Darby Creek Valley Association
Brian Vadino	Watershed Specialist, Delaware County Conservation District
Kevin Boyle	District Technician, Delaware County Conservation District
Bruce Dorbian	Director of Planning and Development, Marcus Hook Borough
Aubrey Mulholland	Borough Manager, Marcus Hook Borough
Kevin Hess	Water Program Specialist, PA Department of Environmental Protection
Samantha Burton	Water Program Specialist, PA Department of Environmental Protection
Stacey Box	Water Program Specialist, PA Department of Environmental Protection
Jaclyn Rhoads	President, Darby Creek Valley Association
Ann Faulds	Associate Director, Pennsylvania Sea Grant
Danielle Bower	Airport Planner, Philadelphia International Airport
Tim Devaney	Member, Ridley Park Shade Tree Commission
Peg Whelan	Director of Parks and Recreation, Ridley Township
David Schreiber	Township Manager, Tinicum Township
Lorraine Daliessio	Resident, Marcus Hook Borough

INTERVIEWS

February 1, 2011 - Naamans Creek Watershed Association (NCWA)

Watershed organizations, and their role within the community, were discussed. The key to success for NCWA, who organizes annual cleanup efforts for the Christina River and Naamans Creek watersheds, is coordination with a diverse group of stakeholders. She suggested contacting Gerald Kauffman at the Delaware Water Resources Agency for water quality and other information. Cinaglia agreed that better interstate cooperation was essential for the conservation and enhancement of the Naamans Creek watershed.

Marianne Cinaglia	Executive Director, Naamans Creek Watershed Association
Zachary Barner	Associate Planner, Delaware County Planning Department

February 7, 2011 - United States Environmental Protection Agency

Mike Towle discussed his work related major cleanup, including 3 to 4 locations in the Study Area. He went on to say that many water quality problems tend to be from oil/petroleum. These don't come just from oil refineries. Places like auto shops, junkyards, and even traffic accidents can impair water quality. Oil can be cleaned much more easily than metals, which settle into the sediment load, making them difficult to mitigate. He also noted that the lack of shade over the creeks is not ideal for promoting water quality because it increases water temperature.

Mike Towle	Onsite Coordinator, Environmental Protection Agency
Shaun Bollig	Senior Planner, Delaware County Planning Department

February 8, 2011 - Environmental Protection Agency

EPA's role in overseeing and funding efforts for non-point source pollution, including PADEP's Act 319 program, were discussed.

Ralph Spagnolo	Watershed Program Manager, Environmental Protection Agency
Shaun Bollig	Senior Planner, Delaware County Planning Department

February 18, 2011 - New Castle County at the University of Delaware

This meeting included a discussion of the Naamans Creek watershed and the effects of upstream activities on the communities downstream in New Castle County, DE. Also discussed were stormwater and floodplain management issues, communities challenging "unfunded mandates" and accuracy of FEMA FIRM (floodplain maps), and the County's Water Resource Protection Area.

Michael L. Clar	Assistant County Engineer, New Castle County
Stacy McNatt	Department of Land Use, New Castle County
Gerald Kauffman	University of Delaware Water Resources Agency
Karen Holm	Manager, Delaware County Planning Department
Shaun Bollig	Senior Planner, Delaware County Planning Department
Zachary Barner	Associate Planner, Delaware County Planning Department

March 24, 2011 - Marcus Hook Preservation Society

Manerchia gave an overview of the history of Marcus Hook and the surrounding communities. He also spoke of some of the historic preservation and appreciation activities the group and others are involved in throughout the river corridor, including the Washington-Rochambeau Revolutionary Route (W3R trail), a Temple University study of archeology in Marcus Hook, and annual community events. Manerchia made the suggestion of a "County History Channel," which would expand upon the idea of a local access channel, like the one in Marcus Hook. Instead of having all text, it could have videos, put on by local historical societies, etc., regarding historic features in the area.

Michael Manerchia	President, Marcus Hook Preservation Society
Zachary Barner	Associate Planner, Delaware County Planning Department

September 12, 2011 - Delaware County Solid Waste Authority

This call involved a discussion of the County's Solid Waste infrastructure, most notably the Covanta waste to energy (or "trash to steam") in Chester, PA.

Sue Cordes	Recycling Coordinator, Delaware County Solid Waste Authority
Shaun Bollig	Senior Planner, Delaware County Planning Department

September 13, 2011 - Tinicum Coastline Partnership

The current state of marinas in Delaware County was discussed, along with some of the potential impacts of the Philadelphia International Airport (PHL) expansion and dredging of the Delaware River on these organizations.

Barbara Kelley	Tinicum Coastline Partnership
Shaun Bollig	Senior Planner, Delaware County Planning Department

APPENDIX B
HISTORIC RESOURCES

Property Name	Address	Municipality	Date	History
Tryens House	710 Tryens Road	Aston	c. 1790	Family home of August Tryens, a Danish immigrant who became an important local leader.
Mt. Hope Methodist Church	4020 Concord Road	Aston	c. 1898	Small church originally founded in 1807, from congregation that originated in home of paper mill owner.
Thatcher House	140 Sweigart Lane	Aston	c. 1750	Early banked farmhouse. Property of the Duttons in 1760s, who were largest contributor to Chichester Friends Meeting.
Bethel Springs (site of)	Foulk Road	Bethel		
Thomas Booth Farm	3221 Foulk Road	Bethel	1819	Home of early settlers of Bethel. Originally a 150-acre working farm, part of land was sold off a few years ago.
Corner Ketch/Chelsea Village	Valleybrook, Concord, Foulk, Chelsea Roads	Bethel	1750-1850	Likely dates to late 17th century, at intersection of Foulk and Chelsea Road. First settled by English Quakers, featuring various houses, stores, and craftsman shops. By 1875, it also had a school and Methodist Meeting House.
Pine Tree Inn	3281 Foulk Road	Bethel	1761	Only inn in Bethel, first recorded in 1761. Temporary hospital following battle of Brandywine. During the Civil War, it was a bootery.
Gibbons House	1047 Bethel Road	Bethel	1700; 1823	Earliest standing residence in Bethel. Home of John Gibbons, significant family in Bethel and Quaker history.
Garnet Mines (site of)		Bethel		
Booth-Cheyney Farm	1645 Bethel Road	Bethel	1721	Presumed to be built by the Booths, a prominent family of southern Delaware County, on the foundation of an earlier log house.
Larkin Mansion	1563 Colonial Drive	Bethel	1756	Home of William Larkin, member of a prominent and powerful family in southern Delaware County.
Larkin Farmhouse "Pine Acres"	3080 Foulk Road	Bethel	1824	Home of William S. Larkin. Once had a small saw mill on property. Larkin was an early coffin maker in Delaware County.
Siloam United Methodist	3714 Foulk Road	Bethel	1852	Established by 50 former members of Bethel Church of Delaware, who split over issues of instrumental music in services.

Clayton Historic District	4688/4757 Naamans Creek Road	Bethel	1733-1825	Houses of Curtis, Nelson, John, sons of Powell Clayton; early residents of the Township.
Zebley's Corner	3789-3828 Foulk Road	Bethel	1830-1930	Owen Zebley purchased 22 acres in 1813, began Zebley's Corner, which was an early crossroads settlement with numerous houses and shops.
Pennsylvania Railroad Passenger Station	6th St, between Avenue of the States and Welsh St	Chester	1903	Originally constructed by Penn Railroad as one of the main depots on the line traveling from Philadelphia to Wilmington to Washington DC.
Colony Hotel	511-513 Welsh St	Chester	1921	Built by the Chester Club, a private men's organization. Luncheon club with hotel accommodations for prominent businessmen.
US Post Office	400 Edgmont Ave	Chester	1936	WPA project. Designed by leading Philadelphia architect Henry D. Dagit.
Pennsylvania National Bank	406-408 Avenue of the States	Chester	1850	Early bank; established as First National Bank/Pennsylvania National Bank. Later purchased by Delaware National Bank.
1724 Chester Courthouse	Market St below 5th St	Chester	1724	First County courthouse and then Chester City Hall. Renovated in 1924 as part of bicentennial campaign. Oldest extant public building in continual use.
Old Swedish Burial Ground	Between East 3rd St, Welsh St, and Avenue of the States	Chester	1702	Established by colonial Swedish settlers, who represented first wave of European settlement in area.
Wolf Building (Delaware County National Bank)	1 West 3rd St	Chester	1882	Originally Delaware County National Bank, designed by prominent architect Patrick Welsh.
Penn's Landing	Penn and Front Streets	Chester	1682/1882	Original landing site of William Penn.
Waterside station of the Philadelphia Electric Company	2501 Seaport Drive	Chester	1916-1918	Built following the increased demand for electricity in Chester, resulting from the buildup of war industries and population.
Alfred O. Deshong Estate and Museum	1020 Avenue of the States	Chester	1850/1913	House (1850) of John O. Deshong, Alfred Deshong's father. Museum (1913) built to house the art collection of Alfred, following his death.
Sun Hill Industrial District	Morton Ave, Vauclain, Curry and Baldwin Streets	Chester	1916	Sites associated with Sun Ship Building Company and employee housing.
Simeon C. Cotton	Northeast corner 2nd and Clayton St	Chester	c. 1876	Early cotton mill. In 1892, taken over by Thurlow Cotton Manufacturing Company. Eventually the mill was purchased by Chester Lace Company.
St Anthony of Padua Church	3rd and Concord St	Chester	1913	Founded by group of Italians, who immigrated to Chester just prior to WWI.

Immaculate Heart of Mary	1408 West 2nd St	Chester	1894	Founded as the congregation of St. Michael's Church outgrew its space. Land donated by local congressman. Construction was slowed by financial panic of 1893, so excavation was done by the parishioners after their shifts ended in factories nearby.
Chester Arms Hotel	401-411 Edgmont Ave	Chester	1918	Started by George Shober as combined apartment house and restaurant. In 1927, additional brick section was added when Shober Hotel was purchased, and renamed Chester Arms.
Lodge XII October, Order of Sons of Italy in America	128-130 East 4th St	Chester	1820	One of the earliest remaining residences in the city. Became Lodge for the Order in the late 19th century and reflects Chester's position as major immigration port.
Old Main and Chemistry Building	14th St between Walnut and Melrose Aves	Chester		On the campus of Widener University.
Carter Graveyard	East side of Concord Road	Chester Twp.	1736	Established as private burial ground for the Carter family, who were early settlers. Walls were built from ruins of 1850 Ebenezer Methodist Church and schoolhouse.
Grave Hill Cemetery	West side of Concord Road, north of railroad	Chester Twp.	c. 1860	Used as African-American cemetery from 1876 to 1907. Now incorporated into Green Lawn Cemetery, which was created after the African-American cemetery behind the Old Franklin School was filled.
Baldwin Locomotives	1510 Chester Pike	Eddystone	1927	At its peak, it was the largest locomotive producer in the world. Also managed Remington Arms Plant. The Executive Office building (Baldwin Tower) remains as unique example of Deco/Beaux Arts design.
PECO - Eddystone Station	Southwest of Crum and Little Crum Creeks	Eddystone		
Eddystone Worker's Housing District	Bounded by Eddystone Ave, 2nd St, 4th St, and Saville Avenue	Eddystone	c. 1880	Built by William Simpson, owner of Eddystone Printworks. Housing for workers, as well as school, meetinghouse and library.
Includes:				
Lighthouse Hall	205 Eddystone Avenue	Eddystone	1880	Meetinghouse and library for Printworks workers.
Thomas Simpson School	4th St and Seville Avenue	Eddystone	c. 1879	School for Printworks worker's children.

Simpson Print Works Housing	Bounded by Eddystone Ave, 2nd Street, 4th Street, and Saville Avenue	Eddystone	c. 1880	Housing for employees at Printworks.
Mason-Dixon Line Boundary Markers	Various	Lower Chichester	1763	
Lawncroft Cemetery and Chauncey Olcott House	West Ridge Road	Lower Chichester	1876	Summer house for Chauncey Olcott, nationally known actor, tenor, and silent movie star. Now offices for cemetery.
Hickman-Larkin House	2333 Orchard Lane	Lower Chichester	1720	Owner of nearby pre-Revolutionary grist mill. Belonged to Nathan Pennell, Samuel Hickman, and other prominent locals.
Chapel of the Holy Saviour	Southwest side of Chichester Ave at Palmers Drive	Lower Chichester	1914	
Holy Savior Roman Catholic Church	East Ridge Road	Lower Chichester	1917	Large parish erected after influx of Catholics coming to work in riverfront industries.
Linwood Public School #2	North Market St	Lower Chichester	1869	Rock Hill Public School, replaced earlier school. Functioned till 1921, then became a private residence and clubhouse. In 1939, it became the municipal building.
Sunoco Inc.	Terminus of Green St and Delaware Ave	Marcus Hook	1901	Early oil industry factory dating to 1901 with buildings of various vintages.
American Viscose Company	South side of Post Road	Marcus Hook	1909	First manufacturer of artificial silk in the United States.
Viscose Village	10th, Chestnut, Spruce, and Walnut Streets	Marcus Hook	1907-1911	Industrial workers village for Viscose Company.
Plank House	221 Market St	Marcus Hook	1683	Oldest structure in Borough. Rumored, though not confirmed, to be Blackbeard's mistress's house.
Marcus Hook Borough Hall	1015 Green Street	Marcus Hook	1939	WPA funded municipal building.
Delaware River Ice Breakers	7 West Delaware Avenue	Marcus Hook	1760s	
St. Martin's Episcopal Church and Cemetery	305 Church Street	Marcus Hook	1845	Believed to be second oldest church in Pennsylvania and fourth oldest in the United States.
Pennsylvania-Delaware Boundary Markers	Various	Bethel, Marcus Hook, Upper Chichester, Lower Chichester	1800s	

Old Market Square	Market St from Fourth to the River	Marcus Hook	1699	Site of market chartered in 1699, which helped make this area the commercial center of town for nearly 200 years. One of the oldest market districts in Pennsylvania.
Cokesbury Methodist Church	305 Market St	Marcus Hook	1871	Built for growing Methodist population in Marcus Hook.
Immaculate Conception Roman Catholic Church	8th and Green Streets	Marcus Hook	1917	Mission church for Italian residents until 1924.
Early sea captain/sailor's housing	12-14 Delaware Ave	Marcus Hook	Early 18th Century	One of the oldest remaining buildings in the Borough. Originally connected, the buildings provided captains and sailor housing.
Corinthian Yacht Club	2nd St, near Taylor Ave	Tinicum	1728; club formed 1892	Early history of brick building remains a mystery; it may be house of wealthy resident, house of man who fled yellow fever epidemic, or it may be the Rosedale Inn. Significant club and hotel in Tinicum's era as a resort and recreational era.
Governor Printz Park	2nd St and Taylor Ave	Tinicum	1643	Site of early Swedish settlement.
Philadelphia International Airport		Tinicum	1937 - various	Outgrowth of 1925 "Municipal Aviation Field" nearby. Site of Hog Island Shipyards was chosen over alternative site in Springfield. Various additions were completed from the 1950s-2000s.
The Lazaretto	Wanamaker Ave at 2nd St	Tinicum	1799	Quarantine station for people inflicted with yellow fever.
Westinghouse Village	Saude Ave, Jensen Ave, Seneca Ave	Tinicum	1918	Industrial workers village constructed as rentals for employees of the nearby plant.
Hog Island Shipyard (site of)	Delaware River and Philadelphia International Airport	Tinicum	1917	Largest shipyard in the world built by the Shipping Board Emergency Fleet in 1917 as part of WWI efforts.
Chevaux-de-Frise	Delaware River off Tinicum Island	Tinicum	1776	Pointed palisades sunk in the river to pierce British war and cargo ships during the Revolutionary War.
St. John the Evangelist Protestant Episcopal Church	3rd and Wanamaker Ave	Tinicum	1892/1929	
Militia Encampment - Camp Gaines (site of)	Ridge Road - either side of Marcus Hook Creek	Trainer, Marcus Hook	1814	During the war of 1812, infantry troops were trained and quartered just north of the crossroads of Market Street and Post Road (US-13) and continuing into Trainer. The encampment known as “Camp Gaines” and later “Fort Snyder,” had between 5,000 and 10,000 men stationed there from early

				September 1814 into early 1815.
ConocoPhillips (former Sinclair/BP) Refinery	South of Ridge Road	Trainer	1921	Started as subsidiary of Union Oil. Replaced earlier factory built in Marcus Hook, which burned down.
Trainer-Kerr House	4360 Ridge Road	Trainer, Marcus Hook	1856	Built by Linwood Mills's owner David Trainer. Situated at apex of mill complex.
Trainer Methodist Church	3709 West 9th St	Trainer	1927	Outgrowth of rapidly expanding Methodist population in area, which started as cottage prayer meetings in various homes. Won first prize in Annual Church Building Competition by the Christian Herald.
Trainer Central Grammar School	South side of Post Road, opposite Main St	Trainer	1880	
Widow Price House	4358 Ridge Road	Trainer	1753	Home of John Price, a shipwright. Purchased grist mill in 1752, on the former site of Trainer's Mills. Pennsylvania militia camped here in 1814.
Chichester Friends Meetinghouse	611 Meetinghouse Road	Upper Chichester	1769	One of earliest Friends Meetings in Pennsylvania. Wounded from battle of Brandywine sheltered here. Caretaker's house is located nearby.
Pennell Homestead	1727 Larkin Road	Upper Chichester	1824	Dairy farm built by Joseph and Mary Pennell, grandparents of famous etcher Joseph Pennell, who began his career here. Later became a private school.
Ogden House	4000 Naamans Creek Road	Upper Chichester	c. 1720	Built by John Ogden, one of the Township's first four settlers to have property surveyed to them. The property had a prosperous dairy farm that later became a "resort house." The community of Ogden was named for this family.
Ogden School	3110 Naamans Creek Road	Upper Chichester	1919	Last one-room schoolhouse in Delaware County, operating until 1970.
Ogden Inn	2247 Mill Road	Upper Chichester	c. 1815	Owned by William McKay, a prominent local citizen. Became site of Oak Lawn Boarding House.
Broomall Homestead	2131 Meetinghouse Road	Upper Chichester	1812	Built by John Broomall as part of early farm. Became famous for cherries and bottling pure spring water. Home of congressman John Broomall.
School #1	SW corner of McKay and Chichester Ave	Upper Chichester	1867	Replaced 1825 subscription school, which became a public school after 1837.

Pierce Farmhouse	2410 Chichester Avenue	Upper Chichester	c. 1815	Supposedly built by William McKay. Crossroads site of small village known as McKaysville. It served as both a farmhouse and a residence at different times.
Jeremiah C. Brown House	670 Meetinghouse Road	Upper Chichester	18th cent c.	Reputedly used to house wounded Americans after the battle of Brandywine.
McKay House	1834 Meetinghouse Road	Upper Chichester	1812	Built by William McKay as centerpiece of large farm.
Summer Resort	4260 Bethel Road	Upper Chichester	c. 1840	Built by the Halsey family and used as a summer resort in the 19th century.

APPENDIX C
STORMWATER PROBLEM AREAS

ASTON TOWNSHIP

#	Location	Description	Watershed
1	Wier Road and Blackthorn Lane	Flooding occurs due to undersized culvert and additions, patios, expanded driveways, decks, and sheds in the watershed without stormwater control.	Marcus Hook Creek
2	Wier Park	Flooding and erosion occurs just downstream of Location #1 (see above) and stream bank erosion is threatening the foundation of the concession stand and bathroom facility at the baseball fields.	Marcus Hook Creek
3	Tuscany Road and Sweigart Lane	Improperly capped springs and frequent excessive overland flow is directed into the rear yards of the properties on Tuscany Road causing erosion of the yards and sinkholes.	Marcus Hook Creek
4	3000 Moser Street	Floods when the capacity of the culvert is impacted by tree limbs and forest debris from open space areas behind residential properties; basement flooding has occurred.	Marcus Hook Creek
5	Morgan Road	Houses along Morgan Road have groundwater issues. Entire yards have settled damaging in-ground pools and possibly affecting house foundations, yard areas have formed sinkholes.	Marcus Hook Creek
6	Concord Square Park	Flooding at Concord Square Park; sinkholes form periodically.	Marcus Hook Creek
7	Richard Road	Significant groundwater problems affecting homes on Richard Road.	Marcus Hook Creek
8	Concord Road at Mount Hope	Roadway flooding occurs due to undersized culvert being blocked.	Marcus Hook Creek

MARCUS HOOK BOROUGH

#	Location	Description	Watershed
1	Pine St	Residential flooding occurs.	Marcus Hook Creek
2	Market St and Fourth St	Residential flooding occurs.	Delaware River

TRAINER BOROUGH

#	Location	Description	Watershed
1	Main St and 9th St	Flooding occurs at Borough Hall on Main and 9th Streets.	Marcus Hook Creek
2	Main St and 7th St	Flooding occurs at Main and 7th Street.	Marcus Hook Creek
3	Post Road and Price St	Flooding occurs at Post Road and Price Street.	Stoney Creek
4	Chestnut St	Flooding occurs along rear of Chestnut Street properties. Overflow from Stoney Creek along railroad to Marcus Hook Creek, drains to and floods the low point in Main Street under the Amtrak overpass at Pennsylvania Avenue.	Marcus Hook Creek
5	Dawes Court	Flooding occurs at the end of Dawes Court.	Stoney Creek
6	Stoney Creek and 9th St	Flooding where Stoney Creek crosses West 9th Street at the border of Chester City.	Stoney Creek
7	Smith St Pump Station	Flooding occurs at the Smith Street Pump Station.	Marcus Hook Creek
8	Post Road and Price St Pump Station	Flooding occurs at the Post Road and Price Street Pump Station.	Stoney Creek

UPPER CHICHESTER

#	Location	Description	Watershed
1	Mill Road and Bethel Avenue	Roadway, curb, and walk damage; embankment erosion.	Naamans Creek
2	Bethel Avenue and Cherry Tree Road	Roadway, curb, and walk damage at open space; embankment erosion. Proposed solution: downstream fill and obstruction removal.	Marcus Hook Creek
3	Meetinghouse Road at Marcus Hook Creek	Roadway, curb, and walk damage; embankment erosion.	Marcus Hook Creek
4	Larkin Road at East Branch of Naamans Creek	Pennsylvania culvert does not convey 25 year storm per PennDOT calculations.	Naamans Creek
5	Rear - Jennifer Way at East Branch of Naamans Creek	Encroachments into floodplains.	Naamans Creek
6	Pleasantview Avenue bridge at Marcus Hook Creek	Roadway, bridge, abutments. Proposed solution: repair and stabilize bank.	Marcus Hook Creek
7	Peach St pedestrian bridge at East Branch of Naamans Creek	Pedestrian bridge obstruction. Proposed solution: remove and raise bridge to pass 100 year storm.	Naamans Creek
8	Rodgers Avenue along unnamed tributary	Pedestrian bridge obstruction. Possible solution: bank stabilization, remove obstructions.	Marcus Hook Creek
9	Greenwood, Peach, Plum, and Cherry Streets along East Branch of Naamans Creek	Stormwater conveyances, roadway and system damage.	Naamans Creek

APPENDIX D
STUDY AREA MUNICIPAL PARKS

DELAWARE DIRECT WATERSHED

Name	Municipality	Type	Size (in acres)
Barry Bridge Park	Chester City	Municipal park	8.8
Butler Park	Chester City	Municipal park	0.7
Comisiak Playground	Chester City	Municipal playground	0.4
Concord Park	Chester City	Municipal park	5.1
Four Seasons Park	Chester City	Municipal park	1.0
Little S Playground	Chester City	Municipal playground	0.2
Lloyd Playground	Chester City	Municipal playground	0.3
Memorial Park	Chester City	Municipal park	25.5
Mitchell Park	Chester City	Municipal park	0.4
MLK Park	Chester City	Municipal park	0.4
Norris Park	Chester City	Municipal park	3.8
Octagon Park	Chester City	Municipal park	0.5
Penn's Landing	Chester City	Municipal park	3.1
W. 10th Street Park	Chester City	Municipal park	0.5
Ward Street Playground	Chester City	Municipal playground	1.1
Chester Township Municipal Building	Chester Township		1.4
Samuel Womack Park	Chester Township	Municipal park	1.0
Williams Circle Playground	Chester Township	Municipal playground	0.6
Yarnall Street Playground	Chester Township	Municipal playground	0.5
Elliot Drive Playground	Lower Chichester	Municipal playground	1.2
Rocco Gaspari, Sr. Municipal Park	Lower Chichester	Municipal park	24.7
Centennial Park	Marcus Hook	Municipal park	0.6
Maiden Lane Playground	Marcus Hook	Municipal playground	0.1
Market Square Memorial Park	Marcus Hook	Municipal park	5.3
Mickey Vernon Park	Marcus Hook	Municipal athletic field	4.2
Governor Printz Park	Tinicum Township	Municipal park	5.5

NAAMANS CREEK WATERSHED

Name	Municipality	Type	Size (in acres)
Calais Woods	Bethel	Open space	7.1
Goodley Road Property	Bethel	Open space	1.1
Jack King Park	Bethel	Park grounds and walking trail	9.2
John T. Adkinson Park	Bethel	Municipal park	6.3
Sharon Park	Bethel	Open space	9.8
Anniline Village Park	Lower Chichester	Municipal park	3.0
Naamans Creek Road Park	Lower Chichester	Municipal park	11.0
Naamans Creek South Open Space	Lower Chichester	Streamside wooded open space, trail	3.5
Chichester Baseball League Fields	Upper Chichester	Baseball complex with four fields	29.3
Furey Road Park	Upper Chichester	Municipal park	16.9
Mill Road Woods	Upper Chichester	Open lawn, streamside wooded open space	5.4
Naamans Creek South Open Space	Upper Chichester	Streamside wooded open space, trail	9.1
Ogden Fields	Upper Chichester	Municipal athletic field	2.7
Peach Street Playground	Upper Chichester	Municipal playground	6.7
Tara Circle Woods	Upper Chichester	Wooded area next to stormwater detention basin	3.2
Unnamed municipal woods	Upper Chichester	Woodland, streamside open space	34.7

MARCUS HOOK CREEK WATERSHED

Name	Municipality	Type	Size (in acres)
Concord Square park	Aston	Municipal park	3.2
North Lamp Post Lane Park	Aston	Municipal park	3.4
Weir Park	Aston	Municipal park	14.0
Anne R. Stevens Memorial Park	Lower Chichester	Municipal park	0.8
Simpson Street Playground	Lower Chichester	Municipal playground	0.4
Market Street Field	Marcus Hook	Municipal athletic field	3.9
Robert Haebel Plaza	Marcus Hook	Municipal park	0.6
Tindall Park	Marcus Hook	Municipal park	1.3
Williamson Field	Marcus Hook	Municipal athletic Field	1.4
Anderson Street Park	Trainer	Municipal park	1.2
Henry Johnson Park	Trainer	Municipal park	20.3
Carlton Wilson Playground	Upper Chichester	Municipal playground	0.9
Community Services Playground	Upper Chichester	Municipal playground	2.0
Johnson Avenue Playground	Upper Chichester	Municipal playground	0.6
Kingsman Road Playground	Upper Chichester	Municipal playground	2.0
Twin Oaks Playground	Upper Chichester	Municipal playground	0.9

STONEY CREEK WATERSHED

Name	Municipality	Type	Size (in acres)
Highland Park	Chester City	Municipal park	0.6
Feltonville Recreation Area	Chester Township	Municipal park	5.5
Jacks Park	Chester Township	Municipal park	7.2
Langley Field	Trainer	Municipal athletic field	5.8
Wilcox Street Playground	Trainer	Municipal playground	0.2

APPENDIX E
OPEN SPACE TOOLKIT

Land preservation is the act of permanently protecting undeveloped open space lands from possible development. There are multiple options for land preservation including, but not limited to, fee simple acquisition, donations, conservation easements, and agricultural security areas. Study Area municipalities may want to review all of the following techniques when implementing land preservation initiatives.

ACQUISITION

FEE SIMPLE PURCHASE

The most effective means of preserving land is through fee simple purchase. Fee simple purchase gives the owner complete control of the land, including all public access and conservation practice decisions. In most situations, fee simple acquisition is also the most expensive method of land control. Therefore, many entities interested in land preservation, particularly public agencies or land conservancies with limited budgets, will explore other, less expensive options for land control.

BARGAIN SALE

A bargain sale involves the donation or sale of land, at a reduced price, to a municipality or land conservancy by a conservation-minded landowner. The landowner's main motivations for this type of sale are the tax benefits which he or she may enjoy as compensation by the municipality and the assurance that the land will be preserved for open space purposes. Also, since a realtor is not required, the landowner avoids paying a sales commission. The municipality receives open space acreages at less than the market price. The municipal solicitor should be contacted for more information on potential tax benefits in a particular municipality.

LIFE ESTATE

In a life estate agreement, a conservation-minded landowner donates, wills, or sells their property (and/or the rights thereon) to a municipality or conservation organization, which at the time of death or other specified condition takes ownership of the land (or rights). As part of the agreement, the landowners and heirs benefit from reduced taxes because another party has legal ownership or interest in the property, and the owner is assured that the land will be used in perpetuity for open space purposes. The municipality benefits from the open space donation and gains peace of mind in knowing that the land will not be sold to a developer. The owner may also be a corporation or a farm, in which case the land becomes the property of the municipality when the company closes or the farm ceases to operate. In some cases there are arrangements made where public access to the

property is granted for recreational uses such as trails, while the owner is still alive or the company is still in business.

PURCHASE AND LEASEBACK OR RESALE

An entity interested in preservation, such as a local government or a conservancy, can purchase land in fee simple, place restrictions on the deed prohibiting certain uses (e.g., residential development), and sell or lease the land to interested parties. The original buyer gains the potential for future use at the current price and may recover some or all, of the purchase price through leasing. The land is maintained in open space and may be developed as a park if and when future demand warrants. Resale of some or all of the land with deed restrictions may maintain open space levels, relieve the municipality of maintenance obligations, and return the land to the tax rolls. A variation of this technique is possible at the County level, when tax-delinquent land parcels become temporary property of Delaware County. The County government might prefer to transfer a parcel in the greenway to the municipal government or other entity, but would first guarantee its preservation by placing a conservation deed restriction upon it.

DONATIONS

Frequently, land or an easement on the land can be acquired through donations from private owners, organizations, and corporations. Local governments should encourage land donations by pointing out benefits of such actions, including federal income and estate tax benefits and public relations value. Prior to accepting a donation, a municipality should consider the location of the parcel and the anticipated development and maintenance costs. If the location is poor and/or projected costs will be excessive, the municipality should strongly consider whether or not to accept the land. In addition to land, corporations and other private parties also frequently provide cash donations for worthy causes, including land preservation.

EMINENT DOMAIN

Open space land intended for public recreational use may be acquired through eminent domain. Eminent domain is the authority a government has to take, or authorize the taking of, private property for public use. It involves condemnation proceedings to acquire land in exchange for "just compensation" from an unwilling seller. The just compensation is usually a dollar amount equal to the fair market value of the condemned land. Eminent domain can be an effective tool for land acquisition, but the condemner must pay all associated costs for acquisition. When used, it is usually a last resort because of the risk of controversy.

EASEMENTS AND DEED RESTRICTIONS

CONSERVATION EASEMENTS/DEED RESTRICTIONS

Conservation easements place restrictions or an outright prohibition on development at a lower cost than fee simple acquisition. Under a conservation easement, land could (and usually does) remain in current ownership, but the property owner voluntarily agrees to donate or sell the right to develop the land. The property owner agrees to place a restriction in the deed of the property, which becomes binding on all future owners of the land. The easement is held by the municipality, county, or a private conservancy, such as Natural Lands Trust or Brandywine Conservancy, both of which have their headquarters in Delaware County. Most conservation easements prohibit the construction of new residential and commercial buildings and the clear-cutting of timber. Furthermore, a conservation easement often provides the property owner with federal income tax and estate tax benefits.

OTHER EASEMENTS

Conservation easements may be used to preserve many types of resources. For example, easements may be placed on historic lands or buildings, open space, forests, or farmland. Conservation easements are frequently used for environmental preservation without providing for public use of the land. However, a conservation easement can also be combined with a *pedestrian easement* or *right of public access easement* to allow public access for walking, hiking, horseback riding, bicycling, fishing, and other activities with established rules and restrictions. With such an easement, state law assures that the landowner is not held liable for any injuries, crimes, or death associated with public use of the land.

Another easement type is the *joint-use easement*, which accommodates multiple uses under one easement. Joint-use easements are particularly appropriate for public utility corridors. Electric transmission lines, sanitary sewer lines, petroleum or gas pipelines, and other such corridors may be ideal for trail connections, as the corridors often contain a cleared pathway.

Agricultural conservation easements may be appropriate in areas with prime farmland adjacent to greenways. The action preserves additional contiguous land and helps to maintain the scenic character of both the greenway and the area as a whole. Local, county, or state governments may purchase easements from owners of prime farmland if the owner agrees to keep the land in agricultural use. The land must meet certain acreage, soil, and production criteria to qualify for the program.[1]

[1] Additional information about agricultural conservation easements is available from the Penn State Cooperative Extension, 20 Paper Mill Road, Springfield, PA 19064 (610-690-2655), DelawareExt@psu.edu.

The Pennsylvania Land Trust Association (PALTA) is the statewide coalition of nonprofit land conservation groups. PALTA has developed model easements and agreements that are available on their website. They include Pennsylvania Conservation Easement, Trail Easement Agreement, Riparian Forest Buffer Protection Agreement, and Fishing Access Agreement

ZONING AND SUBDIVISION TECHNIQUES

CONSERVATION DESIGN/CONSERVATION SUBDIVISION

Also called open space development, conservation design is similar in many respects to "cluster development," and is very useful in areas where greenways pass through land that is zoned for development. When a tract is developed in the open space scheme, increased development densities are allowed in exchange for mandatory open space. As an example, under standard suburban development schemes, a 100-acre lot adjacent to a stream might be subdivided into 100 one-acre lots. Under conservation design:

- The natural features of the site are identified and preserved first (10 acres, for example).
- Open space is then set aside near the stream (40 acres, for example).
- The remaining area is subdivided into the 100 lots originally allowed under conventional zoning, but the lots are only 0.5 acres each.

OPEN SPACE REQUIREMENTS

Open space development can be facilitated with provisions in the zoning ordinance and subdivision and land development ordinance (SALDO). Open space development provisions are often amendments to existing lot size requirements in each zoning district (e.g. "Low Density Residential District: 1.0 acre minimum lot size or 0.60 acre with 40% open space").

MANDATORY DEDICATION OF OPEN SPACE OR FEE-IN-LIEU THEREOF

The Pennsylvania Municipalities Planning Code (Act 247, as amended) enables municipalities to require that residential developers dedicate land, or fees-in-lieu of land, for public recreation. Municipalities must have an adopted recreation plan and an adopted ordinance relating to mandatory dedication before land or fees can be accepted. The amount of land required must be related to the demand for recreation land typically created by new development. The required land dedication should be in addition to the preservation of natural features on the land, such as floodplains, wetlands, steep slopes, woodlands, or other sensitive areas.

MUNICIPAL ORDINANCES

One of the least expensive ways to protect environmentally sensitive land is through municipal zoning ordinance, subdivision and land development ordinances (SALDOs), and other free-standing ordinances. Local ordinances contain provisions that prohibit or limit activities on or near environmentally sensitive areas. The following provisions are most important with regard to greenways.

Riparian Buffers

Riparian buffers are the areas within a specified distance (or "setback") of a waterway within which development or other activities is prohibited or restricted. Typically, riparian buffers are 50–100 feet wide. The most appropriate buffer size depends on the size of the stream and the existing natural and human-built features along the stream. A two-tiered buffer can set different standards for two different setbacks (e.g., no development within 100 feet, and no mowing within 50 feet).

Floodplains

Floodplain regulations prohibit development and certain other activities within the 100-year floodplain, frequently in a separate floodplain ordinance. The 100-year floodplain corridor is composed of a *floodway* and *flood fringe* area. State floodplain regulations represent a bare minimum of floodplain protection. All floodplains should be kept in open space. Activities such as tree-cutting, clearing of vegetation, storage of hazardous materials, and landfill operations would have a negative effect during floods and should be prohibited or restricted. In places where existing structures are located within the floodplain, regulation options include establishing a lowest floor level for buildings, requiring flood-proofing, and prohibiting further development or improvements.

Wetlands

Wetlands, high water table soils, and hydric soils are areas containing permanently or frequently saturated soil conditions or standing water. The three features often coincide. Most zoning ordinances take a site-by-site approach to wetlands regulation, requiring a developer to identify wetland indicators on a site plan for a parcel being developed. If the site contains wetland indicators, the applicant must have a qualified wetland specialist delineate wetlands, on which development must be prohibited. Alternatively, a municipality may have a complete wetlands map database prepared for the jurisdiction by a wetlands specialist.

Steep Slopes

Steep slopes are usually divided into two categories: 15–25% (steep slopes) and 25% and greater (very steep slopes). Development densities and buildings sites are typically restricted in slopes between 15 and 25 %, and restricted or prohibited on slopes 25% and

greater. Keeping steep slopes as open space is a benefit to ridge-based greenways as well as stream-based greenways, where the riparian zone is surrounded by slopes.

Woodlands

Most SALDOs contain tree-cutting provisions, permitting unlimited tree-cutting in areas necessary to accommodate home sites and road rights-of-way, and providing a maximum tree extraction number or rate for other areas. Identifying a maximum percentage of trees that may be removed *per lot* is another, more protective option. Cutting restrictions can also be placed on floodplain forests and upland forests, respectively, to protect woodlands along stream corridors and ridges.

Agricultural Zoning

"Effective agricultural zoning" limits the amount of development on key prime farmland tracts so that most of the land remains in large lots that can still be viable for farming. Agricultural zoning must consider soils, physical features, current land use patterns, and other matters. Limiting water and sewer extensions and transfer of development rights may also help to conserve farmland. In Delaware County, Radnor Township has an "Agricultural Conservation" zoning district on its major farmland and golf course areas; however, detached residences are still one of the permitted uses, with a required minimum lot size of two acres.

Planned Residential Developments/Planned Unit Developments

Planned residential developments (PRDs) or planned unit developments (PUDs) are large-scale development projects that permit a variety of types of uses on the same tract of land. A PUD is developed as a unit under single ownership or unified control. It is processed under the PRD or PUD provisions of a municipal subdivision and land development ordinance. It is designed as a parcel of land as a single unit rather than as an aggregate of individual lots, with design flexibility from traditional siting regulations or land-use restrictions. This greater flexibility makes it possible to include open space is one of the required uses. Within PRD provisions there are performance standards as well as numerical standards for area, bulk, and open space.

PERFORMANCE STANDARDS

A performance standard is a regulation that permits uses based on a particular set of standards. The standard sets a minimum requirement or maximum allowable limit on the effects of a use or measurable or identifiable effect such as, but not limited to, noise, vibration, smoke, or odor. Such standards are placed on individual uses in the zoning code and allow the alteration of zoning or subdivision standards to achieve a desired form of development and protect the public from dangerous or objectionable elements. Examples of a performance standard may be the requirement of screening or an open space buffer between a noisy, odorous, or unsightly development and a residential area.

OFFICIAL MAP

An official map is a map showing public lands and facilities from officially adopted municipal plans, such as a comprehensive plan. Authority for an official map is provided in Article IV of the Pennsylvania Municipalities Planning Code (Act 247, as amended). The official map can be used to reserve a right-of-way for a period of one year, which can be very useful to a municipality for trail development, easement acquisition, or other negotiations with developers. Preferably, when a greenway plan is adopted, the proposed greenways should be put on a municipal official map, which should be adopted by the municipality. If a development is proposed on a parcel where a greenway is proposed, the municipality has one year to acquire control of all or a portion of the parcel, or negotiate other arrangements in accordance with local policies prior to development of the parcel.

Land on an official map can be reserved without immediate purchase, giving the municipality time to set aside funds for future acquisitions. Having an adopted official map allows a municipality up to 12 months to acquire property or begin eminent domain proceedings, after a property owner gives notification of his intentions to build on, subdivide, or otherwise develop the land identified on it. It can also provide leverage for outside funding as it indicates a municipal commitment to purchase land and/or make improvements. Grant agencies are more comfortable funding projects that are part of a well-thought out strategy that has the community's support.

The official map consists of a map and ordinance that identifies both existing and future public projects within the entire municipality or just a specific neighborhood or corridor. Its aim can be to meet many objectives from a municipal comprehensive plan or just a single one such as to preserve or reclaim land along a greenway. It is important to note that an official map is not zoning and does not place landowners in jeopardy of having their land taken away, nor does it imply municipal responsibility for opening, maintaining, or improving the identified property.

NEGOTIATED IMPROVEMENTS

Negotiation is a bargaining tool, often used in conjunction with PRD and cluster development, which will result in a conditional use being allowed. It can involve the use of waivers, the alteration of minor zoning requirements in exchange for desired improvements, increased open space, etc.

Land Swaps

Land swaps or land exchanges are useful when a development interest and a conservation interest both own a piece of land more appropriate to the mission of the other. For example, a residential developer may own a wetland area next to a park while a municipal government owns a vacant tract near an existing developed area. With the land exchange, the environmentally sensitive land is preserved by the municipality and the

developer builds houses in an appropriate location. Any mismatches in land value can be negotiated.

Good Neighbor Agreements

"Good neighbor" agreements between developer and municipality may result from negotiations. In this case, the developer adds some sort of improvement or conservation measure to the site as a way of maintaining good relations with the community or municipal government.

PREFERENTIAL ASSESSMENT

Preferential assessment programs (i.e., Act 515 and Act 319) are valuable tools for open space preservation. They involve a property owner signing a covenant (agreement) not to change the land use from open space, farm, forest, etc. in exchange for a reduced tax assessment. Therefore, development is limited for the life of the agreement on the property. In the meantime, the landowner retains ownership and maintenance of their land. However, the protection that these programs provide should not be considered permanent. High land values can affect a property owner's decision to leave the program after the agreement expires, or the high land value may offset the tax penalty for breaching the program. Both programs have a requirement of 10 acres minimum and parcels under a single covenant must be held in common ownership and be contiguous.

PA Act 515

Act 515, also known as the Pennsylvania Assessment of Open Space Covenant Act (1966), enables counties to offer preferential tax assessment on land that is used for open space, farmland, forest land, or water supply land (per a minimum acreage requirement). The landowner covenants with the County for a reduced assessment for a period of 10 years (with an automatic yearly renewal thereafter). If the covenant is breached, the landowner must pay roll-back tax penalties to all taxing districts. In Delaware County, the Act 515 Open Space Covenant program is administered by the County Planning Department.

PA Act 319

The Pennsylvania Farmland and Forest Land Assessment Act (1974), also known as Act 319, enables counties to offer preferential tax assessment on land based on the agricultural use value of the land according to the productivity of the soil. Act 319 can be applied to farmland or forest land (per minimum acreage and agricultural income requirements). The landowner covenants with the County for a reduced assessment, subject to terms of the County Board of Assessments and based on soil surveys. The landowner must pay roll-back tax penalty for withdrawal from covenant. In Delaware County, the Act 319 program is administered by the Board of Assessments office.

AGRICULTURAL SECURITY AREAS

The Agricultural Area Security Law (Act 43 of 1981) allows for the establishment of agricultural security areas (ASA). ASAs are intended to promote permanent and viable farming operations over the long term by strengthening the farming community's sense of security in land use and the right to farm. They are created by municipalities, in cooperation with individual landowners who agree to collectively place at least 250 acres in an agricultural security area. The Law allows for the creation of joint municipality agricultural security areas. The ASA is reviewed every seven years however; new parcels of farmland may be added to an established ASA at any time.

Under the law, a municipality, or group of contiguous municipalities agree not to pass nuisance ordinances that would restrict normal farming operations. Limitations are placed on the ability of government to condemn farmland located in an agricultural security area for new schools, highways, parks, or other governmental projects.

Having land enrolled in an agricultural security area does not restrict a landowner's ability to use his or her property for non-agricultural development purposes. Landowners who are part of a 500-acre or larger agricultural security area are eligible for consideration to apply to sell an easement on their land under the state's Easement Purchase Program, through the local county's county agriculture preservation program.

Eligible properties must be: 1) noncontiguous farm parcels that are at least 10 acres in area; 2) properties made up of viable agricultural land (cropland, pasture, and woodland can all be included in an ASA.); 3) properties with at least 50% of the land in Soil Capability Classes I-IV as defined by the county soil survey; 4) zoned to permit agricultural uses.

Interested landowners should contact the Delaware County Conservation District (DCCD) to obtain agricultural security area application forms.