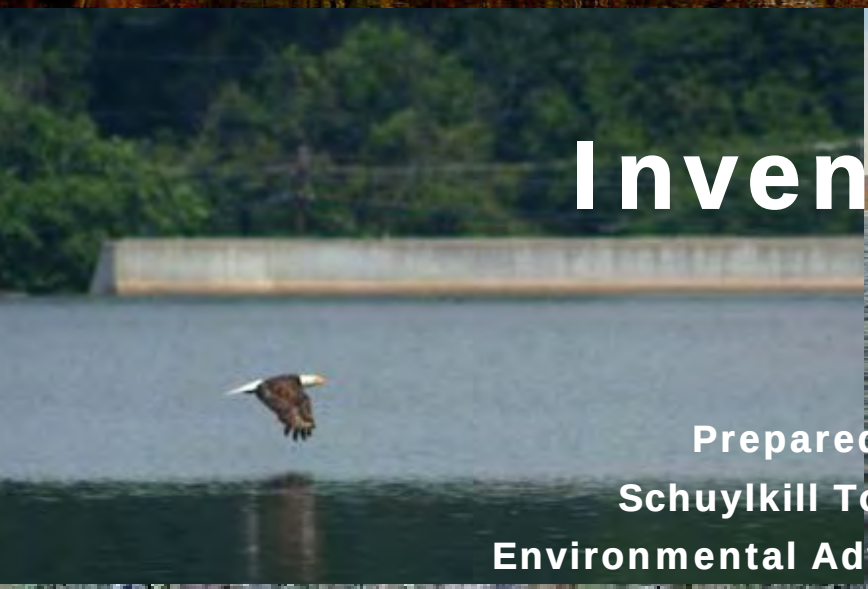
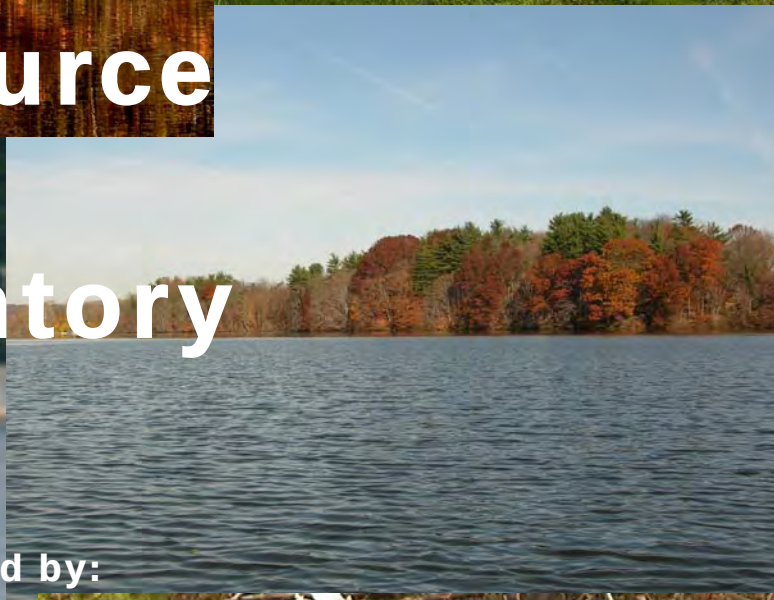
Schuylkill Township

Environmental Resource Inventory





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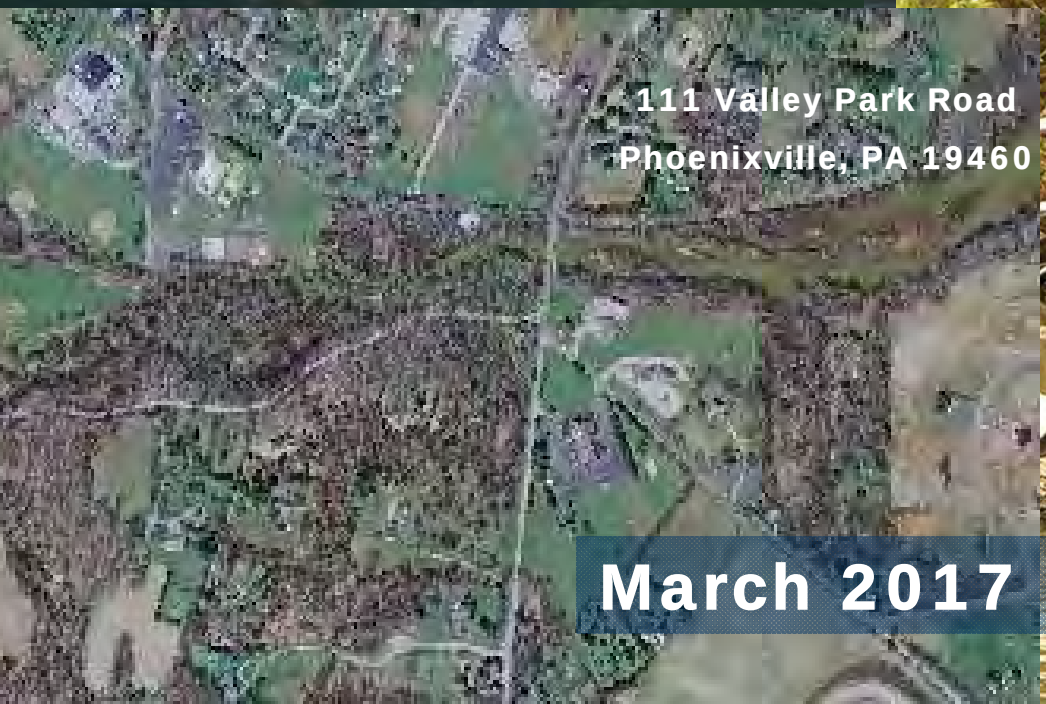

March 2017

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Note:

The views expressed herein are those of the

Schuylkill Township

Environmental Advisory Council (EAC)

and do not necessarily represent the views of the

Schuylkill Township Board of Supervisors

Schuylkill Township EAC Members 2017

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Steve Kunz* (Vice-Chair)
Michelle Garg (Secretary)
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Mary Ellen Heisey
Tom Heisey
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PREFACE

We all share responsibility for the safety, health, and welfare of our community. And "our community" is more than the houses, streets, schools, and businesses in our Township. The natural parts of our community --- the trees and forests, creeks and rivers, farms and fields --- are at least as important as the built-up parts, if not more so.

Although we humans like to think of ourselves as protectors of nature --- we create parks, nature preserves, and zoos --- in fact, our relationship with nature is the other way around. *We* are dependent on *nature* for our very existence --- the air we breathe, the water we drink, the food we eat.

It is important to remember our connection to the land we live on. We are all part of the larger web of life, and what we do or fail to do has an effect on the larger system.

For example, the plants we cultivate around our homes --- our personal landscapes --- can be important components of a productive ecosystem. Using native plants in our yards and gardens, we attract butterflies, bees, birds, and other wildlife that are not just wonders to behold, but provide necessary pollination and other ecological services and help contribute to the diversity and stability of the broader local ecosystem.

The information in this Environmental Resource Inventory (ERI) is intended to provide a framework for better understanding the natural systems that make up Schuylkill Township. Like all Pennsylvania municipalities, our Township faces the challenge of managing growth and development while protecting important natural and cultural resources. This ERI provides a collection of data that can serve as a valuable tool in understanding and managing the Township's environmental resources.

INTRODUCTION

An Environmental Resource Inventory is a compilation of maps and text that illustrate and explain the natural characteristics and environmental features of a municipality. An ERI provides background information that is both interesting and useful for municipal Boards and commissions, residents, visitors, and the regulated community.

For a municipality to make land use decisions that will ensure protection and wise use of its natural resources, it is essential to understand the location, character, and quality of those resources, features which are highlighted in an Environmental Resource Inventory.

> ***The importance of having an ERI cannot be overstated. The scientific and objective natural resource information contained in an ERI is essential to planning for the preservation and enhancement of a community's resources.*** **(PEC 2004)**

This ERI was developed in large part by the Schuylkill Township Environmental Advisory Council (EAC), with mapping assistance provided by the Township Engineer, Gilmore & Associates. The legal basis for EACs to develop an ERI comes from Pennsylvania Act 148, as amended. The "Specific Powers" section of Act 148 enables EACs to "*keep an index of all open areas, publicly or privately owned, including flood-prone areas, swamps, and other unique natural areas, for the purpose of obtaining information on the proper use of such areas."* An ERI is, in effect, an index of these natural areas. The Schuylkill Township EAC is responsible for advising "*local governmental agencies...on matters dealing with the protection, conservation, management, promotion and use of natural resources, including ...land and water resources*." An Environmental Resource Inventory is a major tool for fulfilling this mandate.

In 1992, Schuylkill Township completed and published an *Open Space, Recreation, and Environmental Resources Plan* (Thomas Comitta Associates, Inc.). That document served as an ERI of sorts for the past several decades. Its 24-page Chapter 4, entitled "Inventory of Existing Township Resources and Land", provided information and maps identifying water resources (streams and watersheds, floodplains, wetlands, aquifers), land resources (agricultural soils, steep slopes), biotic resources (wooded areas, habitat areas, stream water quality designations), and scenic, historic, and cultural resources.

This Environmental Resource Inventory effectively updates the 1992 document. It is divided more or less into three major categories: Administrative (base map, aerial photographs, zoning, and land use), Land Resources (geology, topography, surface relief, slopes, and soils), and Water Resources (streams, watersheds, floodplains, riparian buffers, and wetlands). This ERI illustrates environmental conditions in Schuylkill Township as of approximately 2015. However, conditions change --- land is developed, land is preserved, land use requirements evolve --- and so some

of the information in this ERI soon will be obsolete. Most of the information in this ERI is derived from or based on data in the Township's GIS (Geographic Information System), and thus it easily can be updated. It is expected that this ERI may be updated/revised every 5 or 10 years or so.

During September 2012, the Schuylkill Township Zoning Ordinance was amended to adopt the Natural Resources Conservation Overlay District (NRCOD; Article XXVII; Ord. No. 2012-02). The NRCOD was developed over several years largely by members the EAC. After considerable review and revision it was recommended for approval by the Township Planning Commission and then adopted by the Board of Supervisors following public hearing. The NRCOD provides protection to environmental resources, including some that previously had not been afforded formal protection in the Township. This ERI incorporates and describes, among other things, the natural resources protected by the NRCOD. **While every effort has been made to make this ERI as accurate as possible, it is not a legal document** like the Zoning Ordinance or Comprehensive Plan, both of which were adopted by the Board of Supervisors following formal public review.

BASE MAP

Schuylkill Township is located in northeastern Chester County in the southeastern section of Pennsylvania. It encompasses about 9 square miles (approximately 5,700 acres) and is bounded by Phoenixville Borough, East Pikeland Township, Charlestown Township, and Tredyffrin Township (in Chester County), and by Upper Merion Township, Lower Providence Township, and Upper Providence Township (in Montgomery County). Schuylkill Township was incorporated in 1826, and its population was 8,516 in 2010 according to the US Census.

All of the maps presented in this Environmental Resource Inventory utilize a common base map. The ERI map entitled **Base Map** identifies the boundaries of Schuylkill Township, adjacent municipalities, properties [tax parcels] within the Township as of September 2015 (of which there were 3,161), streets and railroads, and major rivers and streams. Most of the data on the base map was obtained from the GIS databases of the Chester County Department of Computing and Information Services.

A common base map enables users to easily identify the environmental resources on or near specific properties. All of the maps are oriented with north at the upper left. All of the maps are presented at the same scale, but the user can zoom in to obtain greater detail for an individual area or property. Please note that given the limitations of the source information, enlargement of the maps does not necessarily provide more accurate information.

AERIAL PHOTOGRAPHS

A set of six aerial photographs of Schuylkill Township taken during **1965, 1980, 1990, 2000, 2010,** and **2014** is provided as part of this ERI. These aerial photos illustrate how the Township looked at different times in the past and how it has changed over time. In 1965, for example, the Township was considerably more rural than it is today. Note that the tax parcels of the base map indicate properties as of 2015, and do not represent properties as of the date of the specific aerial photograph. Where conditions have changed, this series of aerial photos allows users to see the visible physical condition of specific properties during previous times.

ZONING

The Schuylkill Township Zoning Ordinance was first adopted in March 1955. It currently is included in the Township Code as Chapter 370. The Zoning Ordinance provides for a multitude of land uses in Schuylkill Township. Within each zoning district specific uses are permitted, other uses may not be permitted, and some uses may be permitted only as special exceptions. There currently are 14 primary zoning districts, and they include several for residential purposes (FR, R-1, R-2), a PRD (planned residential district), commercial (C, NC), office and professional (NO, APO-1, APO-2), industrial (I, LI, I/LI), public facilities (PFZ), and administrative/research (A-R). The various zoning districts are shown in different colors on the ERI map entitled **Zoning Map**. One can see that most of the Township currently is zoned for residential uses.

In addition to the 14 primary zoning districts, there are 3 "overlay" districts in the Township which by their nature can be found in any other zoning district:

H	Historic Site Overlay District
F	Flood Hazard and Wetlands District
NRCO	Natural Resources Conservation Overlay District

Note: The copy of the Zoning Map included in this ERI is not a legal document --- one can read or obtain a copy of the official current Zoning Map and all Zoning Ordinance requirements on the Township website (see page 22 below).

The NRCO District was adopted by the Board of Supervisors in September 2012. Its purpose is to identify selected natural resources within the Township and to establish standards to protect them. The NRCO District focuses specifically on the following resources: floodplains, steep slopes, watercourses and riparian areas, outstanding resource waters, and wetlands. Each of these is discussed more fully below.

Also shown on the Zoning Map are T-Zones. The September 2005 addendum to the Township Comprehensive Plan divided Schuylkill Township into character areas, split along rural to urban "transects", or T-Zones. There are four such T-Zones in Schuylkill Township:

T-1 -- *Most Rural*: Farmland, Horse Farms, and Woodland/Forested Areas
T-2 -- *More Suburban*: already subdivided, and not T-1, T-3, or T-4
T-3 -- *Most Suburban/Less Urban:* not as intense as T-4
T-4 -- *More Urban*: closer to Phoenixville Borough, and adjoining the Borough.

LAND USE

While zoning requirements establish guidelines for what may be built in a specific area or how it may be used, "land use" is a reflection of what actually exists there. For example, an area may be "zoned" for medium-density residential, but it may be undeveloped and so its current "land use" may be woodlands or cropland. As time goes on, the land uses of the Township change, both by natural succession (unmowed open fields become shrubland, shrublands become forestland) and by manmade development or redevelopment. The historic aerial photographs discussed above display the land uses of the Township at specific points in time. The ERI map entitled **Land Use Map** illustrates the location and pattern of 23 different land uses identified in Schuylkill Township as of 2015, according to the Chester County GIS database. The land uses of Schuylkill Township can be broken down in several ways.

LAND USES in Schuylkill Township (2015)

63%	Developed (& Transitional) Uses
37%	Undeveloped Uses
100%	

Acres	Category DEVELOPED USES	% of Category	% of Township
2,108.2	Residential	59	37
533.0	Transportation/Communications/Utilities	15	9
343.8	Institutional	10	6
308.1	Commercial and Services	8	5
256.8	Mixed/Other Urban/Built-up/Transitional	7	5
43.4	Industrial	1	1
3,593.3	Developed Uses, Subtotal	100	63
	UNDEVELOPED USES		
903.8	Forest	43	16
581.2	Agricultural	28	10
284.7	Water and Wetlands	13	5
257.7	Public Recreation/Conservation	12	5
81.8	Shrub and/or Herbaceous	4	1
2,109.2	Undeveloped Uses, Subtotal	100	37
5,702.5	TOWNSHIP TOTAL		100

In 2015, Schuylkill Township was almost two-thirds developed and about one-third undeveloped. Residential uses comprised the largest category of developed uses (59%), and also the single-largest category of all land uses (37%). Forest cover accounts for most (43%) of the undeveloped uses, and is the second-largest single land use category overall (16%). Agricultural uses (primarily cropland and pasture) represent the third-largest single category of land use in the Township, accounting for 10% overall and 28% of the undeveloped area.

LAND RESOURCES

The following sections discuss the natural land-based resources of Schuylkill Township. These include surface geology, topography and surface relief, steep slopes, and soils. These features are all inter-related; for example, the existing pattern of soils and the shape of the land surface are a direct result of the rocks that formed and the geologic processes that occurred over many millions of years.

SURFACE GEOLOGY

The physical structure of the land surface is best understood by examining its geological history. The underling geology of an area, how the rocks formed and changed over time, dictates various current surface conditions including topography, soil types, and surface and groundwater patterns. Geologic processes such as folding and faulting also impact the type of topographic landscape that results. Because different types of rocks erode at different rates through geologic time, the local terrain of Schuylkill Township varies from nearly level areas to steeply sloped hills.

Schuylkill Township is located within the Piedmont Physiographic Province of southeastern Pennsylvania. A physiographic province is a geographic region with characteristic subsurface rock types or structural elements. There are six physiographic provinces in Pennsylvania, and several of them are subdivided into "Sections". Schuylkill Township encompasses parts of two Sections of the Piedmont Province: the Gettysburg-Newark Lowland Section occupies the northwestern two-thirds of the Township, and the Piedmont Upland Section occupies the southeastern one-third of the Township (see ERI map entitled **Surface Geology Map**). Both Sections are underlain by complexly deformed metamorphosed igneous rocks and lesser amounts of metamorphosed sedimentary rocks ranging in age from the Precambrian Period (4.6 billion to 540 million years old), through the Paleozoic Period (540 million to 250 million years old), and into the Triassic Period (250 million to 200 million years old). From north to south, Schuylkill Township bedrock ranges in age from the more recent Triassic to the older Precambrian (see Table on next page). In addition, unconsolidated recent sediments (10,000 plus years old to present) associated with the Schuylkill River and its tributaries occur along the boundaries of those waterways.

The northern approximately 60% of the Township is underlain by Triassic-aged rocks of the Stockton Formation. Note that these correspond with the Gettysburg-Newark Lowland Section of the Piedmont Province on the Surface Geology Map. Rocks of the Stockton Formation primarily are coarse-grained arkosic sandstone, and include lesser amounts of siltstones and mudstones. These sediment types were deposited directly adjacent to much older rock types due to Triassic tectonic activities (faulting) that created local and regional depositional basins.

Immediately south of, and in places in direct contact with, the Stockton Formation are:

- Felsic Gneiss which is a metamorphic Precambrian rock type;
- The Octoraro Formation Lower Paleozoic in age made up of schists, phyllites, and gneisses;
- Several bands of Lower Paleozoic pegmatite an intrusive igneous rock type;
- Felsic, mafic, intermediate and banded mafic gneiss, Precambrian in age;
- Graphic felsic gneiss, Precambrian in age;
- The Chickies Formation, a Lower Paleozoic series of quartzite's, schists, slates and conglomerates
- The Antietam and Harpers Formations of Cambrian age.

The four Precambrian-aged rocks which make up the surface geology of the southern portion of Schuylkill Township are some of the oldest rocks exposed at the surface in Pennsylvania.

Geologic Age	**Geologic Formation / Type**	**Acres**
Triassic	Stockton	3667.5
Lower Paleozoic	Octoraro/ schist, pegmatite, phyllite, gneiss	249.3
Cambrian	Antietam and Harpers, undivided	5.8
Cambrian	Chickies	524.7
Precambrian	Graphic felsic gneiss	43.7
Precambrian	Felsic to mafic gneiss	228.8
Precambrian	Felsic and intermediate gneiss	400.2
Precambrian	Banded mafic gneiss	582.5
TOTAL		5,702.5

The amount and quality of groundwater in an area is related to the types and characteristics of the subsurface rocks. Rocks have different porosity and permeability characteristics, which means that water does not move around the same way in all rocks below ground. When a water-bearing rock readily transmits water to wells and springs, it is called an aquifer. Wells can be drilled into an aquifer and water can be pumped out. Precipitation

eventually adds water to (recharges) the porous rock of the aquifer.

Although the majority of Township residents currently receive municipally-supplied water, groundwater continues to be important for some rural, agricultural, and industrial areas of the Township. The Township geology is dominated by rock types that are not considered typical porous and continuous groundwater aquifers. In this geology, water is trapped and stored in an unconfined condition in fracture systems in the igneous and metamorphic rocks, and in discontinuous sedimentary beds.

Precambrian rocks in the Township as well as rocks of the Reading Prong, which is a Precambrian geological structural element that trends northeast/ southwest through Reading, Pennsylvania, are known for elevated levels of radon. Because of this, there is the potential for elevated levels of radon occurring in subgrade structures (basements) in certain sections of the Township.

TOPOGRAPHY AND RELIEF

Topography relates to the three-dimensional shape of surface features and landforms. Terrain, or relief (also referred to as topographical relief), is the vertical and horizontal dimensions of the land surface. Topography literally refers to the "lay of the land" and it involves factors such as elevation and slope. Local terrain affects surface water flow and distribution. Over larger areas, it can affect weather and climate patterns.

There are three ERI maps associated with topography: USGS Topography, Surface Relief, and Slopes.

USGS TOPOGRAPHY

A topographic map is a type of map characterized by large-scale detail and quantitative representation of relief, usually using contour lines. A contour line is a line connecting places of equal elevation. The United States Geological Survey (USGS), a civilian federal agency, produces topographic maps at various scales, but the most commonly used for local purposes is 1:24,000 scale (1 inch = 2,000 feet), also known as 7.5-minute quadrangles. Parts of four such quadrangles cover Schuylkill Township:

Collegeville, Malvern, Phoenixville, and Valley Forge, and they are combined on the ERI map entitled **USGS Topography Map**.

SURFACE RELIEF

The land surface in Schuylkill Township ranges in elevation from a low of less than 90 feet NGVD[1] (National Geodetic Vertical Datum of 1929) at the confluence of Valley Creek with the Schuylkill River, to a high of about 600 feet NGVD (on Diamond Rock Hill along the border with Tredyffrin Township). The ERI map entitled **Surface Relief Map** combines elevations into nine color-coded groupings of roughly 65 feet each, which provides an easy way to view the surface relief of the Township. As the map shows most of the higher elevation areas are in the southeastern section of the Township. Comparison of this map with the Surface Geology Map shows the close correlation between the areas of lower elevation (less than 200 feet, green colors) and the Triassic Stockton Formation.

SLOPES

Slope is the measurement of the steepness, gradient, incline, or grade of an area. A higher slope value indicates a steeper incline. On a topographic map, steeper slopes are portrayed where the contour lines are closer together. Steep slopes represent transitional areas in the landscape --- for example, a transition from higher terrain to a lower terrain such as along stream corridors. Steep slopes present a number of implications for community development and the environment. Slopes that are very steep, such as those in excess of 25%, often present serious limitations for development, and as a result may require extensive and costly engineering for safe construction.

Steep slopes occur naturally along drainage courses, streams, and rivers and can also be created by manmade activities, such as where “cut and fill” has occurred in conjunction with construction.

The ERI map entitled **Steep Slopes Map** identifies three slope categories: 0-15%, 15-25%, and greater than 25%. Only 5% of the land in the Township (264 acres) is on slopes of 15 to 25%, and only 1.5% (84 acres) is

[1] Note: Elevation typically is expressed as feet above sea level, which is approximately 0 feet NGVD.

on land with slopes greater than 25%. Most of the Township (5,355 acres; more than 93%) is on the more gentle 0 to 15% slopes.

The three categories of slopes on the ERI map correspond with the definitions of slopes in the Schuylkill Township Code, particularly in the Zoning Ordinance (Chapter 370) and the Subdivision and land Development Ordinance (SALDO, Chapter 320). The SALDO definition simply defines *Steep Slopes* as those which are greater than 15%. The Zoning Ordinance is more detailed, and breaks steep slopes down into "Intermediate Steep Slopes" (those greater than 15% but less than or equal to 25%) and "Elevated Steep Slopes" (those greater than 25%).

When development is being considered for a specific parcel of land, areas of *Steep Slopes* (among other things) are excluded from the overall area that is defined as “Developable Land” according to both the Zoning Ordinance and the SALDO. That is not to say that steep slopes cannot be developed: disturbance is allowed on up to 20% of land that is considered Intermediate Steep Slopes and on up to 10% of land that is considered Elevated Steep Slopes.

SOILS

The United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS), which formerly was called the Soil Conservation Service (SCS), has been instrumental in the formal identification, classification, and mapping of soils throughout the country. The NRCS has prepared detailed maps and descriptions of the soils of the United States, county by county. The original intent of county soil surveys, as they are called, was to assist farmers in the use and management of their lands for agricultural production. The utility of soil surveys expanded over time, and information about soils today is important to a wide range of groups including engineers, developers, conservationists, and residents.

The soils of Schuylkill Township consist primarily of silt loams belonging to the *Penn-Croton-Bucks* soil association. These typically are moderately-deep to deep silty soils formed from red shale and sandstone. Soils of this association occur throughout the northern two-thirds of the Township. The southern one-third of the Township consists of soils of the *Edgemont* and the *Glenelg-Manor-Chester* soil associations.

Soil scientists sometimes categorize soils according to drainage class, which is based on observations of water table depth, soil wetness, landscape position, and soil morphology. There are seven soil drainage classes, which range from excessively drained (water is removed very rapidly; the occurrence of internal free water is very rare or very deep; typically coarse sandy soils) to very poorly drained (water is removed so slowly that free water remains at or very near the ground surface during much of the growing season; typically very clayey soils). Drainage characteristics often are controlled more by elevation, slope, and proximity to drainage systems than by the soil type present.

As shown on the map entitled **Soil Drainage Class**, the soils in Schuylkill Township belong to four of the more moderate classes, including: somewhat excessively drained, well drained, moderately well drained, and poorly drained. Areas shown in white on the map (typically urban/developed map units) and areas of open water, which together encompass more than one-quarter of the Township, are not assigned a soil drainage classification.

The distribution of soils in each soil drainage class in Schuylkill Township is detailed in the table below. Soils that are either excessively drained or poorly drained can present constraints to their use or development. Such soils comprise less than 5% of the Township. Most (64%) of the Township soils are well drained, which is a key reason that agriculture was such an important factor in the history of the Township.

Soil Drainage Class	Acres	Percent
Somewhat Excessively Drained	25	<1
Well Drained	3,630	64
Moderately Well Drained	296	5
Poorly Drained	205	4
Urban/Unclassified	1,541	27

Poorly drained and very poorly drained soils typically are considered to be hydric soils, which is one of three technical criteria (the others being hydrophytic vegetation and hydrology) used to identify wetlands. Wetlands are important resources, and their development presents additional technical and regulatory constraints (see Wetlands, below). In Schuylkill Township there are several current or former soil units classified as poorly drained: Croton silt loam (CyA, CyB), Hatboro sit loam (Ha), Towhee silt loam (ToB) [formerly, in part, known as Wehadkee silt loam (We), and in part known as

Worsham silt loam (WoA, WoB)], and Bowmansville-Knauers silt loams (Bo) [formerly, in part, known as Wehadkee silt loam (We)].

WATER RESOURCES

The following sections discuss the water resources of Schuylkill Township. These include the major streams and their watersheds, floodplains, riparian areas, and wetlands. The quality and nature of surface waters reflect in part the shape of the land (discussed in the previous sections) and the uses which have occurred on those lands. The earliest inhabitants typically identified with the rivers and streams nearby. Indeed, our Township's name is based on the river that forms its northeastern boundary: the Schuylkill River got its name from Dutch settlers who called it "*schuylen-kill*", or "hidden creek".

If you look at an aerial photograph of Schuylkill Township (especially those aerials included with this ERI which highlight certain water resources), there is one feature in the center of the Township that immediately draws your attention --- the Pickering Creek Reservoir. The Pickering Reservoir, which encompasses approximately 110 acres, is important because it serves as a Township and regional drinking water source. The Reservoir is owned and operated by Aqua Pennsylvania, Inc. (*a.k.a.*, Aqua America, Inc., and formerly known as Philadelphia Suburban Water Company). According to the "Source Water Protection Report" for the Pickering Creek (PSW 2007):

> ... *the area along the Pickering Creek from Pickering to Anselma* [the area upstream from the Reservoir] *should be considered a priority protection corridor and have special protective zoning, ordinances, regulations and legislation to restore and protect water quality.*

The streams and other water resources of Schuylkill Township are important not only for drinking water, but for their scenic and aesthetic values, and for the opportunities they provide for fishing, hiking, and other recreational and educational pursuits.

STREAMS / WATERSHEDS

A watershed is an area of land that collects all the precipitation falling on it and all of the surface water and groundwater running through it and directs it into a larger body of water. A watershed is sometimes called a drainage

basin or a catchment area. Every creek or stream has its own watershed, and larger waterways such as rivers contain the combined watersheds of all of the smaller streams and creeks within it. A smaller stream that flows into a larger stream is called a tributary of the larger stream. The upper end of a stream is called its headwaters; the lower end where it drains into another body of water is called its mouth. The place where two streams join together is called their confluence.

Schuylkill Township is entirely within the Schuylkill River watershed, which in turn is one of several major watersheds that make up the Delaware River Basin. Streams within Schuylkill Township belong to several distinct subwatersheds, as depicted on the ERI map entitled **Streams/Watershed Map**. The Pickering Creek watershed (shaded light yellow on the map) covers more than half of Schuylkill Township (see table on next page) and drains the central part of the Township. Direct unnamed tributaries to the Schuylkill River (shaded green on the map) comprise the second largest subwatershed in the Township. The Jug Hollow Run watershed (shaded purple) is almost entirely contained within the Township. Additionally, there are the French Creek watershed in the western section (light blue) and the Valley Creek watershed in the eastern section (dark yellow).

The watershed is an important concept because the streamflow and water quality of an area are affected by what happens *upstream* from that area. When a pollutant is introduced into the surface or groundwater at a certain place, it travels downstream and affects downstream users. The phrase "*we all live downstream"* means in part that we all depend on the good stewardship of those who live upstream from us.

Topography determines the pattern and rate of water flows within a watershed. Water always flows downhill. Ridge tops that surround a stream determine the boundary of its watershed, and the ridges and hills that separate two watersheds are called a drainage divide.

Most larger streams are shown as blue lines on USGS topographic maps, and some (but not all) of them are named. Not all waterways are shown on the USGS maps, however. Many smaller streams, and particularly headwater streams, are not mapped. Just because it is not mapped, however, does not mean that a stream is not a stream. Any waterway with a defined bed and banks, whether perennial (flowing year-round) or intermittent, is considered

a "regulated water of the Commonwealth" and is protected by both State and Schuylkill Township requirements.

Every waterway in Pennsylvania has been assigned a "designated use" by the Pennsylvania Department of Environmental Protection (PADEP). That "use" in part identifies its overall water quality and thus the level of protection it should be afforded. The very highest quality streams in the Commonwealth have been designated EV (Exceptional Value). The second best streams are designated HQ (High Quality). Together, EV and HQ streams are classified as "Special Protection" waters, and because of their extraordinary characteristics any development proposed in or near them must implement special measures to ensure that their water quality is not degraded.

Watershed	Designated Use	Acres	%
Pickering Creek	**HQ-TSF***	3,185	56
Tributaries to Schuylkill River	**HQ-TSF***	1,061	19
Jug Hollow Run	**HQ-TSF***	861	15
French Creek	TSF	371	6
Valley Creek	**EV***	222	4

*** "Special Protection" designation**

Pennsylvania has more than 86,000 miles of streams, more than any other US state except Alaska. Of that total, less than 30% qualify as "Special Protection" waters, *i.e.*, are designated either EV or HQ (Delaware Riverkeeper Network 2011). Many municipalities have no Special Protection waters within their boundaries. Schuylkill Township is fortunate in that almost all of its land area (94%) lies within EV or HQ watersheds. The Valley Creek watershed, encompassing 222 acres in the Township, is designated EV. The Pickering Creek watershed, the Jug Hollow watershed, and all direct tributaries to the Schuylkill River, all are designated HQ-TSF (high quality - trout stocking fishery). The Schuylkill River itself is designated WWF (warm water fishes). The 371-acre area within the French Creek watershed is the only non-Special Protection watershed in the Township; it is designated TSF.

Municipalities have a responsibility to maintain and protect their streams and watersheds, not only for the benefit of current and future residents, but for all downstream users as well. Scientists have found (Carlisle et al 2013) a direct correlation between forest cover and stream water quality (streams have better water quality in watersheds with a higher percentage of forest

cover) and an inverse correlation between impervious cover and water quality (as the percentage of impervious area goes up, the quality of streams goes down). Because its streams and watersheds are of the highest caliber, Schuylkill Township seeks to protect and maintain their excellent water quality.

FLOODPLAINS

Certain areas along streams may be prone to flooding when the stream overflows its banks, typically as a result of heavy rainfall, tropical storms, or hurricanes. Although flooding from extreme precipitation events is a natural phenomenon, development along or close to a stream can exasperate flooding problems, especially if adequate or effective stormwater management practices are not implemented. The erection of structures and other types of development in a floodplain can displace floodwater and cause flooding to occur more quickly or to reach a higher elevation. If not properly managed, the conversion of natural landscapes to impervious surfaces (such as roofs, driveways, and roads where rainfall cannot percolate into the ground) anywhere in a watershed, not only alongside a stream, can result in increased volumes of stormwater runoff being discharged into waterways.

The Federal Emergency Management Agency (FEMA) has analyzed streams throughout the US (including in Schuylkill Township) to calculate the elevations that floodwaters would be expected to reach during certain storm events. The most common storm event for which flood elevations are established is the "100-year storm", which is simply a flood event that has a 1% probability of occurring in any given year. FEMA mapping under the National Flood Insurance Program (NFIP) identifies such areas as Special Flood Hazard Areas. Specific floodplain management regulations must be adopted and enforced in municipalities (such as Schuylkill Township) which participate in the NFIP. The mandatory purchase of flood insurance applies to landowners with homes within the 100-year floodplain.

According to FEMA floodway mapping, areas subject to flooding by the 100-year storm event in Schuylkill Township encompass 637 acres (approximately 11% of the Township). Those areas are shown in light blue on the ERI map entitled **Floodplain Map**. Where no FEMA maps or studies have defined the boundary of the 100-year flood, there is an assumed floodway that extends 50 feet beyond the top of each bank of a stream.

Stormwater management in most communities has improved over the past several decades, but increases in impervious surfaces, with or without the implementation of stormwater management practices, continues to affect local and regional flooding. In the years since Superstorm Sandy, which impacted the east coast during October 2012, FEMA has been re-evaluating and revising its flood maps in certain areas to reflect an increased risk of flooding due to changing climatic conditions and increased development.

RIPARIAN BUFFERS

The term "riparian" refers to anything connected with or immediately adjacent to a stream or other body of water. A Riparian Buffer, therefore, is a buffer adjacent to a stream. It is similar in many ways to a floodplain, except that a Riparian Buffer has a specific, intentional purpose. That purpose is to protect the associated stream, which is accomplished by providing a vegetated area, or buffer, along the waterway. In general, the wider and more diversely planted the buffer, the more likely it is to provide positive water quality and stormwater benefits.

A Riparian Buffer helps to protect the integrity of a stream by stabilizing its banks and reducing erosion. It reduces the impact of stormwater runoff by trapping, absorbing, and filtering sediments, nutrients, and other types of pollutants. It also supplies food, cover, and thermal protection to fish and other aquatic species and wildlife.

Although any vegetation along a stream provides a good riparian buffer, an area that is thickly wooded or dense with shrubs immediately adjacent to the stream typically is best. Trees and shrubs have a much denser root system than a row crop or lawn. Wooded buffers support the stream bank so that the bank does not wash away over time. Trees and shrubs shade the stream, helping the stream maintain a cooler temperature. Wooded Riparian Buffers are very effective at trapping sediments and pollutants prior to entering the streams, and they provide many animal species with necessary habitat and corridors for safe movement.

In Schuylkill Township, Riparian Buffers are established and protected by the Natural Resources Conservation Overlay District of the Zoning Ordinance (Article XXVIII of Chapter 370). The Riparian Buffer consists of two sections.

There is a 50-foot wide "inner buffer" which encompasses essentially the same area, and provides the same restrictions on new development, as the Floodplain requirements. The second section of a Riparian Buffer includes an additional 50-foot wide area ("outer buffer"), where regrading and other disturbances are limited to a maximum of 10% of the area.

Schuylkill Township recognizes certain waters as "Outstanding Resource Waters" in accordance with the Natural Resources Conservation Overlay District of the Zoning Ordinance. Those are waters which have especially significant water quality values and thus require special protection.

"Outstanding Resource Waters" in Schuylkill Township include the Pickering Reservoir, wetlands along and adjacent to the Pickering Reservoir, any wetlands that have been determined by PADEP to be "exceptional value wetlands", and any waters that have been determined by PADEP to be "Exceptional Value" waters (such as those within the Valley Creek watershed). The Riparian Buffer associated with "Outstanding Resource Waters" has an additional 50-foot wide buffer, for a total of 150 feet in width, along each side of the water.

As illustrated on the ERI map entitled **Riparian Buffer Map**, Riparian Buffers (shown in yellow) encompass 594 acres of land beyond the FEMA-mapped floodplains (shown in light blue). The Outstanding Resource Water Buffers are shown in brown on the map, and encompass 112 acres of land beyond or in addition to the standard Riparian Buffers.

WETLANDS

At one time, wetlands were widely viewed as inhospitable wastelands teeming with mosquitoes, unpleasant odors, and disease --- places best drained and filled in for more "productive" uses. Today, wetlands are recognized as important natural resources which are valuable to communities because of the diverse and essential functions they perform. Wetlands can: provide critical habitat for fish and wildlife, decrease flooding, remove pollutants from water, recharge groundwater, protect streams, and provide recreational, research, and educational opportunities. Wetlands also play an important role in the cycling of carbon, nitrogen, and water.

Wetlands typically are found alongside waterways, in localized depressions,

or in low topographic positions in the landscape. Most wetlands in Chester County are classified as "palustrine" (nontidal freshwater systems) and are dominated by trees, shrubs, and/or persistent emergent vegetation.

In recognition of their values, wetlands have been protected at the federal and state levels since the late 1970s. Wetland protections also are included in the ordinances of Schuylkill Township and many other municipalities.

Unlike some environmental constraints, there is no definitive map of regulated wetlands in Schuylkill Township (or in any municipality in Pennsylvania). One can easily identify environmental resources such as floodplains (which have been mapped by FEMA) or steep slopes (which can be determined from topographic maps). Although most people might recognize a swampy area filled with cattails as a wetland, the existence or boundaries of many wetlands are not always so obvious.

In the late 1970s, the US Fish & Wildlife Service (USFWS) established a program to map wetlands nationwide, primarily for wildlife inventory purposes. They produced a set of National Wetland Inventory (NWI) maps as overlays to USGS topographic quadrangles. Based largely on high-altitude aerial photography and with very limited field checking, NWI maps are a decent generalized source of wetland information, but they are not, and never were intended to be, accurate for site-specific regulatory purposes.

More recently, the US Army Corps of Engineers (Corps) has developed a standard methodology and set of criteria to be used to identify (delineate) wetlands on a given parcel of land. The PADEP relies on the same technical criteria and methodologies as the Corps. Regulated wetlands are identified and defined by three parameters, all of which must be present for an area to be considered a wetland:

> Hydrophytic Vegetation - Wetlands must have an abundance of plants that have adapted to grow in saturated soils and/or ponded conditions, plants which research and experience have determined are most commonly associated with wetlands. Almost every native plant has been assigned a "wetland indicator status" indicating the frequency with which it is found growing in wetlands under natural conditions.
>
> Hydric Soils - Wetlands must have soils that formed under anaerobic (lacking oxygen) conditions as a result of prolonged saturation or inundation. Specific indicators have been developed to identify hydric soils in the field using visual and chemical evidence of past or current anaerobic conditions.

Wetland Hydrology - Water is the most important factor in determining whether an area is a wetland ("wet" land), but often it is the most difficult to identify. Wetlands require prolonged inundation or saturation necessary for the creation of hydric soils and the growth of hydrophytic vegetation. Many people have the not-unreasonable impression that wetlands must be wet *all* or *most of* the time. In fact, the technical standard for wetland hydrology is 14 or more consecutive days during the growing season of most years when an area must be flooded or ponded or a water table must be 12 inches or less below the ground surface. Thus, although many wetlands are wet most of the time, wetlands can be dry for extended periods of any given year.

Wetlands are important resources, but whether or not they exist on a specific property often requires a site inspection to determine if the three parameters listed above are present. Because there is no accurate map of regulated wetlands, they typically are not delineated unless or until a landowner plans to construct something or otherwise needs to disturb an area that is or may be wetland. Further complicating matters is the fact that wetland boundaries can change over time (usually long periods of time, measured in years or decades) if a site becomes significantly wetter or drier due to natural or manmade events (for example, the construction or removal of a beaver dam). This of course begs the question --- how does one *know* if an area is a regulated wetland?

There are two sources of information regarding potential wetland areas that can be used as a guide. One, as noted above, are the NWI maps prepared by the USFWS. In Schuylkill Township, the NWI has mapped 254 acres as wetland, but most of that total (231 acres) is open water. As already mentioned, NWI maps are not accurate for site-specific regulatory purposes, but they *do* tend to identify some larger or more obvious wetlands. If an area has been identified as a wetland on an NWI map, there is a high probability that a wetland is there or somewhere nearby.

The second, and more reliable, source of information regarding potential wetland areas is the mapping of soils by the USDA (see also "Soils", above). All Pennsylvania counties have a printed Soil Survey. Although the one for Chester County was prepared more than 50 years ago (Kunkle 1963), it still is remarkably detailed and accurate. A more current version of soils mapping is available online at the USDA's "Web Soil Survey", which reflects ongoing advancements in soil science and changes in nomenclature.

One characteristic of soils is its drainage classification, which is how easily and quickly water drains through it. Most soils which are classified as

"poorly drained" or "very poorly drained" are considered hydric soils. However, because a mapped soil type may consist of a number of soil components in different proportions, there can be inclusions of poorly or very poorly drained soils in soils with drainage classifications of "somewhat poorly drained", "moderately well drained", or even "well drained".

Most poorly drained soils have a grey or mottled appearance, which distinguishes them from well drained soils that typically are uniformly brown in color. Hydric soils also tend to have higher proportions of clay than sand, and often are located in depressions (where water collects) or along waterways (which periodically overflow their banks). No matter what a map may show, to determine whether a soil on a specific property actually is a "hydric soil" or not requires onsite confirmation.

Even if present, an area of hydric soil must be accompanied by hydrophytic vegetation and wetland hydrology to be considered a regulated wetland. Most wetlands are found in areas where soils either are mapped as "hydric soils" or have significant components of hydric inclusions. Thus, for initial screening purposes in Schuylkill Township, and in the absence of a site-specific wetland delineation, wetlands can be *presumed* to exist in any area where the Soil Survey maps a soil unit that has more than 5% of hydric soil components[2].

To accurately identify a wetland, a delineation should be conducted on-site by an experienced investigator following the prescribed 3-parameter methodology. The Corps has established a process by which a landowner can obtain a "JD" (jurisdictional determination) which will formally confirm the limits of wetlands and other waters on a property. Once issued, a Corps JD can be relied upon by a landowner to resolve any questions about the location or extent of wetlands on a property. The Philadelphia District of the Corps of Engineers serves all of southeastern Pennsylvania, including Schuylkill Township.

The ERI map entitled **Potential Wetlands Map** identifies two types of areas where wetlands are likely to be found. Shown in purple are areas which are mapped as wetlands according to the NWI maps; those areas encompass 254 acres in the Township. Shown in green are the soil map units that are

[2] These include the following soil types: Bo (Bowmansville-Knauers silt loams), CaA and CaB (Califon loams), Co (Codorus silt loam), CyA and CyB (Croton silt loams), Ha (Hatboro silt loam), MlA and MlB (Mount Lucas silt loams), ReA and ReB (Readington silt loams), Ro (Rowland silt loam), and ToB (Towhee silt loam).

known to have more than five percent of hydric soil components; those areas encompass 501 acres. Most of the NWI-mapped areas also are mapped as hydric soils, so together the mapped potential wetlands encompass approximately 510 acres in Schuylkill Township, or 9% of the land area. As the map shows, such areas most commonly are found along streams.

SOURCES OF ADDITIONAL INFORMATION

The following is a list of sources of data and other information related to the natural features of Schuylkill Township, many of which were used or consulted in the preparation of this ERI. Some of the listed sources are simply links to websites, but those are of value because they may include updated and more current information than is presented in this ERI. All links were accurate and active as of this writing, but unfortunately web links can change or become unavailable for any number of reasons. Note: if clicking on a link does not work, try cut-and-pasting it into your web browser.

One particularly useful resource is called ***ChescoViews*** and it is found on the Chester County website: https://arcweb.chesco.org/cv3/ ChescoViews is an easy to use, interactive application that allows a user to find and view information about specific tax parcels or larger areas in Chester County. One can zoom in or out and view such things as individual properties, roads and railroads, streams, floodplains, soils, and recorded subdivisions, and users can switch between basemaps of different types.

Information about **Schuylkill Township** can be found at the following links:

- Schuylkill Township Homepage
- Schuylkill Township Municipal Code
- Natural Resources Conservation Overlay District (NRCOD)
- Schuylkill Township Native Plant List

Information from the **Pennsylvania Department of Environmental Protection** (PADEP) can be found at the following links:

- Homepage
- Waterways and Wetlands
- Southeast Regional Office (which covers all of Chester County)

Information about **Chester County** can be found at the following links:

Homepage
County Parks and Trails
County Planning Commission
County Comprehensive Plan: Landscapes 2

GIS data for Pennsylvania:

Pennsylvania Spatial Data Access (PASDA)

US Army Corps of Engineers

Philadelphia District Resources

Specific Resources:

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Final Thoughts

Look deep into nature, and then you will understand everything better.

~Albert Einstein

Nature holds the key to our aesthetic, intellectual, cognitive and even spiritual satisfaction.

~E. O. Wilson

To forget how to dig the earth and to tend the soil is to forget ourselves.

~Mahatma Gandhi

Nature is not a place to visit. It is home.

~Gary Snyder

We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.

~Aldo Leopold