CAPITAL REGION™
WATER

Source Water Protection Plan
DeHart Reservoir and Susquehanna River
PWSID #7220049-001, 002

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Prepared in partnership with:
Susquehanna River Basin Commission
4423 North Front Street
Harrisburg, PA 17110
717-238-0423
www.srbc.net

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EXECUTIVE SUMMARY

Safe drinking water is an important and basic need for everyone. In recent years, Source Water Protection (SWP) has become a growing issue for public safety and health. In 1996, the U.S. Environmental Protection Agency (USEPA) established a new requirement under Section 1453 of the 1996 Safe Drinking Water Act for each state to develop a Source Water Assessment and Protection Program (SWAP) to assess all public drinking water sources. SWAP has two components: assessment and protection. The assessment component was mandatory and assessment reports were completed in the early 2000s. The second component, protection, is voluntary and consists of developing a SWP plan. These SWP plans will: (1) delineate the critical area for the surface water source; (2) provide an inventory of existing and potential sources of regulated and some unregulated contaminants in the assessment area; (3) determine the susceptibility of the public water source to contamination; (4) identify management options for best protecting a system's water source(s); (5) review contingency plans in the event of contamination events; and (6) investigate the potential for new sources.

The Drinking Water System

Capital Region Water (CRW) operates two intakes in the Lower Susquehanna River Basin. The primary source is the DeHart Reservoir in Rush Township, Dauphin County, PA. The secondary source is the mainstem of the Susquehanna River near the City of Harrisburg, PA. The system serves a population of approximately 67,000 people.

The watershed for the DeHart Reservoir is approximately 20 square miles. The watershed for the Susquehanna River intake is 23,563 square miles, while the study area is only 596 square miles. The major tributaries to the Susquehanna River that enter within the study area, from north to south, are Penns Creek, Mahanoy Creek, Mahantango Creek, Wiconisco Creek, the Juniata River, Sherman Creek, and Clark Creek.

Steering Committee and Public Participation

The local community, watershed protection partners, and local officials play a large role in protecting drinking water. They have firsthand knowledge of the watershed and issues that threaten the safety of the water. They also play a key role in educating their neighbors about SWP issues. Steering committee meetings were held to include input from community members and local officials.

Zone Delineations

The watershed upstream of each public surface water supply intake was delineated into three protection zones (Zones A, B, and C) based on the time-of-travel (TOT) approach approved by DEP, and mean annual stream velocities built into the National Hydrography Dataset Plus (NHDPlus).

Zone A represents a 0.25-mile buffer on either side of the stream within a 5-hour TOT. Zone B represents a 2-mile buffer on either side of the stream within a 25-hour TOT and Zone C makes up the remainder of the watershed. The 5-hour and 25-hour TOT delineations represent the entire drainage area within their given upstream times of travel.

Contaminant Source Inventories

An inventory of potential sources of contamination (PSOCs) was completed for the entire assessment area. PSOCs include activities and locations that use, store, transport, or dispose of contaminants. PSOCs can be point or nonpoint pollutants. The sources were identified by using Geographic Information Systems (GIS) data layers. The GIS layers used for the point source analysis include, but are not limited to, regulated facilities, underground storage tank locations, hazardous material locations, and regulated discharges. Maps and tables of the point source PSOCs were also created. Nonpoint pollutants were evaluated using 2005 land use data from the U.S. Geological Survey (USGS). The potential for a public drinking water supply to draw contaminated water is determined by the susceptibility analysis. The susceptibility analysis utilizes a series of matrices that assign a susceptibility rating of "A" thru "F" to the PSOCs. An "A" rating is the highest susceptible and highest protection priority and a rating of "F" is the least susceptible and less of a protection priority.

Management Options

CRW will use a variety of management options to develop a comprehensive approach to SWP and monitoring of its water supply from the identified PSOCs. Much of the effort will rely on public education and enhancing their relationship with local stakeholders, including state agencies and first responders.

Management options include educating CRW customers and government officials about the importance of SWP, continually monitoring PSOCs in the watershed, and becoming active in the Susquehanna River Basin Commission's (SRBC's) Early Warning System (EWS).

Contingency Planning and New Source Development

CRW maintains an emergency response plan that is regularly updated. The plan includes emergency contacts and provisions for alternate water sources. CRW can rely solely on one source, if the other source is contaminated.

CRW will work closely with local and county first responders in the event of a contamination or accident event that may threaten the water supply. If the event causes the Susquehanna River to become unusable for an indefinite amount of time, a new source of water will need to be identified and developed.

INTRODUCTION

In 1996, USEPA established a new requirement under Section 1453 of the 1996 Safe Drinking Water Act for each state to develop a Source Water Assessment and Protection Program. The program's goals are to evaluate water sources that serve public drinking water systems through an initial assessment phase, develop a SWP plan outlining management options for best protecting those sources, and encourage community-based implementation of the management measures prioritized in the SWP plan.

Source water assessments were developed for most drinking water sources in Pennsylvania from 2000 through 2003. These assessment reports (City of Harrisburg Susquehanna River and DeHart Dam, 2003) provided basic information that: (1) delineated the critical area for the surface water source; (2) provided an inventory of existing and potential sources of regulated and some unregulated contaminants in the assessment area; and (3) determined the susceptibility of the public water source to contamination. The information in these assessment reports was used as the basis for the development of this SWP plan for CRW.

The SWP planning process builds upon the initial assessments by providing additional information related to management options for best protecting a system's water sources, contingency plans in the event of contamination events, and potential new sources. The SWP plan also provides updated information about point and nonpoint PSOCs in the assessment areas. These plans are intended to be used as a basis for building voluntary, community-based barriers to drinking water contamination.

Pollution prevention is critical to protecting drinking water from contamination, and greatly reduces the cost of treatment. Since a majority of surface water supply systems have little to no control over the land use practices and wastewater discharges that influence the quality of rivers and streams, the SWP process provides the stakeholder framework for prioritizing and coordinating necessary management measures to best protect water quality. Many times, clean water goals are shared by a range of groups interested in drinking water, fisheries, manufacturing, and recreation. Pooling resources to best meet these goals in a collective manner only improves the potential for successful implementation of a drinking water protection strategy.

In the Lower Susquehanna Basin, source water assessments were completed for a majority of surface and groundwater systems by 2003. In a handful of cases, these assessments served as the basis for SWP planning activities that included education on drinking water protection issues, development of ordinances adding land use protections, and promotion of best management practices (BMPs) to address nonpoint source pollution. It is intended that this plan encourages similar activities, both to address local issues and contribute to the protection of drinking water sources in a more regional context through a Lower Susquehanna partnership.

THE DRINKING WATER SYSTEM

The water system is owned and operated by CRW. The William T. DeHart Dam and Reservoir (PWSID# 7220049-001) is the primary water supply, located on Clark Creek in Rush Township, Dauphin County. The Susquehanna River is the secondary water supply (PWSID# 7220049-002). CRW prefers not to use the Susquehanna River intake because of the increased treatment cost. CRW has estimated that using the Susquehanna River would cost an extra $1000/day. In addition to the increased cost, the Susquehanna has a greater risk of contamination. CRW rarely has treatment challenges when using the DeHart Dam. Potassium permanganate has only been used a few times to treat for taste and odor caused by algae blooms on the reservoir.

The Water Allocation Permit issued by PADEP allows a maximum withdrawal of 13.5 million gallons per day (mgd) from DeHart Dam and 15 mgd from the Susquehanna River. The average daily withdrawal from either source is 9 mgd. This system serves 67,000 consumers through roughly 21,000 service connections.

Raw water from the DeHart Reservoir could receive primary treatment at the reservoir. The DeHart Dam and Reservoir's Control Building and Chemical Feed Facility provide flow metering and potential for chemical additions to the raw water. Water is conveyed by gravity using a combination of varying diameter (42 inch and 36 inch) transmission main approximately 20.7 miles to the Dr. Robert E. Young Water Services Center.

The intake on the Susquehanna River consists of a screened intake structure. Raw water from the river flows by gravity through the intake structure to the Susquehanna River Pump Station's intake well. The water then is pumped approximately 3.1 miles through a 36 inch diameter transmission main to the Dr. Robert E. Young Water Services Center.

The Dr. Robert E. Young Water Services Center treats raw water received from the William T. DeHart Dam and Reservoir or from the Susquehanna River. The center uses chemical addition, flocculation, coagulation, sedimentation, filtration, and disinfection to treat the raw water.

The center has two parallel treatment process trains with a combined flow capacity of 20 mgd. The process trains contain two raw water flowmeters and two static mixers, four three-stage paddle wheel flocculators, four rectangular clarifiers, eight multi-media gravity filters with an air backwash system, two 150 horsepower centrifugal blowers, chemical feed equipment, two backwash pumps, four finished water pumps, and two finished water flow meters.

The center is capable of treating the water with the chemical addition of potassium permanganate, alum, soda ash, powdered activated carbon, polyphosphate, hydrated lime, caustic soda, ammonia,

and sodium silicofluoride. Chlorine, chlorine dioxide, or chloramines are used for disinfection of the finished water.

The Dr. Robert E. Young Water Services Center has four finished water pumps used to transport finished water to the Upper and Lower Reservoirs at Reservoir Park for distribution throughout the service areas. Two of these pumps are used for standby service. The Lower Reservoirs consist of two, 6 million gallon, pre-stressed concrete tanks. These reservoirs serve consumers within the City of Harrisburg west of Eighteenth Street. These reservoirs serve the low-pressure zone.

The Upper Reservoir at Reservoir Park serves the system's high-pressure zone. The Upper Reservoir has two reinforced, concrete, covered, underground, interconnected tanks. The basins can store a total of 28 million gallons of finished water. The Upper Reservoir serves consumers east of Eighteenth Street within the city of Harrisburg, Susquehanna Township, Penbrook Borough, Swatara Township, and Lower Paxton Township.

WATERSHED DESCRIPTION

Location

A watershed is the area of land which drains water to the location of interest; in this case, the surface water intake. The location of the intakes and the watersheds upstream of the intakes are shown in Figure 1 and Figure 2. Any activities (construction, land use, discharges, roads, etc.) or stormwater runoff within the delineated watershed areas shown on the map will eventually reach the surface water intake and could possibly affect the source water quality.

DeHart Reservoir Intake

DeHart Dam and Reservoir are located in Clarks Valley, approximately 20 miles northeast of the City of Harrisburg. The watershed has 650 acres of water surface area extending over four miles upstream of the dam. The watershed covers 22 square miles between Peters Mountain and Stony Mountain. The watershed is lightly populated, because Clark Creek flows through State Game Land 210. Some developments exist in Rush Township. The watershed covers portions of Cold Spring Township, Lebanon County and East Hanover, Rush, and Jefferson Townships, Dauphin County (Table 1).

Table 1. Municipalities Located within the DeHart Reservoir Watershed

County	Municipality	Zone
Lebanon County	Cold Spring Township	A
Dauphin County	East Hanover Township	A
	Rush Township	A
	Jefferson Township	A

Susquehanna River Intake

The entire watershed for the Susquehanna intake is approximately 23,563 square miles and covers parts of Pennsylvania and New York. The headwaters begin at Otsego Lake near Cooperstown, NY. The Susquehanna River Basin drains 27,510 square miles, covering half the land area of Pennsylvania and portions of New York and Maryland. The Susquehanna River is 444 miles from its headwaters near Cooperstown to its mouth at Havre de Grace, MD, where the river meets the Chesapeake Bay. The river's watershed comprises 43 percent of the Chesapeake Bay's drainage area.

Since the entire watershed is so large, the study area for this report is limited to Zone A and Zone B of the watershed. The study area is approximately 596 square miles and covers portions of seven counties and 59 municipalities in PA (Table 2). The study area extends from the intake north up the

mainstem of the river to Selinsgrove, PA and up the Juniata River to Walker Township, Juniata County, PA. The major tributaries to the Susquehanna River that enter within the study area, from north to south, are Penns Creek, Mahanoy Creek, Mahantango Creek, Wiconisco Creek, the Juniata River, Sherman Creek, and Clark Creek.

Table 2. Municipalities Located within the Susquehanna River Study Area

County	Municipality	Zone
Cumberland	East Pennsboro Township	A
Dauphin	Dauphin Borough	A
	East Hanover Township	B
	Halifax Borough	B
	Halifax Township	B
	Harrisburg City	A
	Jackson Township	B
	Jefferson Township	B
	Lower Paxton Township	B
	Middle Paxton Township	A and B
	Mifflin Township	B
	Millersburg Borough	B
	Reed Township	A and B
	Rush Township	B
	Susquehanna Township	A
	Upper Paxton Township	B
	Washington Township	B
	Wayne Township	B
	West Hanover Township	B
Juniata	Delaware Township	B
	Susquehanna Township	B
	Thompsontown Borough	B
	Walker Township	B
Lebanon	Cold Spring Township	B
	East Hanover Township	B
Northumberland	Herndon Borough	B
	Jackson Township	B
	Jordan Township	B
	Lower Augusta Township	B
	Lower Mahanoy Township	B

	Upper Augusta Township	B
Perry	Bloomfield Borough	B
	Buffalo Township	B
	Carroll Township	B
	Centre Township	B
	Duncannon Borough	A and B
	Greenwood Township	B
	Howe Township	B
	Juniata Township	B
	Liverpool Borough	B
	Liverpool Township	B
	Marysville Borough	A
	Miller Township	B
	Millerstown Borough	B
	New Buffalo Borough	B
	Newport Borough	B
	Oliver Township	B
	Penn Township	A and B
	Rye Township	A and B
	Spring Township	B
	Tuscarora Township	B
	Watts Township	B
	Wheatfield Township	B
Snyder	Chapman Township	B
	Penn Township	B
	Perry Township	B
	Selinsgrove Borough	B
	Union Township	B
	Washington Township	B

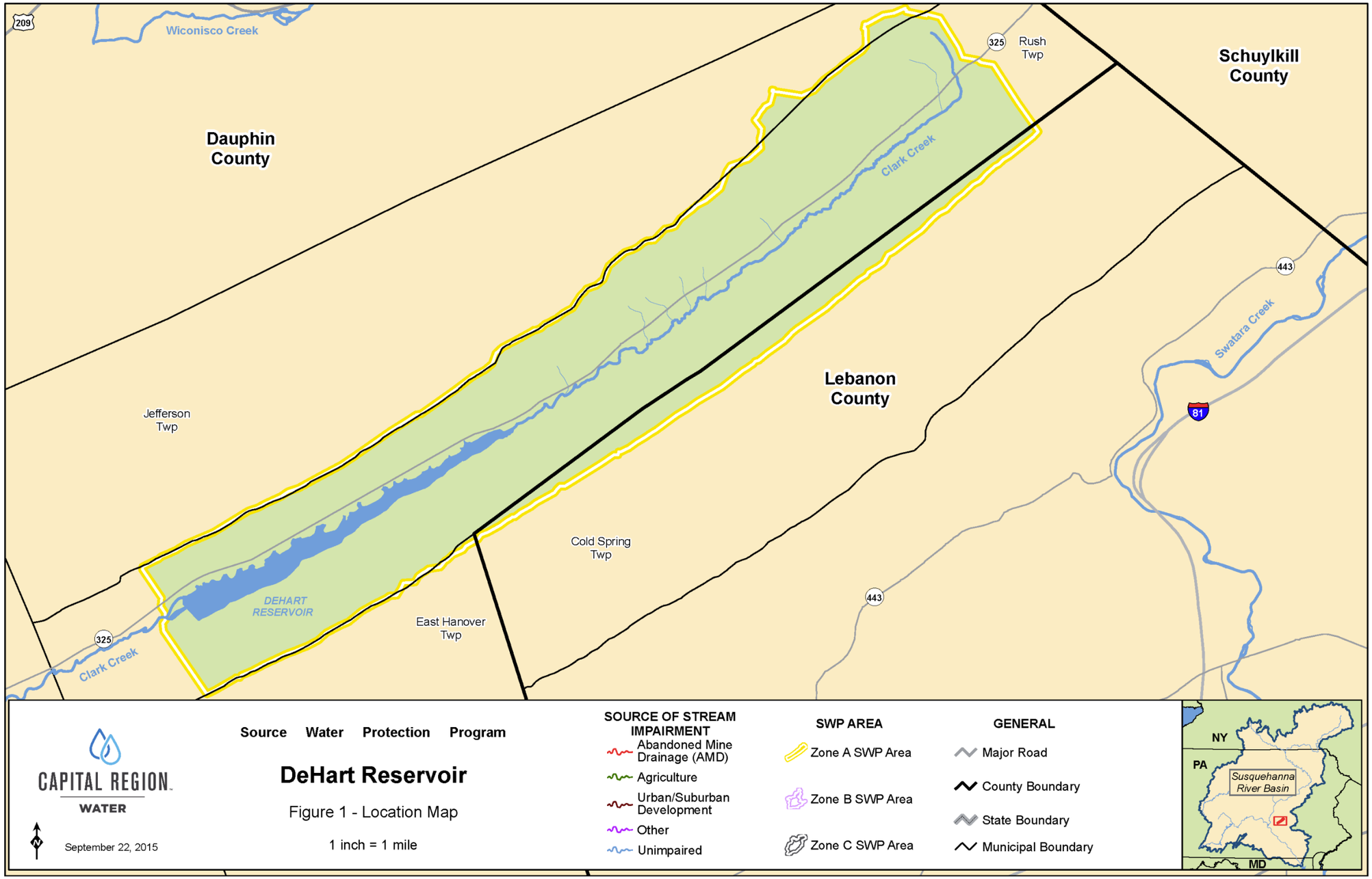

Figure 1. Location of the CRW DeHart Reservoir Source

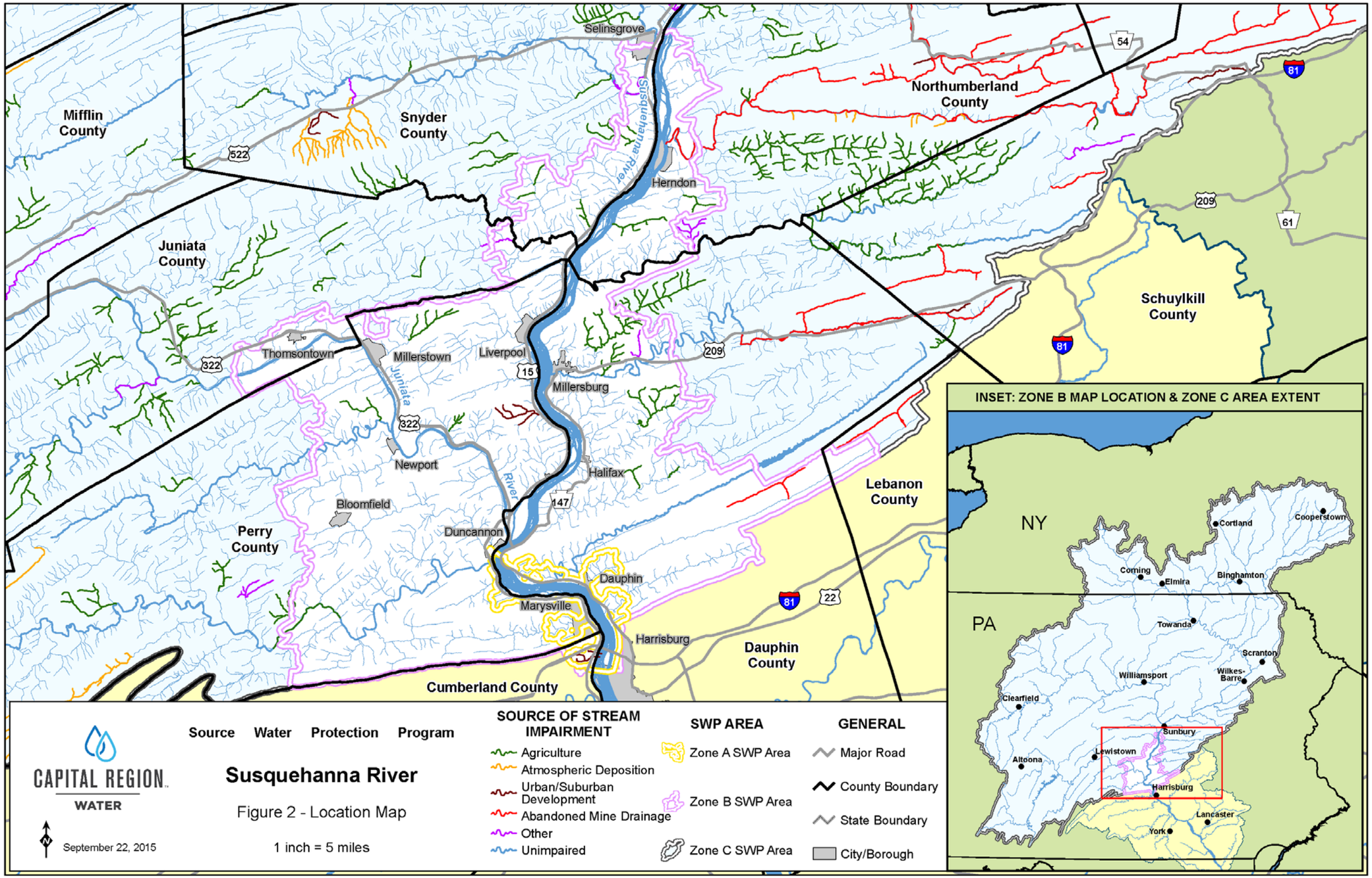

Figure 2. Location of the CRW Susquehanna River Source

Topography

DeHart Reservoir Intake

The watershed is completely within the Ridge and Valley Physiographic Province. Clark Creek is bounded to the north by Peters Mountain and to the south by Stony and Sharp Mountains. A peak elevation of 1,700 feet is reached near Peters Mountain in the State Gamelands. The DeHart Reservoir lies between Peters and Stony Mountains, and has an average elevation of 700 feet. The spillway elevation is 644 feet.

Susquehanna River Intake

The study area is completely within the Ridge and Valley Physiographic Province. The Blue Mountain Section and the Appalachian Mountain Section run thought the southern tip of the study area. The remainder of the study area is split between the Susquehanna Lowland Section and the Anthracite Upland Section.

Geology

DeHart Reservoir Intake

The watershed is composed of two rock types (Figure 3). The watershed is 84 percent interbedded sedimentary rock and 16 percent sandstone. The thin band of sedimentary rock runs along the southern edge on the watershed along Stony and Sharp Mountains.

Susquehanna River Intake

The study area is composed of four rock types (Figure 4). The study area is 66 percent interbedded sedimentary rock, 25 percent sandstone, 5 percent shale and 4 percent carbonate rock. Sandstone is distributed evenly throughout the study area in bands. The shale and carbonate rock are found along the southern and western edges of study area, with a small amount in the northern section of the study area. They are normally located beside one another.

Geology plays a significant role in influencing water quality within the DeHart Reservoir Watershed and the Susquehanna River study area. Substances in groundwater can be removed through several different processes, including precipitation, biodegradation, and sorption to mineral grains or organic carbon. As a result, some contaminants will move slowly through the ground. In general, depending on the type of contaminant, the slower the travel time, the more likely the contaminant is to naturally degrade (Fetter, 1992).

The movement of groundwater in bedrock is controlled largely by two factors: porosity and permeability. Porosity represents the amount of void space in rock material, while permeability represents the interconnectedness of that void space. Two geologic processes, weathering and

fracturing, increase overall porosity and permeability. Igneous and metamorphic rocks typically have low porosity and permeability, resulting in longer travel times for groundwater. Groundwater flow through sedimentary rock depends on the type and location of the rock formation. Water can generally flow with greater ease through limestone than through sandstone and shale. Groundwater flow in carbonate rock, commonly referred to as karst terrain, may be fairly rapid because cavities and fractures, caused by dissolution, serve as conduits for flow. Sandstone and some metamorphic rock also can be fracture-influenced in areas of Pennsylvania specifically parallel and perpendicular to the ridge lines. Any contaminants flushed into these cavities or fractures by runoff or streamflow could pose a potential threat to a drinking water source.

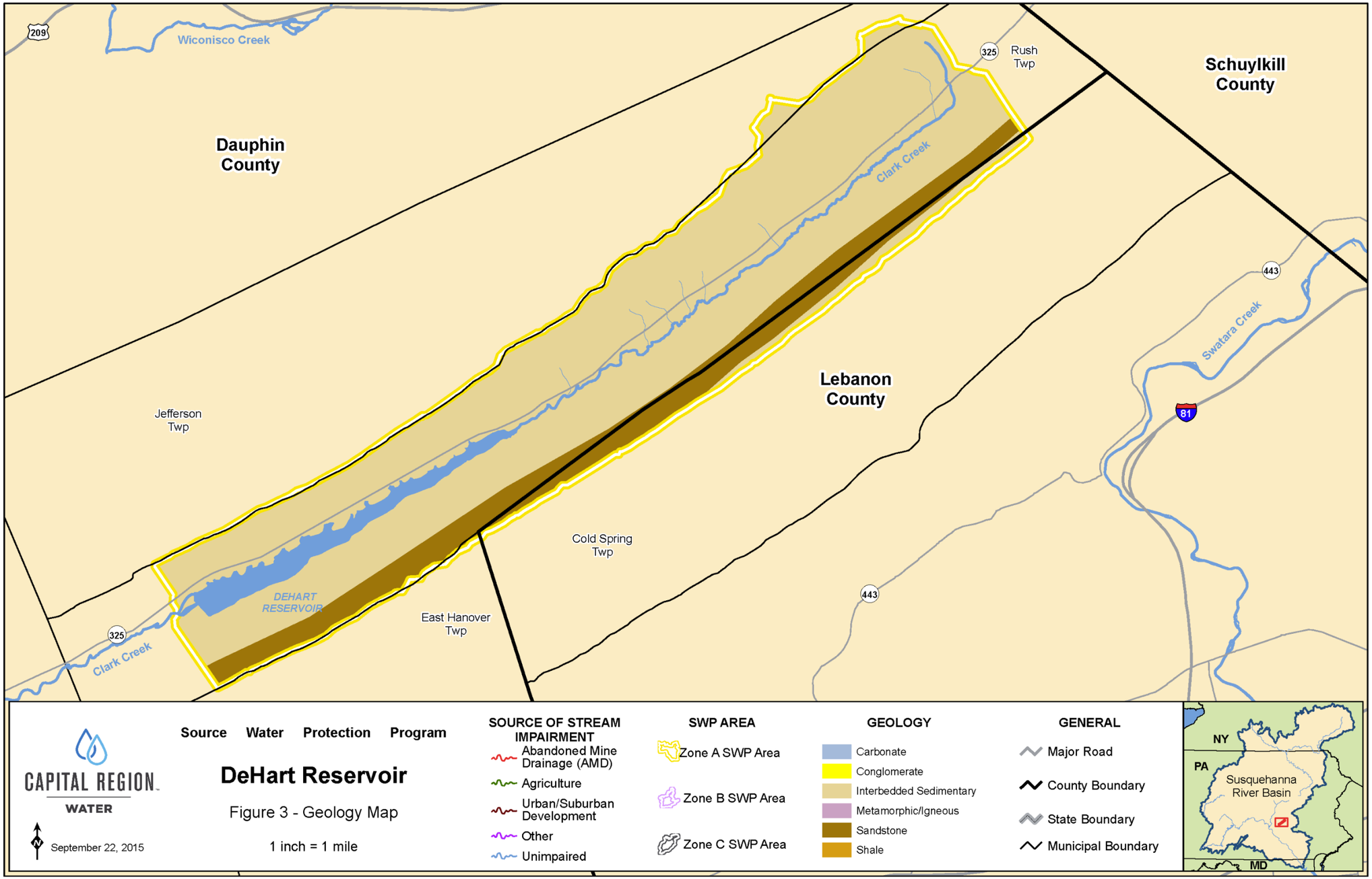

Figure 3. Geology in the CRW DeHart Reservoir Source

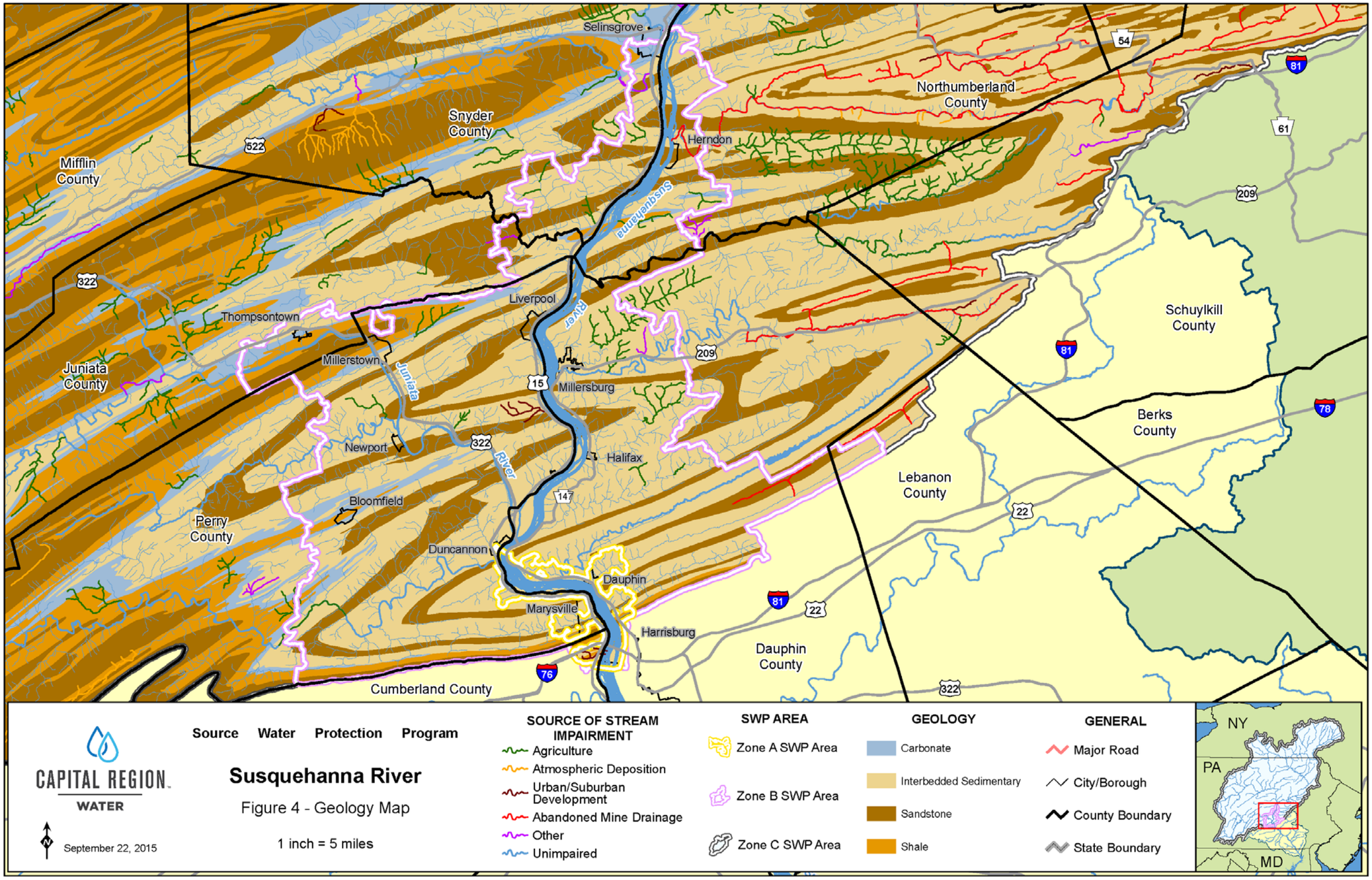

Figure 4. Geology in the CRW Susquehanna River Source

Soils

DeHart Reservoir Intake

The only soil series in the DeHart Reservoir watershed is Hazelton soils. Hazleton soils are formed from acid gray, brown, and red sandstone and are well-drained, moderately permeable soils. Hazelton soils are associated with woodlands of mixed oaks, maple, cherry, and occasional conifers. Some areas have been cleared for pasture and cropland (USDA-NRCS, 2011).

Susquehanna River Intake

Berks soils are the dominate soil type, covering 35 percent of the study area. Berks soils are well-drained and moderately permeable. Berks soils are derived from weathered shale, siltstone, and fine grained sandstone. The dominate land use for Berks soils is cropland. Berks soils are located west of the river and east of the river in Northumberland County. The second most prevalent soils are Hazleton soils, accounting for 26 percent of the study area. Hazleton soils are found in bands running east to west through most of the study area along the ridges. Hazleton soils are formed from acid gray, brown, and red sandstone and are well-drained, moderately permeable soils. Hazelton soils are associated with woodlands. Leck Kill soils cover 17 percent of the study area and are mostly found east of the river. Leck Kill soils are well-drained and are derived from weathered red shale, siltstone, and sandstone. These soils are associated with cropland, pastures, and mixed hardwood forest. Eight percent of the study is covered with Pope soils. Pope soils are formed in the alluvium of flood plains and are well-drained with moderate to moderately rapid permeability. As expected, Pope soils are located along the Susquehanna and Juniata Rivers. Pope soils are mainly used to cultivate the following crops: corn, sorghum, small grains, tobacco, hay, pasture, and vegetables. Kreamer soils and water each account for 5 percent of the study area. Kreamer soils are formed in colluvium or glacial material derived from limestone. They are moderately well-drained and have moderately slow to slow permeability. Their main use is general farm crops with patches of hardwoods. Urban land and Hagerstown soils each account for 2 percent of the study area. The remaining percent of the study is covered by Morrison soils, Murrill soils, or Allenwood soils (USDA-NRCS, 2011).

The K factor is the erodability of soil under normal conditions and is a factor in the Revised Universal Loss Equation (RUSLE). RUSLE estimates soil erosion due to rainfall and overland runoff. The K factor is impacted by soil properties such as texture, organic matter, structure, and permeability. Soil detachability, infiltration and runoff rates, and eroded sediment transportability determine the K factor. Generally, clay and sandy soils have a low K factor. Clay soils have a low K factor because clay particles are tightly held together and resist detachment. Sandy soils also have a low K factor because of high infiltration rates and their particle size does not allow for easy transport of sediment. Silt soils have the highest K factor given that the particles are easily detached and transported. These soils also have a tendency to crust, which leads to high runoff rates (USDA, 2003).

The permeability and erodability of the soil coverage impact the rate at which potential contaminants can spread through the watershed. Highly permeable soils transmit fluid with greater ease, while erodible soils increase overland runoff. Runoff ranges vary between soil types, and are often dependent on slope. Soil erosion is an important factor when considering land use practices and their effects on sediment and pollutant transport in streams. Increased soil erosion in agricultural areas can carry contaminants, such as pesticides and fertilizers, to the stream.

Land Use

The land use within the study areas will indicate what activities may take place and the type of contaminants, which may affect the source water (see Figure 5 and Figure 6). The land use in Zone A will have a greater influence on water quality than land use further away. Generalized land use data were obtained and estimates extracted for the entire basin. The land use data were derived from the most recent available satellite imagery (2006), but recent land development may have changed those areas.

DeHart Reservoir Intake

The watershed is 94 percent forested/wetlands. Water covers 5 percent of the watershed. Land used for agriculture accounts for just over half of one percent. Developed land and disturbed land combined account for less than half of one percent of the watershed (Table 3).

Table 3. General Land Use for the DeHart Reservoir Watershed

	Zone A/Watershed		
Land Use	**Percent of Total**	**Acres**	**Square miles**
Water	4.7	659.0	1.0
Disturbed	<0.1	1.3	0.0
Developed	0.3	37.1	0.1
Agriculture	0.6	89.4	0.1
Forested/Wetlands	94.3	13126.4	20.5
Total	**100.0**	**13913.2**	**21.7**

Susquehanna River Intake

The dominate land use in the study area is forested/wetlands at 61 percent. Agriculture covers 28 percent of the study area. Water accounts for 6 percent of the study area and the largest body of water is the Susquehanna River. Developed land accounts for 4 percent of the study area. Less than a tenth of a percent of the study area is disturbed (Table 4).

The land use within Zone A varies from the land use of the study area. The dominate land use in Zone A is still forested/wetlands at 54 percent, but water is second most dominate land use at 23 percent. The developed land accounts for 15 percent of Zone A. The developed areas include northern Harrisburg, Marysville, and Dauphin. Agriculture only accounts for 8 percent of Zone A and disturbed land accounts for less than a tenth of a percent of Zone A.

Table 4. General Land Use for the Susquehanna River Study Area [1]

	Zone A			Study Area		
Land Use	**Percent of Total**	**Acres**	**Square miles**	**Percent of Total**	**Acres**	**Square miles**
Water	23.2	4866.0	7.6	6.1	22330.2	34.9
Disturbed	<0.1	7.6	0.0	<0.1	99.9	0.2
Developed	15.2	3193.8	5.0	4.4	15954.6	24.9
Agriculture	7.9	1650.2	2.6	28.3	102911.2	160.8
Forested/Wetlands	53.7	11295.7	17.6	61.1	221998.8	346.9
Total	**100.0**	**21013.3**	**32.8**	**100.0**	**363294.7**	**567.7**

[1]The Study Area values provided by SRBC are based on generalized land use data and associated estimates. Although the total area differs from the larger delineated protection zones, the estimates allow for protection planning in regards to land use.

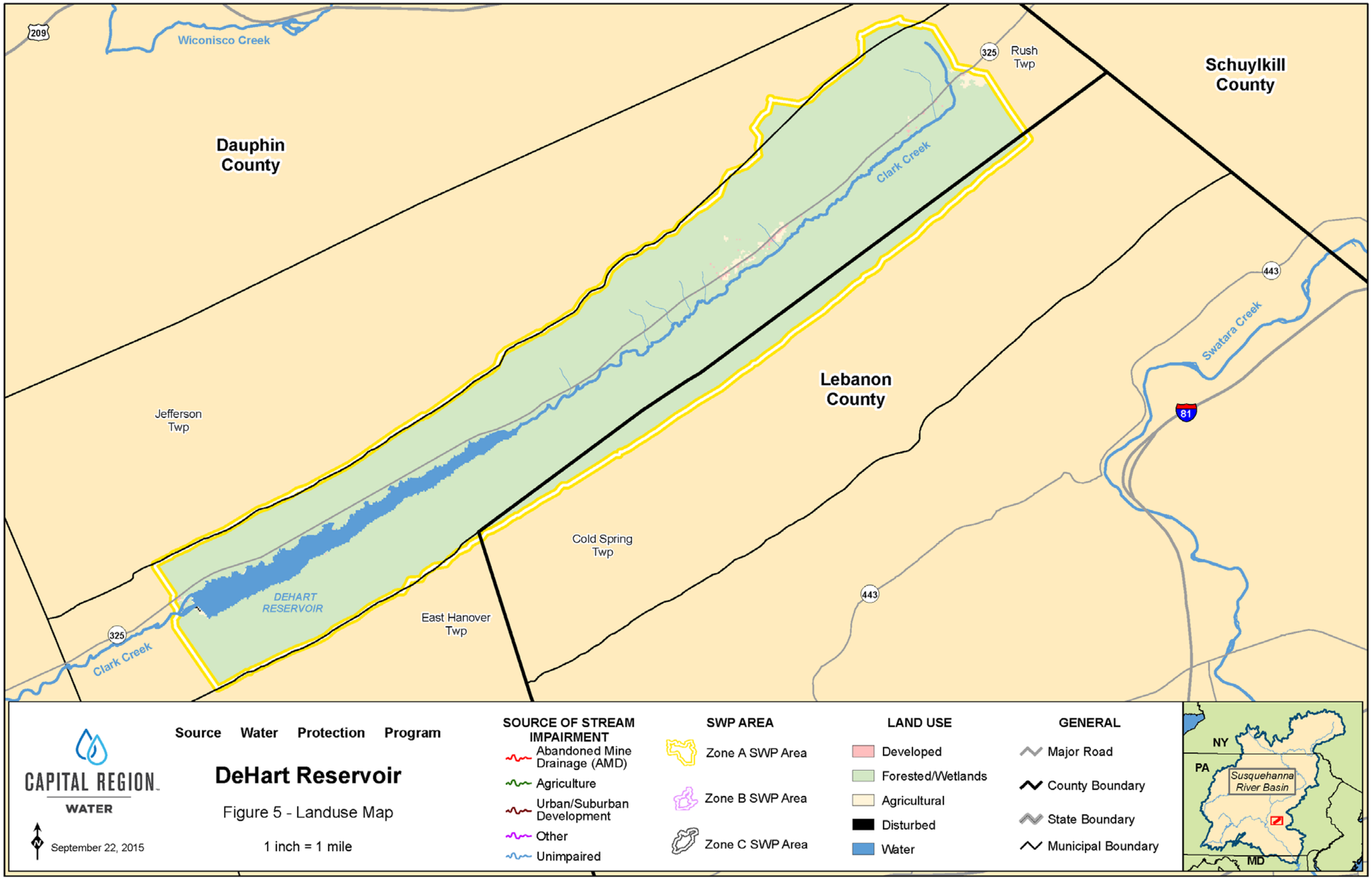

Figure 5. Land Use in the CRW DeHart Reservoir Source

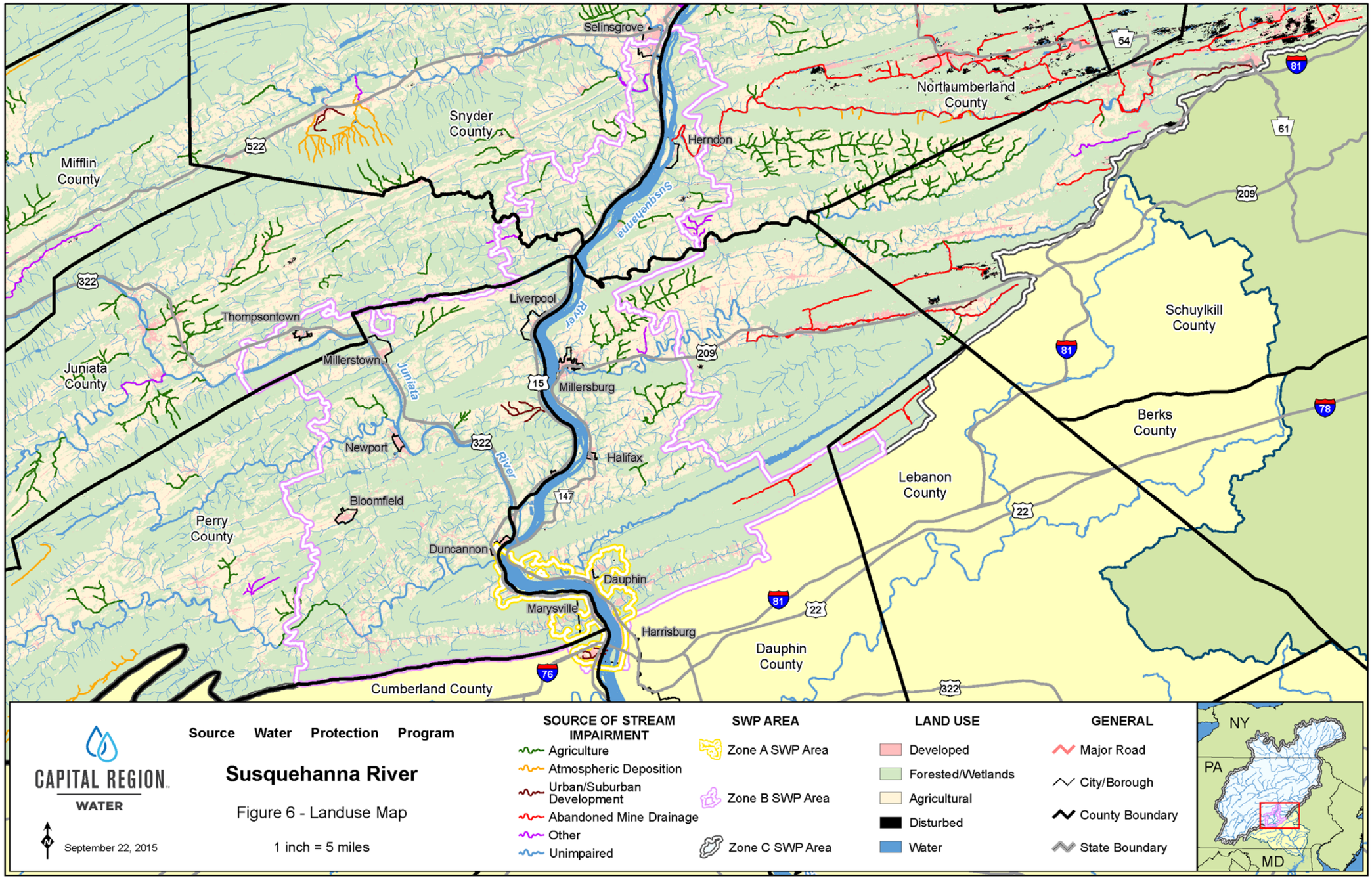

Figure 6. Land Use in the CRW Susquehanna River Source

EXISTING SWP EFFORTS AND STUDIES

SWP is not new to CRW. For the past several years, CRW has been a member of the SRBC's Early Warning System (EWS). The EWS monitors the water quality of the mainstem of the Susquehanna River and the Chemung River near public water supply intakes. As a EWS member, CRW can view raw water quality data from water suppliers upstream of their intake and monitor the changing water quality condition of the river. These data can be used to help CRW select the correct level of treatment needed on a day to day basis. In the event of a spill, the EWS will coordinate the flow of information among water suppliers on the Susquehanna River. During a contamination event, the water quality data and information flow gives CRW some lead time to make treatment changes or to close the intake, depending on the type and amount of contamination, before the contamination plume reaches their intake.

CRW also gives tours of its plant to civic groups, including school and scout groups. The tours educate the public about where their water comes from and why it is important to keep the source water clean. CRW has also presented the TAP program at local schools.

CRW is proactive in minimizing risk associated with several activities of concern. CRW is concerned about on-lot septic systems and illegal dumping. CRW routinely monitors the water quality of Clark Creek at six monitoring locations. The monitoring locations are distributed upstream of, in the middle of, and downstream of the on-lot septic systems. CRW staff has also identified several sites prone to littering or illegal dumping. Staff checks on these locations often and cleans them as needed.

In 2003, SRBC completed a source water assessment report for CRW (then the Harrisburg Authority), through PADEP's Source Water assessment program. The assessment report provided an overview of the water system and its watersheds. The report also provides a brief summary of the potential sources of contamination.

STEERING COMMITTEE AND PUBLIC PARTICIPATION

A steering committee was formed for this project. The committee consisted of project stakeholders, local officials, and other interested parties. The steering committee provided comments and ideas to SRBC and CRW with respect to knowledge of issues in the watershed. They also served as a sounding board for ideas and recommendations being developed as part of the SWP plan and served as a liaison between their respective organizations and the messages covered at the steering committee meetings. A subset of steering committee members have also been convened by CRW to discuss ideas and recommendations specific to the DeHart Reservoir source and intake. CRW anticipates expansion of this group with a commitment to stakeholder outreach. Current partners for this effort are identified below.

To help facilitate coordination and reduce duplication in SWP efforts, a Lower Susquehanna regional steering committee meeting was held. Public water suppliers, municipal officials, and environmental agencies from across the Lower Susquehanna River Subbasin were in attendance. As a result of the initial meeting, there is continued interest and participation in the regular convening of a Lower Susquehanna Source Water Protection Partnership to address SWP issues. More information on this effort, including project partners, can be found online at www.srbc.net/programs/partnership.htm.

CRW's SWP plan will be accessible online at www.capitalregionwater.com as well as subsequent meeting dates, implementation status updates, and any related presentations and/or decisions that have been considered by CRW's Board of Directors. SWP information will also be integrated into CRW's annual Consumer Confidence Report (CCR), commonly referred to as the annual water quality report, for distribution to customers. Staff may also be contacted at (717)525-7677 for additional information.

Steering committee members are:

- Raly T. A. Bey, CRW
- Andrew Bliss, CRW
- Tanya Dierolf, CRW
- Daniel L. Galbraith, CRW
- Paula Zankel, Clarks Creek Watershed Preservation Association
- Bob Christoff, Dauphin County Conservation District
- Gil Hirschel, Dauphin County Conservation District
- Rob Frank, Dauphin County Conservation District
- Dennis Coffman, Doc Fritchey Chapter of Trout Unlimited
- Jenn Fetter, Penn State Cooperative Extension – Dauphin County
- Andrew Brought, Pennsylvania Dept. of Conservation and Natural Resources

Technical Advisors are:

- Joe Hebelka, P.G., PADEP
- Derrick Havice, P.G., PADEP
- Ed Chescattie, PADEP
- Cathy Port, PADEP
- Andrew Gavin, SRBC
- Kimberly Dagen, SRBC
- Tyler Shenk, SRBC

The following meetings were held for this project:

- April 8, 2011
- February 9, 2012
- November 20, 2013
- July 2, 2014
- December 16, 2014
- April 13, 2015
- October 8, 2015 (anticipated)

Appendix A includes information from the steering committee meetings. Since SWP is ongoing, the steering committee anticipates meeting twice a year and/or as issues are presented in the watershed.

DELINEATION OF THE SOURCE WATER PROTECTION AREA

The watershed upstream of each public surface water supply intake was delineated into three protection zones (Zones A, B, and C) based on the time-of-travel (TOT) approach approved by DEP, and mean annual stream velocities built into the National Hydrography Dataset Plus (NHDPlus). Zone A represents a 0.25-mile buffer on either side of the stream within a 5-hour TOT. Zone B represents a 2-mile buffer on either side of the stream within a 25-hour TOT and Zone C makes up the remainder of the watershed. The 5-hour and 25-hour TOT delineations represent the entire drainage area within their given upstream times of travel.

The delineations were developed using GIS and several datasets. One of the most important datasets is the NHDPlus dataset. The NHDPlus dataset contains mean flow rates and volumes for each section of stream. The NHDPlus data along with additional data, such as slope and area of the watershed, was used to calculate the mean TOT for each stream section. The mean TOTs were then accumulated to calculate mean TOT for the entire watershed. A more technical description of the process used and calculations performed is below.

All TOT delineations were developed on Google Earth (v5.1) using USEPA's Watershed Assessment, Tracking and Environmental Results (WATERS) web and database services, and converted for further use and analysis in GIS. USEPA WATERS services, which are made accessible to the public through a vector-based KMZ file (v1.2), provide real-time access to datasets and analysis tools stored in the WATERS Database, including the most current NHDPlus (v1.0). NHDPlus is a geospatial dataset that integrates the medium resolution (1:100,000 scale) NHD stream network with the national Watershed Boundary Dataset and National Elevation Dataset. Within NHDPlus, each networked flowline contains mean annual flow estimates based on Unit Runoff calculations and mean annual velocity estimates derived using the Jobson method (USEPA and USGS, 2010). NHDPlus also includes elevation-derived drainage areas (called catchments) produced by "burning in" the 1:100,000 scale NHD stream network and building "walls" using the national Watershed Boundary Dataset. The resulting TOT delineations, therefore, include the designated drainage area upstream of a water supply intake during typical flow conditions.

Using WATERS KMZ on Google Earth, all TOT delineations were developed using the 'Upstream with Tributaries' navigation feature within the Drainage Area Delineation Tool and confirmed using flowlines returned by the 'Upstream with Tributaries' Upstream-Downstream Search Tool. All TOT delineations were then converted from KML to ESRI shapefiles, with Albers Equal-Area Projection, and overlaid on high resolution (1:24,000 scale) GIS stream layers for the development of Zones A and B.

DeHart Dam Intake

Zone A is 21.7 square miles and is completely within Dauphin County, PA. The entire Watershed on the DeHart Dam intake is contained within Zone A so there is no Zone B or C.

Susquehanna River Intake

Zone A is 32.4 square miles and is split among Cumberland, Perry, and Dauphin Counties, PA. Zone B extends from Zone A up to the 25-hour TOT. Zone B is 533.3 square miles and reaches north into Northumberland and Snyder Counties, PA to near Selinsgrove, PA. Zone B extends out the Juniata River to Walker Township, Juniata County, PA. The remainder of the watershed is in Zone C which is 23,023.7 square miles. Zone C covers portions of Pennsylvania and New York.

CONTAMINANT SOURCE INVENTORIES

An inventory of PSOCs was completed for the study area. Potential contaminant source inventories include activities that use, store, transport, or dispose of the following types of contaminants. PSOCs can be point or nonpoint pollutants.

Point Sources

Point source pollutants are defined as having an identifiable point of discharge. The sources were identified by using GIS data layers: NPDES, Brownfields (brownfld and brownfld_pa), Captive Hazardous Waste Operations (cahwo) sites, Commercial Hazardous Waste Operations (cohwo) sites, Superfund National Priority List sites (cerclis), Land Recycling Cleanup Location (lrcl_pa) sites, Municipal Waste Operation (mwo) sites, Resource Conservation and Resource Conservation and Recovery Act (rcra) sites, Residual Waste Operation (rwo) sites, Underground Storage Tanks (ustanks) sites, and Water Pollution Control Facility (wpcf) sites (see Figure 7 and Figure 8). The Steering Committee and technical advisors reviewed GIS results for accuracy. However, errors may still exist in the data.

DeHart Reservoir Intake

There are no permitted facilities from the list above within the DeHart Reservoir's watershed.

Susquehanna River Intake

Due to the large surface area of the entire watershed and the resulting large number of PSOCs within the entire the watershed, the PSOC analysis was limited to the study area, Zone A and Zone B. This also allows CRW to focus their efforts and resources on the areas closest to their intake, where they have the most influence. CRW is one of many public water suppliers using the Susquehanna River as its water source. If the other public water suppliers using the Susquehanna River would also engage in SWP activities, the PSOCs in CRW's Zone C would be addressed by the other suppliers.

There are eight NPDES permitted facilities located within Zone A (Figure 9). These facilities consist of five municipal sewage treatment plants, one non-municipal sewage discharge, one industrial stormwater discharge, and one industrial waste discharge. There are 79 NPDES permitted locations in Zone B. Non-municipally owned sewage discharges are the dominate type of discharges (44). There are 13 municipal sewage discharges, nine industrial waste discharges, seven industrial stormwater discharges, three groundwater clean-up locations, and three permitted quarries in Zone B.

Sewage facilities typically discharge fecal coliforms, residual chlorine, suspended solids, dissolved solids, ammonia, nitrogen, phosphorus, and sulfate. Some sewage discharges also contain iron,

manganese, aluminum, cadmium, copper, nickel, zinc, cyanide, phenolics, barium, boron, and cobalt. The industrial facilities may discharge oil, grease, benzene, toluene, ethylbenzene, xylene, and other chemicals.

In addition to the NPDES permitted facilities, there are other permitted facilities of concern. Zone A contains 12 of the additional permitted locations and Zone B contains 62 permitted locations. There are no superfund sites in the study area. The other permitted locations include, but are not limited to: underground storage tanks, municipal waste land applications, concentrated animal feeding operations, land recycling and clean up locations, and hazardous material storage locations.

Nonpoint Sources

Nonpoint pollutants are pollutants that are unable to be tracked to a distinct discharge point. Examples of nonpoint pollutants include leachate from on-lot septic systems, agricultural and road runoff, streambank erosion, and abandoned mine drainage (AMD).

Common nonpoint source pollutants include synthetic organic chemicals (SOCs), volatile organic chemicals (VOCs), pathogens, inorganic chemicals (IOCs), secondary contaminates, sediments, and nutrients such as nitrates, phosphorus, and total organic carbon (TOC). Excessive nutrients may enter stream systems via runoff from a variety of sources including the following: crop and grazing related agricultural activities; animal feeding operations; unrestricted livestock access to streambanks; urban/stormwater runoff from impervious sources; golf courses; suburban lawn care; and leaching of private septic tanks. In stream systems, elevated nitrogen and phosphorus loads can lead to increased algal productivity (Novotny and Olem, 1994). As algal productivity increases, so does the demand for oxygen. As oxygen levels decrease to meet demand, fish and macroinvertebrate habitats become stressed, and may result in population decreases.

Siltation can also be an impairment to drinking water quality, as well as recreational use and fish habitat. The small particles clog waterways and decrease water clarity, deposit in pool areas (possibly smothering fish eggs), and can carry pesticides and microbial pathogens into streams. Although filtration of raw water for drinking purposes works to eliminate the health concerns chemical and microbiological contaminants pose, increased turbidity from siltation presents the need for increased treatment, and therefore, increased cost. The major contributors of siltation are unmanaged crop and pasture fields, urban/stormwater runoff, runoff from animal feeding operations, and unmanaged construction (Iowa Environmental Council, 2003).

DeHart Reservoir Intake

Most of the land use in the DeHart Reservoir Watershed is forested and therefore protected from most nonpoint sources. Nonpoint sources such as road runoff, illegal dumping, and on-lot septic systems can contribute contaminants to the stream. Runoff from Route 325, which runs parallel to Clark Creek, can deposit road salt and other contaminants into the stream. There are several known

dumping sites in the watershed that CRW staff monitors and cleans up as needed. The watershed also contains several homes and seasonal cabins with on-lot septic systems and fuel oil storage. Sediment and runoff from all-terrain vehicle (ATV) trails is also a concern. There are no planned ATV trails in the watershed, but CRW staff has discovered a few trails within the watershed.

Susquehanna River Intake

Several nonpoint sources have been identified as contributing to water quality degradation. These sources include runoff from cropland, agriculture, and urban stormwater runoff. Some of the causes of water-quality degradation associated with these sources are excessive nutrients, siltation, and low dissolved oxygen. AMD in the northern reaches of the watershed may contribute metals to streams as well as affect the pH of the stream.

Nonpoint sources cause man-induced effects such as turbidity and nutrient deposit. Stormwater runoff may occur after rainfall and snowmelt events. When these conditions occur, CRW must change its treatment processes. For both of these conditions, the typical response is to increase aluminum sulfate, potassium permanganate, and chlorine dosages as needed. Solids removal from filters and sedimentation basins is increased as necessary.

Potential contaminants associated with urban runoff are metals, VOCs, SOCs, nitrates/nitrites, and an increase in turbidity. There are also numerous transportation corridors within the study area. Major transportation corridors in Zone B include I-81, U.S. Route 11, U.S. Route 15, U.S. Route 322, and PA Route 147.

Susceptibility Analysis

The potential for a public drinking water supply to draw contaminated water is determined by the susceptibility analysis. The susceptibility analysis utilizes a series of matrices that evaluate the TOT, quantity, persistence, and potential for release of the inventoried contaminants. A susceptibility rating of “A” thru “F” is then used to rank protection priorities for the potential contaminant sources compiled in the inventory. An “A” rating is highly susceptible and a protection priority. A rating of “F” is the least susceptible and less of a priority. Table 5 and Table 6 provide a summary of the susceptibility analysis for each intake; a complete table is included in Appendix C. See Appendix D for a list of permitted facilities and their ratings that are within Zone A and B of the assessment area.

DeHart Reservoir Intake

Potential contamination from fuel oil storage and on-lot septic systems is a priority concern. They have received a high susceptibility rating. Nonpoint sources such as silviculture and lawn care also received high ratings. The potential for contamination due to swimming pools, on-lot septic systems, hazardous materials, and lawn care results primarily from the development that has taken place in Rush Township. Aquatic wildlife and transportation are moderate, potential concerns.

In the past, CRW maintained a forestry plan and contracted for selective harvesting activities. CRW had experienced minor siltation issues after a clear-cutting of three to four acres. CRW has since contracted for the drafting of a Forest Stewardship Council (FSC) compliant forest management plan and consideration of more comprehensive stewardship for the property is underway. Currently, CRW is more concerned with siltation from unplanned ATV trails in the watershed and illegal dumping. CRW is moderately concerned about transportation accidents and spills on Route 325. In the recent past, there have only been two minor incidents. There was a car fire and a barrel oil found on the road. Incidents similar to these have the potential to affect the reservoir water quality, but due to the low frequency of such events, they receive a lower priority of concern.

Table 5. Susceptibility Analysis Summary for the DeHart Reservoir Watershed

Source of Contaminants	Susceptibility Rating	Predominant Zone
Fuel Oil Storage	A	A
On-lot Septic	A	A
Silviculture	B	A
Swimming Pools	B	A
Household Hazardous Materials	B	A
Lawn Care	B	A
Aquatic Wildlife	C	A
Transportation Corridors	C	A
Natural Gas Pipeline	D	A

Susquehanna River Intake

The protection priorities determined for the Susquehanna River Study Area include potential contamination due to NPDES permitted discharges, transportation corridors, stormwater runoff, auto repair and gas/service stations, agricultural practices, and AMD. Approximately 28 percent of the land use within Zone B is used for agricultural purposes. Many streams throughout the study area are stated on the 303(d) list as being impaired due to agricultural practices. AMD has resulted in some streams in the northern sections of the watershed being listed as impaired. A summary of 303(d) listed streams within the watershed is included in the Appendix E.

Fifteen percent of the land in Zone A is developed land. Bridges that cross the river and roads that run parallel to the river allow for potential spills to occur. Railroad lines and bridges also allow for potential spills to occur. Potential spills may contain any type of contaminant. Interstates, U.S. routes, other roadways, and residential areas also create potential contamination concerns due to run off. Wastewater treatment plants and other permitted discharges are common throughout the study area. Auto repair shops and gas/service stations exist throughout the study area and are a source of potential contaminants.

Table 6. Susceptibility Analysis Summary for the Susquehanna River Study Area

Source of Contaminants	Susceptibility Rating	Predominate Zone
Transportation Corridors	A	A and B
Gas/Service Stations	A	A and B
Auto Repair Shops	A	A and B
Other (NPDES Locations)	A	A and B
Urban/Stormwater Runoff	A	A and B
Agriculture	A	B
Waste Water Treatment Plants	B	A and B
Landfills	B	A and B
Livestock	B	B
Industrial Discharges	B	A and B
Abandoned Mine Drainage	C	B
Fuel Oil Storage	C	A and B
Petroleum Pipelines	D	A and B
Railroad Bridges	D	A and B
Power Plants	D	B

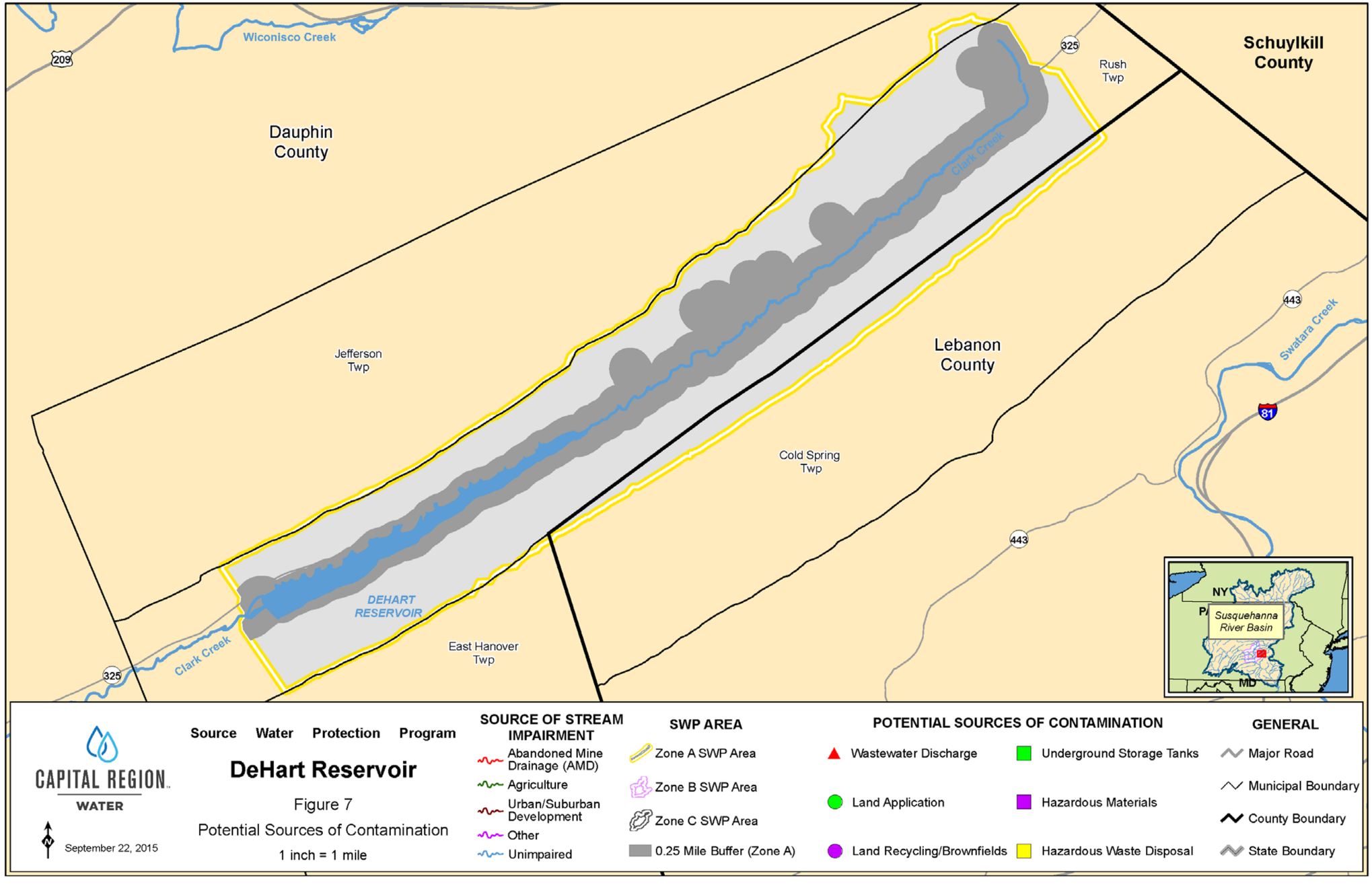

Figure 7. Potential Sources of Contamination in the CRW DeHart Reservoir Source

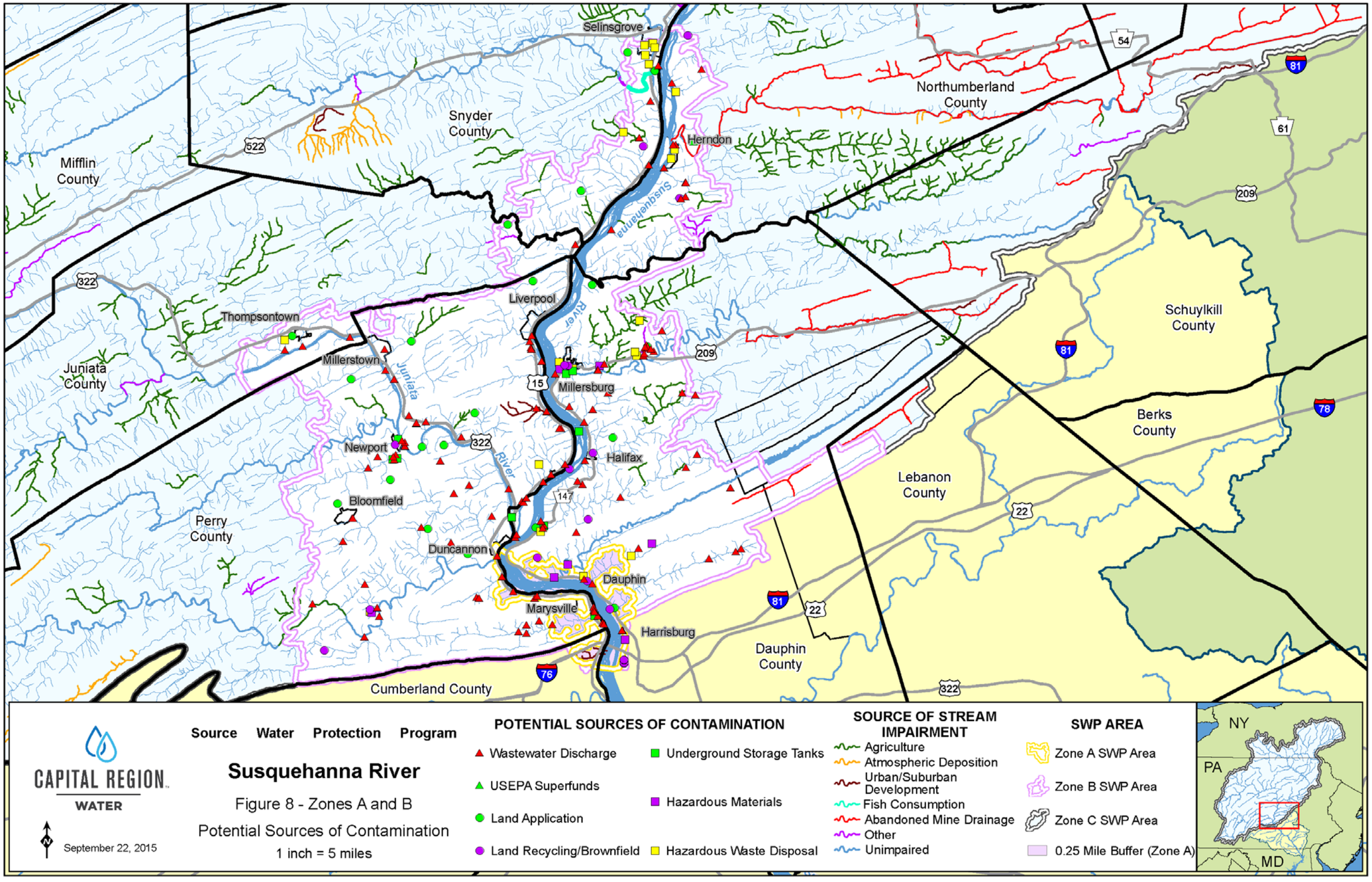

Figure 8. Potential Sources of Contamination in the CRW Susquehanna River Source

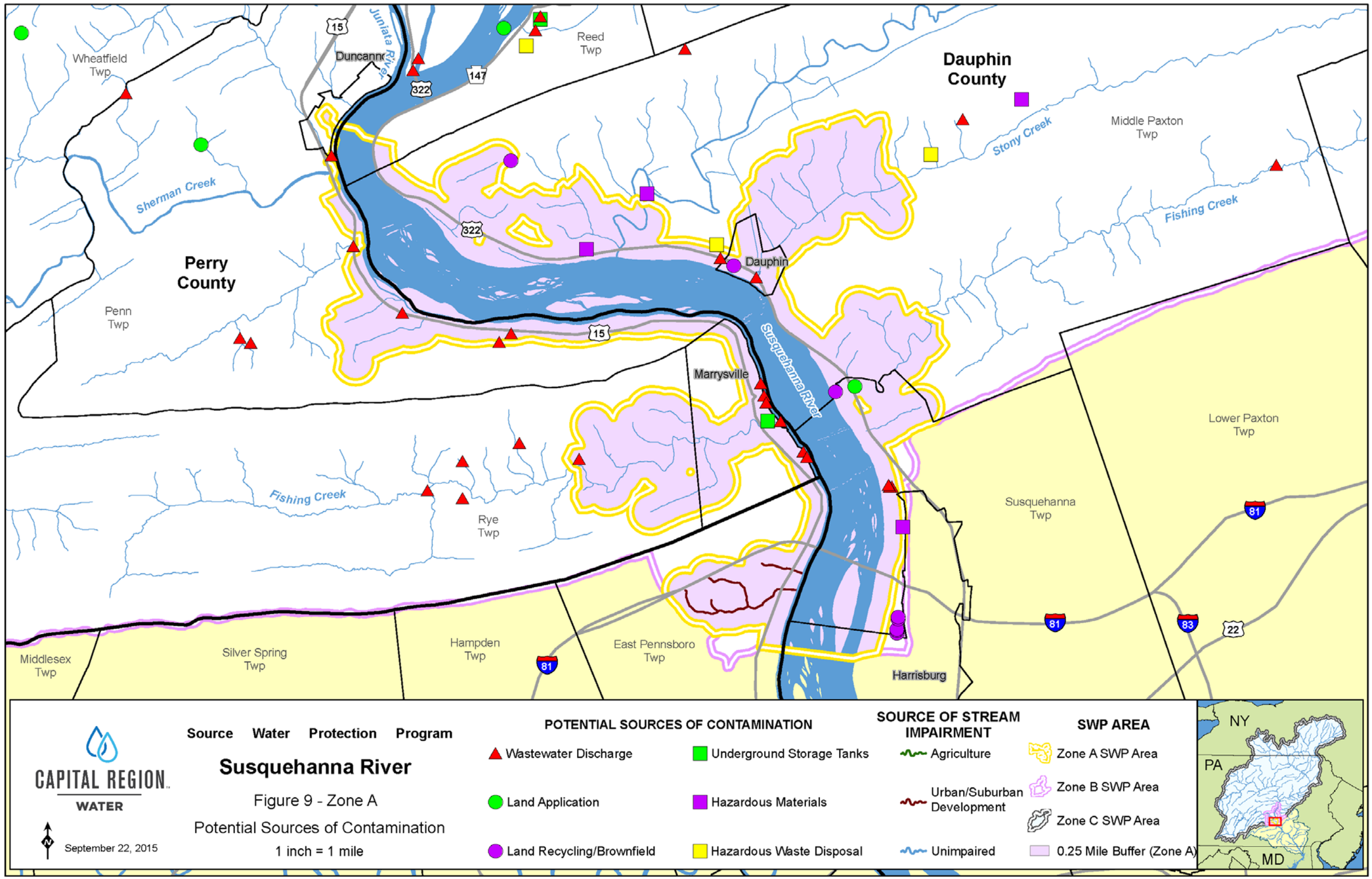

Figure 9. Zone A Potential Sources of Contamination in the CRW Susquehanna River Source

MANAGEMENT OPTIONS

This section describes the management options that CRW can pursue for SWP. The list below is neither all-inclusive nor required. The list is tailored to include specific measures to address protection zones as well as general options to ensure comprehensive SWP. See also Table 7 for additional information.

Public Outreach

1. Continue to conduct tours of the water supply facilities. A refined tour protocol allows residents, customers and partners to see firsthand the origin and treatment of their water as an effective way to teach them about SWP.

2. Place signs in areas that are prone to littering or illegal dumping. Signs should serve as an educational resource to promote the importance of identifying a public water source area and maintaining the quality of that source.

3. Install signage for emergency spill response along Route 325. Signs should include contact information in the event of a spill and serve as an educational resource for SWP.

4. Provide educational mailings to CRW customers, upstream Rush Township homeowners and/or facilities with PSOCs that could promote SWP and raise awareness of issues in the watersheds. Mailings would also serve as a reminder to residents/facilities that there are public water intakes downstream. Topics could include:

    - The basics of SWP and where drinking water comes from.

    - How contaminates move through a watershed and how a small leak at their home/facility could affect thousands of people.

5. Work with local schools to spread the word about SWP. Provide presentations to students about water quality and the importance of protecting the community's source. Encourage teachers to use educational tools such as:

    - TAP Water Kit: The Talking About Pennsylvania Water Kit was developed by the American Water Works Association. It contains videos, activity books, and a guide for teachers based on the new state guidelines on teaching about water.

- Enviroscape model: This is a large educational landscape model that shows nonpoint source pollution. Students can simulate pollution on the landscape using food-based products. This shows them the correlation between surface contamination and groundwater contamination. They can also modify the landscape to improve water quality conditions.

- Envision groundwater flow model: This is an interactive Plexiglas educational model that shows how groundwater moves underground. It has multiple components that show the relationship between groundwater flows and surface water flows.

6. Work with local stakeholders to plan trash clean up days for the DeHart Reservoir Watershed. A focus could be placed around Earth Day or the Great American Cleanup to increase awareness of the event.

Steering Committee Participation

7. Continue to facilitate biannual DeHart steering committee meetings and attend the Lower Susquehanna Source Water Protection Partnership meetings to discuss SWP issues in the watersheds.

8. Assist with the organization/planning of the Lower Susquehanna Regional Partnership.

SWP Notification

9. Ensure active participation/membership by appropriate staff in SRBC's EWS.

10. Educate and coordinate with local officials, county commissions, planning commissions, and other governmental agencies about protection zones with the watersheds. This could also include PennDOT and the Pennsylvania Game Commission.

11. Work with Rush Township officials to ensure ordinances are protective of water quality.

12. Register for DEP's eNotice to become aware of any permitting actions within the watersheds.

Emergency Planning

13. Continue to review and update the emergency response plan on an annual basis.

14. Build a relationship with local first responders to promote notifications in the event of contamination and to ensure proper actions are taken to protect intakes.

Table 7. CRW SWP Management Options Chart

Activity	Capital Region Water	Potential Partners							Schedule	Cost $-no/little cost $$-medium $$$-high	Possible Funding Source
		SRBC	Conservation Partners	Local Government	Technical Advisors	EMA Network	Lower Sus. Regional Partnership	Sus. EWS / Suppliers			
Public Outreach											
Conduct facility tours	X								Ongoing	$ - Staff time	Grant Opp. (i.e.,WREN)/ General Revenue
Illegal dumping signage	X								2016+	$$	State partner opp.
Spill response signage	X								2016+	$-$$	State parter opp.
Educational info/mailing	X		X	X	X		X		2015-16+	$$ -$2,000	WREN/ General Revenue
School outreach	X		X		X				Ongoing	$	General Revenue/ In-kind services
Trash cleanup	X		X		X				Ongoing	$-$$	WREN/In-kind services
SWP Notification											
Emergency management education and coordination	X	X		X		X	X		Ongoing	$ - Staff time	General Revenue
DEP eNotice registration	X								Ongoing	$ - Staff time	General Revenue
Coordination											
SRBC's EWS	X	X					X	X	Ongoing	$ - Staff time	General Revenue
Monitoring											
Continue intake monitoring	X	X	X					X	Ongoing	$ - Staff time	General Revenue/ In-kind services
Planning											
SWP committee (DeHart specific)	X	X	X		X				2/year	$ - Staff time	General Revenue/ In-kind services
Lower Susquehanna SWP Partnership	X	X	X		X		X	X	2/year	$ - Staff time	General Revenue
Emergency Response Plan/ coordination	X	X		X		X		X	Annual review	$ - Staff time	General Revenue
Rush Twp. ordinance review (zoning, on-site septic)	X			X					2015	$ - Staff time	General Revenue

CONTINGENCY PLANNING

In the event of an emergency that could impact CRW's source water supply, it is critical to take quick and immediate action to correct the issue. Therefore, it is essential that CRW have an emergency response plan that will provide guidance to ensure safe and adequate drinking water under stressed conditions. Possible emergencies include a distribution system line break, power outage, flood or drought conditions, disinfection system failure, contamination of water supply, and prolonged water outage.

CRW maintains an emergency response plan for its water system. The plan is updated yearly and contains contact information of local officials, media, and emergency responders in the area. As part of the plan, CRW can rely solely on one source, if the other source is contaminated.

NEW SOURCES

As part of an approved SWP plan, the community water supplier must evaluate alternative sources for long-term supply in the event that an existing source becomes unusable.

The DeHart Reservoir is the primary source and it has low risk for contamination. The Susquehanna River has a higher risk for contamination events; but due to its size, it is highly unlikely that the river will become contaminated to a degree that it would become unusable. A more likely scenario involves contamination for several hours or even days. CRW also maintains emergency water interconnections with United Water Pennsylvania.

Currently, there are no new plans by CRW to develop new sources for their customer base.

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Appendix A

Steering Committee Meeting Documentation

April 8, 2011 - Overview of Source Water Protection

Attendees:
Gregg Haney, HMWA (predecessor to CRW)
Daniel L. Galbraith, HMWA
Raly T. A. Bey, HMWA
Ed Chescattie, PADEP
Joe Hebelka, P.G., PADEP
Derrick Havice, P.G., PADEP
Kimberly Dagen, SRBC

Meeting Agenda

- Introductions – All
- Overview of Source Water Protection Program and Goals – PADEP and SRBC
- Water Supply Overview – HMWA
- Potential Source of Contamination list and maps – All with SRBC lead
- Major Issues/Concerns – All
- Possible Management Options – All
- Discuss SWP Activities and Timeframe – All
- Early Warning System – SRBC and HMWA

February 9, 2012 – Lower Susquehanna Regional Partnership Meeting
http://www.srbc.net/programs/2012partnershipmeeting.htm

Attendees:
Joe Hebelka, P.G., PADEP
Derrick Havice, P.G., PADEP
Ed Chescattie, PADEP
Cathy Port, PADEP
Kimberly Dagen, SRBC
Andrew Gavin, SRBC

Meeting Agenda
8:00 am Registration and Networking (light refreshments provided)
8:30 am Welcome and Introductions
Purpose and Goals for the Meeting – SRBC
8:45 am Source Water Protection (SWP) Overview
- The value of SWP activities from a water supplier
- Overview of SWP from an agency perspective

9:30 am SWP Case Studies from the Lower Susquehanna Region
PANEL (15-minute presentation by each panelist, followed by questions/discussion)
- Building SWP into County-wide Integrated Water Resources Plans – Mary Gattis, Lancaster Co. Planning
- Implementing the Red Lion SWP Plan – Keith Kahwajy, Borough of Red Lion
- Connecting BMP efforts to SWP – Walter Hess, Borough of Kutztown

10:30 am Break
10:45 am Forming Regional Partnerships
PANEL (15-minute presentation by each panelist, followed by questions/discussion)
- Development of the Schuylkill Action Network (SAN) – Tom Davidock, SAN coordinator
- The Potomac Drinking Water Partnership – Karin Bencala, Interstate Commission for the Potomac River Basin
- River Alert Information Network (RAIN) – Gina Cyprych, RAIN

11:45 am Lunch (provided)
12:15 pm Funding for Drinking/Source Water Projects
Brion Johnson, Deputy Executive Director, PENNVEST
12:45 pm Lower Susquehanna Source Water Protection Partnership
(5-minute presentation, followed by facilitated discussion)
Strategic Plan development
1:45–2:30 pm Susquehanna River Basin Early Warning System
- System history and recent upgrades
- Demonstration of new web tools (time-of-travel, map interface, etc.)

- Expansion of system efforts and discussion of needs for the Strategic Plan

2:30–3:00 pm Action Items

November 20, 2013 – Lower Susquehanna Regional Partnership Meeting

http://www.srbc.net/programs/2013partnershipmeeting.htm

Meeting Agenda

8:30 AM Welcome and Introductions

8:40 AM Purpose of the Meeting – PADEP, SRBC

- Quick overview of other partnerships
- Synthesis of issues compiled from SWP meetings with water suppliers
- Proposed pilot committee and schedule
- Discussion

9:00 AM Stormwater Issues

- Background – Andy Gavin, SRBC (5 minutes)
- Collaborative Opportunities – County MS4 Coalition Updates
    - Cumberland County MS4 coalition – Alliance for the Chesapeake Bay (15 minutes)
    - York County MS4 coalition update – York County Planning (10 minutes)
    - Lebanon County MS4 coalition update – Lebanon County Planning (5 minutes)
- Water Treatment Challenges
    - Swatara Creek Storm Flows – PA American Water (15 minutes)
- Open discussion on other efforts in the region
- Action items for the Lower Susquehanna

10:30 AM Break

10:45 AM Emergency Response Issues

- Background – Cathy Port, PADEP South-central Region Office (10 minutes)
- Collaborative Case Studies
    - Tioga County 911 GIS-SWP system – Tioga County GIS Department (40 minutes)
    - Adams County 911/SWP coordination – Adams County (5 minutes)
    - Time-of-travel tools for spill tracking – SRBC (15 minutes)
- Open discussion on other efforts in the region
- Action items for the Lower Susquehanna

12:30 PM Lunch

1:00 – 2:00 PM Susquehanna River Early Warning System Update – SRBC staff

- Special focus session for Susquehanna River mainstem water suppliers, and those on major tributaries, in the Lower Susquehanna Region (but anyone welcome)
    - Brief background/history of the system
    - Overview of the updated system
    - Data summary

- Discussion of possible expansion of monitoring stations to tributaries
- Summary of other data collection efforts for the mainstem
- Open discussion on future direction/enhancements to the system
- Action items

July 2, 2014 – Lower Susquehanna Regional Partnership Meeting
http://www.srbc.net/programs/2014partnershipmeeting.htm

Meeting Agenda
8:45 AM Welcome and Introductions
8:50 AM Opening Remarks – SRBC
- Summary of last meeting
- Overview of the agenda

9:00 AM Planning Primer and Strategies for SWP
- Background/Context – SRBC
  - Planning process and tools for enhancing source water protection efforts – Shannon Rossman, Berks County Planning (30 minutes)
  - ELANCO case study: Reaching out to agriculture for assistance with source water protection – Randy Heilman, Lancaster County Planning (30 minutes)

10:00 AM Open Discussion / Questions
10:15 AM Break
10:30 AM Emergency Response/Preparedness
- Source water protection awareness for emergency responders – Jessie Goldberg, Miller Environmental (consultant for Reading Area Water Authority) and Lyn O'Hare, Spotts, Stevens and McCoy (30 minutes)
- PA WARN – Mike Snyder, PaWARN (30 minutes)

11:30 AM Open Discussion / Questions
11:45 AM Tabletop Emergency Response Exercises – a tool for preparedness
- Water supplier perspective – Jon Prawdzik, PA American Water
- Emergency response perspectives
- Open discussion on other efforts in the region
- Action items for the Lower Susquehanna

12:15 PM Lunch (Presentation of Source Water Protection Planning Certificate)
1:00 – 2:00 PM MS4 Stormwater Conveyance Mapping Strategies – Nate Merkel, Pa. Rural Water

December 16, 2014 – Lower Susquehanna Regional Partnership Meeting
http://www.srbc.net/programs/2014Decemberpartnershipmeeting.htm

Meeting Agenda
7:50 AM Welcome and Introductions
8:00 AM Strategic Overview of Disaster Management for Water & Wastewater (MGT342)
Topics to be covered include:
- Effects of a natural disaster to a water or wastewater system
- Identify potential terrorism/WMD threats to water and wastewater facilities and systems
- Analyze measures to reduce vulnerability of drinking water and wastewater systems
- Determine appropriate response measures to an actual or threatened incident
- Sequence procedures required for recovery from an incident

11:30 AM Open Discussion
12:00 PM Lunch (Provided)
1:00 PM Planning and the Land Use-Water Interface – Stan Lembeck
2:00 – 2:30 PM Discussion/Updates on County/Local Planning Efforts – All Participants
2:30 PM Break
2:45 PM Source Waters and Disinfection By-Products (DBPs) – Sharon Fillmann, Chester Water Authority
3:15 PM Monitoring Roundtable – Who's monitoring what, where, and how frequently? – All Participants
3:45 – 4:00 PM Wrap up and Adjourn

April 13, 2015 - Source Water Protection Planning Meeting at the Dauphin Co. Conservation District

Attendees:
Andrew Bliss, CRW
Tanya Dierolf, CRW
Daniel L. Galbraith, CRW
Paula Zankel, Clarks Creek Watershed Preservation Association
Bob Christoff, Dauphin County Conservation District
Gil Hirschel, Dauphin County Conservation District
Rob Frank, Dauphin County Conservation District
Dennis Coffman, Doc Fritchey Chapter of Trout Unlimited
Jenn Fetter, Penn State Cooperative Extension – Dauphin County
Andrew Brought, Pennsylvania Dept. of Conservation and Natural Resources

Meeting Agenda
Goal: Review source water protection planning in Clarks Creek and discuss management options for implementation

1. Introductions, including updates on any relevant projects – All

2. Overview of Source Water Protection Program and goals – CRW/DEP/SRBC (as available)

3. Plan review – CRW

4. Discussion of possible management options, including current activities – All

5. Review and next steps – CRW

Appendix B

List of Acronyms for Susceptibility Analysis

AMD	Abandoned Mine Drainage
BMP	Best Management Practice
CCR	Consumer Confidence Report
CERCLIS	Superfund National Priority List Sites
CWF	Cold Water Fishes
D	Disinfectants
DO	Dissolved Oxygen
GIS	Geographic Information Systems
HM	Heavy Metals
IFD	Industrial Facilities Discharge
M	Metals
MGD	Million gallons per day
MP	Microbiological Pathogens
NN	Nitrate/Nitrite
NPDES	National Pollution Discharge Elimination System
Pa. DEP	Pennsylvania Department of Environmental Protection
PH	pH
PHC	Petroleum Hydrocarbons
R	Radionuclide
RCRIS	Resource Conservation and Recovery Information Systems
SDWA	Safe Drinking Water Act
SOC	Synthetic Organic Compound
SWAP	Source Water Assessment Program
T	Turbidity
TOT	Time of Travel
TRI	Toxic Release Inventory
TSS	Total Suspended Solids
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound
WHPP	State Wellhead Protection Program
WWF	Warm Water Fishes

Appendix C

Susceptibility Analysis for Capital Region Water Study Areas

DeHart Reservoir Intake

Source of Contaminants	Contaminant	Matrix A (TOT vs. Persistence)	Matrix B (A vs. Quantity)	Matrix C (Contamination Potential vs. Sensitivity)	Potential for Release	Matrix D (Susceptibility Rating)
Fuel Oil Storage	VOC	High	Medium	High	High	A
	PHC	High	Medium	High	High	A
On-lot Septic	MP	High	Medium	High	High	A
	NN	High	Medium	High	High	A
Silviculture	T	Medium	Low	High	Medium-High	B
	SOC	High	Medium	High	Medium-High	B
Swimming Pools	VOC	High	Medium	High	Medium	B
Household Hazardous Materials	VOC	High	Medium	Medium	High	B
	SOC	High	Medium	Medium	High	B
Lawn Care	NN	High	Medium	Medium	High	B
	M	High	Medium	Medium	High	B
	SOC	High	Medium	Medium	High	B
Aquatic Wildlife	MP	High	High	Medium	Medium-high	C
	NN	High	High	Medium	Medium-high	C
Transportation Corridor	SOC	Medium	Low	Low	High	C
	M	Medium	Low	Low	High	C
	T	Medium	Low	Low	High	C
Natural Gas Pipeline	VOC	High	High	High	Low	D
	PHC	High	High	High	Low	D

Susquehanna River Intake

Source of Contaminants	Contaminant	Matrix A (TOT vs. Persistence)	Matrix B (A vs. Quantity)	Matrix C (Contamination Potential vs. Sensitivity)	Potential for Release	Matrix D (Susceptibility Rating)
Transportation Corridors	SOC	High	High	High	High	A
	M	High	High	High	High	A
	T	High	High	High	High	A
Gas/Service Stations	VOC	High	High	High	High	A
	PHC	High	High	High	High	A
	M	High	High	High	High	A
Auto Repair Shops	VOC	High	High	High	High	A
	HM	High	High	High	High	A
	PHC	High	High	High	High	A
	M	High	High	High	High	A
Other (NPDES Locations)	MP	High	High	High	Medium High	B
	NN	High	High	High	High	A
	D	High	High	High	High	A
	T	High	High	High	High	A
Urban/Storm-water Runoff	VOC	High	High	High	High	A
	SOC	High	High	High	High	A
	NN	High	High	High	High	A
	T	Medium	High	High	High	A
	M	High	High	High	High	A
Agriculture	NN	High	High	High	High	A
	T	High	High	High	High	A
Water Treatment Plants	M	High	High	High	Medium-high	B
	T	High	High	High	Medium-high	B
Aquatic Wildlife	MP	High	Medium	Medium	High	B
	NN	High	Medium	Medium	High	B
Wastewater Treatment Plants	D	High	High	High	Medium-high	B
	MP	High	High	High	Medium-high	B
	NN	High	High	High	Medium-high	B

Source of Contaminants	Contaminant	Matrix A (TOT vs. Persistence)	Matrix B (A vs. Quantity)	Matrix C (Contamination Potential vs. Sensitivity)	Potential for Release	Matrix D (Susceptibility Rating)
	VOC	High	High	High	Medium-high	B
	SOC	High	High	High	Medium-high	B
	M	High	High	High	Medium-high	B
Landfills	VOC	High	High	High	Medium High	B
	SOC	High	High	High	Medium High	B
	HM	Medium	Medium	Medium	Medium High	C
	R	High	High	High	Medium High	B
	PHC	High	High	High	Medium High	B
Livestock	MP	High	High	High	High	A
	NN	High	High	High	Medium High	B
	D	High	High	High	High	B
	T	Medium	Medium	Medium	High	B
Industrial Discharges	MP	Medium	Medium	High	Medium High	B
	NN	Medium	Medium	High	Medium High	B
	D	High	High	High	Medium High	B
Abandoned Mine Drainage	M	Medium	Medium	Medium	Medium High	C
	PH	Medium	Medium	Medium	Medium High	C
	T	Medium	Medium	Medium	Medium High	C
Residential	VOC	High	Medium	High	Medium	C
	SOC	High	Medium	High	Medium	C
	PHC	High	Medium	High	Medium	C
	NN	High	Medium	High	Medium	C
	M	High	Medium	High	Medium	C

Source of Contaminants	Contaminant	Matrix A (TOT vs. Persistence)	Matrix B (A vs. Quantity)	Matrix C (Contamination Potential vs. Sensitivity)	Potential for Release	Matrix D (Susceptibility Rating)
	MP	High	Medium	High	Medium	C
Fuel Oil Storage	VOC	Medium	Low	Low	High	C
	PHC	Medium	Low	Low	High	C
Petroleum Pipelines	VOC	High	High	High	Low	D
	PHC	High	High	High	Low	D
Railroad Bridges	VOC	High	Medium	High	Low	D
	SOC	High	Medium	High	Low	D
	HM	High	Medium	High	Low	D
	PHC	High	Medium	High	Low	D
Power Plants	HM	Medium	High	High	Low	D
	M	Medium	High	High	Low	D

Appendix D

Permitted Facilities in Capital Region Water Study Areas

DeHart Reservoir Intake

There are no permitted Facilities in the DeHart Dam Watershed.

Susquehanna River Intake

Zone	Type				Permit	Site	Susceptibility Ranking
A	brownfield_pa					3401 North Sixth Street	D
A	brownfield_pa					3405 North Sixth Street	D
A	brownfield_pa					3407 North Sixth Street	D
A	brownfield_pa					3501 North Sixth Street	D
A	lrcl				669965	AARON RUBIN & SONS CO INC (North Prop.)	D
A	lrcl				714364	DAUPHIN CNTY FT HUNTER PARK	D
A	lrcl				679724	A W GOLDEN PONTIAC	D
A	mwo				557346	SUSQUEHANNA TWP DAUPHIN CNTY	C
A	npdes_pa	wpcf			PAR803659	ROHRER BUS SVC	A
A	npdes_pa	wpcf			PA0014621	UNITED WATER HBG 6TH ST	A
A	npdes_pa				PA0024350	DAUPHIN BORO MUNI AUTH DAUPHIN CNTY	A
A	npdes_pa				PA0021571	MARYSVILLE STP	A
A	npdes_pa				PA0021571	MARYSVILLE STP	A
A	npdes_pa				PA0084701	PENN TWP MUNI AUTH PERRY CNTY	A
A	npdes_pa				PAG043655	SFS THOMAS, DAVID	A
A	npdes_pa				PA0021571	MARYSVILLE STP	A
A	rcra				PAR000501130	MCCLURE CO	D

Zone	Type				Permit	Site	Susceptibility Ranking
A	rcra				PAR000031062	SORGIOVANNIS PAINTING	D
A	rwo				300635	CARPENTER TECH CORP	C
A	ustanks					SADLER OIL CO	C
B	cahwo				PAD987384252	AT&T TROY HILL	B
B	cahwo	rcra			PAD003003068	DAUPHIN PRECISION TOOL MFG MILLERSBURG PLT 1	C
B	cahwo				PAD987400355	FURNITURE TECH	C
B	cahwo				PAD981741218	PA DOT SELINSGROVE	C
B	cahwo				PAR000040667	ROYERS BODY SHOP	C
B	cahwo				PAD987272671	STEININGER LAUNDRY	D
B	cahwo				PAD069790426	SUSQUEHANNA UNIV SELINSGROVE CAMPUS	C
B	cahwo	rwo			PAD014556591	TRUCK & TRAILER SALES & LEASING	C
B	lrcl				3-6-949-1058	BRENNTAG NORTHEAST HULLER LN PLT	E
B	lrcl				22-23916	DAUPHIN DENTAL LAB	E
B	lrcl				705893	MARSTELLAR OIL CO DRUM RENTAL PROP	E
B	lrcl				631662	HASS GORMAN	E
B	lrcl				3-22-917-7535	JACKSON TWP T 462 RD	E
B	lrcl				671024	SNEEDER RES	E
B	lrcl				3-50-918-7536	BUCKHORN FARM LDFL	E
B	lrcl				711384	BETTY MILLER RES	E
B	lrcl				668364	CINDY PRICE PROP	D
B	lrcl				4-55-913-813	SPOROCO	E
B	mwo				3-128 100060	ALANDAR BROTHERS LDFL	C

Zone	Type				Permit	Site	Susceptibility Ranking
B	mwo				603304	P CARMICHAEL FARM SLUDGE SITE	D
B	mwo				4-157 100039	CHAPMAN DSPL SITE	D
B	mwo					JEFFREY FERGUSON PROP	D
B	mwo				100063	FRED D.THEBES SANITARY LANDFILL	D
B	mwo				538006	PFAUTZ FARM SLUDGE SITE	D
B	mwo				538004	ROBERT SCHREIBER FARM SLUDGE SITE	D
B	mwo				602869	CLUGSTON FARM 1 SLUDGE SITE	D
B	mwo				534971	ALLEN SHAFFER FARM BIOSOLIDS SITE	D
B	mwo				538001	ROY BYERS FARM SLUDGE SITE	D
B	mwo				538000	BLOOMFIELD BORO DSPL SITE 1 SLUDGE SITE	D
B	mwo				537995	LARRY FRY FARM SLUDGE SITE	D
B	mwo				603257	JOHN DELANCY FARM SLUDGE SITE M	D
B	mwo				3-037	PORT ROYAL LANDFILL	E
B	mwo				602441	HEIMBACH FARM SELINSGROVE MUNI AUTH	D
B	mwo				602328	RHOADS FARM	D
B	mwo				535994	DEAN STEPHENS FARM 4 BIOSOLIDS SITE	D
B	mwo				603208	DON BENNER FARM BIOSOLIDS SITE	D

Zone	Type				Permit	Site	Susceptibility Ranking
B	npdes_pa				PA0084115	CLARKS FERRYAUTO/TRUCK PLAZA	B
B	npdes_pa	wpcf	cahwo	rwo	PAR223528	ARMSTRONG THOMPSONTOWN CABINET MFG	B
B	npdes_pa				PAG044870	ARNOLD & SHARON DUCK JR RES	B
B	npdes_pa				PAG043562	ARNOLD RES	B
B	npdes_pa	wpcf			PAR803551	AUMILLERS AUTO PARTS	B
B	npdes_pa				PAG043565	WEAVER RES	B
B	npdes_pa				PA0083283	BRUAW MHP	B
B	npdes_pa				PA0084417	VILLAGE SQUARE PLAZA MALL	B
B	npdes_pa	wpcf	cahwo		PA0081485	BUCKEYE PIPE LINE INGLENOOK PETRO PROD TERM	B
B	npdes_pa	wpcf			PA0034304	READING TUBE DIV OF CAMBRIDGE LEE IND	B
B	npdes_pa				PA0088536	CAMP HEBRON RETREAT	B
B	npdes_pa				PAG043695	SFS CAMPBELL CATHERINE	B
B	npdes_pa				PAG043660	SFS CAMPBELL, DONALD	B
B	npdes_pa				PAG043580	SFS CASTILLO, JAMES	B
B	npdes_pa				PA0084051	CREEKVIEW FARMS MHP	B
B	npdes_pa				PA0081221	BAILEY RUN MHP	B
B	npdes_pa	wpcf	cahwo		PAR324803	CREATIVE PLAYTHINGS HERNDON PLT	B
B	npdes_pa				PA0081779	YELLOW BREECHES EDUCATION CENTER	B
B	npdes_pa				PA0084018	FISHING CRK ESTATES STP	B

Zone	Type				Permit	Site	Susceptibility Ranking
B	npdes_pa	wpcf	mwo		PA0594491	DAUPHIN MEADOWS 2 LDFL QUARRY	B
B	npdes_pa				PA0080471	DECOVEN FACILITIES	B
B	npdes_pa				PA0021245	DUNCANNON STP	B
B	npdes_pa				PA0594431	EASTERN IND LIVERPOOL QUARRY	B
B	npdes_pa				PA0110582	EASTERN SNYDER CNTY REG AUTH STP	B
B	npdes_pa				PAG043569	SFS ETTLINGER, ROBERT	B
B	npdes_pa	wpcf			PAR223531	EXCEL HOMES MFG LIVERPOOL	B
B	npdes_pa	wpcf			PAG053553	EXXON INGLENOOK PETRO PROD TERM	B
B	npdes_pa				PA0110116	THE HUT RESTURANT STP	B
B	npdes_pa				PA0083852	FERRYBOAT CAMPGROUND	B
B	npdes_pa				PA0247979	SFS CRYDER, GARY	C
B	npdes_pa				PA0034754	ALEX ACRES MHP	B
B	npdes_pa				PA0024457	HALIFAX STP	B
B	npdes_pa				PA0260126	BUFFALO CROSSING DEV STP	B
B	npdes_pa				PAG044957	HARRY & MARY REIGEL RESIDENCE	B
B	npdes_pa				PA0036790	PARADISE MHP	B
B	npdes_pa				PA0228800	HERNDON BORO JACKSON TWP JT MUNI AUTH SEW SYS STP	B
B	npdes_pa	wpcf			PAR213537	JUNIATA CONCRETE MFG NEWPORT	B
B	npdes_pa				PA0086941	STARDUST MOTEL	B
B	npdes_pa				PA0246816	LENKER ESTATES SUBDIVISION	B

Zone	Type				Permit	Site	Susceptibility Ranking
B	npdes_pa				PA0041581	LIVERPOOL STP	B
B	npdes_pa				PA0228231	LOWER MAHANOY TWP MUNI AUTH SEW SYS STP	B
B	npdes_pa				PAG045041	HARVEY S MARTIN RES	C
B	npdes_pa				PAG043711	SFS OTTO, CAMILLE	C
B	npdes_pa	lrcl			PA0224316	MECKLEYS LIMESTONE MANDATA & E QUARRY	C
B	npdes_pa	wpcf	cahwo	rcra	PAR203595	MI METALS MILLERSBURG METAL DOOR MFG	B
B	npdes_pa	wpcf			PA0085570	MILLERSBURG BORO WATER SYS	B
B	npdes_pa				PA0021849	MILLERSTOWN STP	B
B	npdes_pa	wpcf			PA0260487	MOUNTAIN PURE WATER BOTTLING PLT	B
B	npdes_pa	wpcf			PAR603545	MYERS USED AUTO PARTS	B
B	npdes_pa				PA0020478	BLOOMFIELD STP	B
B	npdes_pa				PA0260762	NEW BUFFALO BORO STP	B
B	npdes_pa				PA0080489	NEW BUFFALO RESTAURANT	B
B	npdes_pa	wpcf			PA0085375	NEWPORT WELL #1 WS	B
B	npdes_pa	wpcf			PA0086622	NEWPORT PLAZA MALL	B
B	npdes_pa				PA0248231	OTTERBEIN UNITED METH CH DEV	B
B	npdes_pa				PA0031950	LITTLE BUFFALO STATE PARK	B
B	npdes_pa				PA0084123	PENN TWP KINKORA STP	B
B	npdes_pa				PA0229181	PENNS TAVERN AND BARN	B

Zone	Type				Permit	Site	Susceptibility Ranking
B	npdes_pa				PA0612120	PENNSY SUPPLY DROMGOLD QUARRY	C
B	npdes_pa				PA0613169	PENNSY SUPPLY NEWPORT QUARRY	C
B	npdes_pa				PA0246867	RIVERSIDE APTS	B
B	npdes_pa	wpcf			GWCU43	GETTY DAUPHIN SVC STA	B
B	npdes_pa				PAG045080	STEPHANIE M SHIPE SFTF / STEPHANIE M SCHMICK SFTF	B
B	npdes_pa				PA0083861	BENNERS COUNTRY RESTAURANT	B
B	npdes_pa				PAG043511	SFS SHULL, KENNETH	C
B	npdes_pa	wpcf			PA0083984	RANCH HOUSE RESTAURANT	B
B	npdes_pa				PA0083488	STONEBRIDGE HEALTH & REHAB CTR	B
B	npdes_pa				PA0084492	STROHECKER MHP	B
B	npdes_pa				PA0112950	SUNOCO INC 2342 STP	B
B	npdes_pa	wpcf	cahwo	rcra	PAG103508	TEXAS EASTERN DAUPHIN CNTY HYDROSTATIC TEST SITE, STONEY CREEK VALVE PIT	B
B	npdes_pa	wpcf			PAG103507,	TEXAS EASTERN PERRY CO HYDRO	B
B	npdes_pa	wpcf	cahwo	rcra	PA0087769	TEXAS EASTERN SHERMANS DALE GWCU	B
B	npdes_pa				PA0111422	THOMPSONTOWN STP	B
B	npdes_pa	wpcf			PA0088340	TJS RESTUARANT & BAR	B
B	npdes_pa				PA0087459	MEADOW VIEW VILLAGE MHP	B

Zone	Type				Permit	Site	Susceptibility Ranking
B	npdes_pa				PA0228338	UNION CHAPMAN REG AUTH SEW SYS STP	B
B	npdes_pa				PA0084034	CARROLL ELEM SCH	B
B	npdes_pa				PA0021237	NEWPORT BORO STP-CSO	B
B	npdes_pa				PA002123	NEWPORT BORO STP	B
B	rcra				PAD987350428	HAGEY LANE, DAUPHIN	D
B	rwo				793324	ADVANCED SCIENTIFICS MFG	D
B	rwo				838599	COLEMAN'S SURPLUS	D
B	rwo					STAHL MURRAY	D
B	rwo				PA0000971754	PHILIPS PRODUCTS	D
B	rwo				563537	ROY ADAMS & SON TANK REMOVERS	D
B	rwo				838457	LARRY BOLTON PROP	B
B	rwo				689362	MURRAY STAHL FARM	D
B	ustanks					AEP RR 1 G	D
B	ustanks					EXXON INGLENOOK TERM	D
B	ustanks					STEELTON QUARRY	D
B	ustanks					JAMES L TURNBAUGH & SON	D
B	ustanks					RE SMITH & SON INC	D
B	ustanks					SUBURBAN PROPANE	D
B	ustanks					SUBURBAN PROPANE	D
B	ustanks					SUNOCO LOGISTIC PGH TERM	D
B	ustanks					TWO RIVER TERM	D
B	wpcf				PA0259829	ARMSTRONG VALLEY FARM	B

Zone	Type				Permit	Site	Susceptibility Ranking
						CAFO, ARMSTRONG VALLEY FARMS LEAK DETECTION OUTLET	
B	wpcf				PA0119121	GLEN GERY SHOEMAKERSVILLE 2 PLT QUARRY	C
B	wpcf				PAG123650	ROSEHIL FARM CAFO	B
B	wpcf				PA0088846	ASPEN PERRY HOG FARM CAFO	B
B	wpcf				PAG123544	SHADEWOOD FARMS CAFO	B
B	wpcf				PA0246905	LAUDEN DAIRY CAFO	B
B	wpcf				PAG123667	GARY MILLER FARM CAFO	C
B	wpcf				PAG123532	SCHMWALM HOG FARM CAFO	B
B	wpcf				PAG123606	SUNRISE FARM CAFO	B

Appendix E

Streams Included on the 303(d) List that are Within Capital Region Water Study Areas

DeHart Reservoir Intake

There are no impaired streams in the DeHart Reservoir's Watershed.

Susquehanna Intake

Name	Source of Impairment	Cause of Impairment
Aline Creek	Agriculture	Siltation
	Removal of Vegetation	Siltation
Armstrong Creek	Agriculture	Siltation
Bucks Run	Small Residential Runoff	Flow Alterations, Siltation
Dalmatia Creek	Crop Related Agriculture	Siltation
	Removal of Vegetation	Siltation
Devils Race Course	Abandoned Mine Drainage	pH
Hoffer Creek	Grazing Related Agriculture	Siltation
Leiningers Run	Habitat Modification	Other Habitat Alterations
Little Wiconisco Creek	Agriculture	Nutrients, Siltation
Mahanoy Creek	Abandoned Mine Drainage	pH, Metals
Middle Creek	Source Unknown	Mercury
Powells Creek	Agriculture	Siltation
Rattling Run	Abandoned Mine Drainage	pH
Shermans Creek	Agriculture	Pathogens
	On site Wastewater	Pathogens
Silver Creek	Grazing Related Agriculture	Siltation

Prepared in partnership with:
Susquehanna River Basin Commission