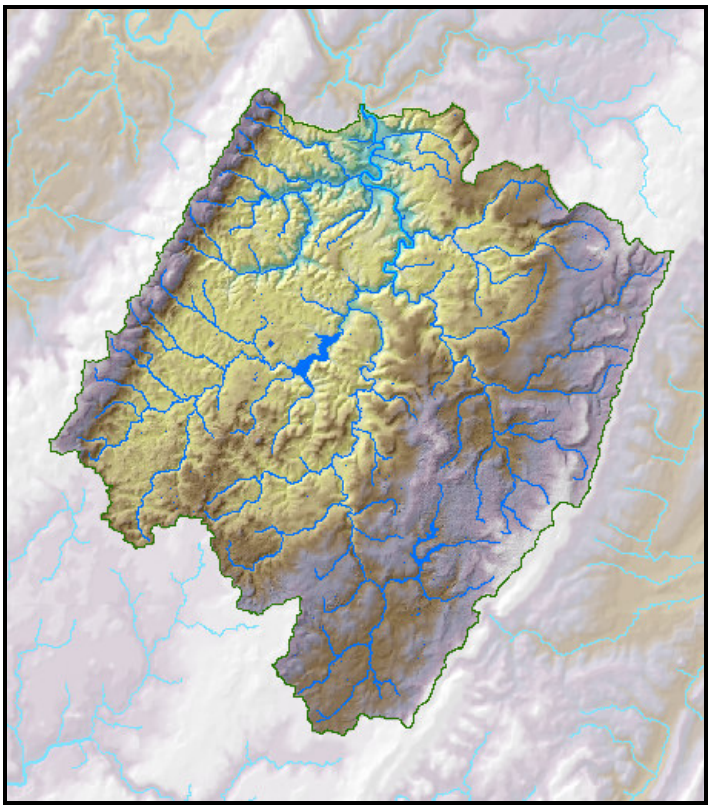
STONYCREEK RIVER WATERSHED
ACT 167 – PHASE 2
STORMWATER MANAGEMENT PLAN

VOLUME II – PLAN CONTENTS



CAMBRIA AND SOMERSET COUNTIES,
PENNSYLVANIA

BLE PROJECT NO. 2005-1719-00

STONYCREEK RIVER WATERSHED
ACT 167 – PHASE 2
STORMWATER MANAGEMENT PLAN

CAMBRIA AND SOMERSET COUNTIES, PENNSYLVANIA

VOLUME II - PLAN CONTENTS

BLE PROJECT NO. 2005-1719-00

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CAMBRIA COUNTY COMMISSIONERS

PJ Stevens, President Commissioner
Milan Gjurich
William G. Harris

SOMERSET COUNTY COMMISSIONERS

Pamela Tokar-Ickes, Chair
John Vatavuk, Vice Chair
James Marker, Secretary

CAMBRIA COUNTY CONSERVATION DISTRICT

Robert W. Piper Jr., District Manager
John S. Dryzal, Assistant District Manager/Park Director
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Louis A. Kopczyk, Ag Conservation Engineer
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STONYCREEK RIVER WATERSHED DESIGNATED WPAC MEMBERS
As of May 27, 2009

County	Municipality	Contact
Cambria County Conservation District - Robb Piper		
Cambria	Adams Twp	William Smith
	City of Johnstown	Jeffrey Silka
	Conemaugh Twp	Lawrence Marhefka
	Daisytown Boro	Robert Sweeney
	Dale Boro	Jerry Held
	Ferndale Boro	Robert Rucosky
	Geistown Boro	Donna Hutchison
	Lorain Boro	Larry Faust
	Lower Yoder Twp	Gary Stiffler
	Richland Twp	Melvyn Wingard
	Scalp Level Boro	Bruce Drenning
	Southmont Boro	Kevin Pile
	Stonycreek Twp	William Knipple
	Upper Yoder Twp	Roy Shaffer
	Westmont Boro	Susan Holmes
Somerset County Planning Commission - Brad Zearfoss		
Somerset	Allegheny Twp	Miles K Costello Jr.
	Benson Boro	Lloyd Reed Jr.
	Berlin Boro	John Long
	Boswell Boro	Mary Ann Deluca
	Brothersvalley Twp	Jason Ickes
	Central City Boro	Daniel Dabbs
	Conemaugh Twp	Stephen Buncich
	Hooversville Boro	Kenneth Karashowsky
	Indian Lake Boro	Michael Miscoe
	Jenner Twp	Keith Barnick
	Jennerstown Boro	Terry Henry
	Lincoln Twp	James Yoder
	Ogle Twp	Harvey Weyandt, Jr.
	Paint Boro	Dennis Berkey
	Paint Twp	David Blough
	Quemahoning Twp	Mark Corden
	Shade Twp	John Topka Jr.
	Shanksville Boro	James Hillegas
	Somerset Twp	Daniel Halverson
	Stonycreek Twp	Gregory Walker
	Stoystown Boro	Amos D. Snyder Jr.
	Windber Boro	Anthony Turcato

RESOLUTION

WHEREAS, the Stormwater Management Act 167 of 1978 provides for the regulation of land and water use for flood control and stormwater management, requires the Pennsylvania Department of Environmental Protection to designate watersheds, and provides for grants to be appropriated and administered by the Department for plan preparation and implementation costs, and provides that each county will prepare and adopt a watershed stormwater management plan for each designated watershed; and

WHEREAS, the Cambria County Commissioners entered into a grant contract with the Pennsylvania Department of Environmental Protection to develop the watershed stormwater management plan for the Stonycreek River designated watershed; and

WHEREAS, the purpose of the Stonycreek River Watershed Stormwater Management Plan is to protect public health and safety and to prevent or mitigate the adverse impacts related to the conveyance of excessive rates and volumes of stormwater runoff by providing for the management of stormwater runoff and control of erosion and sedimentation; and

WHEREAS, design criteria and standards of stormwater management systems and facilities within the Stonycreek River watershed shall utilize the criteria and standards as found in the watershed stormwater management plan;

NOW, THEREFORE, BE IT RESOLVED that the Cambria County Commissioners hereby adopt the Stonycreek River Watershed Stormwater Management Plan, including all volumes, figures, appendices, Model Ordinance and forward the Plan to the Stormwater Management Section of the Pennsylvania Department of Environmental Protection for approval.

This Resolution is hereby adopted this _____day of _____, 2009 by:

CAMBRIA COUNTY COMMISSIONERS

_____

PJ Stevens, President Commissioner

_____

Milan Gjurich

_____

William G. Harris

RESOLUTION

WHEREAS, the Stormwater Management Act 167 of 1978 provides for the regulation of land and water use for flood control and stormwater management, requires the Pennsylvania Department of Environmental Protection to designate watersheds, and provides for grants to be appropriated and administered by the Department for plan preparation and implementation costs, and provides that each county will prepare and adopt a watershed stormwater management plan for each designated watershed; and

WHEREAS, the Somerset County Commissioners entered into a grant contract with the Pennsylvania Department of Environmental Protection to develop the watershed stormwater management plan for the Stonycreek River designated watershed; and

WHEREAS, the purpose of the Stonycreek River Watershed Stormwater Management Plan is to protect public health and safety and to prevent or mitigate the adverse impacts related to the conveyance of excessive rates and volumes of stormwater runoff by providing for the management of stormwater runoff and control of erosion and sedimentation; and

WHEREAS, design criteria and standards of stormwater management systems and facilities within the Stonycreek River watershed shall utilize the criteria and standards as found in the watershed stormwater management plan;

NOW, THEREFORE, BE IT RESOLVED that the Somerset County Commissioners hereby adopt the Stonycreek River Watershed Stormwater Management Plan, including all volumes, figures, appendices, Model Ordinance and forward the Plan to the Stormwater Management Section of the Pennsylvania Department of Environmental Protection for approval.

This Resolution is hereby adopted this _____day of _____, 2009 by:

SOMERSET COUNTY COMMISSIONERS

_____
Pamela Tokar-Ickes, Chair

_____
John Vatavuk, Vice Chair

_____
James Marker, Secretary

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PLAN FORMAT

The format of the Stonycreek River Stormwater Management Plan consists of Volume I, the Executive Summary, Volume II, the Plan Report that includes GIS maps and the Model Ordinance, and Volume III that contains the background technical materials.

Volume I provides an overview of Act 167 and a summary of the standards and criteria developed for the Plan. Volume II, the Plan Report provides an overview of stormwater management, purpose of the study, data collection, present conditions, projected land development patterns, calculation methodology, and ordinance provisions and implementation discussion.

Volume III provides supporting data, watershed modeling parameters and modeling runs, peak flows, release rates, the existing municipal ordinance matrix, and obstructions inventory. Due to large volumes of data, one copy of Volume III will be on file at each of the Cambria County Conservation District and the Somerset County Planning Commission offices.

The Draft Plan's figures are in black and white. The Final Plan will have color figures. Large-scale color copies of the figures are at the County Planning Department offices.

Definitions for stormwater related terms or phrases can be found in Article II of the Model Ordinance, Appendix 3.

SECTION I

INTRODUCTION

A. Introduction

This Plan has been developed for the Stonycreek River watershed in Cambria and Somerset Counties, Pennsylvania to comply with the requirements of the Pennsylvania Stormwater Management Act, Act 167, of 1978. The outlet of the Stonycreek River watershed corresponds with the confluence of the Conemaugh River in Cambria County. In order to properly address stormwater management in the Stonycreek River watershed below the confluence of the Conemaugh River, it was determined that the watershed needed to be hydrologically evaluated in both counties. One Act 167 Plan was, therefore, developed encompassing both Cambria and Somerset County, thus satisfying the Act 167 planning requirements for the entirety of the Stonycreek River watershed. For the purposes of this report, when the combined counties in the single watershed are being formally referenced such as in section headings, the text used to refer to them will read the Stonycreek River watershed. Otherwise, they will be referenced individually when appropriate to do so.

The policy and purpose as stated in Section 3 of Act 167 is to encourage planning and management of storm water runoff in each watershed which is consistent with sound water and land use practices, authorize a comprehensive program of storm water management designated to preserve and restore the flood carrying capacity of Commonwealth streams; to preserve to the maximum extent practicable natural storm water runoff regimes and natural course, current and cross-section of water of the Commonwealth; and to protect and conserve ground waters and ground-water recharge areas, and encourage local administration and management of storm water consistent with the Commonwealth's duty as trustee of natural resources and the people's constitutional right to the preservation of natural, economic, scenic, aesthetic, recreational and historic values of the environment.

This report is developed with the intent to present all information that may be required in order to implement the Plan. The comprehensiveness of the Plan covers legal, engineering, and municipal government topics, which combined, form the basis for implementation and enforcement of a final Ordinance which will be developed and adopted by each affected municipality. A sample stormwater management ordinance for reference use has been developed as part of the Plan and is included in Appendix 3.

SECTION II

ACT 167

A. Stormwater Management Act 167

Recognizing the need to address this serious and growing problem, the Pennsylvania General Assembly enacted Act 167 of 1978. The statement of legislative findings at the beginning of the Pennsylvania Storm Water Management Act (Act 167) sums up the critical interrelationship among land development, accelerated runoff, and floodplain management. Specifically, this statement of legislative findings points out that:

1. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases flood flows and velocity, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines floodplain management and floodplain control efforts in downstream communities, reduces groundwater recharge, and threatens public health and safety.

2. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, and welfare and the protection of the people of the Commonwealth, their resources, and their environment.

The Act requires Pennsylvania counties to prepare and adopt stormwater management plans. Most importantly, these plans are to be prepared in consultation with municipalities working through a Watershed Planning Advisory Committee (WPAC). This Stormwater Management Plan for the Stonycreek River watershed includes: a survey of existing runoff characteristics in small as well as large storms, including the impact of soils, slopes, vegetation and existing development; a survey of existing significant obstructions and their capacities; an assessment of projected and alternative land development patterns in the watershed, and the potential impact of runoff quantity, velocity and quality; an analysis of present and projected development in flood hazard areas, and its sensitivity to damages from future flooding or increased runoff; a survey of existing drainage problems and proposed solutions; a review of existing and proposed storm water collection systems and their impacts; an assessment of alternative runoff control techniques and their efficiency in the particular watershed; an identification of existing and proposed State, Federal and local flood control projects located in the watershed and their design capacities; a designation of those areas to be served by storm water collection and control facilities within a ten-year period, an estimate of the design capacity and costs of such facilities, a schedule and proposed methods of financing the development, construction and operation of such facilities, and an identification of the existing or proposed institutional arrangements to implement and operate the facilities; an identification of flood plains within the watershed; criteria and standards for the control of storm water runoff from existing and new development which are necessary to minimize dangers to property and life and carry out the purposes of this Act; priorities for implementation of action within each plan; and provisions for periodically reviewing, revising and updating the plan. This Stormwater Management Plan: contains such provisions as are reasonably necessary to manage storm water such that development or activities in each municipality within the watershed do not adversely affect health, safety and

property in other municipalities within the watershed and in basins to which the watershed is tributary; and considers and is consistent with other existing municipal, county, regional and State environmental and land use plans.

The types and degree of controls that are prescribed in the Plan need to be based on the expected development pattern and hydrologic characteristics of each individual watershed. The management Plan, specifically the standards and criteria, are to be developed from the technical evaluations performed in the planning process in order to respond to the "cause and effect" nature of existing and potential storm runoff impacts in the watershed. The final product of the Act 167 watershed planning process is to be a comprehensive and practical implementation plan, developed with a firm sensitivity to the overall needs (e.g., financial, legal, political, technical, etc.) of the municipalities in the watershed.

All counties must, in consultation with its municipalities, prepare and adopt a stormwater management plan for each of its designated watersheds. The county, in consultation with the municipalities in the watershed, shall periodically review and revise the Plan at least every five years. Within six months following adoption and approval of the Plan, each municipality is required to adopt or amend stormwater ordinances as laid out in the Plan. These ordinances must regulate development within the municipality in a manner consistent with the watershed stormwater plan and the provisions of the Act.

Any landowner and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics are required to manage the quantity, velocity, and direction of resulting stormwater runoff in a manner that adequately protects health and property from possible injury. They must implement control measures that are consistent with the provisions of the Stormwater Management Plan and the Act. The Act also provides for civil remedies for those aggrieved by inadequate management of accelerated stormwater runoff.

B. Purpose of the Study

The policy and purpose of the Act is to encourage planning and management of storm water runoff in each watershed which is consistent with sound water and land use practices, authorize a comprehensive program of storm water management designated to preserve and restore the flood carrying capacity of Commonwealth streams; to preserve to the maximum extent practicable natural storm water runoff regimes and natural course, current and cross-section of water of the Commonwealth; and to protect and conserve ground waters and ground-water recharge areas, and encourage local administration and management of storm water consistent with the Commonwealth's duty as trustee of natural resources and the people's constitutional right to the preservation of natural, economic, scenic, aesthetic, recreational and historic values of the environment.

There is an increased statewide as well as local recognition that a sound and effective stormwater management plan requires a diversified multiple purpose plan. This Plan addresses the full range of hydrologic consequences resulting from development by considering tributary timing of flow volume reduction, base flow augmentation, water quality control and ecological protection rather than simply focusing on controlling site specific peak flow.

Managing stormwater runoff on a site-specific basis does not meet the requirements of watershed based planning. The timing of flood peaks for each subbasin within a watershed contributes greatly to the flooding potential of a particular storm. Each stormwater control site within a subbasin should be managed by evaluating the comprehensive picture.

The Stonycreek River Watershed Stormwater Management Plan provides reasonable regulations of development activities to control accelerated runoff and protect the health, safety and welfare of the public. The Plan includes recognition of the various rules, regulations and laws at the federal, state, county and municipal level. Once implemented, the Plan will aid in reducing costly flood damages by reducing the source and cause of local uncontrolled runoff. The Plan will make municipalities and landowners and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics more aware of comprehensive planning in stormwater control and will help maintain the quality of Stonycreek River and its tributaries.

SECTION III

GENERAL DESCRIPTION OF WATERSHED

The Stonycreek River watershed is located predominantly in the northern portion of Somerset County. Portions of the watershed extend into southern Cambria County. There are fifteen (15) municipalities in Cambria County and twenty-one (21) municipalities in Somerset County as listed in Table III-1 and illustrated in Map III-1, the Base Map.

TABLE III-1
Stonycreek River Watershed – Municipalities

Cambria County (15)	
Adams Township*	Lower Yoder Township*
Conemaugh Township*	Richland Township*
Daisytown Borough*	Scalp Level Borough*
Dale Borough*	Southmont Borough*
Ferndale Borough*	Stonycreek Township*
Geistown Borough*	Upper Yoder Township*
Johnstown City*	Westmont Borough*
Lorain Borough*	
Somerset County (21)	
Benson Borough	Ogle Township
Berlin Borough	Paint Borough*
Boswell Borough	Paint Township*
Brothers Valley Township	Quemahoning Township
Central City Borough	Shade Township
Conemaugh Township*	Shanksville Borough
Hooversville Borough	Somerset Township
Indian Lake Borough	Stonycreek Township
Jenner Township	Stoystown Borough
Jennerstown Borough	Windber Borough*
Lincoln Township	

Of the 36 municipalities within the Stonycreek River watershed, nineteen (19) are contained within the Johnstown Urbanized Area (UA) as designated by the 2000 US Census. These municipalities are listed above with an asterisk (*) appearing next to their name. Each of these municipalities which owns or operates a system of conveyance (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) within the designated urbanized area is required to comply with the National Pollutant Discharge Elimination System (NPDES) Phase II requirements for operators of Municipal Separate Storm Sewer Systems (MS4s), as specified by the Environmental Protection Agency (EPA). The NPDES Phase II requires owners of these MS4s to develop, implement, and enforce a stormwater management program designed to

reduce the discharge of pollutants from their MS4s to the "maximum extent possible" to protect water quality. Each stormwater management program must, at the least, address the following six minimum control measures (MCMs):

MCM	Description
1	Public Education and Outreach
2	Public Participation / Involvement
3	Illicit Discharge Detection and Elimination (IDD&E)
4	Construction Site Runoff Control
5	Post-Construction Runoff Control
6	Pollution Prevention / Good Housekeeping

As part of the Act 167 process, steps may be taken by the County and/or Municipality to address these minimum control measures during the Act 167 planning process.

A. Drainage Area

Stonycreek River begins at a spring house in Berlin Borough, Somerset County and travels in a northerly direction for approximately 45 miles to the City Johnstown in Cambria County where it meets with the Little Conemaugh River to form the Conemaugh River. The Stonycreek River drains a watershed area of approximately four hundred sixty nine (469) square miles. Stonycreek River includes the following major tributaries: Paint Creek (36 sq. miles), Bens Creek (49 sq. mile), Quemahoning Creek (100 sq. miles), and Shade Creek (98 sq. miles). Elevations within the watershed range from 3,005 feet above sea level in northern Juniata Township to 1,138 ft in the City of Johnstown.

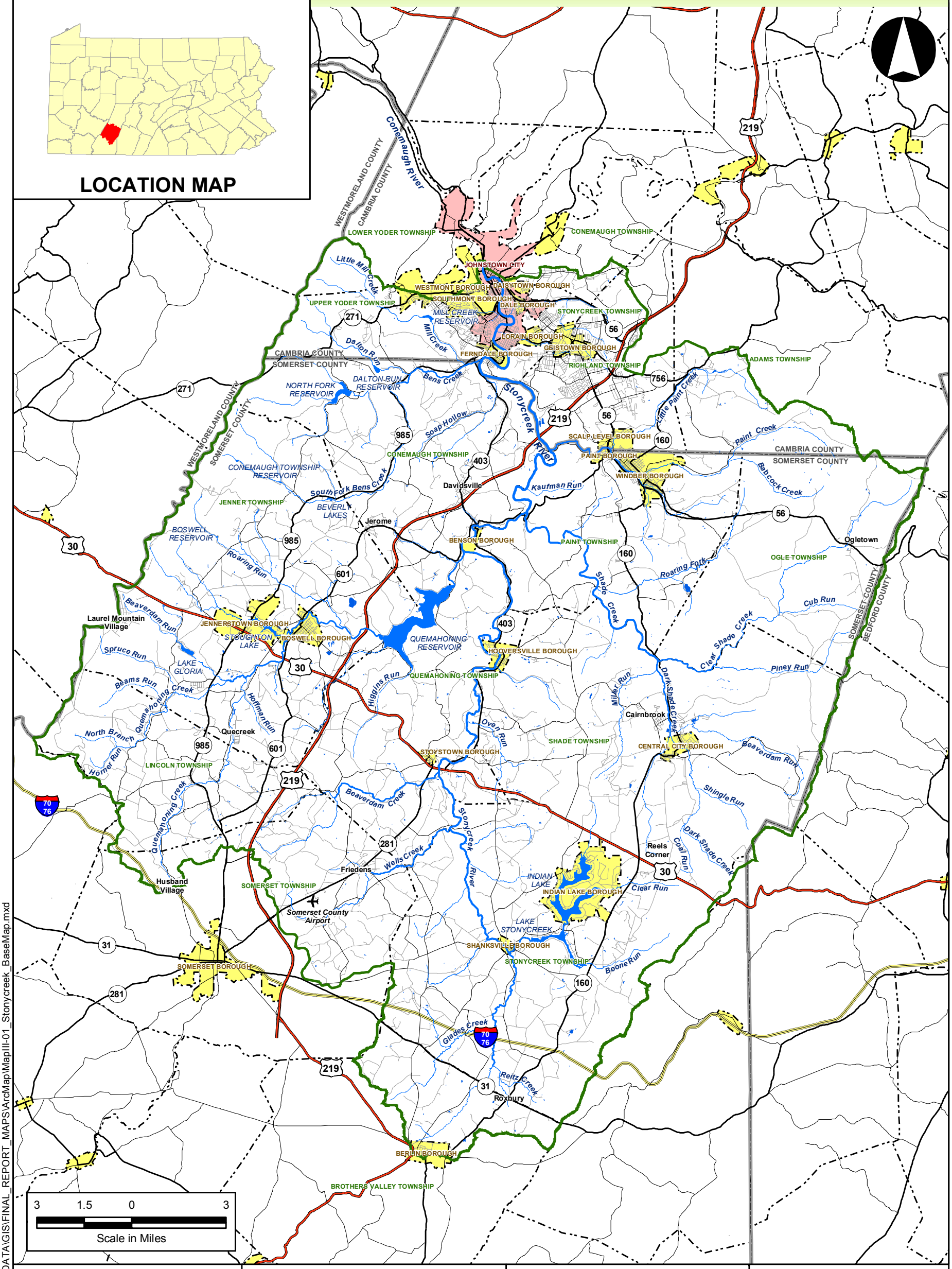
Stonycreek River is in the Allegheny Mountain Section of the Appalachian Plateaus Physiographic Province. The basin contains large fields of bituminous coal which have been extensively mined in the past and has significantly impacted water quality within the watershed due to years of acid mine drainage (AMD) discharging from abandoned mine sites. Several initiatives have begun to address the issues of AMD within the Stonycreek River watershed. Restoration projects, such as those performed under the Stonycreek-Conemaugh River Improvement Project (SCRIP) have already had significant impacts on water quality within the watershed.

Several tributaries to the Stonycreek River are designated by PaDEP under Chapter 93, Water Quality Standards, as High Quality Cold Water Fisheries (HQ-CWF), including sections of Beaverdam Creek, Higgins Run, Clear Shade Creek, Piney Run and Bens Creek. There are also Exceptional Value (EV) streams within the watershed, including sections of Roaring Run, Clear Shade Creek, Piney Run and Bens Creek. Portions of Stonycreek and Paint Creek are also designated as Trout Stocking Fisheries (TSF). The remainder of the streams within the watershed are designated as either Cold Water Fisheries (CWF) or Warm Water Fisheries (WWF).

Land cover in the watershed is primarily agricultural and forest (approximately 88%). Surface mining operations account for approximately 4.4% of the watershed. Residential, commercial, urban areas, light industrial areas, and community parks make up the remaining portion of the watershed (USGS, 1996).

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN

LOCATION MAP



Map III-1
BASE MAP

Prepared For:
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Legend

- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- BOROUGH
- CITY
- WATERSHED BOUNDARY
- STREAMS
- WATER BODIES

Roads

- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

NOTE:
Portions of this map were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this ACT 167 Plan to correct all of the mapping data.

SOURCES:
Watershed Boundary - PADEP Modified by BLE
State and Local Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies - Derived from USFWS NWI Wetlands data

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PREPARED BY: WSB CHECKED BY: SJD
Date: 5/18/2009 PROJECT #: 2005-1719-00

FILE: \Athens\dProjects\2005\1719\00\DATA\GIS\FINAL_REPORT_MAPS\ArcMap\MapIII-01_Stonycreek_BaseMap.mxd

B. Data Collection

In order to evaluate the hydrologic response of the watershed, data was collected on the physical features of the watershed as follows:

1. Base Map: The base map was created using data from a variety of sources. The watershed boundary for this Plan was derived from state-wide Act 167 watershed boundaries delineated by the PaDEP. The PaDEP boundary was laid over USGS 1:24,000 scale topographic maps to assure accuracy and make minor corrections.

   Roads and municipal boundaries for the base map were obtained from PennDOT.

   Streams data were obtained from Penn State Environmental Resources Research Institute (ERRI). The ERRI streams data were derived from PaDEP streams data as digitized on USGS topographic maps. The ERRI attributes include a Strahler Classification which indicates the order of the stream segments.

   Lakes and reservoirs were derived from USFWS National Wetlands Inventory data. Lacustrine wetland polygons were extracted as a stand alone data layer. This data layer was laid over USGS digital raster graphics and edited to increase accuracy.

2. Topography: USGS digital raster graphic (DRG) formatted topographic maps (1:24,000, 7.5 minute quadrangles) were used to create a watershed-wide DRG. Corresponding 7.5 minute digital elevation models (DEM) were used to create a watershed-wide digital elevation model.

   Subwatersheds or subareas used in the watershed modeling process were derived from the watershed DEM. Subareas, drainage courses, land slopes and lengths, and drainage element lengths and slopes were determined utilizing the DEM.

3. Soils: All soil data was obtained from the United States Department of Agriculture, Natural Resources Conservation Service (NRCS) in digital format. Generalized soils were obtained from the State Soil Geographic Database (STATSGO). STATSGO maps are state-wide soil maps made by generalizing the detailed soil survey data. Soil mapping units with similar characteristics are grouped together.

   Data on hydrologic soil groups (HSG) was derived from the detailed Soil Survey Geographic Database (SSURGO) data. The spatial component of SSURGO data (the soil map) is provided as a GIS data layer. The attribute data (soil information) is provided as a relational Access database. Together the spatial data and relational database are referred to as National Soil Information System (NASIS) data. The NASIS data were processed to extract HSG classifications for the surface horizon of the soil mapping units within the watershed.

4. Geology: The geology for the watershed was extracted from the state-wide bedrock geology coverage produced by Pennsylvania Bureau of Topographic and Geologic Survey, Department of Conservation and Natural Resources (DCNR). The dataset obtained from the DCNR are not intended to be used at any scale finer than 1:250,000. The geology data are

displayed for the watershed at a scale larger than 1:250,000. The geology information is provided for illustrative and general information only.

5. Land Cover: The land cover data for Stonycreek River watershed was derived from the USGS National Land Cover Dataset. The National Land Cover Dataset (NLDC) was compiled from Landsat satellite TM imagery (circa 1992) with a spatial resolution of 30 meters and supplemented by various ancillary data (where available). Land cover data was reviewed and revised as appropriate by the counties to reflect current conditions in the watershed. This data is intended to provide a general overview of the watershed and to model stormwater runoff characteristics.

6. Wetlands: Wetlands were obtained from the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) in digital format and incorporated into the overall GIS. NWI maps are compiled from photointerpreted aerial photography from the National Aerial Photography Program (NAPP) 1:40,000 Scale, and the National High Altitude Photography Program (NHAP) 1:58,000 or 1:80,000 Scale. Sources' dates range from the 1970's to the present. The minimum mapping unit for treeless areas is 1/4 acres, 1 to 3 acres in general.

   The wetlands data is provided for illustrative purposes. Other wetland areas likely exist in the watershed that are not depicted on NWI maps.

7. Development in Floodplains: 100-year floodplain data, or special flood hazard areas, for Cambria, Somerset, Westmoreland and Bedford counties were derived from the September 1996 Federal Emergency Management Agency (FEMA) National Flood Insurance Program Q3 Flood Data CD. The existing land cover was then clipped to these areas within the watershed to depict the development in floodplains.

8. Obstructions: Bridges, culverts and pipes that convey streams and tributaries under roads, railroads and other similar infrastructure are referred to as obstructions. The obstruction locations and attribute information (size and shape) for the Stonycreek River watershed were provided by Cambria County.

   Borton-Lawson compiled the data and converted it into the GIS for processing and modeling.

9. Problem Areas: Stormwater problems include flooding, erosion, sedimentation, landslides, groundwater impacts, pollution and other potential issues. Data on the location of these problems in the watershed were collected by the municipalities within the watershed and provided to Borton-Lawson for plotting and incorporation into the watershed GIS. The municipalities were provided a topographic map of their township or borough and a set of forms. They identified and plotted the locations of the known problem areas on paper maps or in digital format and completed the forms that describe the problems at each location.

   Borton-Lawson compiled the data from the municipalities and created a data layer to illustrate problem areas throughout the watershed. Significant problem areas and clusters of problems were used as points of interest (POIs) in the hydrologic model.

10. Stormwater Management Facilities: Stormwater management facilities may include detention/retention basins, swales, underground storage and constructed wetlands. These types of facilities were also identified, plotted and described on forms by the municipalities.

    As with the problem area data, the municipality stormwater management facilities information was compiled by Borton-Lawson and converted into GIS format. Some municipalities submitted storm sewer maps which enabled Borton-Lawson to illustrate the areas of these townships and boroughs that are served by storm drains.

11. Stormwater Sewer System Outfalls: Municipalities in urban areas (as defined by the US Census Bureau) are required to map the location of storm sewer outfalls as part of the PaDEP Municipal Separate Storm Sewer System (MS4) program. This information was collected by the municipalities and the County and provided to Borton-Lawson for inclusion in the GIS.

C. Topography and Streambed Profile

The topography of the watershed ranges from hilly terrain in the northwestern portion of the watershed to gently sloping areas throughout most of the central to southern end. The highest point in the watershed is in northern Juniata Township with an elevation of 3,005 feet above sea level USGS datum. The lowest elevation, 1,138 feet above sea level, is found along the Stonycreek River in Johnstown City. The average channel slope is approximately 38 feet per mile (about 0.7%). The Digital Elevation Model (DEM) for the watershed is displayed in Map III-2.

D. Soils

The NRCS State Soil Geographic (STATSGO) data base is compiled by generalizing more detailed soils survey maps, such as a County Soils Survey. Map unit composition for a STATSGO map is determined by transecting or sampling areas on the more detailed maps and expanding the data statistically to characterize the whole map unit. A generalized soils group can consist of up to 21 different soil components; however the naming convention is typically based upon the three largest components which make up the group. In the Stonycreek River watershed, six generalized soil groups were identified. The most common soil association within the watershed is the *Gilpin-Wharton-Ernest Association*. This soil group accounts for almost 308 square miles or approximately 66% of the watershed. The *Hazleton-Dekalb-Buchanan Association* is the second most dominant soil type, occupying roughly 128 square miles or 27% of the watershed. Below is a listing of the six generalized soils groups within the watershed and a description of the three largest components. The distribution of the generalized soil groups in the Stonycreek River watershed is shown in Map III-3.

1. Hazleton-Dekalb-Buchanan (PA022)

HAZLETON - The Hazleton series consists of deep and very deep, well drained soils formed in residuum of acid gray, brown or red sandstone on uplands. Slope ranges from 0 to 80 percent. Permeability is moderately rapid to rapid.

DEKALB - The Dekalb series consists of moderately deep, excessively drained

soils formed in material weathered from gray and brown acid sandstone in places interbedded with shale and graywacke. Slope ranges from 0 to 80 percent. Permeability is rapid.

BUCHANAN - Soils of the Buchanan series are very deep, moderately well drained, and slowly permeable. They formed in colluvium on mountain footslopes, sideslopes and in valleys that is weathered from acid sandstone, quartzite, siltstone, and shale. Slope ranges from 0 to 45 percent.

2. Berks-Weikert-Bedington (PA033)

BERKS - The Berks series consists of moderately deep, well drained soils formed in residuum weathered from shale, siltstone and fine grained sandstone on rounded and dissected uplands. Slope ranges from 0 to 80 percent. Permeability is moderate or moderately rapid.

WEIKERT - The Weikert series consist of shallow, well drained soils formed in material that weathered from interbedded gray and brown acid shale, siltstone, and fine-grained sandstone on gently sloping to very steep areas on uplands. Slope ranges from 0 to 90 percent. Permeability is moderately rapid.

BEDINGTON - The Bedington series consists of very deep, well drained soils. Bedington soils formed in residuum from dark brown, gray and olive acid, sedimentary, siltstone and shale, with some sandstone interbeds. They are on nearly level to steep convex uplands and on the sideslopes of hills and ridges. Permeability is moderate.

3. Gilpin-Wharton-Ernest (PA053)

GILPIN - The Gilpin series consists of moderately deep, well drained soils formed in residuum of nearly horizontal interbedded shale, siltstone, and some sandstone of the Allegheny Plateau. They are on gently sloping to steep, convex, dissected uplands. Slope ranges from 0 to 70 percent. Permeability is moderate.

WHARTON - The Wharton series consists of deep and very deep, moderately well drained soils formed in residuum from interbedded clay shale, siltstone, and fine-grained sandstone. They are on uplands. Slopes range from 0 to 35 percent. Permeability is slow or moderately slow.

ERNEST - The Ernest series consists of very deep, moderately well drained soils with moderately slow to slow permeability. These soils

formed in colluvium from shale, siltstone, and sandstone. They are on foot slopes and colluvial fans. Slopes range from 0 to 50 percent.

4. Calvin-Klinesville-Leck Kill (PA054)

CALVIN - The Calvin series consists of moderately deep, well drained soils formed in residuum of red non-calcareous shale, siltstone, and sandstone on summits, hillslopes and side slopes of ridges. Permeability is moderately rapid. Slope ranges from 0 to 80 percent.

KLINESVILLE - The Klinesville series consists of shallow, somewhat excessively drained soils formed in residuum derived from red shale, siltstone, slate, and fine-grained sandstone. They are on dissected uplands. Slopes range from 3 to 80 percent. Permeability is moderately rapid.

LECK KILL - The Leck Kill series consists of deep and very deep, well drained soils formed in residuum or glacial till weathered from red shale, siltstone, and sandstone. They are on the uplands. Slopes range from 0 to 60 percent excessively drained, moderately permeable soils on uplands. They formed in materials weathered from micaceous schist. Slopes range from 0 to 65 percent.

5. Monongahela-Philo-Atkins (PA055)

MONONGAHELA - The Monongahela series consists of very deep, moderately well drained soils formed in old alluvium derived largely from acid sandstone and shale on terraces. Permeability in the fragipan is moderately slow or slow. Slope ranges from 0 to 25 percent.

PHILO - The Philo series consists of very deep, moderately well drained soils on floodplains. They formed in recent alluvium derived mainly from sandstone and shale. Permeability is moderate to moderately rapid. Slope ranges from 0 to 6 percent.

ATKINS - The Atkins series consists of very deep, poorly drained soils formed in acid alluvium washed from upland soils that formed in shale and sandstone. Permeability is slow to moderate. Slope ranges from 0 to 3 percent.

6. Gilpin-Brinkerton-Cavode (PA056)

GILPIN - The Gilpin series consists of moderately deep, well drained soils formed in residuum of nearly horizontal interbedded shale, siltstone, and some sandstone of the Allegheny Plateau. They are on gently sloping to steep, convex, dissected uplands. Slope ranges from 0 to 70 percent. Permeability is moderate.

BRINKERTON - The Brinkerton series consists of very deep, poorly drained soils formed in medium textured colluvium derived from acid gray shale and siltstone. They are on footslopes of uplands. Slope ranges from 0 to 15 percent. Permeability is moderate in the surface layer, moderately slow in the upper subsoil, and slow in the fragipan and substratum.

CAVODE - The Cavode series consists of deep and very deep, somewhat poorly drained upland soils formed in residuum weathered from gray and yellow acid shale interbedded with siltstone and sandstone. Permeability is moderate to moderately slow in the surface layer and upper subsoil and slow in the lower subsoil and substratum. Slope ranges from 0 to 25 percent.

Soil properties influence the runoff generation process. The USDA, Natural Resources Conservation Service (NRCS) has established a criterion determining how soils will affect runoff by placing all surface horizon soils into four Hydrologic Soil Groups (HSGs) – A through D, based on infiltration rate and depth. Hydrologic soil group A characteristics, which have a high infiltration rate and therefore low runoff potential, are found sporadically throughout the Stonycreek River watershed. The majority of the surface horizon soils in the watershed fall in Group B and C. Group B is characterized as having moderate infiltration rates, and it consists primarily of moderately deep to deep, moderately well to well drained soils that exhibit a moderate rate of water transmission. Group C soils have slow infiltration rates when thoroughly wetted and contain fragipans, a layer that impedes downward movement of water and produces a slow rate of water transmission. Found throughout the watershed, D soils are tight, low permeable soils with high runoff potential and are typically clay soils. This information was incorporated into the GIS and, from this, the watershed HSG map was developed as shown in Map III-4.

E. Geology

Geology plays a direct role in surface runoff in the Stonycreek River watershed because it affects its soil types within the watershed through parent material breakdown. The three major geologic formations in the Stonycreek River watershed are the Glenshaw Formation (almost 39%), the Allegheny Formation (approximately 33%) and the Pottsville Formation (almost 11%). There is no limestone (carbonate) surface geology in the Stonycreek River watershed and therefore the presence of limestone sinkholes does not exist. The geologic map of the watershed can be found in Map III-5. The following descriptions of geologic formations in the watershed are modified from Berg, T. M., Geyer, A. R., Edmunds, W. E., and others, compilers, 1980, *Geologic map of Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Map 1.

1. Allegheny Formation: Cyclic sequences of sandstone, shale, limestone, clay, and coal; includes valuable clay deposits and Vanport Limestone; commercially valuable Freeport, Kittanning, and Brookville-Clarion coals present; base is at bottom of Brookville-Clarion coal.

2. Burgoon Sandstone: Buff, medium-grained, crossbedded sandstone; includes shale and coal; in places, contains conglomerate at base; contains plant fossils; equivalent to Pocono Formation of Ridge and Valley province.

3. Casselman Formation: Cyclic sequences of shale, siltstone, sandstone, red beds, thin, impure limestone, and thin, nonpersistent coal; red beds are associated with landslides; base is at top of Ames limestone.

4. Glenshaw Formation: Cyclic sequences of shale, sandstone, red beds, and thin limestone and coal; includes four marine limestone or shale horizons; red beds are involved in landslides; base is at top of Upper Freeport coal.

5. Mauch Chunk Formation: Grayish-red shale, siltstone, sandstone, and some conglomerate; some local nonred zones. Includes Loyalhanna Member (crossbedded, sandy limestone) at base in south-central and southwestern Pennsylvania; also includes Greenbrier Limestone Member, and Wymps Gap and Deer Valley Limestones, which are tongues of the Greenbrier. Along Allegheny Front from Blair County to Sullivan County, Loyalhanna Member is greenish-gray, calcareous, crossbedded sandstone.

6. Monongahela Group: Cyclic sequences of limestone, shale, sandstone, and coal; commercial coals present; base is at bottom of Pittsburgh coal.

7. Pottsville Formation: Predominantly gray sandstone and conglomerate; also contains thin beds of shale, claystone, limestone, and coal; includes Olean and Sharon conglomerates of northwestern Pennsylvania; thin marine limestones present in Beaver, Lawrence, and Mercer Counties; minable coals and commercially valuable high-alumina clays present locally.

8. Rockwell Formation: Buff, fine- to medium-grained, crossbedded, argillaceous sandstone and dark-gray shale; includes some carbonaceous shale, sporadic conglomerate beds, and diamictite; included in lower "Pocono" of earlier workers.

9. Shenango Formation through Oswayo Formation, undivided: Greenish-gray, olive, and buff sandstone and siltstone, and gray shale in varying proportions; includes "Pocono" ("Knapp") and Oswayo of earlier workers; difficult lithologic distinction between Oswayo and "Knapp"- "Pocono" south and east of type area at Olean, N.Y.; contains marine fossils; includes lateral equivalents of Shenango Formation, Cuyahoga Group, Corry Sandstone, Bedford Shale, and Cussewago Sandstone, plus Oswayo Formation.

F. Climate

Although the Stonycreek River watershed encompasses both Cambria and Somerset Counties which experience somewhat different weather patterns due to topography and latitudinal location on the

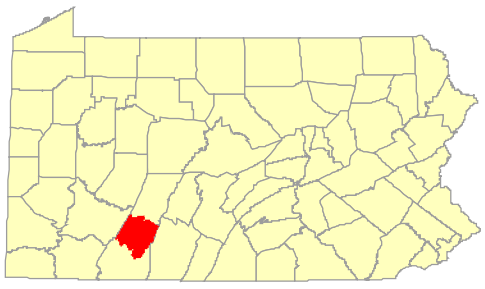
Earth, the bulk of the watershed lies in Somerset County. Therefore, although both the Cambria County and Somerset County Soil Surveys were referenced, the 1983 Soil Survey of Somerset County received more emphasis to make generalizations about the climate in the region.

The watershed experiences average annual precipitation levels of about 42 inches. About 55 percent (23 inches) of this precipitation falls between April and September. Heavy rainfall events such as thunderstorms generally occur in the summer months, and an annual average shows that these events occur on about 35 – 40 days each year.

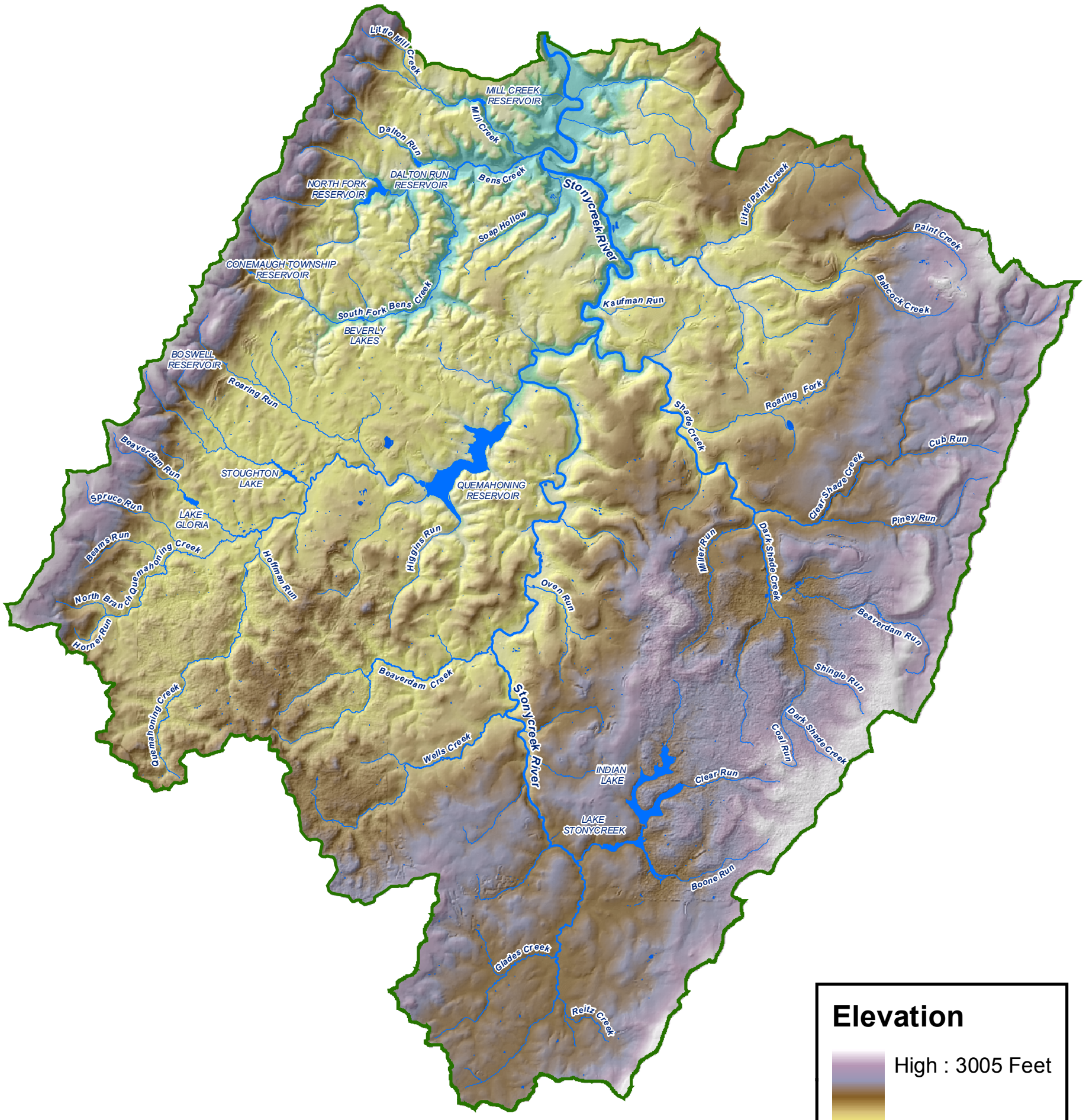
The region is moderately humid with an average midafternoon relative humidity of 60 percent. Prevailing winds from the southwest help to move this moisture, and bring high and low pressure systems through the area. The sun plays a role in the hydrologic cycle by supplying energy necessary for evaporation and the movement of air systems, and the sun shines about 60 percent of the time in summer and 35 percent of the time in winter.

During the summer months, the average temperature is 68 degrees F with an average daily maximum temperature of 81 degrees F. The winter brings an average temperature of 29 degrees F, and the average daily minimum temperature is around 19 degrees F. Extreme fluctuations have been seen where a high temperature during the summer has been over 100 degrees F, and a low temperature in the winter has been below -20 degrees F.

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



LOCATION MAP



Map III-2
DIGITAL ELEVATION MODEL

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Legend

- WATERSHED BOUNDARY
- STREAMS
- WATER BODIES

NOTE:
Portions of this map were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this ACT 167 Plan to correct all of the mapping data.

SOURCES:
Watershed Boundary - PADEP Modified by BLE
Streams - PaDEP
Water Bodies -Derived from USFWS NWI Wetlands data
Digital Elevation Model - United States Geologic Survey (USGS)

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PREPARED BY: WSB CHECKED BY: SJD
DATE: 6/22/2006 PROJECT #: 2005-1719-00

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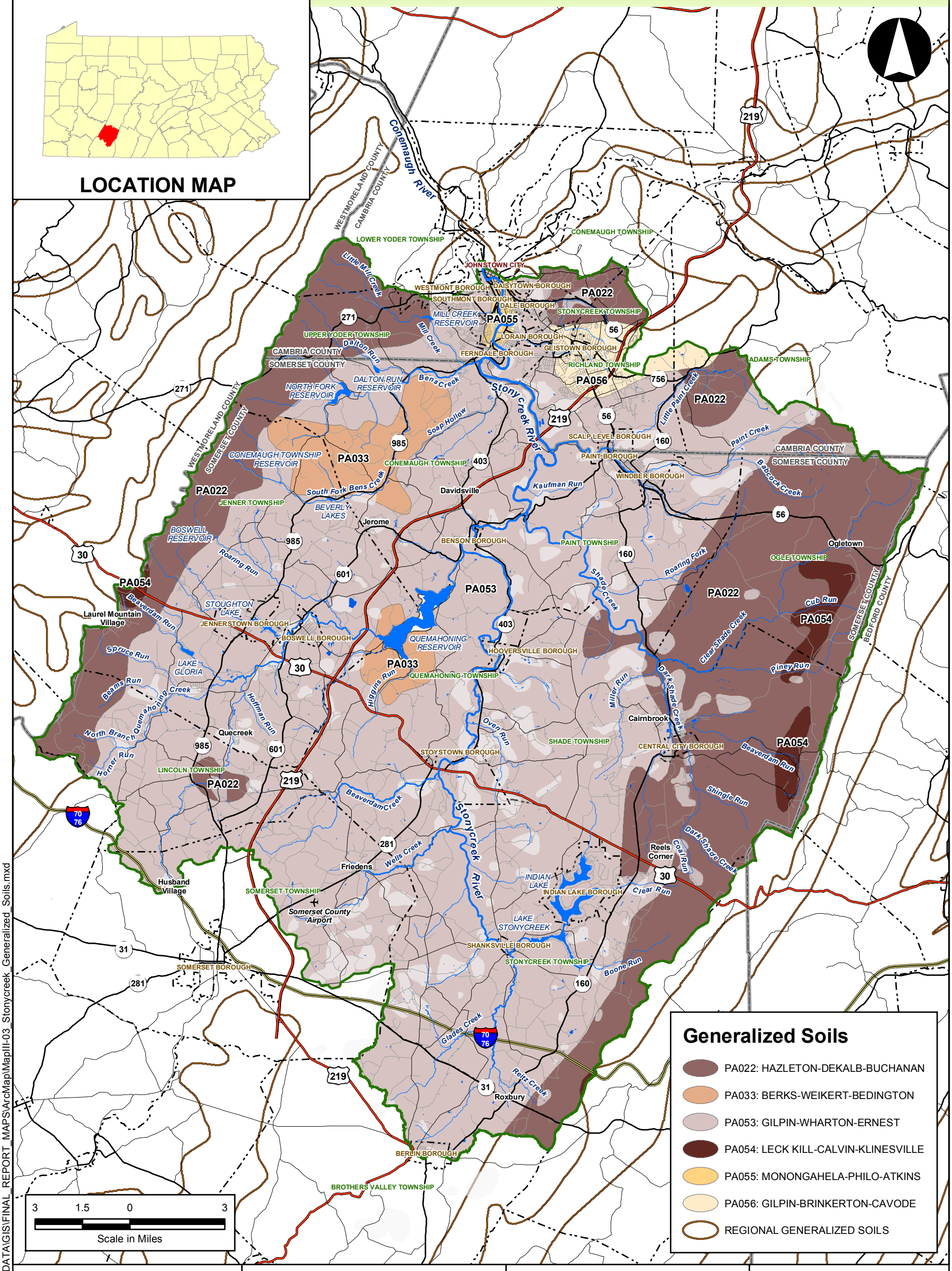
STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN

LOCATION MAP



3 1.5 0 3

Scale in Miles

Generalized Soils

- PA022: HAZLETON-DEKALB-BUCHANAN
- PA033: BERKS-WEIKERT-BEDINGTON
- PA053: GILPIN-WHARTON-ERNEST
- PA054: LECK KILL-CALVIN-KLINESVILLE
- PA055: MONONGAHELA-PHILO-ATKINS
- PA056: GILPIN-BRINKERTON-CAVODE
- REGIONAL GENERALIZED SOILS

Map III-3
GENERALIZED SOILS

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Legend

- WATERSHED BOUNDARY
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- ABANDONED MINE LANDS

Roads

- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

NOTE:
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SOURCES:
Watershed Boundary - PADEP Modified by BLE
State and Local Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies -Derived from USFWS NWI Wetlands data
Generalized Soils - USDA State Soil Geogaphic Database (STATSGO)

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Date: 5/15/2009 PROJECT #: 2005-1719-00

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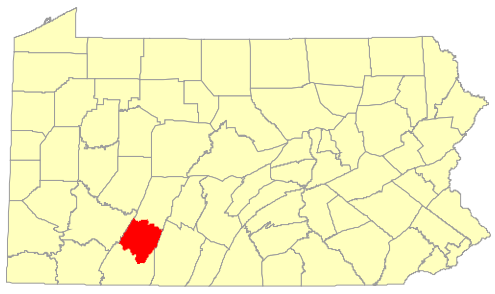
STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



LOCATION MAP

Conemaugh River
WESTMORELAND COUNTY
CAMBRIA COUNTY
LOWER YODER TOWNSHIP
CONEMAUGH TOWNSHIP
JOHNSTOWN CITY
WESTMONT BOROUGH
DAISYTOWN BOROUGH
SOUTHMONT BOROUGH
DALE BOROUGH
STONYCREEK TOWNSHIP
MILL CREEK RESERVOIR
Little Mill Creek
UPPER YODER TOWNSHIP
Dalton Run
Mill Creek
LORAIN BOROUGH
GEISTOWN BOROUGH
FERNDALE BOROUGH
RICHLAND TOWNSHIP
ADAMS TOWNSHIP
CAMBRIA COUNTY
SOMERSET COUNTY
NORTH FORK RESERVOIR
DALTON RUN RESERVOIR
Bens Creek
Stonycreek River
Soap Hollow
SCALP LEVEL BOROUGH
Little Paint Creek
Paint Creek
PAINT BOROUGH
CAMBRIA COUNTY
SOMERSET COUNTY
WINDBER BOROUGH
Babcock Creek
CONEMAUGH TOWNSHIP RESERVOIR
CONEMAUGH TOWNSHIP
Kaufman Run
South Fork Bens Creek
JENNER TOWNSHIP
BEVERLY LAKES
Davidsville
Jerome
BOSWELL RESERVOIR
BENSON BOROUGH
PAINT TOWNSHIP
Ogletown
OGLE TOWNSHIP
Roaring Run
Roaring Fork
Shade Creek
Cub Run
STOUGHTON LAKE
Laurel Mountain Village
JENNERSTOWN BOROUGH
Beaverdam Run
BOSWELL BOROUGH
QUEMAHONING RESERVOIR
HOOVERSVILLE BOROUGH
Clear Shade Creek
SOMERSET COUNTY
BEDFORD COUNTY
Spruce Run
LAKE GLORIA
Higgins Run
Piney Run
Beams Run
North Branch Quemahoning Creek
QUEMAHONING TOWNSHIP
Miller Run
Dark Shade Creek
Hoffman Run
Cairnbrook
Quecreek
Oven Run
SHADE TOWNSHIP
CENTRAL CITY BOROUGH
Beaverdam Run
Horner Run
LINCOLN TOWNSHIP
STOYSTOWN BOROUGH
Shingle Run
Beaverdam Creek
Stonycreek River
Quemahoning Creek
Wells Creek
Friedens
JL
Reels Corner
Coal Run
Dark Shade Creek
SOMERSET TOWNSHIP
INDIAN LAKE
INDIAN LAKE BOROUGH
Clear Run
Somerset County Airport
LAKE STONYCREEK
SHANKSVILLE BOROUGH
STONYCREEK TOWNSHIP
Boone Run
SOMERSET BOROUGH
Glades Creek
Reitz Creek
Roxbury
BERLIN BOROUGH
BROTHERS VALLEY TOWNSHIP

219 271 56 756 160 403 985 601 30 70 76 31 281

3 1.5 0 3
Scale in Miles

HYDROLOGIC SOIL GROUPS

- A - High Infiltration Rates (Low Runoff Potential)
- B - Moderate Infiltration Rates
- C - Low Infiltration Rates
- D - Very Low Infiltration Rates (High Runoff Potential)

Map III-4
HYDROLOGIC SOIL GROUPS

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Legend

- WATERSHED BOUNDARY
- STREAMS
- WATER BODIES
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES

Roads

- Interstate
- US Federal Highway
- PA State Route
- Other State Road

NOTE:
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SOURCES:
Watershed Boundary - PADEP Modified by BLE
State Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies -Derived from USFWS NWI Wetlands data
Hydrologic Soil Groups - USDA/ NRCS Soil Survey Geographic (SSURGO) Database

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Date: 5/15/2009 PROJECT #: 2005-1719-00

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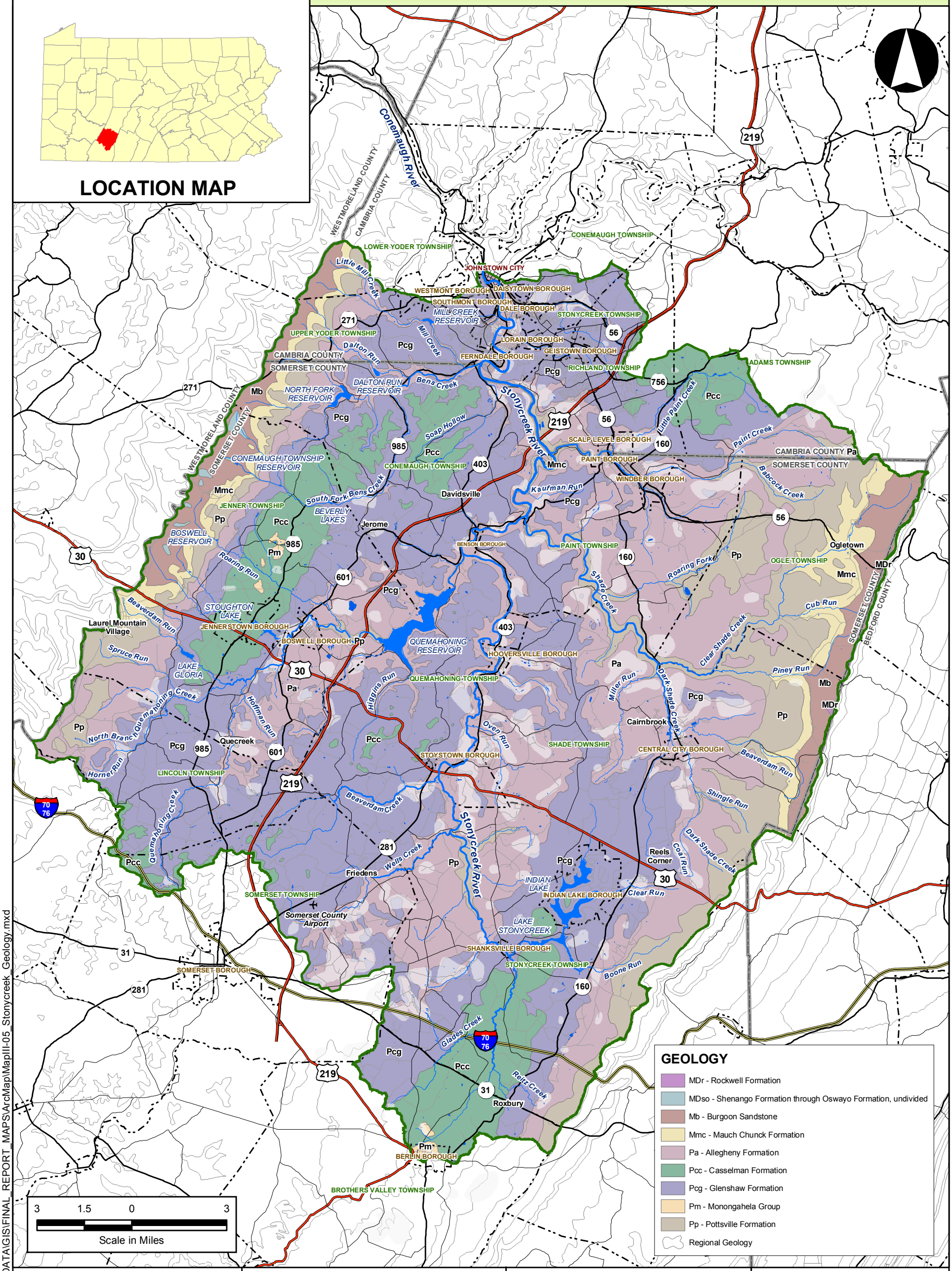
STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN

LOCATION MAP



GEOLOGY

- MDr - Rockwell Formation
- MDso - Shenango Formation through Oswayo Formation, undivided
- Mb - Burgoon Sandstone
- Mmc - Mauch Chunck Formation
- Pa - Allegheny Formation
- Pcc - Casselman Formation
- Pcg - Glenshaw Formation
- Pm - Monongahela Group
- Pp - Pottsville Formation
- Regional Geology

Map III-5
GEOLOGY

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Legend

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Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies -Derived from USFWS NWI Wetlands data
Geology - PA Dept of Conservation and Natural Resources:
PA Geologic Survey

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G. Land Cover

The Stonycreek River watershed covers a large area (469 square miles) dominated by forests and farm land. Forests (deciduous, coniferous, mixed forests and wooded wetlands) comprise approximately 52% of the watershed with farmland (pastures and row crops) accounting for about 36%. Only 5% of the watershed is classified as urban (high or low density) with the remaining areas classified as mines, quarries, water, emergent wetlands and transitional areas. Map III-6 displays the existing land cover of the watershed while Table III-2 details the land cover by category.

The land cover data for Stonycreek River watershed was derived from the USGS National Land Cover Dataset. This dataset was created for any number of purposes such as assessing wildlife habitat, water quality, pesticide runoff, land cover change, etc. The National Land Cover Dataset (NLDC) was compiled from Landsat satellite TM imagery (circa 1992) with a spatial resolution of 30 meters and supplemented by various ancillary data (where available). The Pennsylvania portion of the NLCD was created as part of land cover mapping activities for Federal Region III that includes the States of Maryland, Delaware, Pennsylvania, Virginia, West Virginia, and the District of Columbia. The NLCD was produced as a cooperative effort between the U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (US EPA) to produce a consistent, land cover data layer for the conterminous U.S. using early 1990s Landsat Thematic Mapper (TM) data purchased by the Multi-resolution Land Characterization (MRLC) Consortium.

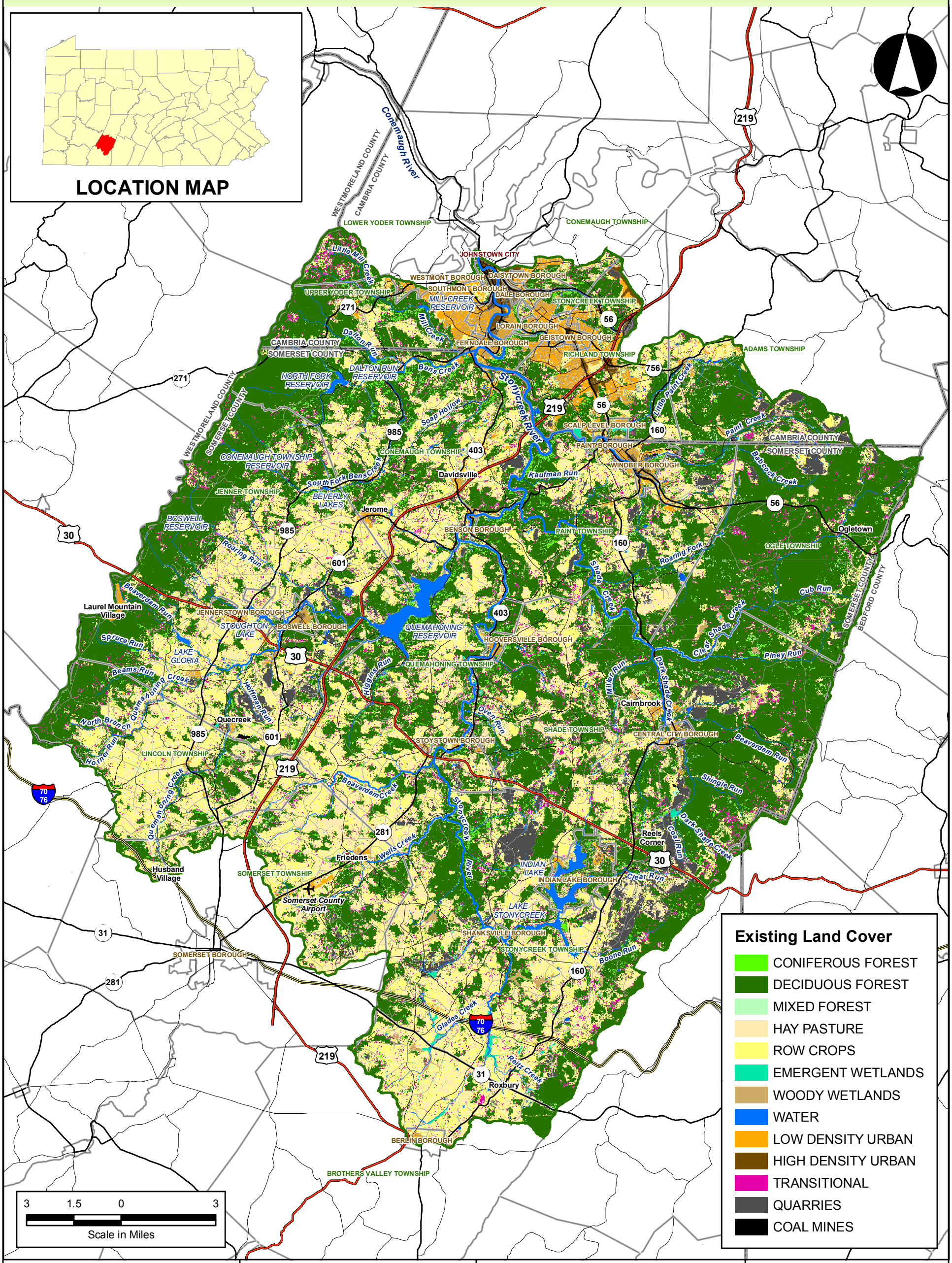
County Conservation District and Planning staff members live, travel, and work in the watershed. With an intimate knowledge of the watershed and its features, County staff members were able to review existing land cover conditions with great accuracy.

Field verifications took place on several occasions. County staff members identified, documented, and field measured every obstruction in the watershed over the course of a year. This field investigation not only served to identify and document obstructions, but allowed for watershed characteristics to be identified on both a regional and local scale. Cambria County and Somerset County staff members also performed a week long field investigation effort in May 2009 as a final verification of land cover features and watershed characteristics. Borton-Lawson staff also conducted watershed field investigations on two occasions. One general field survey was performed at the onset of the planning process (2004), and a second field survey was performed by the consultant at the onset of the technical analysis (2006) to verify watershed features pertinent to hydrologic modeling.

TABLE III-2
Land Cover by Category

LAND COVER DESCRIPTION	SQ MILES	ACRES	PERCENT AREA
COAL MINES	0.2	128	0.04
CONIFEROUS FOREST	8.2	5,248	1.75
DECIDUOUS FOREST	226.7	145,088	48.34
EMERGENT WETLANDS	0.8	512	0.17
HAY PASTURE	66.1	42,304	14.09
HIGH DENSITY URBAN	2.9	1,856	0.62
LOW DENSITY URBAN	19.4	12,416	4.14
MIXED FOREST	7.4	4,736	1.58
QUARRIES	15.2	9,728	3.24
ROW CROPS	96.5	61,760	20.58
TRANSITIONAL	19.1	12,224	4.07
WATER	4.8	3,072	1.02
WOODY WETLANDS	1.7	1,088	0.36
TOTAL	**469**	**300,160**	**100.00**

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



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Map III-6
EXISTING LAND COVER

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Legend

- WATERSHED BOUNDARY
- STREAMS
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- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES

Roads

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State and Local Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies -Derived from USFWS NWI Wetlands data
Existing Land Cover - Derived from PALULC2000, a statewide land cover map generated from Enhanced Thematic Mapper satellite data and three other ancillary data sources. Created by Penn State University

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PREPARED BY: WSB CHECKED BY: SJD
Date: 5/15/2009 PROJECT #: 2005-1719-00

H. Land Development Patterns

There is an abundant amount of undeveloped land which can be developed throughout the watershed. Table III-3 provides an overview of estimated projected development patterns over the next 10 years. These probable future land cover patterns were developed under moderate build-out conditions along major routes as well as input from the Cambria County Conservation District, Cambria County and Somerset County Planning Commissions, as well as logic (i.e., areas of undeveloped land that intersect major highways were developed and water bodies and wetlands were preserved). The future land cover depicts generalized patterns of development and is not intended to specify appropriate land covers for individual parcels of land or what will actually be developed in the watershed. Future land cover in the Stonycreek River watershed is depicted in Map III-7.

The majority (approximately 90%) of new development is expected to be low density urban; the remaining 10% is expected to be high density urban. The majority of this new development is expected to occur primarily near major road corridors in the central and lower portions of the watershed. In addition, an ultimate build-out scenario was developed for hydrologic comparison purposes.

These increased impervious areas were then included in the U.S. Army Corps of Engineers, Hydrologic Engineering Center, Hydrologic Modeling System (HEC-HMS) to develop future condition flows for the 2-, 5-, 10-, 25-, 50- and 100-year storms for both the moderate development and ultimate build-out scenarios. There is virtually no change in flow rates between existing conditions and the moderate development scenario, and in some areas the flow decreases due to some reforestation that is expected to occur in the southern and eastern portions of the watershed. A comparison of peak flows for the 100-year storm for future and existing conditions can be found in Table III-4.

In the ultimate build-out scenario, the increase in peak flow rates can vary drastically depending on the local subarea conditions and the location in the watershed where the comparison is being made. For instance, the increase in the 100-year flow from existing to ultimate build-out conditions at the outlet of the Stonycreek River watershed is ***3.8%***; the flow rate increases from 44,921 cfs to 46,650 cfs (1,729 cfs increase). However, the maximum increase in the subareas comprising the watershed is ***35.4%***; the 100-year flow rate in subarea W1190 increases from 4,598 cfs to 6,223 cfs (1,625 cfs increase). To determine a representative percent increase for the watershed from existing conditions to ultimate build-out conditions, the average increase in flow rates for the 100-year storm for all subareas was calculated. The ultimate build-out 100-year storm hydrograph peak was found to be an average of ***15.8%*** greater than the existing 100-year storm hydrograph peak flow; in other words, the watershed may experience on average ***115.8%*** of the present 100-year storm peak flows, if proper stormwater management techniques are not implemented. Table III-4 summarizes the flows for each subwatershed for existing conditions and for the two future land cover projections, assuming proper stormwater management facilities are not installed.

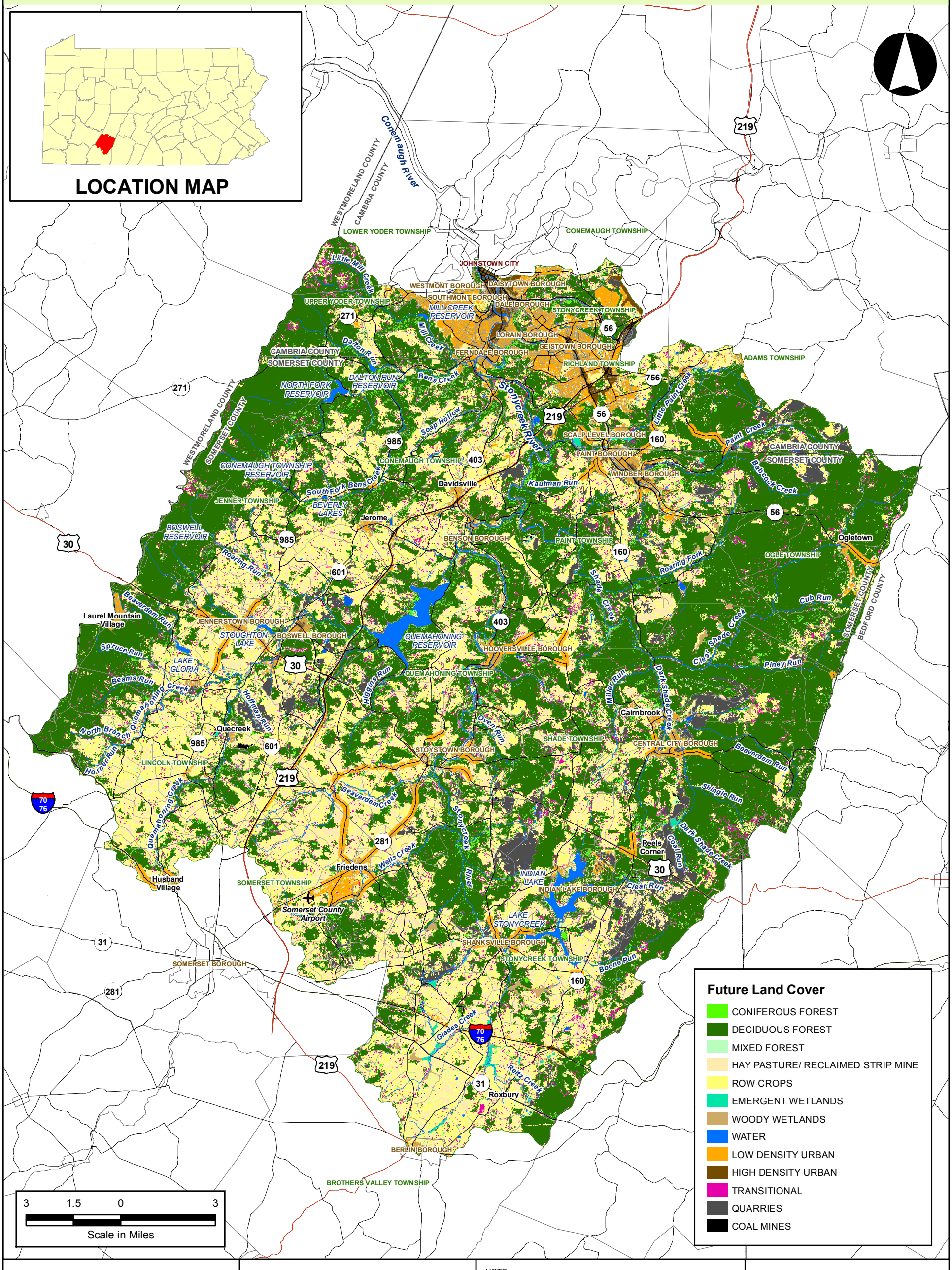
Other storm frequencies can be found in Volume III, Technical Appendix. Increased development in a watershed increases runoff peaks, volumes and velocities. This decreases the time to peak, worsening the frequency of flooding.

TABLE III-3
Development Potential by Municipality
Based Upon Existing Patterns in the Stonycreek River Watershed

Municipality	CM	FO	HD	HP	LD	RC	QU	TR	WA	WE
Adams Twp	---	R	---	R	X	R	---	---	---	---
Benson Boro	---	---	---	---	---	---	---	---	---	---
Berlin Boro	---	---	---	R	X	R	---	---	---	---
Boswell Boro	---	R	---	---	X	R	---	---	---	---
Brothers Valley Twp	---	R	---	---	X	R	---	---	---	---
Central City Boro	---	---	---	---	---	---	---	---	---	---
Conemaugh Twp (Cambria)	---	R	---	R	X	R	---	---	---	---
Conemaugh Twp (Somerset)	---	R	X	---	O	R	---	---	---	---
Daisytown Boro	---	---	X	---	R	---	---	---	---	---
Dale Boro	---	---	---	---	---	---	---	---	---	---
Ferndale Boro	---	---	X	---	R	---	---	---	---	---
Geistown Boro	---	---	X	---	R	---	---	---	---	---
Hooversville Boro	---	---	---	---	---	---	---	---	---	---
Indian Lake Boro	---	---	---	---	---	---	---	---	---	---
Jenner Twp	---	R	---	R	X	R	---	---	---	---
Jennerstown Boro	---	R	---	R	X	R	---	---	---	---
Johnstown City	---	---	X	---	R	---	---	---	---	---
Lincoln Twp	---	R	---	R	X	R	---	---	---	---
Lorain Boro	---	R	X	---	R	---	---	---	---	---
Lower Yoder Twp	---	---	---	---	---	---	---	---	---	---
Ogle Twp	---	---	---	---	O	R	---	---	---	---
Paint Boro	---	R	---	---	X	R	---	---	---	---
Paint Twp	---	R	---	R	X	R	---	---	---	---
Quemahoning Twp	---	R	---	R	X	R	---	---	---	---
Richland Twp	---	R	X	R	X	R	---	---	---	---
Scalp Level Boro	---	R	O	---	O	R	---	---	---	---
Shade Twp	---	R	---	R	X	R	---	---	---	---
Shanksville Boro	---	R	---	---	O	---	---	---	---	---
Somerset Twp	---	R	---	R	X	R	---	---	---	---
Southmont Boro	---	---	X	---	R	---	---	---	---	---
Stonycreek Twp (Somerset)	---	R	---	R	X	R	---	---	---	---
Stonycreek Twp (Cambria)	---	R	X	---	O	---	---	---	---	---
Stoystown Boro	---	---	---	---	---	---	---	---	---	---
Upper Yoder Twp	---	---	O	R	R	R	---	---	---	---
Westmont Boro	---	---	X	---	R	---	---	---	---	---
Windber Boro	---	R	---	---	O	R	---	---	---	---

CM – Coal Mines	--- No Impact
FO – Coniferous, Deciduous, or Mixed Forest	O Minor Impact
HD – High Density Urban	X Major Impact
HP – Hay Pasture	R Reduction in Land Cover
LD – Low Density Urban	
QU – Quarry	
RC – Row Crops	
TR – Transitional	
WA – Water	
WE – Emergent or Woody Wetlands	

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



Map III-7
FUTURE
LAND COVER

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Legend

- WATERSHED BOUNDARY
- STREAMS
- WATER BODIES
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES

Roads

- Interstate
- US Federal Highway
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Water Bodies -Derived from USFWS NWI Wetlands data
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Date: 5/15/2009 PROJECT #: 2005-1719-00

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TABLE III-4
Present (Existing) Versus Future Combined Peak Flows –
100-Year 24-Hour Storm

Subarea No.	Subarea Area (sq. mi.)	Cumulative Area (sq. mi.)	Existing Peak Q (cfs)	Moderate Development Peak Q (cfs)	Ultimate Build-Out Peak Q (cfs)
W1000	7.28	7.28	1,792	1,791	2,397
W1010	2.56	6.87	452	452	452
W1020	0.07	6.87	40	40	40
W1040	8.81	8.81	1,177	1,171	1,529
W1050	6.43	36.82	1,598	1,598	1,689
W1060	1.93	36.82	477	477	621
W1070	0.32	43.74	83	83	83
W1080	18.71	43.74	3,120	3,106	3,149
W1090	19.04	24.72	2,528	2,517	3,250
W1100	3.55	126.39	1,136	1,125	1,185
W1110	6.02	28.45	1,529	1,526	1,559
W1120	0.04	28.45	57	57	58
W1130	10.16	10.16	1,815	1,805	2,224
W1140	7.28	126.39	2,319	2,319	2,519
W1150	12.24	12.24	2,544	2,531	3,141
W1160	18.73	115.55	5,661	5,645	6,981
W1170	1.92	115.55	488	489	519
W1180	17.07	94.90	4,976	4,964	5,055
W1190	18.08	77.83	4,598	4,586	6,223
W1200	7.60	7.60	6,294	6,299	6,490
W1210	6.27	6.27	5,119	5,115	6,278
W1220	0.88	24.36	1,040	1,040	1,077
W1240	6.89	59.76	2,282	2,282	2,339
W1250	9.62	24.36	6,417	6,404	8,380
W1260	0.02	26.60	18	18	18
W1270	0.01	26.60	11	11	11
W1280	5.06	5.06	1,529	1,525	2,008
W1290	11.55	11.55	3,240	3,229	4,342
W1300	5.00	5	1,671	1,660	1,732
W1310	4.97	4.97	1,512	1,503	1,547
W1320	1.84	24.72	611	606	790
W1340	3.83	3.83	669	662	867
W1380	3.06	32.88	971	971	1,280
W1390	9.82	9.82	2,046	2,030	2,680
W1430	1.08	38.22	453	453	598
W1450	3.91	3.91	1,100	1,095	1,461
W1490	4.67	99.26	1,370	1,370	1,811
W1500	8.60	25.26	2,591	2,590	3,435

TABLE III-4 (CONT.)

W1540	1.01	59.76	1,086	1,077	1,119
W1550	0.90	25.26	1,111	1,112	1,121
W670	1.43	468.19	1,271	1,265	1,299
W680	8.29	466.77	4,469	4,479	5,023
W690	7.38	49.37	2,089	2,076	2,111
W700	7.16	466.77	3,147	3,142	3,524
W710	0.23	49.59	137	137	181
W720	0.34	401.73	356	355	365
W730	3.77	49.37	1,488	1,488	1,490
W750	12.30	33.93	4,671	4,654	6,281
W760	7.75	401.39	3,015	3,016	3,314
W770	6.34	401.39	2,517	2,517	3,300
W780	0.35	38.22	214	214	269
W800	20.00	32.88	3,242	3,239	4,313
W810	2.57	387.31	2,041	2,043	2,191
W820	1.20	33.93	1,251	1,246	1,627
W830	4.28	387.31	1,550	1,550	1,567
W840	13.07	13.07	3,539	3,528	3,677
W850	7.36	7.36	3,386	3,387	4,538
W860	4.53	249.01	2,060	2,060	2,133
W870	9.13	97.52	1,566	1,565	1,986
W880	20.61	20.61	2,313	2,308	3,035
W900	18.83	145.22	3,722	3,718	5,021
W910	12.56	88.39	2,404	2,403	3,201
W920	12.05	71.16	1,715	1,710	2,247
W930	9.68	57.09	1,487	1,475	1,496
W940	6.96	88.39	1,426	1,425	1,836
W950	2.02	71.16	457	457	510
W960	1.61	85.99	356	356	414
W970	3.67	57.09	1,209	1,208	1,230
W980	0.05	85.99	83	83	83
W990	5.90	5.90	1,061	1,061	1,073

Note: The computed flow values were derived for watershed planning purposes and should not be considered regulatory values for permitting purposes. While they may be used for comparison or checking purposes, additional hydrologic computations may be needed for the design of bridges, culverts and dams.

I. Present (Existing) and Projected Development in the Flood Hazard Areas

The U.S. Department of Housing and Urban Development, Federal Insurance Administration, and Federal Emergency Management Agency (FEMA) prepares Flood Insurance Studies (FISs) and floodplain mapping for the municipalities in the Stonycreek River watershed. This activity is now a responsibility of the U.S. Department of Homeland Security. Municipalities and the Pennsylvania Department of Community and Economic Development (PADCED) should be contacted as to the latest FIS studies before use.

There are two types of studies conducted in the FIS program: detailed and approximate. Detailed methods include hydrologic computations and detailed HEC-2 or HEC-RAS backwater computations. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction. Areas studied by the approximate methods were areas having low development potential or minimal flood hazards.

Map III-8A shows the 100-year floodplains classified as detailed and approximate as taken from the FEMA mapping for the Stonycreek River watershed, overlain with existing land cover conditions. Encroachments of residential, industrial, and commercial land covers are shown by overlaying these areas on the floodplain in the GIS. Approximately 11,683 acres (4%) of the watershed are within the floodplains. Of these 11,683 acres, roughly 1,700 are developed. The remainder is forest, wetlands, row crops, hay pastures, or water. Table III-5 provides a summary of the total amount of developed floodplain area.

TABLE III -5
Summary of the Total Amount of Developed Floodplain Area

Existing Land Cover	Acres in Floodplain	Square Miles in Floodplain
Coal Mines	3.3	<0.01
High Density Urban	549.8	0.86
Low Density Urban	685.1	1.07
Quarries	85.1	0.13
Transitional	376.3	0.59
TOTAL	**1,699.6**	**2.66**

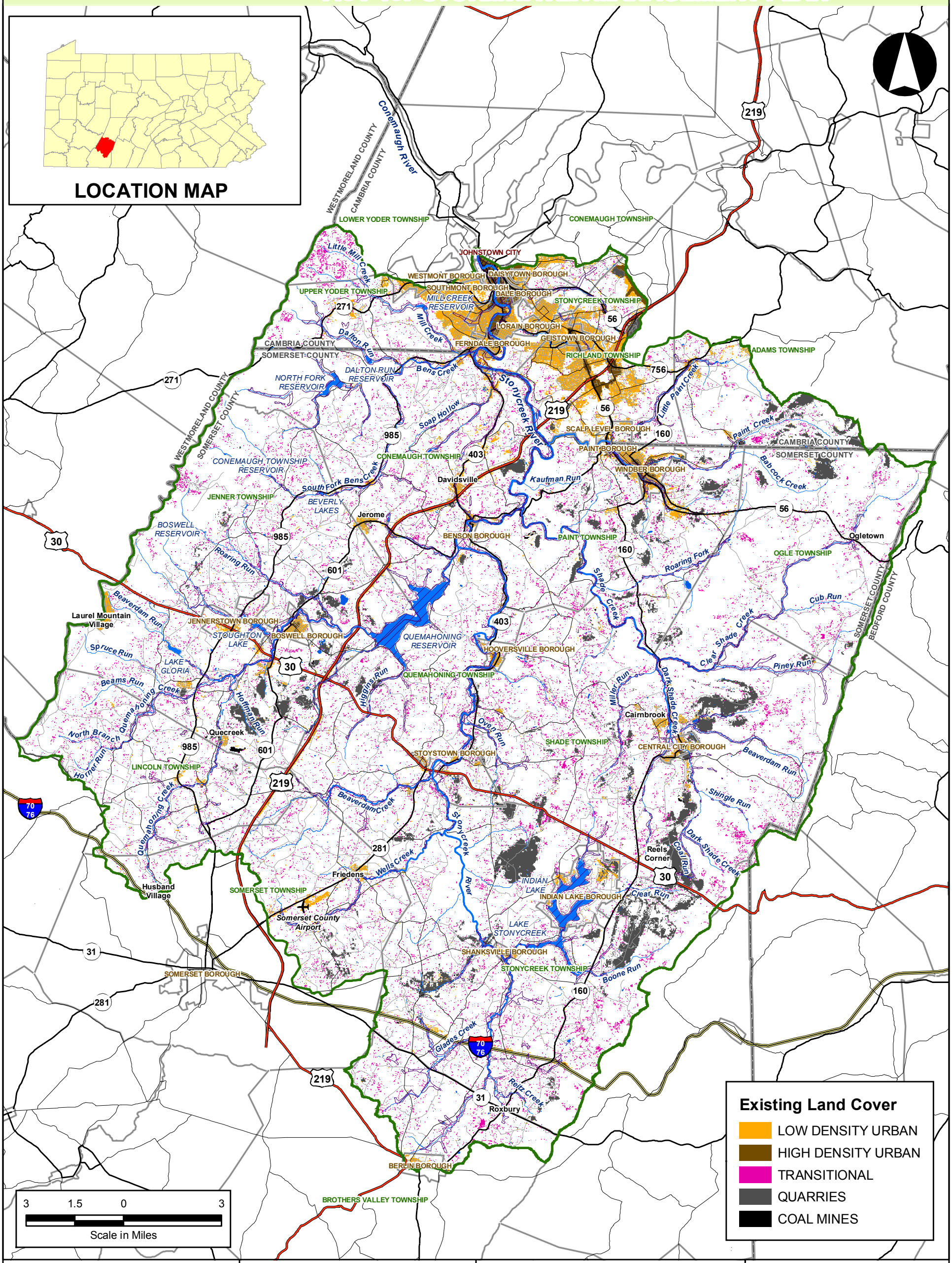
Map III-8B shows the 100-year floodplains classified as detailed and approximate as taken from the FEMA mapping for the Stonycreek River watershed, overlain with future land cover conditions. By overlaying the Future Land Cover with the floodplain it is projected that of the 11,683 acres in the floodplain, roughly 1,980 will be developed. The remainder will remain forest, wetlands, row crops, hay pastures, or water. Table III-6 provides a summary of the total amount of future developed floodplain area.

TABLE III -6
Summary of the Total Amount of Future Developed Floodplain Area

Future Land Cover	Acres in Floodplain	Square Miles in Floodplain
Coal Mines	3.2	<0.01
High Density Urban	549.8	0.86
Low Density Urban	981.8	1.53
Quarries	83.7	0.13
Transitional	364.3	0.57
TOTAL	**1,982.8**	**3.10**

The overall evaluation of the municipal questionnaires which were received shows several occurrences of stream flooding throughout the watershed during major storm events, resulting in property damages.

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



Map III-8A
FLOODPLAINS AND DEVELOPMENT

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Legend

- WATERSHED BOUNDARY
- 100 - YEAR FLOODPLAINS
- STREAMS
- WATER BODIES
- COUNTY BOUNDARIES
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Floodplains -

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CHECKED BY: SJD
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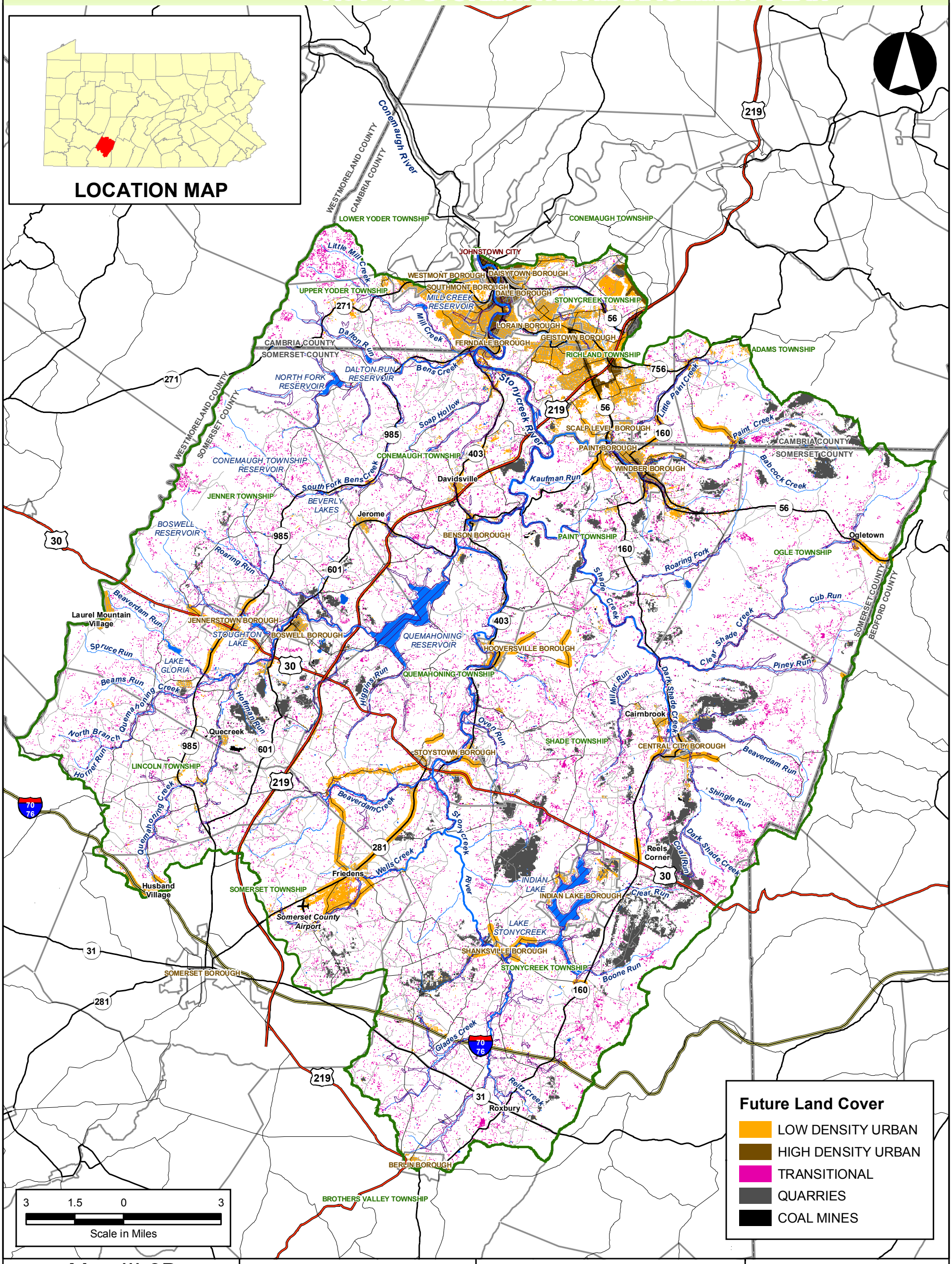
STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



Map III-8B
FLOODPLAINS AND FUTURE DEVELOPMENT

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Legend

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PREPARED BY: SAV
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Stormwater management planning is critical in the areas both affected and currently unaffected by stormwater problems in the Stonycreek River watershed. For areas which are currently being affected, the frequency of flooding is mainly during larger storm events. The Act 167 Plan can significantly address future more frequent flooding problems in these areas by managing runoff from newly developing areas. This Plan shall also provide these communities with information essential in evaluating and upgrading current undersized stormwater systems as indicated in Section III-J. For areas currently unaffected by stormwater problems, the Act 167 Plan shall provide controls on future development to aid in preventing future stormwater runoff problems.

One of the biggest problems in floodplain management is the increase in peak flow caused by development in the watershed. Recognizing this, the National Flood Insurance Program (NFIP) has developed a Community Rating System (CRS) to give communities credit for floodplain management activities that exceed the minimum requirements. As part of this rating system, credit points can be awarded to communities if they implement the following:

- Regulatory language (ordinance) requiring peak rate of runoff from development to be no greater than the predevelopment runoff
- A stormwater master plan (such as this Act 167 Plan)
- State review of the stormwater management plan
- Requirement for a building's lowest floor to be elevated above flood levels
- Erosion and sediment control regulations (such as Chapter 102)
- Water quality regulations

The more credits a community can accumulate, the less its residents will have to pay for flood insurance. For further information on the community rating system, the publication *"CRS Credit for Stormwater Management,"* January 2006, published by FEMA, is available online at the FEMA website: http://www.fema.gov/business/nfip/crs.shtm

J. Obstructions

Locations of significant waterway obstructions (i.e., culverts, bridges, etc.) were obtained by inspection of the United States Geologic Survey (USGS) topographic base map. Data on these obstructions was then obtained from the Pennsylvania Department of Transportation (PADOT), FEMA Flood Insurance Studies, and field surveys.

The obstruction flow capacities were compared to the peak flow at that point derived through the modeling process for each design storm frequency. The obstructions were then classified into seven categories as follows:

- Those obstructions which are able to pass the 100-year, 24-hour storm and lesser without obstructing the flow

- Those obstructions which are able to pass the 50-year, 24-hour storm and lesser without obstructing the flow

- Those obstructions which are able to pass the 25-year, 24-hour storm and lesser without obstructing the flow

- Those obstructions which are able to pass the 10-year, 24-hour storm and lesser without obstructing the flow

- Those obstructions which are able to pass the 5-year, 24-hour storm and lesser without obstructing the flow

- Those obstructions which are able to pass the 2-year, 24-hour storm and lesser without obstructing the flow

- Those obstructions which are NOT able to pass the 2-year, 24-hour storm and greater without obstructing the flow.

The locations of all obstructions, including those that fall into the seven categories above, can be found in Maps III-9A – III-9E. The obtained data and the obstruction flow capacities can be found in the Technical Appendix.

During the field work phase of this project, project team members noted that there were large numbers of pipes and culverts either in disrepair or clogged to a point that the flow capacity of the pipe was reduced or completely blocked. It is recommended that municipalities take advantage of the data collected and shown in Maps III-9A through III-9E to rank which culverts may need repair. A program should be established by the municipalities to maintain unobstructed flow on all culverts and bridges.

K. Existing Drainage Problems and Proposed Solutions

Information on drainage problems and proposed solutions was solicited from each municipality within the Stonycreek River watershed by providing forms to each Watershed Plan Advisory Committee (WPAC) member early in the Watershed Plan study.

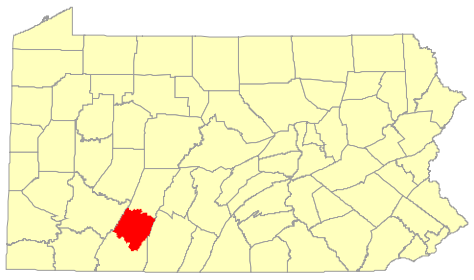
Problems were discussed at the WPAC meetings and were varied, ranging from regional flooding to minor, local in nature, consisting of mostly clogged or undersized inlets and cross pipes.

The recorded stormwater related problems were analyzed to determine if they were caused by localized (i.e., inadequately sized storm sewers) or regional (i.e., stream overbank flooding) sources. As can be seen in Map III-10, the problems identified can be classified generally into one of these two classes. One is those directly related to or adjacent to the stream, an indication of a regional or watershed-wide problem. The other problem areas are most likely caused by a localized situation, inadequately sized stormwater conveyance systems, sedimentation, or uncontrolled local runoff.

Table III-7 summarizes the problems discussed. These are shown graphically in Map III-10 (Problem Areas). Potential solutions to existing stormwater problems were documented by the municipalities on Form A – Problem Areas as part of the data collection effort and further discussed at WPAC meetings. Cambria County and Somerset County participate in the Chapter 105 program and make technical advice available upon request. The counties reviewed all municipal data collected as part of this Plan for consistency and accuracy.

Forty six (46) problem areas were identified in this study, including several types of problems. The type, cause, and occurrence of these problems are indicated on Table III-7. The categories selected in Table III-7 typically have similar causes and solutions that are discussed below.

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



LOCATION MAP

1.25 0.625 0 1.25

Scale in Miles

Obstructions

- Able to Pass 100-Year Flow
- Able to Pass 50-Year Flow
- Able to Pass 25-Year Flow
- Able to Pass 10-Year Flow
- Able to Pass 5-Year Flow
- Able to Pass 2-Year Flow
- Undersized
- Undetermined

WESTMORELAND COUNTY
CAMBRIA COUNTY
SOMERSET COUNTY
Conemaugh River
LOWER YODER TOWNSHIP
UPPER YODER TOWNSHIP
JOHNSTOWN CITY
WESTMONT BOROUGH
DAISYTOWN BOROUGH
DALE BOROUGH
SOUTHMONT BOROUGH
LORAIN BOROUGH
FERNDALE BOROUGH
CONEMAUGH TOWNSHIP
JENNER TOWNSHIP
JENNERSTOWN BOROUGH
BOSWELL BOROUGH
BENSON BOROUGH
Davidsville
Jerome
Little Mill Creek
Dalton Run
Mill Creek
Bens Creek
Stonycreek River
Soap Hollow
South Fork Bens Creek
Roaring Run
DALTON RUN RESERVOIR
NORTH FORK RESERVOIR
CONEMAUGH TOWNSHIP RESERVOIR
BOSWELL RESERVOIR
STOUGHTON LAKE
BEVERLY LAKES
QUEMAHONING RESERVOIR
271
985
601
403
BC104
SCR1
SCR2
SCR3
SCR10
SCR11
SCR12
SCR13
SCR16
SCR14
SCR15
SCR4
SCR8
SCR9
SCR7
SCR6
SCR5
SCR226
SCR22
BC1
BC2
BC142
BC143
BC103
BC8
BC7
BC106
BC105
BC107
BC108
BC109
BC144
SCR116
SCR115
BC23
BC14
BC13
BC110
BC12
SCR215
SCR214
SCR87
BC15
SCR89
SCR88
SCR227
BC102
BC10
BC4
BC9
BC22
BC24
BC100
BC99
BC27
BC98
BC3
BC11
BC36
BC111
SCR43
SCR90
BC21
BC35
BC112
SCR212
SCR213
BC101
BC97
BC5
BC6
BC16
BC20
BC34
SCR44
SCR165
BC118
BC17
BC33
SCR50
SCR45
SCR46
SCR74
BC25
BC119
BC30
BC113
SCR68
SCR52
SCR69
SCR49
BC26
BC123
BC18
SCR209
SCR70
SCR47
SCR75
BC117
BC122
BC19
SCR73
SCR71
SCR76
BC121
BC31
BC114
SCR72
SCR48
SCR43
SCR51
BC28
BC124
SCR59
SCR55
SCR53
SCR78
BC120
BC32
SCR57
SCR211
SCR79
BC69
BC67
BC29
SC2G
SCR58
SCR77
SCR80
BC134
BC66
BC38
SCR60
SCR56
SCR81
BC135
BC65
BC37
SCR82
BC68
BC125
SCR67
SCR61
SCR54
SCR83
BC137
BC136
BC127
SCR104
SCR66
SCR210
SCR84
SCR108
BC133
BC128
BC126
SCR65
SCR62
SCR105
SCR107
BC64
BC58
SCR64
SCR63
SCR85
BC94
BC96
BC39
SCR106
BC93
BC63
BC129
BC57
BC49
BC91
BC95
BC138
BC40
BC48
BC50
SCR103
SCR181
BC92
BC62
BC41
BC52
SCR100
SCR102
SCR182
BC73
BC139
BC90
BC89
BC46
BC51
SCR101
SCR98
SCR162
BC72
BC71
BC70
BC141
BC61
BC53
SCR99
BC74
BC47
BC54
SCR97
SCR120
BC75
BC60
BC45
SCR111
SC3C
BC59
BC44
BC55
SCR114
BC77
BC87
BC83
BC42
BC56
SCR121
QC117
BC132
BC76
BC140
BC84
BC43
SCR113
SCR115
BC79
BC85
BC130
QC3
SCR112
QC116
QC118
BC80
BC78
BC131
BC88
BC86
QC5
SCR216
SCR117
SCR119
QC113
QC7
QC212
QC6
SCR118
QC114
BC81
QC223
QC8
QC9
SCR116
SCR115
SCR161
QC240
QC112
BC82
QC35
QC1
QC11
SCR125
QC115
SC3F
QC222
QC2
QC34
QC4
QC10
SCR124
QC110
QC36
QC20
QC33
QC12
QC14
SCR159
SC3E
QC111
QC37
QC33
QC13
SCR127
QC186
QC58
QC17
QC15
QC188
QC187
QC57
QC213
QC21
SCR217
QC119
QC215
QC16
SCR160
QC129
QC128
QC56
QC120
QC130
QC122
QC54
SCR126
QC55
QC22
SC3D
SC3C
QC52
QC125
QC243
QC216
QC23
SCR128
SCR131
QC124
QC43
QC109
QC38
SC3B
QC121
QC217
QC24
SCR130
QC123
QC42
QC50
QC221
QC132
QC225
QC224
QC53
QC59
SCR129
SCR132
QC127
QC44
QC40
QC51
QC18
SCR158
QC133
SC4C
QC41
QC39
SC3A
SCR133
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QC135
QC126
QC146
QC232
SCR135
SCR220
QC144
QC47
SCR136

FILE: \\Athens\d\Projects\2005\1719\00\DATA\GIS\FINAL_REPORT_MAPS\ArcMap\MapIII-09A_Stonycreek_Obstructions.mxd

Map III-9A
OBSTRUCTIONS

Prepared For:
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Legend

- WATERSHED BOUNDARY
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

NOTE:
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SOURCES:
Watershed Boundary - PADEP Modified by BLE
State and Local Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies - Derived from USFWS NWI Wetlands data
Obstructions - Cambria County

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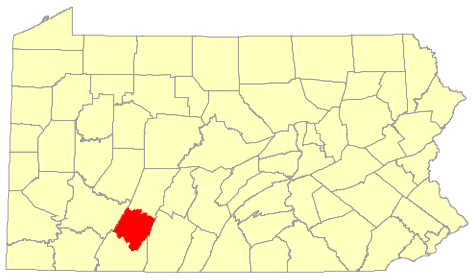
PREPARED BY: SAV CHECKED BY: SJD
Date: 5/15/2009 PROJECT #: 2005-1719-00

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



LOCATION MAP

1.25 0.625 0 1.25
Scale in Miles

Obstructions
- Able to Pass 100-Year Flow
- Able to Pass 50-Year Flow
- Able to Pass 25-Year Flow
- Able to Pass 10-Year Flow
- Able to Pass 5-Year Flow
- Able to Pass 2-Year Flow
- Undersized
- Undetermined

CONEMAUGH TOWNSHIP
STONYCREEK TOWNSHIP
LORAIN BOROUGH
GEISTOWN BOROUGH
RICHLAND TOWNSHIP
ADAMS TOWNSHIP
SCALP LEVEL BOROUGH
PAINT BOROUGH
WINDBER BOROUGH
PAINT TOWNSHIP
OGLE TOWNSHIP
ERSVILLE BOROUGH
Ogletown
CAMBRIA COUNTY
SOMERSET COUNTY
BEDFORD COUNTY
Stonycreek River
Little Paint Creek
Paint Creek
Babcock Creek
Kaufman Run
Shade Creek
Roaring Fork
Cub Run
56
160
219
756

Map III-9B
OBSTRUCTIONS

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Legend
- WATERSHED BOUNDARY
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

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County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies - Derived from USFWS NWI Wetlands data
Obstructions - Cambria County

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PREPARED BY: SAV CHECKED BY: SJD
Date: 5/15/2009 PROJECT #: 2005-1719-00

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STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN

Obstructions

- Able to Pass 100-Year Flow
- Able to Pass 50-Year Flow
- Able to Pass 25-Year Flow
- Able to Pass 10-Year Flow
- Able to Pass 5-Year Flow
- Able to Pass 2-Year Flow
- Undersized
- Undetermined

1.25 0.625 0 1.25

Scale in Miles

Map III-9C
OBSTRUCTIONS

Prepared For:
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Legend

- WATERSHED BOUNDARY
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

NOTE:
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County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies - Derived from USFWS NWI Wetlands data
Obstructions - Cambria County

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PREPARED BY: SAV CHECKED BY: SJD
Date: 5/15/2009 PROJECT #: 2005-1719-00

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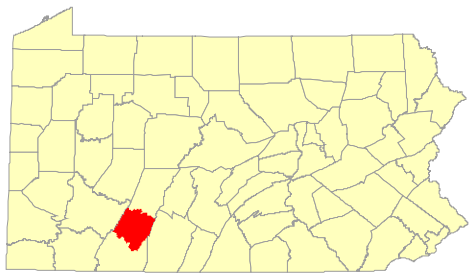
STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



LOCATION MAP

QUEMAHONING TOWNSHIP
STOYSTOWN BOROUGH
SHADE TOWNSHIP
Carinbrook
Reels Corner
INDIAN LAKE BOROUGH
INDIAN LAKE
SHANKSVILLE BOROUGH
LAKE STONYCREEK
STONYCREEK TOWNSHIP
Friedens
Somerset County Airport
Roxbury
BERLIN BOROUGH
Oven Run
Beaverdam Creek
Wells Creek
Stonycreek River
Glades Creek
Reitz Creek
Miller Run
Clear Run
Boone Run

1.25 0.625 0 1.25
Scale in Miles

Obstructions

- Able to Pass 100-Year Flow
- Able to Pass 50-Year Flow
- Able to Pass 25-Year Flow
- Able to Pass 10-Year Flow
- Able to Pass 5-Year Flow
- Able to Pass 2-Year Flow
- Undersized
- Undetermined

Map III-9D
OBSTRUCTIONS

Prepared For:
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Legend

- WATERSHED BOUNDARY
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

NOTE:
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SOURCES:
Watershed Boundary - PADEP Modified by BLE
State and Local Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies - Derived from USFWS NWI Wetlands data
Obstructions - Cambria County

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PREPARED BY: SAV CHECKED BY: SJD
Date: 5/15/2009 PROJECT #: 2005-1719-00

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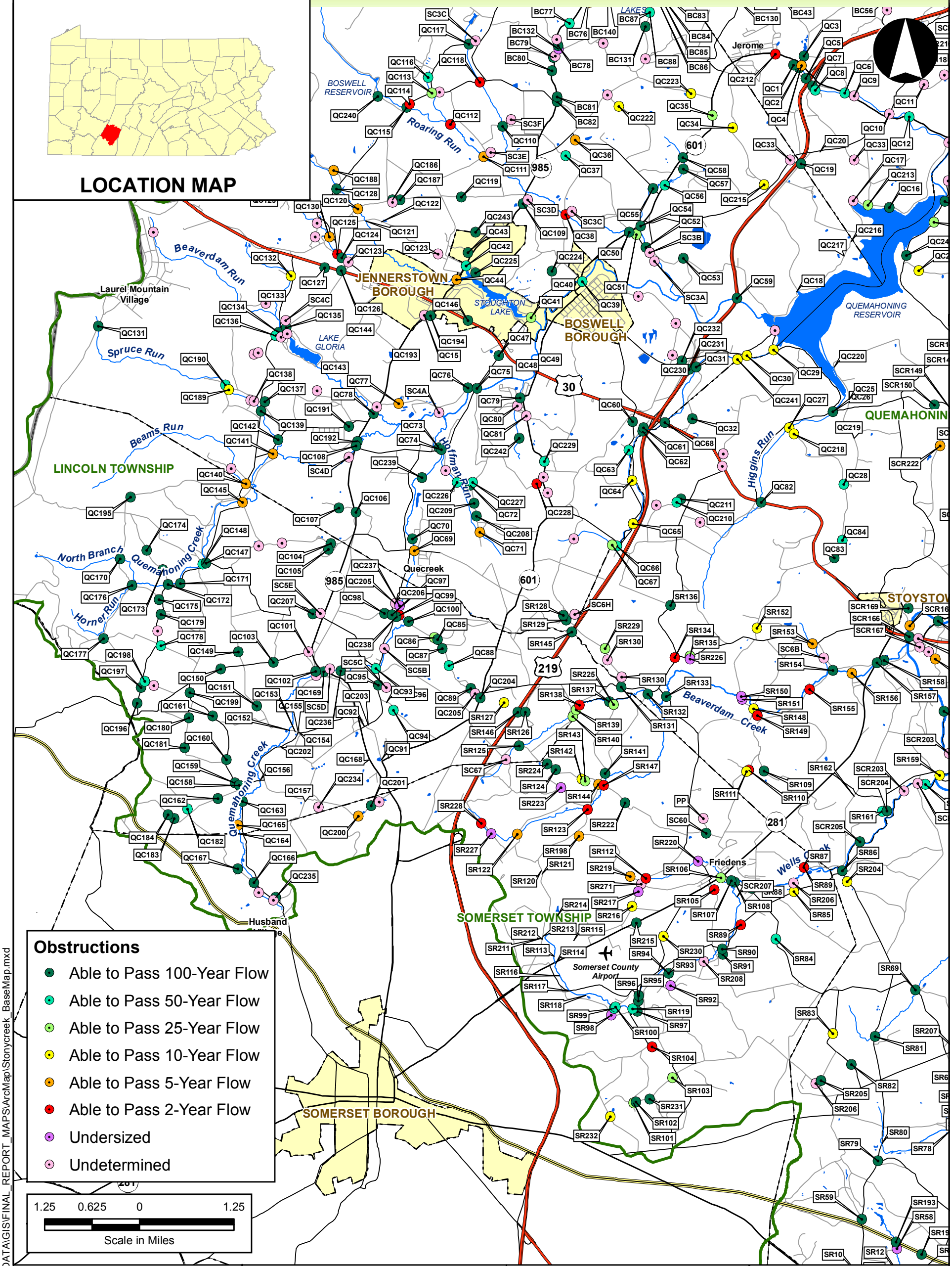
STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN

LOCATION MAP



Obstructions

- Able to Pass 100-Year Flow
- Able to Pass 50-Year Flow
- Able to Pass 25-Year Flow
- Able to Pass 10-Year Flow
- Able to Pass 5-Year Flow
- Able to Pass 2-Year Flow
- Undersized
- Undetermined

1.25 0.625 0 1.25

Scale in Miles

Map III-9E
OBSTRUCTIONS

Prepared For:
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Legend

- WATERSHED BOUNDARY
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

NOTE:
Portions of this map were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this ACT 167 Plan to correct all of the mapping data.

SOURCES:
Watershed Boundary - PADEP Modified by BLE
State and Local Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies - Derived from USFWS NWI Wetlands data
Obstructions - Cambria County

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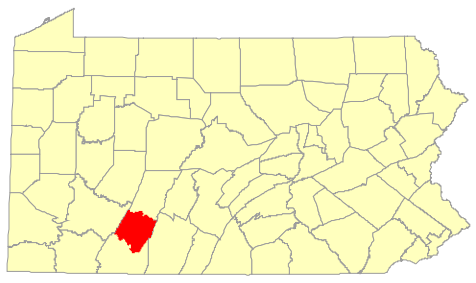
Bethlehem, PA 18017
Tel: 484-821-0470

PREPARED BY: SAV CHECKED BY: SJD
DATE: 2/6/2008 PROJECT #: 2005-1719-00

FILE: \\WBData\Projects\2005\1719\00\DATA\GIS\FINAL_REPORT_MAPS\ArcMap\Stonycreek_BaseMap.mxd

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



LOCATION MAP

Map III-10
PROBLEM AREAS

Prepared For:
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Legend

- WATERSHED BOUNDARY
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- BOROUGH
- CITY

Roads

- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

Problems

- 1 Type of Problem Reported
- 2 Types of Problems Reported
- 3 Types of Problems Reported
- 4 Types of Problems Reported
- 5 Types of Problems Reported
- Water Quality Problem Areas

3 1.5 0 3
Scale in Miles

NOTE:
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SOURCES:
Watershed Boundary - PADEP Modified by BLE
State and Local Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies - Derived from USFWS NWI Wetlands data
Problem Areas - Municipalities within the Watershed

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PREPARED BY: WSB CHECKED BY: SJD
Date: 5/15/2009 PROJECT #: 2005-1719-00

FILE: \\Athens\d\Projects\2005\1719\00\DATA\GIS\FINAL_REPORT_MAPS\ArcMap\MapIII-10_Stonycreek_Prob_Areas.mxd

TABLE III-7 Stonycreek River Watershed Problems				
Municipality	**Type Of Problems**	**Causes Of Problems**	**Occurrences Of Problems**	**Types Of Damage**
	(A)	(B)	(C)	(D)
Adams Township	1,2,3,4,5,6	1,2,4	1	3
Benson Borough				
Berlin Borough	1,3	1,4	1	3
Boswell Borough				
Brothers Valley Township				
Central City Borough				
Conemaugh Township (Cambria County)	2	1	2	
Conemaugh Township (Somerset County)				
Daisytown Borough				
Dale Borough				
Ferndale Borough				
Geistown Borough	2,3	1,2,3,4	1	
Hooversville Borough				
Indian Lake Borough				
Jenner Township	1	1	1,2	3
Jennerstown Borough				
Johnstown City				
Lincoln Township	1,2,3,5,6	1,2,3,4	1	1,2,3
Lorain Borough				
Lower Yoder Township				
Ogle Township	1,2,3,5	1	1	3
Paint Borough	1,3	1	1	3
Paint Township				
Quemahoning Township	1	1		3
Richland Township				
Scalp Level Borough				
Shade Township				
Shanksville Borough				
Somerset Township	1,3,6	1,2	1	
Southmont Borough				
Stonycreek Township (Somerset County)	1,3	4	1	
Stonycreek Township (Cambria County)	1,3,5	1,2	1,2	3
Stoystown Borough				
Upper Yoder Township	1,2	1,2,3	2	3
Westmont Borough				
Windber Borough				

Types of Problems		Causes of Problems	
(A)	1. Flooding	(B)	1. Stormwater Volume
	2. Accelerated Erosion		2. Stormwater Velocity
	3. Sedimentation		3. Stormwater Direction
	4. Landslide		4. Water Obstruction
	5. Groundwater		5. Other
	6. Water Quality		
	7. Other		
Occurrences of Problems		**Types of Damages**	
(C)	1. > 1 time per year	(D)	1. Loss of life
	2. < 1 time per year		2. Loss of vital services
	3. Only major flood events		3. Property damage

Flooding (Type 1 in Table III-7)

As discussed in Section III-I, Stonycreek River and its tributaries have caused flooding conditions in the Stonycreek River watershed. The areas within the watershed immediately adjacent to Stonycreek River and various low lying wetland areas are generally subject to minor flooding after rain or thaw conditions. Flooding in the watershed can be classified into two categories: 1) local flooding caused by inadequately sized storm culverts; and 2) flooding caused by the location of structures within the floodplain of the major tributaries. Of the sites identified in Table III-7, most are caused by inadequate conveyance systems in developed areas.

Potential Solutions: To fix these problems municipalities must first identify and prioritize the problems based upon their severity. After the problems are prioritized to identify the most urgent problems, the Municipality should complete a hydraulic analysis to identify the causes of the problem and propose a solution. Some of the problems can be fixed with a more aggressive maintenance program to clear blockages while others may be helped through the volume control measures included in this Plan. Although the volume control measures incorporated into this Plan can help alleviate some of the problems, often the permanent solution to these problems requires an engineered solution which may necessitate the removal of an obstruction or the construction of flood mitigation measures such as a floodwall, regional detention, or property acquisition.

Erosion and Sedimentation (E & S), and Landslide (Types 2, 3, and 4 in Table III-7)

The Cambria and Somerset County Conservation Districts are responsible for administering PA Title 25, Chapter 102 (Erosion Control Regulations). These regulations address accelerated erosion and the resulting sedimentation from earthmoving activities. Improvements in the watershed can be realized by reviewing plans for new developments to make certain the methods and techniques are being specified, conducting inspections to ensure the methods specified are being installed properly and maintained, and investigating and documenting any existing sources of prolonged problems.

Potential Solutions: Permanent stabilization of exposed areas and proper stabilization of channels of conveyance will reduce erosion problems. A potential solution to those areas where there are persistent problems is the application of various bioengineering techniques such as turf reinforcement mats, natural fiber rolls, reforestation with live plantings, and in particularly difficult areas, armoring. A common source of funding for these problems, particularly in areas owned by the Municipality is the State's Growing Greener program.

Areas where both erosion and sedimentation is a problem would most benefit from a solution which would investigate the cause of the erosion and/or sedimentation and then recommend a solution to stabilize the problematic channels. Therefore a detailed FGM assessment of the areas experiencing erosion and sedimentation is recommended to determine what the specific cause or causes of the problems are and to determine the best way to stabilize the channel without causing additional erosion and sedimentation. This type of an assessment is not only valuable in those areas experiencing problems, but also in stable areas, upstream and downstream of the sites in order to create a baseline evaluation for comparison with subsequent assessments near the sites. In areas where erosion is occurring, erosion-resistant materials should be placed on the banks of the channel and in certain instances the morphology or alignment of the channel altered to fully stabilize the channel. Stabilization of the eroded reaches reduces the amount of sediment available for transport downstream of the problem site and reduces the amount of deposition that can occur at points where the velocity in the stream drops below the critical velocity needed to keep the materials suspended. In areas with sedimentation problems alteration of the channel morphology may be needed to increase velocities to a point that does not cause erosion but yet prevents sedimentation from occurring. Typically it is ideal to use bioengineering methods to stabilize the channel and to avoid hard armoring of the stream; however, in certain locations hard armoring with rip-rap or similar materials may be necessary to provide long term stabilization. Stabilization is also needed in areas where only accelerated erosion is designated as the problem. Modifying the channel or floodplain configuration or possibly the channel slope and lining in these areas to slow the water conveyed in the channel may also prove as a valuable means of reducing erosion.

Groundwater Problems (Type 5 in Table III-7)

Many of the groundwater issues in the watershed are associated with uncontrolled discharge into mining areas resulting in acid mine drainage (AMD). Other groundwater problems are associated with development in areas with a high water table, resulting in basement flooding.

Potential Solutions: AMD can be reduced by controlling stormwater runoff in known areas of past mining activities. Groundwater recharge should be cautiously exercised in these areas to ensure infiltration is not increasing the flow of groundwater to subsurface mines. Geotechnical investigations and soil testing must be conducted before any infiltration facility is proposed. To avoid basement flooding, the water table elevations should be identified in both dry and wet conditions before new development is proposed.

Water Quality (Type 6 in Table III-7)

Whenever erosion is a problem, sedimentation also becomes a problem, for it is in downstream areas of the watershed where the water begins to slow, and the bed load or sediment that is carried in the stream settles out. Sedimentation is often deposited in the main channel of the creek, reducing the depth of water in the creek, changing the flow regime and altering the aquatic environment of various species living in the watershed. Sediment when it is deposited around pipes and culverts diminishes carrying capacity and can affect flooding in lower portions of the watershed. Sedimentation is the number one water quality problem in the Commonwealth. In addition to sedimentation, AMD groundwater issues also present water quality issues in the watershed.

Potential Solutions: Sedimentation requires proactive measures by preventing erosion from occurring. The reduction in streambank erosion will result in a decrease in sedimentation and bed loadings. Permanent stabilization of exposed areas and proper stabilization of channels of

conveyance will reduce erosion problems. A potential solution to those areas where there are persistent problems is the application of various bioengineering techniques such as turf reinforcement mats, natural fiber rolls, reforestation with live plantings, and in particularly difficult areas, armoring. A common source of funding for these problems, particularly in areas owned by the Municipality is the State's Growing Greener program.

Undersized Storm Sewers, Culverts, and Outlets (Cause 4 in Table III-7)

Some of the problems identified in Table III-7 are the result of inadequately sized storm culverts, and/or unstable outlets that traverse state, township, or private roads. Regular maintenance of existing sewers and culverts is typically the starting point to resolving some of these issues. In certain instances, storm sewer system appurtenances can be constructed such as trash racks, sediment basins or energy dissipaters to prevent clogging of pipes. However, when routine maintenance is incapable of solving the drainage problems, the typical solution involves performing a hydrologic study to modify pipe sizes, increase the number of inlets and improve the capacity of the system. Costs are typically borne by the owner of the road.

Undersized Bridges (Cause 4 in Table III-7)

High bed loads of streams within the watershed and corresponding gravel deposits reduce the waterway opening which in turn reduces the conveyance capacity of the bridge. As a first step gravel deposits surrounding the bridge should be removed from the opening to restore the conveyance capacity of the waterway opening. Once the capacity is restored an active maintenance schedule can be enacted to maintain the capacity of the bridges. If sedimentation is a frequent problem the size of the waterway opening can be reduced for lower stream stages to maintain the water velocity through the bridge and prevent the water from slowing and depositing sediment around the bridge. Excessive scour at select locations around a bridge or a constriction in a waterway can result in sedimentation downstream of the scour at a location where the velocity slows. In these locations often the best solution is to evaluate the cause of the scour and design counter measures to minimize the effects of the scour. An active maintenance program does not require a hydraulic study to initiate; however, any modification of the waterway opening or the channel configuration around a bridge typically involves a hydraulic study. The solution costs are typically borne by the owner of the bridge.

L. Existing and Proposed Stormwater Collection Systems

Based on the information in the data collection forms, supplied by the municipalities through the survey, stormwater collection systems in the Stonycreek River watershed are located in the following municipalities: Berlin Borough, Jennerstown Borough, Johnstown City, Paint Borough, and Southmont Borough. Berlin Borough as well as Indian Lake Borough reported to have proposed stormwater collection systems. Of the 36 municipalities within the Stonycreek River watershed, nineteen (19) are contained within the Johnstown Urbanized Area (UA) as designated by the 2000 US Census. Each of these municipalities which owns or operates a system of conveyance (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) within the designated urbanized area is required to comply with the National Pollutant Discharge Elimination System (NPDES) Phase II requirements for operators of Municipal Separate Storm Sewer Systems (MS4s), as specified by the Environmental Protection

Agency (EPA). Through this program, the counties are familiar with the stormwater collection systems and their impacts, which translated into the preparation of this Plan.

M. Existing and Proposed State, Federal and Local Flood Control Projects

Based on the information in the data collection forms, supplied by the municipalities through the survey, there are nine existing and three proposed local flood control projects in the Stonycreek River watershed. Cambria County and Somerset County assisted with the identification of flood control projects. Borton-Lawson staff, as part of the field survey, also investigated the flood control projects in the watershed. Dale Borough reported a 25-foot rectangular channel, Southmont Borough reported a concrete lined channel and an enclosed concrete pipe, and Jennerstown Borough reported having a manmade dam. Paint Borough reported several existing channel realignments and pipe channels as well as three proposed pipe channels. These flood control projects are depicted in Map III-11.

There are several dams in the Stonycreek River watershed, according to PaDEP records. The majority (17) of these dams are classified as small impoundments, which have little impact on watershed hydrology. Six (6) larger dams within the watershed were included in the hydrologic model and are listed in Table III-8 below, along with their attenuation impacts and maximum storage volume for the 100-year storm event.

TABLE III-8
Stonycreek River Dams 100-Year Flow Attenuation

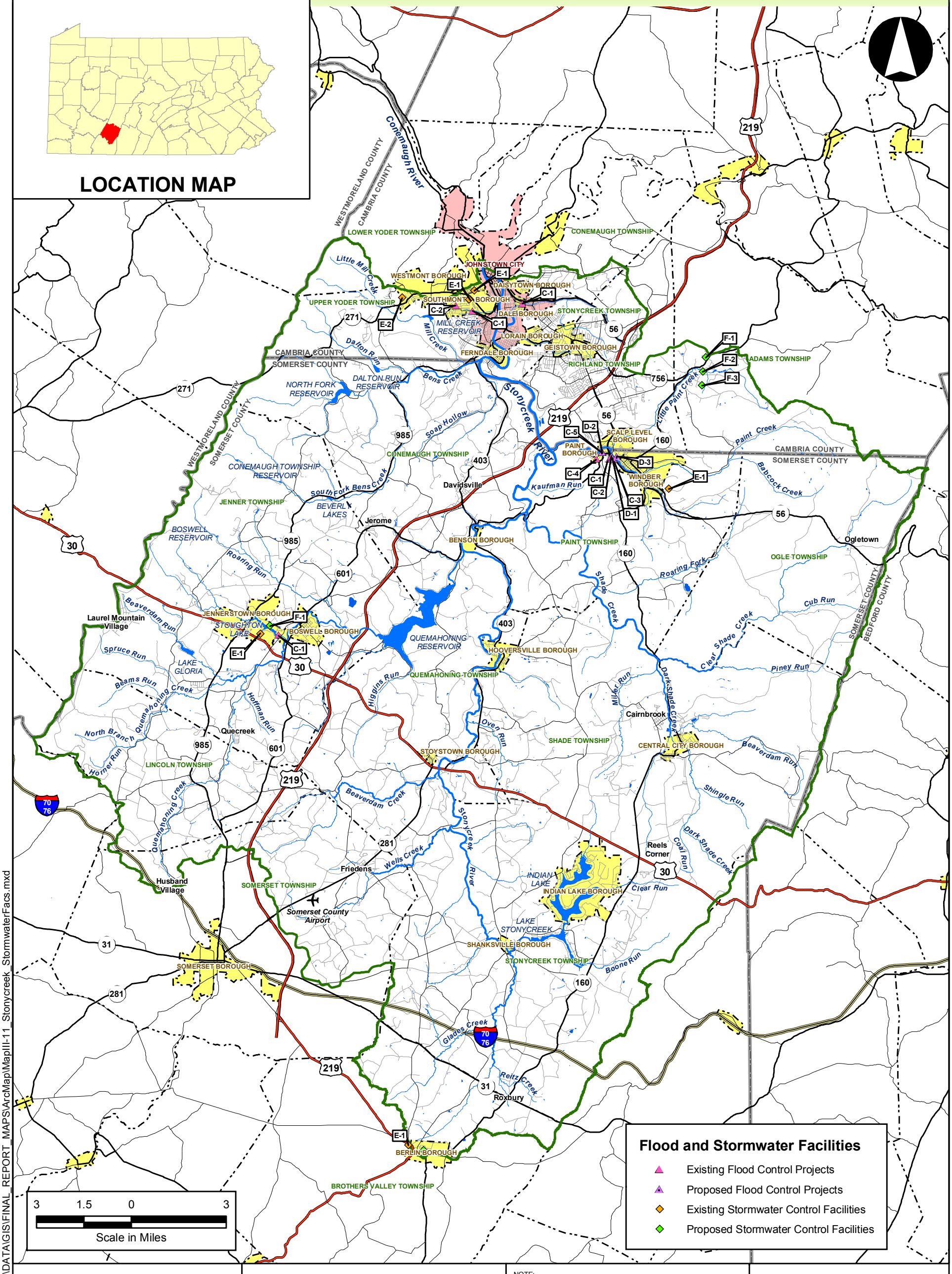
			100- Year Flow (cfs)		Maximum Storage Volume
Lake	**DEP ID**	**Subarea**	**Into Dam**	**Out of Dam**	**(acre-ft)**
Indian Lake Dam	56-103	W1220	15,947	2,849	19,200
Lake Gloria	56-091	W1340	670	637	330
Lake Stonycreek Dam	56-097	W1550	2,927	1,833	2,000
North Fork Lake Dam	56-053	W1390	2,046	2,003	3,376
Quemahoning Dam	56-004	W1500	12,622	9,889	37,000
Stoughton Lake Dam	56-078	W930	1,487	1,406	200

N. Existing and Proposed Stormwater Control Facilities

There are reportedly six existing and five proposed stormwater control facilities as shown in Map III-11. Berlin Borough and Jennerstown Borough each reported having a detention basin and Westmont Borough has an underground detention basin as well as a detention pond. Paint Township reported having a sediment trap and Southmont Borough noted a stormwater pond. One detention basin is proposed in Jennerstown Borough, while three detention basins are proposed in Adams Township; Berlin Borough reported a proposed infiltration device.

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN

LOCATION MAP



Flood and Stormwater Facilities

- Existing Flood Control Projects
- Proposed Flood Control Projects
- Existing Stormwater Control Facilities
- Proposed Stormwater Control Facilities

Map III-11
FLOOD AND STORMWATER FACILITIES

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Legend

- WATERSHED BOUNDARY
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- BOROUGH
- CITY

Roads

- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

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SOURCES:
Watershed Boundary - PADEP Modified by BLE
State and Local Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies - Derived from USFWS NWI Wetlands data
Flood and Stormwater Facilities - Municipalities within watershed

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PREPARED BY: WSB CHECKED BY: SJD
Date: 5/15/2009 PROJECT #: 2005-1719-00

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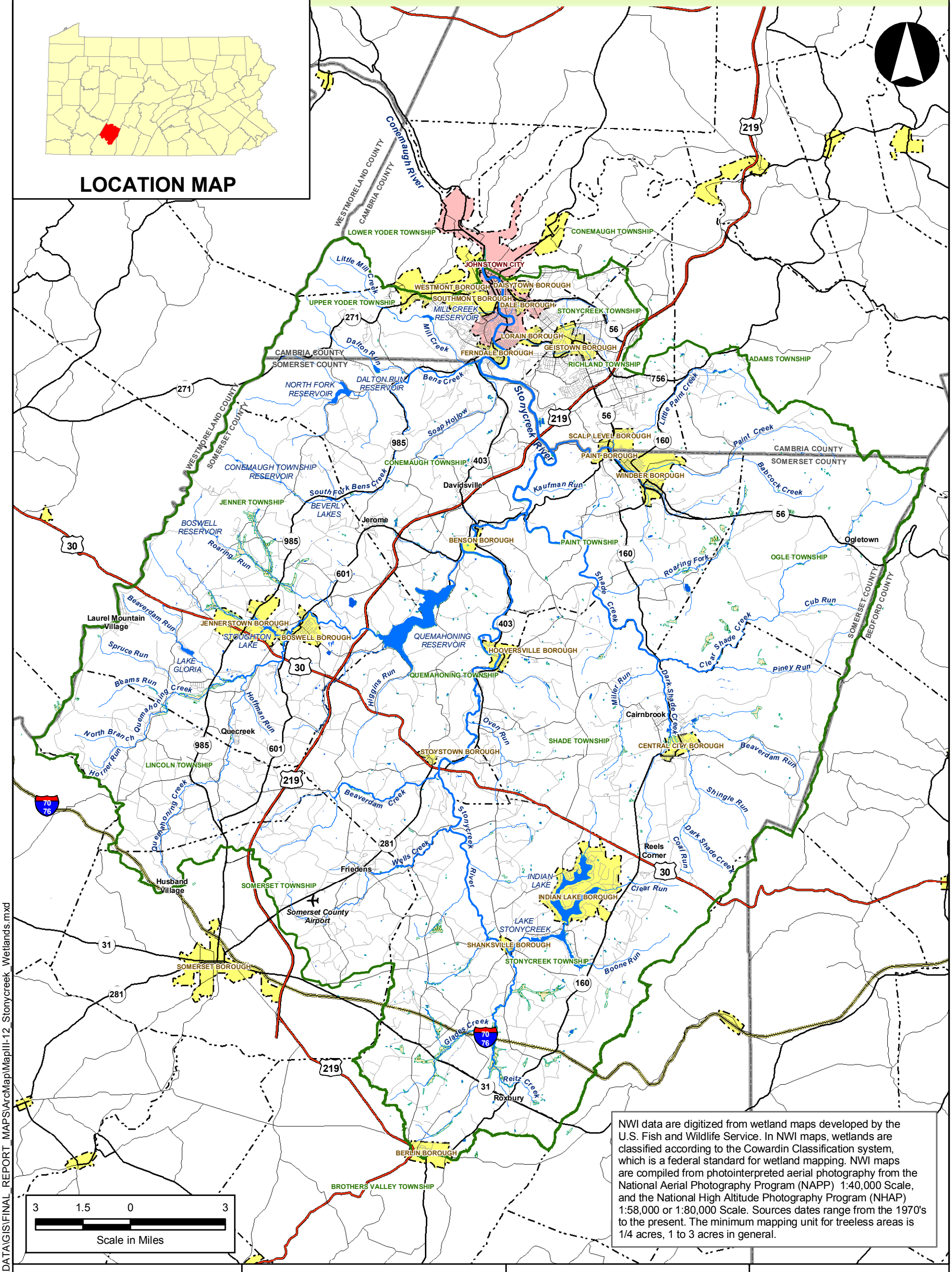
O. Wetlands

Wetlands were obtained from the National Wetlands Inventory Maps in digital format and incorporated into the overall GIS. Map III-12 shows the wetlands for the watershed.

Wetlands play an important part in flood flow attenuation and pollutant filtering. Wetlands within the watershed are primarily found along Stonycreek River and its tributaries. Wetland flood flow attenuation was accounted for in the computer modeling by adjusting the stream routing time, or stream velocities, for overbank events. Wetlands should be preserved through the joint permit application process.

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN

LOCATION MAP



3 1.5 0 3

Scale in Miles

NWI data are digitized from wetland maps developed by the U.S. Fish and Wildlife Service. In NWI maps, wetlands are classified according to the Cowardin Classification system, which is a federal standard for wetland mapping. NWI maps are compiled from photointerpreted aerial photography from the National Aerial Photography Program (NAPP) 1:40,000 Scale, and the National High Altitude Photography Program (NHAP) 1:58,000 or 1:80,000 Scale. Sources dates range from the 1970's to the present. The minimum mapping unit for treeless areas is 1/4 acres, 1 to 3 acres in general.

Map III-12
WETLANDS

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Legend

- WATERSHED BOUNDARY
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- BOROUGH
- CITY
- WETLANDS

Roads

- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

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Streams - PaDEP
Water Bodies -Derived from USFWS NWI Wetlands data
Wetlands - US Fish and Wildlife Service National Wetland Inventory

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Date: 5/15/2009 PROJECT #: 2005-1719-00

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SECTION IV

WATERSHED TECHNICAL ANALYSIS

A. Watershed Modeling

An initial step in the preparation of this stormwater management plan was the selection of a stormwater simulation model to be utilized. It was necessary to select a model which:

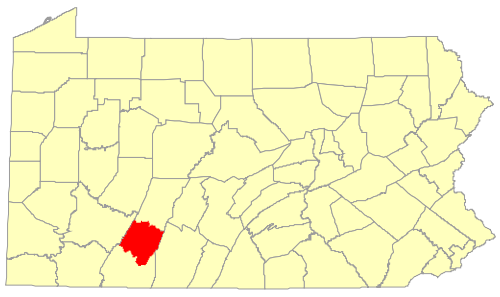
- Modeled design storms of various durations and frequencies to produce routed hydrographs which could be combined
- Was adaptable to the size of subwatersheds in this study
- Could evaluate specific physical characteristics of the rainfall-runoff process
- Did not require an excessive amount of input data yet yielded reliable results

The model decided upon was the U. S. Army Corps of Engineers, Hydrologic Engineering Center, Hydrologic Modeling System (HEC-HMS) for the following reasons:

- It had been developed at the Hydrologic Engineering Center specifically for the analysis of the timing of surface flow contributions to peak rates at various locations in a watershed
- Although originally developed as an urban runoff simulation model, data requirements make it easily adaptable to a rural situation
- Input parameters provide a flexible calibration process
- It has the ability to analyze reservoir or detention basin routing effects and location in the watershed
- It is accepted by the Pennsylvania Department of Environmental Protection

Although other models, such as TR-20, may provide essentially the same results as HEC-HMS, HMS's ability to compare subwatershed contributions in a peak flow presentation table make it specifically attractive for this study. The HEC-HMS Model generates runoff flows for selected subareas along the drainage course and compares subarea contributions to the total runoff. The model generates runoff quantities for a specified design storm based upon the physical characteristics of the subarea, and routes the runoff flow through the drainage system in relation to the hydraulic characteristics of the stream. The amount of runoff generated from each subarea is a function of its slope, soil type or permeability, percent of the subwatershed that is developed, and its vegetative cover. Composite runoff curve numbers were generated by overlaying the land use map with the subarea and hydrologic soil group maps. The generated curve numbers were then used for input into the computer model. Figure IV-1 displays the subarea delineation for Stonycreek River watershed on digital USGS Quadrangles or digital raster graphics (DRG's).

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN



LOCATION MAP

Conemaugh River
WESTMORELAND COUNTY
CAMBRIA COUNTY
CONEMAUGH TOWNSHIP
LOWER YODER TOWNSHIP
JOHNSTOWN CITY
WESTMONT BOROUGH
DAISYTOWN BOROUGH
SOUTHMONT BOROUGH
DALE BOROUGH
STONYCREEK TOWNSHIP
MILL CREEK RESERVOIR
Little Mill Creek
Mill Creek
UPPER YODER TOWNSHIP
Dalton Run
LORAIN BOROUGH
GEISTOWN BOROUGH
FERNDALE BOROUGH
RICHLAND TOWNSHIP
ADAMS TOWNSHIP
SOMERSET COUNTY
DALTON RUN RESERVOIR
NORTH FORK RESERVOIR
Bens Creek
Stonycreek River
Little Paint Creek
Paint Creek
SCALP LEVEL BOROUGH
PAINT BOROUGH
WINDBER BOROUGH
Babcock Creek
CONEMAUGH TOWNSHIP RESERVOIR
South Fork Bens Creek
Soap Hollow
Kaufman Run
Davidsville
JENNER TOWNSHIP
BEVERLY LAKES
Jerome
BENSON BOROUGH
PAINT TOWNSHIP
Ogletown
OGLE TOWNSHIP
BOSWELL RESERVOIR
Roaring Run
Roaring Fork
Shade Creek
Cub Run
BEDFORD COUNTY
STOUGHTON LAKE
Beaverdam Run
Laurel Mountain Village
JENNERSTOWN BOROUGH
BOSWELL BOROUGH
QUEMAHONING RESERVOIR
HOOVERSVILLE BOROUGH
Clear Shade Creek
Spruce Run
LAKE GLORIA
QUEMAHONING TOWNSHIP
Higgins Run
Piney Run
Miller Run
Dark Shade Creek
North Branch Quemahoning Creek
Hoffman Run
Quecreek
Cairnbrook
Oven Run
SHADE TOWNSHIP
CENTRAL CITY BOROUGH
Horner Run
LINCOLN TOWNSHIP
STOYSTOWN BOROUGH
Shingle Run
Quemahoning Creek
Beaverdam Creek
Wells Creek
Coal Run
Reels Corner
Friedens
INDIAN LAKE
INDIAN LAKE BOROUGH
Clear Run
SOMERSET TOWNSHIP
Somerset County Airport
LAKE STONYCREEK
SHANKSVILLE BOROUGH
STONYCREEK TOWNSHIP
Boone Run
SOMERSET BOROUGH
Glades Creek
Reitz Creek
Roxbury
BERLIN BOROUGH
BROTHERS VALLEY TOWNSHIP
W670 W680 W690 W700 W710 W720 W730 W750 W760 W770 W780 W800 W810 W820 W830 W840 W850 W860 W870 W880 W900 W910 W920 W930 W940 W950 W960 W970 W980 W990 W1000 W1010 W1040 W1050 W1060 W1070 W1080 W1090 W1100 W1130 W1140 W1150 W1160 W1170 W1180 W1190 W1200 W1210 W1220 W1240 W1250 W1260 W1270 W1280 W1290 W1300 W1310 W1320 W1340 W1380 W1390 W1430 W1450 W1490 W1500 W1540 W1550
219 271 56 985 403 160 30 601 281 70 76 31

3 1.5 0 3
Scale in Miles

Map IV-1 Subareas

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Legend

- WATERSHED BOUNDARY
- SUBAREAS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- STREAMS
- WATER BODIES

Roads

- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

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Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies -Derived from USFWS NWI Wetlands data
Subareas - Delineated by BLE

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B. Modeling Process

After delineating the Stonycreek River watershed on the USGS topographic map, the watersheds were divided into subwatersheds for modeling purposes. The main considerations in the subdivision process were the location of significant stormwater problem areas, obstructions, and tributary confluences. The most downstream point of each of these areas is considered a "point of interest" where increased runoff must be analyzed for its potential impact. The effect of stormwater runoff at existing known problem areas is a crucial component in the development of standards and criteria to address stormwater management, and the use of the hydrologic model to evaluate runoff conditions in the watershed took the locations of these stormwater problems into account when developing Management Districts.

The reason points of interest are selected is to provide watershed runoff control through effective control of individual subarea runoff. Thus, control of stormwater runoff in the entire watershed can be achieved through stormwater management in each subbasin.

The watersheds were then modeled to determine the hydrologic response for the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year for the 24-hour storm events. The results are shown in Volume III, Technical Appendix available at the County Offices.

The modeling process addressed:

- Peak discharge values at various locations along the stream and its tributaries
- Time to peak for the above discharges
- Runoff contributions of individual subareas at selected downstream locations; and
- Overall watershed timing

C. Calibration

In order to simulate storm flows for a watershed with confidence and reliability, the computer model must first be calibrated. This involves “fine tuning” the model to provide the most accurate representation of the real runoff and timing conditions of a watershed. Calibration of a model involves the adjustment of input parameters (within acceptable value ranges) to reproduce the recorded response of storm events.

When actual storm event data is available (i.e. stream flow and rain gage data), this information can be input into the model and simulated “hydrographs” developed by the model. Hydrographs are simply a plot of time versus flow in cubic feet per second. To simulate a specific event, antecedent moisture conditions and rainfall distribution must be duplicated in the model input. Adjustments to other parameters are then made to attempt to duplicate hydrograph shapes and peak flow rates at points in the watershed where flow recordings were made. In order to utilize actual stream flow and rain gage data for calibration, sufficient data must be available. Rain gages must be in close proximity to the watershed so that actual rainfall conditions from these gages are representative of the actual rainfall that occurs over the watershed. Localized events, snowmelt, and unique conditions are typically not used for calibration due to their unique circumstances.

In order to maximize the accuracy of the HEC-HMS model, a modeling calibration effort was undertaken. At several essential points in the watershed, HEC-HMS generated flows were compared to historic event discharges from USGS gage data and developed from available regression models typically used in the estimation of design storm peak flows on large watersheds.

FEMA Flood Insurance Studies were also referenced in areas where detailed floodplain information was available. FIS cross-sections were referenced for Manning's n values, channel capacities, and channel and overbank velocities.

There are several potential calibration parameters within HEC-HMS. These include initial abstraction, surface roughness, subbasin time of concentration, runoff curve number, and hydrograph routing velocity and travel time. Several runs were performed for sensitivity analyses of each of these parameters. From these runs, it was determined that the initial rainfall abstraction and subarea travel time were the most sensitive parameters. These numbers could be revised with confidence, while remaining within an acceptable range of values, for similar soil and sloped subareas, to arrive at flow values from the gage data.

Historic Storm Calibration

Since rainfall patterns can vary greatly throughout a watershed area, it is desirable to have many stream gages located within the watershed boundary to accurately calibrate against historic storm events. However for the Stonycreek River watershed, only four (4) stream gages were located within the watershed boundary; these are shown in Table IV-I. Therefore historic storm calibration was not performed for this watershed.

TABLE IV-1
USGS Stream Gages within the Stonycreek River Watershed

USGS Gage No.:	Location	Period of Record
03040000	Stonycreek River At Ferndale, PA	1914-2005
03039930	South Fork Bens Creek near Thomasdale, PA	1984-85
03039925	North Fork Bens Creek at North Fork Reservoir, PA	1985-97
03039200	Clear Run near Buckstown, PA	1961-78

Design Storm Calibration Results

In order to calibrate the model to develop design event flood flows, the 2-, 5-, 10-, 25-, 50-, and 100-year design storms were analyzed to compare HEC-HMS generated flows to flows developed by the regression models as well as in the available FEMA Flood Insurance Studies.

Figures IV-2 through IV-5 show results of the peak flow values developed by the calibrated HEC-HMS model compared to predicted flow values at various locations throughout the Stonycreek River watershed. Table IV-2 compares the target value flows, the calibrated HEC-HMS model flows and the FEMA flows. The target value flows were generated using the PeakFQ program version 5 which follows the U.S. Bulletin 17B guidelines, and with the National Flood Frequency (NFF) program version 3.0. NFF utilizes the Water Resources Investigations Report 00-4189 regression method. Note there is a significant difference in FEMA flows versus the target and model flows. This is attributed to the fact the FEMA flows were generated using bulletin 17A, which preceded the development of bulletin 17B in June of 1977. It should be noted that regression methods oftentimes do not account for localized variables such as soils and topography. Therefore, on a subwatershed basis, the results may vary.

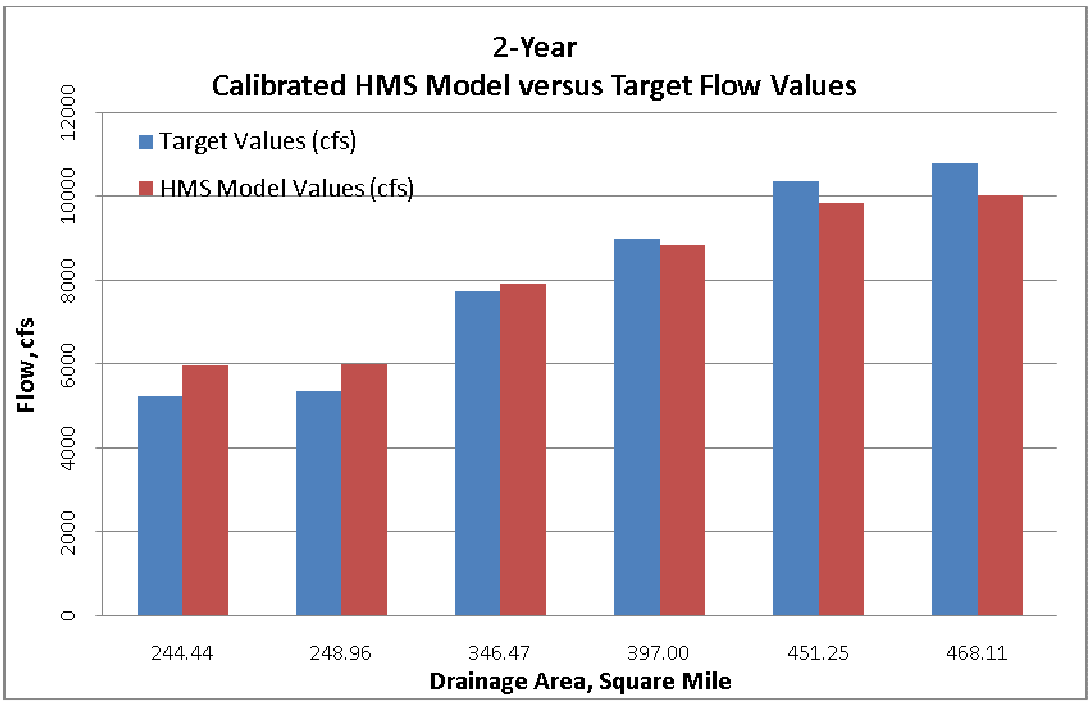

FIGURE IV-2
2-Year Calibrated Model Comparison

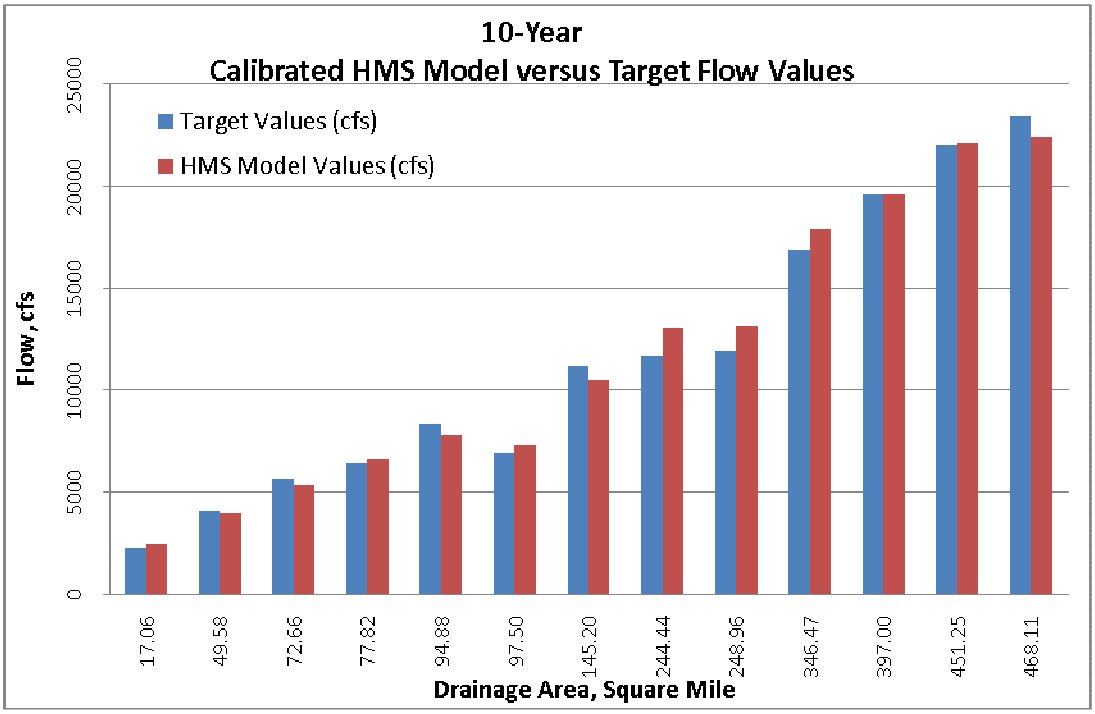

FIGURE IV-3
10-Year Calibrated Model Comparison

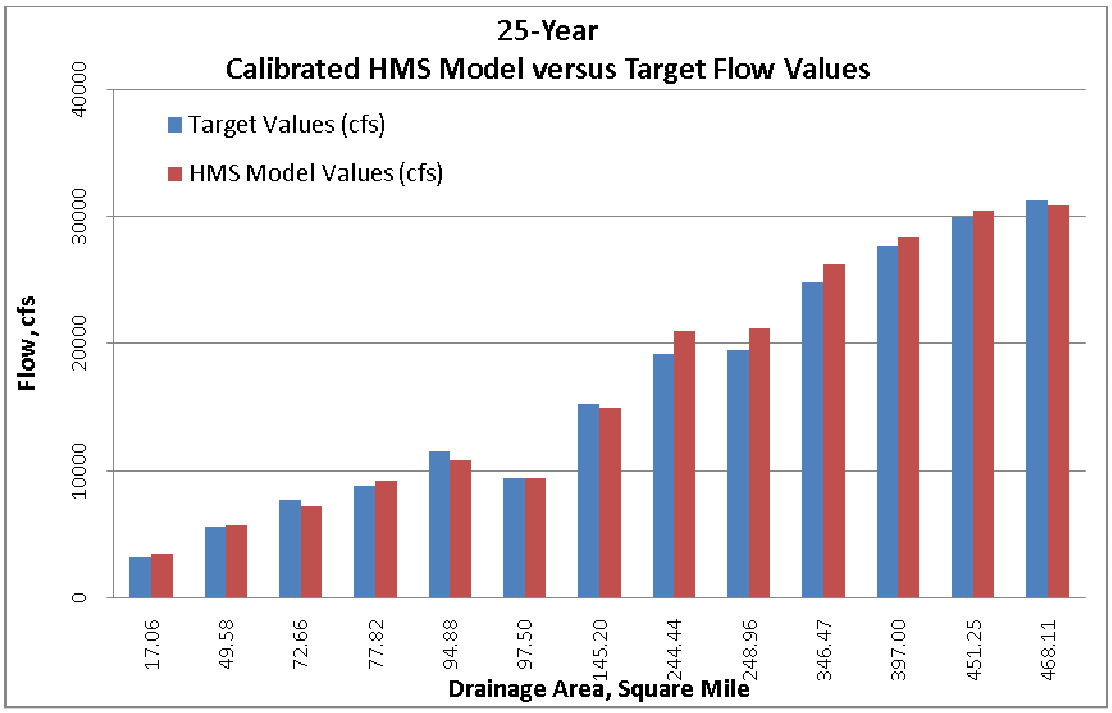

FIGURE IV-4
25-Year Calibrated Model Comparison

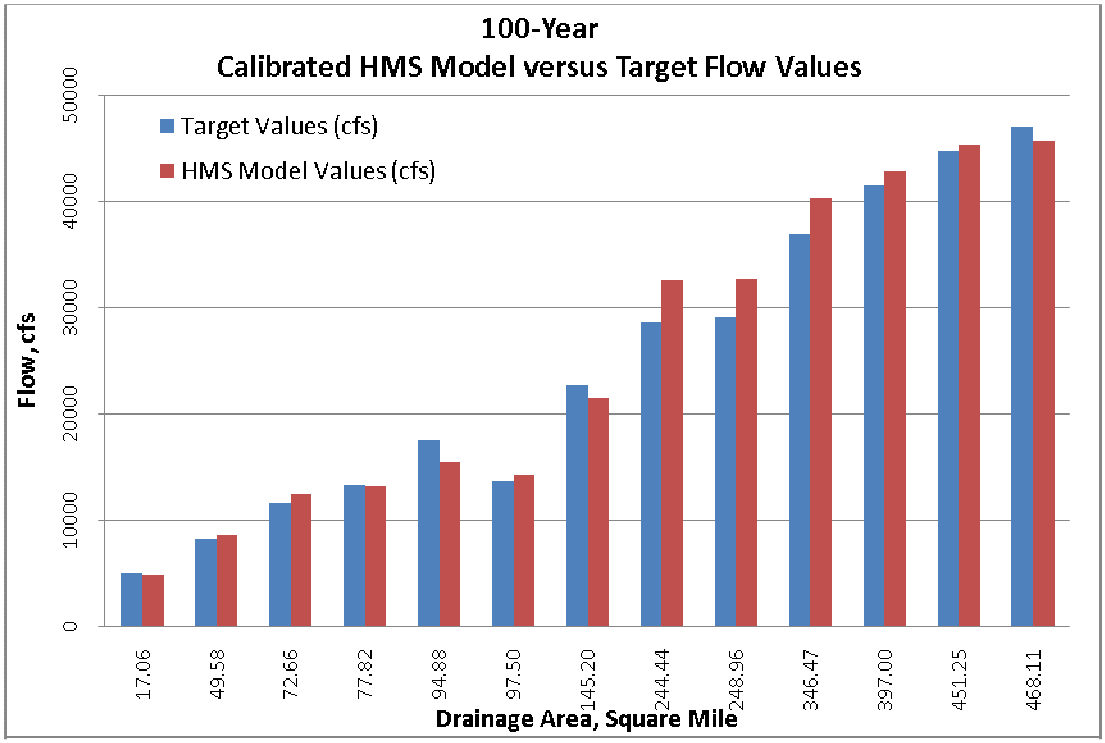

FIGURE IV-5
100-Year Calibrated Model Comparison

TABLE IV-2
Comparison of 100-Year Calibrated Model To 100-Year Target Values and 100-Year FEMA Flow Values

Point	Drainage Area (sq. miles)	FEMA Flows (cfs)	Target Values (cfs)	Calibrated Model Flows (cfs)
Stonycreek River Outlet	469.0	64,200	47,035	44,921
Stonycreek - DS Confluence with Bens Creek	451.25	60,000	44,658	44,538
Stonycreek - US Confluence with Bens Creek	397.0	54,450	41,474	41,932
Bens Creek Outlet	49.58	5,750	8,292	8,451
Stonycreek – US Confluence with Quemahoning Creek	145.2	25,300	22,658	21,644

SECTION V

STANDARDS AND CRITERIA FOR STORMWATER CONTROL

A. Watershed Level Control Philosophy

An increase in development, and in turn an increase in impervious surfaces, results not only in an increase in runoff peaks but also in runoff volume. The primary difference between on-site runoff control philosophy and the watershed level philosophy is the manner in which runoff volume is managed. Conventional on-site control philosophy has as its goal the control of runoff peaks from the site. There are numerous volume controls that can be implemented on-site such as infiltration basins, porous pavement, etc. The proposed watershed level runoff control philosophy seeks to manage the increase in runoff volumes such that the peak rates of runoff throughout the watershed are not increased. The basic goal is therefore the same for both on-site and watershed level philosophies.

B. Standards and Criteria – Five Phased Approach

The goal of Act 167 and this Stormwater Management Plan is to encourage planning and management of stormwater runoff that is consistent with sound water and land use practices. In addition, the Act authorized a comprehensive stormwater management program designated to preserve and restore flood carrying capacities of streams, preserve to the maximum extent practical natural stormwater runoff regimes and the natural course, current and cross sections of streams, and to protect and conserve groundwaters and groundwater recharge areas. Maintaining the existing hydrologic regime for newly developing areas in the watershed and restoring the previously functioning hydrologic regime in redeveloping areas of the watershed is the best means to accomplish this goal. The technical standards and criteria developed as a part of this task will be watershed-wide in their interpretation and/or application. To strive towards achieving this goal, and to address stream bank erosion, flooding, water quality, groundwater recharge, and stormwater management measures on development sites should consider the following five (5) objectives.

- Maintain groundwater recharge (infiltration)
- Maintain or improve water quality
- Reduce channel erosion
- Manage overbank flood events
- Manage extreme flood events

Recommended standards and criteria accommodate various types of land development activities. The standards and criteria provide management practices for the implementation of stormwater control measures.

The standards and criteria also address the following:

a. Identification of all areas within the watershed where different criteria apply;

b. Recommended Stormwater Management Districts to manage accelerated runoff from the subareas identified in item a;

c. Recommended design flood frequencies and computational methodologies for stormwater management measures;

d. A list of recommended alternate stormwater collection and control measures;

e. Specifications for construction and maintenance of stormwater systems;

f. Safety requirements for stormwater systems during and after construction.

1. Groundwater Recharge (Infiltration) and Water Quality

Infiltration

Recharging rainfall into the ground replenishes the groundwater that provides baseflow to streams, (a process that keeps streams flowing during the drier summer months), and maintains groundwater for drinking water purposes. As development occurs and the impervious area increases, less rainfall reaches the groundwater systems resulting in lower base flows and smaller groundwater supplies. It has also been found that streambank capacities are equivalent to approximately the 1½ year storm, and streambanks begin to erode when flows approximate this depth, a term called critical velocity.

Although detention basins can reduce the proposed conditions peak rate of flow to the existing conditions rate, the increased volume of runoff still gets passed downstream unless special provisions are designed into the basin to recharge this increase in runoff volume.

Thus in highly developed watersheds, it is not uncommon to see dry streams along with severely depleted groundwater drinking supplies during periods of drought. Stormwater management measures such as porous pavement with underground infiltration beds and infiltration/recharge structures or Best Management Practices (BMPs) can be designed to promote groundwater recharge. These measures are encouraged, particularly in hydrologic soil groups A and B and should be utilized wherever practical.

It is realized, however, that due to certain soils and topographic conditions, recharge may not be practical on every site. This is especially true in areas of past or present mining activities where acid mine drainage (AMD) is problematic. It will be up to the design professional, therefore, to show that recharge cannot be *physically* accomplished.

Soils

A detailed soils evaluation of the project site is required in order to determine the suitability of infiltration facilities. The evaluation shall be performed by a qualified design professional, and at a minimum, address soil permeability, depth to bedrock and subgrade stability. The general process for designing the infiltration BMP shall be:

a. Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of sub-grade stability; infiltration is not permitted to be ruled out without conducting these tests.

b. Provide field tests such as double ring infiltrometer or hydraulic conductivity tests (at the level of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Percolation tests are not recommended for design purposes.

c. Design the infiltration structure for the required volume, which is described below in the section titled Water Quality and Infiltration Volume Requirements and in Section 303 of the model ordinance, based on field determined capacity at the level of the proposed infiltration surface.

d. If on-lot infiltration structures are proposed by the Applicant's design professional, it must be demonstrated to the municipality that the soils are conducive to infiltrate on the lots identified.

Water Quality

Pollutants accumulate on impervious surfaces between rainfall events or during dry weather. Pollutant concentrations in runoff from developed land, therefore, tend to be greatest at the beginning of the storm event, or during the first one half (1/2) inch to one (1.0) inch of runoff, a phenomenon commonly known as the first flush. It has also been found that approximately eighty percent of the rainfall events are one half inch of rainfall or less, storms that essentially simulate this "first flush." The majority of the nonpoint source pollutants, therefore, are being washed into streams during this first flush. Capturing this first flush and smaller storms will, depending on the BMP design, allow the stormwater to be detained and will allow pollutants to settle out, allowing biological breakdown or uptake of these pollutants.

Water Quality Standards

The Applicant shall comply with the following water quality requirements.

No regulated earth disturbance activities within the Municipality shall commence until approval by the Municipality of a plan which demonstrates compliance with State Water Quality Requirements post-construction is complete.

BMPs shall be designed, implemented and maintained to meet State Water Quality Requirements, and any other more stringent requirements as determined by the Municipality.

To control post-construction stormwater impacts from regulated earth disturbance activities, State Water Quality Requirements can be met by BMPs, including site design, which provide for replication of pre-construction stormwater infiltration and runoff conditions, so that post-construction stormwater discharges do not degrade the physical, chemical or biological characteristics of the receiving waters. As described in the DEP Comprehensive Stormwater Management Policy (#392-0300-002, September 28, 2002), this may be achieved by the following:

1. Infiltration: replication of pre-construction stormwater infiltration conditions,

2. Treatment: use of water quality treatment BMPs to ensure filtering out of the chemical and physical pollutants from the stormwater runoff, and

3. Streambank and Streambed Protection: management of volume and rate of post-construction stormwater discharges to prevent physical degradation of receiving waters (e.g., from scouring).

Additionally, pretreatment must be provided prior to infiltration. Pretreatment is a technique employed in stormwater BMPs to provide storage or filtering to trap coarse materials and other pollutants before they enter the system.

For areas within defined Special Protection Subwatersheds which include Exceptional Value (EV) and High Quality (HQ) waters, the temperature and quality of water and streams shall be maintained through the use of BMPs to treat thermally impacted stormwater and stormwater conveyance systems.

According to Section 301.C of the Model Ordinance the Municipality may, after consultation with DEP, approve measures for meeting the State Water Quality Requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, State law including but not limited to the Clean Streams Law.

Additionally to meet the water quality goals of the Model Ordinance it is necessary to implement measures to:

a. Minimize disturbance to floodplains, wetlands, natural slopes over 8%, and existing native vegetation.

b. Preserve and maintain trees and woodlands. Maintain or extend riparian buffers and protect existing forested buffer. Provide trees and woodlands adjacent to impervious areas whenever feasible.

c. Establish and maintain non-erosive flow conditions in natural flow pathways.

d. Minimize soil disturbance and soil compaction. Over disturbed areas, replace topsoil to a minimum depth equal to the original depth or 4 inches, whichever is greater. Use tracked equipment for grading when feasible.

e. Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.

Water Quality and Infiltration Volume Requirements

Infiltration and water quality volume requirements are outlined in Section 303 of the Model Ordinance. By satisfying the volume controls in Section 303 of the Model Ordinance, both the water quality and infiltration volume requirements are being met.

Water volume controls shall be implemented using the *Design Storm Method* in Subsection 1 or the *Simplified Method* in Subsection 2 below. For Regulated Activity areas equal or less than 10,000 square feet that do not require hydrologic routing to design the stormwater facilities, this Ordinance establishes no preference for either methodology; therefore, the Applicant may select either methodology on the basis of economic considerations, the intrinsic limitations on applicability of the analytical procedures associated with each methodology, and other factors.

1. *The Design Storm Method* (CG-1 in the SWM Manual[1]) is applicable to any size of Regulated Activity. This method requires detailed modeling based on site conditions.

   a. Do not increase the post-development total runoff volume for all storms equal to or less than the 2-year 24-hour duration precipitation.

   b. For modeling purposes:

      i. Existing (pre-development) non-forested pervious areas must be considered meadow or its equivalent.

      ii. Twenty (20) percent of existing impervious area, when present, shall be considered meadow in the model for existing conditions.

2. *The Simplified Method* (CG-2 in the SWM Manual[1]) provided below is independent of site conditions and should be used if the Design Storm Method is not followed. This method is not applicable to Regulated Activities greater than 10,000 square feet or for projects that require design of stormwater storage facilities. For new impervious surfaces:

   a. Stormwater facilities shall capture at least the first two inches (2") of runoff from all new impervious surfaces.

   b. At least the first one inch (1.0") of runoff from new impervious surfaces shall be permanently removed from the runoff flow (i.e., it shall not be released into the surface waters of this Commonwealth). Removal options include reuse, evaporation, transpiration, and infiltration.

   c. Wherever possible, infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases at least the first one-half inch (0.5") of the permanently removed runoff should be infiltrated.

   d. This method is exempt from the requirements of Section 304 of the PA Model Stormwater Management Ordinance.

This volume requirement can be accomplished by the permanent volume of a wet basin or the detained volume from other BMPs. Where appropriate, wet basins shall be utilized for water quality control and shall follow the guidelines of the *"Pennsylvania DEP Stormwater Best Management Practices Manual"*.

To accomplish the above, the Applicant shall submit original and innovative designs to the Municipal Engineer for review and approval. Such designs may achieve the water quality and infiltration objectives through a combination of different BMPs.

Minimum Requirements for BMPs

It is required that BMPs meet the following criteria:

a. The design of all facilities over Karst or mined areas shall include an evaluation of measures to minimize adverse effects.

b. Infiltration BMPs should be spread out, made as shallow as practicable, and located to maximize use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.

c. Storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.

Minimum Requirements for BMPs

It is required that BMPs meet the following criteria:

a. Infiltration BMPs intended to receive runoff from developed areas be selected based on suitability of soils and site conditions. A detailed soils evaluation of the project site is required to determine the suitability of recharge facilities, especially in mined areas. The evaluation shall be performed by a qualified design professional, and at a minimum, address soil permeability, depth to bedrock and subgrade stability.

b. Infiltration BMPs be constructed on soils that have a minimum depth of 24 inches between the bottom of the facility and the seasonal high water table and/or bedrock (limiting zones).

c. Infiltration BMPs be constructed on soils that have an infiltration rate sufficient to accept the additional stormwater load and drain completely as determined by field tests conducted by the Owner's professional designer.

d. Pretreatment be provided prior to infiltration.

e. Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility). The design of the facility shall provide for protection from clogging and unwanted sedimentation.

f. Design of these BMPs shall be in accordance with design specifications outlined in the "Pennsylvania DEP Stormwater Best Management Practices Manual" or other applicable manuals. The following factors shall be considered when evaluating the suitability of BMPs used to control water quality at a given development site:

    1. Total contributing drainage area;
    2. Permeability and infiltration rate of the site soils;
    3. Mining activities;
    4. Slope and depth to bedrock;
    5. Seasonal high water table;
    6. Proximity to building foundations and wellheads;
    7. Erodibility of soils;
    8. Land availability and configuration of the topography;
    9. Peak discharge and required volume control;

10. Stream bank erosion;
11. Efficiency of the BMPs to mitigate potential water quality problems;
12. The volume of runoff that will be effectively treated;
13. The nature of the pollutant being removed;
14. Maintenance requirements;
15. Creation/protection of aquatic and wildlife habitat;
16. Recreational value;
17. Enhancement of aesthetic and property value.

Buffers

Maintaining or restoring natural buffers has many stormwater related benefits (see Table V-1) including aiding in groundwater recharge, improving water quality of runoff, and protecting streambanks from erosion. Although not required by the Ordinance or State Law, the following is recommended for buffers: if a perennial or intermittent stream passes through the site, the Applicant shall create a stream buffer extending a minimum of fifty (50) feet to either side of the top-of-bank of the channel. The buffer area shall be maintained with and encouraged to use appropriate native vegetation (Reference to Appendix B of "*Pennsylvania DEP Stormwater Best Management Practices Manual"* for plant lists). If the applicable rear or side yard setback is less than fifty (50) feet, the buffer width may be reduced to twenty-five (25) percent of the setback to a minimum of ten (10) feet. If an existing buffer is legally prescribed (i.e. deed, covenant, easement, etc.), the existing buffer shall be maintained. [Note: The Municipality may select a smaller buffer width (above) if desired, but the selected buffer may not be less than ten (10) feet]. This does not include lakes or wetlands.

TABLE V-1
Twenty Benefits Of Buffers

1. Reduce watershed impervious area.
2. Maintain distance from impervious cover.
3. Help prevents small drainage problems and complaints.
4. Stream "right-of-way" allows for lateral movement.
5. Land area may provide effective flood water storage.
6. Protection from streambank erosion.
7. Increase property values.
8. Increased pollutant removal.
9. Foundation for present or future greenways.
10. Provide food and habitat for wildlife.
11. Mitigate stream warming.
12. Protection of associated wetlands.
13. Prevent disturbance to steep slopes.
14. Preserve important terrestrial habitat.
15. Corridors for conservation.
16. Essential habitat for amphibians.
17. Fewer barriers to fish migration.
18. Discourage excessive storm drain enclosures/channel hardening.
19. Provide space for stormwater ponds.
20. Allowance for future restoration.

2. Streambank Erosion

Several areas of streambank erosion were found within the Stonycreek River watershed during the field survey. As storm flows increase, the velocities in streams also increase, thus exacerbating streambank erosion problems. The Pennsylvania Stormwater BMP Manual, 2006 states "In a natural stream system in Mid-Atlantic States, the bank full stream flow occurs with a period of approximately 1.5 years. If the runoff volumes from storms less than the 2-year event are not increased, the fluvial impacts on streams will be reduced." (Section 3.3.3 Volume Control Guideline 1). The rate control and volume control criteria as outlined above and in sections 303 and 304 of the model ordinance, to meet water quality and infiltration requirements also satisfy the streambank erosion requirements. An additional streambank erosion requirement which helps to alleviate streambank erosion problems, which is outlined above in the section describing minimum requirements for BMPs and also found in section 301.K of the model ordinance, is that storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.

3. Overbank Events

Flooding and stormwater problems are caused by excess stormwater quantity. Storm events which result in water exceeding the natural bank of a stream are termed as "overbank" events and are typically defined as an expected frequency of occurrence. Based upon the realization that most

bankfull events occur at approximately the 1.5- to 2-year event, it is evident that events greater than the 2-year storm result in overbank flooding. These "overbank" events typically range from the 2-year to 10-year events. Management of these "overbank" events requires a detailed knowledge of the interrelationship between all contributing areas of a watershed. Analysis of peak runoff, timing of runoff, and duration of runoff from the various areas of a watershed is critical for establishing these criteria. The result of this analysis is the Management District Concept, discussed in Section V.D.

4. Extreme Events

"Extreme" flooding events are separated from "overbank" flooding events by the severity of damage which is incurred. Typically, events such as the 25-, 50- and 100-year events are labeled as "extreme" events.

While some overbank and extreme flooding events are inevitable, the goal is to control the frequency of occurrence for such events such that the level of overbank flooding is the same over time so that damages to existing conditions infrastructure are not exacerbated by upstream development. Therefore, different management criteria are given for these "overbank" and "extreme" event floods.

It must be recognized that there is a difference between the meanings of storm and flood when considering 5-year storms and 5-year floods. Although a certain quantity of rain may classify a rainfall event as a 5-year storm, this does not mean that same amount of rain will result in a 5-year flood. For example, if the event would occur during a drought, a 5-year storm may result in only a 2-year flood because of the capacity of the soil and ground to absorb water. However, if the same event occurred on top of a snow melt, then a 10-year flood may occur because of the extra water volume present in the melting snow.

Similarly, the term "5-year flood" does not mean that this event will occur once every five years. Nor does it mean that once a 5-year event occurs, it will be another five years until that event may occur again. A 5-year event refers to the probability that the event will occur in any given year, which is the inverse of the frequency event. Therefore, a 5-year event has a 20% probability of occurring in any given year.

C. Management District Concept (For Overbank and Extreme Events)

Many Act 167 plans were based upon the release rate concept where each subarea of the watershed was assigned a release rate (as a percent value). For any development scenario, the post-development runoff rate must meet a percent (release rate) of the pre development runoff rate. These release rates were developed by analyzing the individual subarea contribution to the overall watershed runoff. This Plan equates release rates to equivalent design storms and places the subareas in separate management districts. The management district concept uses the same idea as the release rate concept; however, it displays the final criteria by grouping subareas into "management districts" rather than assigning a release rate to each individual subarea. Each management district contains specific criteria which are to be met in order to address "overbank" and "extreme" design events.

A major goal of the Stonycreek River Act 167 Plan was to determine where in the watershed stormwater detention was appropriate for new development. It was also important to determine to what extent stormwater detention would be required in individual subareas as described above. In Table V-2, the peak rate of proposed conditions runoff would have to be reduced to the peak rate of existing conditions runoff for the design storms specified below. Individual subareas would fall into one of three districts:

TABLE V-2

Stormwater Management Districts in the Stonycreek River Watershed

District	Proposed Condition Design Storm	(reduce to)	Existing Condition Design Storm
A	2-year		1-year
	5-year		5-year
	10-year		10-year
	25-year		25-year
	50-year		50-year
	100-year		100-year
B-1	5-year		2-year
	10-year		5-year
	25-year		10-year
	50-year		25-year
	100-year		100-year
B-2	2-year		2-year
	25-year		10-year
	50-year		25-year
	100-year		100-year

D. Process to Accomplish Standards and Criteria

Table V-3 provides a process to accomplish the required standards and criteria, on a priority basis, looking at means other than detention to promote recharge (infiltration), improve water quality and to reduce proposed conditions peak flows to the required existing conditions rate.

The PA BMP Manual and other sources in the Reference Section of this Plan should be consulted to aid the design engineer in BMP selection and design.

The required standards and criteria developed are summarized in Table V-4 while recommended standards and criteria can be found in Table V-5. The recommended standards and criteria are not required as part of the Plan, however, some of them may be required as part of another state or municipal regulation, and are recommended in conjunction with the Plan's required standards and criteria to improve the effectiveness of the Plan. The ultimate goal would be to match the predevelopment hydrograph, not just the predevelopment peak. Non-structural stormwater

management measures (also referred to as conservation design or low impact development, LID) should be evaluated to help achieve this goal. Conservation design focuses on preserving the areas most beneficial to environmental conservation, and developing on the areas most suitable to development. This typically includes development of an opportunity and constraints map. Conservation design measures are discussed in more detail in Section V.F. Section V of Pennsylvania's BMP Manual should also be consulted to achieve these goals.

TABLE V-3
Process to Achieve the Standards and Criteria
in Order of Required Consideration
(Ultimate Goal - Match Existing Conditions Hydrograph)

1. Maximize use of Non-structural Stormwater Management Alternatives
   - ♦ Minimize disturbance of natural features
   - ♦ Minimize grading
   - ♦ Minimize impervious surfaces, consider pervious surfaces
   - ♦ Break up large impervious surfaces
2. Satisfy groundwater recharge (infiltration) objective
3. Satisfy water quality
4. Apply BMPs near the source of the runoff
5. Satisfy the runoff peak attenuation objective considering all measures other than detention basins
6. After satisfying the above requirements, incorporate dual purpose detention measures, if necessary, to attenuate peaks. Dual purpose detention is recommended, e.g., recycling water, wetlands basins, water storage for fire flow, etc.

TABLE V-4
Required Criteria & Standards in the Stonycreek River Watershed

Required Standard	Benefit
Stormwater Management A, B-1, and B-2 Management Districts	No increase in runoff on a watershed wide basis, stormwater attenuation.
Recharge/Infiltration/Retention All development proposed should investigate the implementation of infiltration or retention structures for the stormwater control measures as opposed to surface detention (in all Hydrologic Soils Groups) and adhere to the recharge requirements of the Model Ordinance. This also pertains to the portions of the watershed that have storm sewers. Recharge structures installed prior to tapping into the storm sewers are recommended where soils and physical conditions permit. Impacts on subsurface mine pools and Karst areas should be evaluated before recommending this type of practice.	Groundwater/stream baseflow recharge, flow attenuation.
Water Quality Provide adequate storage and treatment facilities necessary to capture and treat the Water Quality Volume (WQv) and also provide pretreatment prior to infiltration.	Allows pollutants to settle thus providing improved water quality.
Calculations Methodology Parameters must be obtained from the Model Ordinance.	Calculations for consistent stormwater management.
Existing Storm Sewers or Culverts Discharge into existing sewer networks or culverts will be based on system capacity or design storm(s), whichever is more restrictive.	Preserve sewer/culvert capacity thereby reducing Operation and Maintenance and replacement costs.
Discharge of Accelerated Runoff Only excess accelerated stormwater runoff (after all criteria has been met) shall be safely discharged into existing drainage patterns and storm sewers without adversely affecting properties or causing channel scouring and erosion.	Safe conveyance, continued surface and groundwater quality, flow attenuation.
Inappropriate Outlets If outlet from stormwater conveyance systems from a development site to a stream, tributary, stabilized channel, or storm sewer is not possible, runoff shall be collected in a BMP and discharged at a nonerosive rate. Outlets discharging onto adjacent property owner(s)' properties must have adjacent property owner(s)' written permission.	Safe conveyance, continued surface and groundwater quality, flow attenuation.
Wetlands Refer wetland impacts to state agency for review.	Infiltration, surface and groundwater recharge, stream baseflow, water quality, flow attenuation, detention.

Note: *See the Model Ordinance for more detailed standards and criteria.*

TABLE V-5
Recommended Criteria & Standards in the Stonycreek River Watershed

Recommended Standard	**Benefit**
Erosion and Sediment Pollution Control In addition to meeting Erosion and Sediment Pollution Control regulations found in PA code Title 25, Chapter 102, and any other local regulations, it is recommended that earth disturbance activities be constructed and maintained to protect areas designated for recharge and to minimize the removal of native vegetation.	Infiltration, structure integrity, surface water quality, safe conveyance, stream, culvert, and channel capacity.
Floodplains In addition to meeting state and local floodplain regulations. It is recommended that those floodplains in which the floodplain stores floodwaters shall not be filled or covered with impervious surface so as to not reduce the storage capacity.	Natural stormwater detention/flood control downstream.
Roof Drains, Residential/Commercial Prevent all roof drains from discharging into storm sewers, roadside ditches, or channels. Discharge to lawn; recharge basin or storage facilities for re-use.	Promotes infiltration, flow attenuation, and increases runoff time of concentration, flow attenuation.
Pervious Surfaces The use of pervious materials will be encouraged for parking surfaces and sidewalks. Compaction of soils is discouraged and natural or undisturbed areas onsite are encouraged in order to keep open space pervious. Aquifer or groundwater recharge beds are encouraged.	Infiltration, groundwater recharge.
Structures Concentrate on locating facilities within areas conducive to recharge and accommodate recharge to meet management district requirements. No stormwater structures are allowed in floodplains that would reduce the storage volume.	Infiltration, groundwater recharge, stream baseflow.
Steep Slopes Regulate activities in critical slope areas where management of stormwater by structure is inappropriate. Slopes should be vegetated with native vegetation.	Stream base flow, flow attenuation, conveyance integrity, surface water quality.
Green Roof Construct rooftop gardens.	Flow attenuation and small storm retention
Riparian Buffer Width that is recommended is 50 feet measured from the top of bank on both sides of the stream.	Water quality, flood drainage reduction, habitat enhancement erosion reduction.

Note: *See the Model Ordinance for more detailed standards and criteria.*

E. Alternative Runoff Control Techniques

Each developer must not allow the runoff from his site to exceed the applicable release rate applied to the subwatershed where the site is located. This runoff control can be obtained in a number of different ways. The following tables indicate an overview of general measures that can be applied to reduce or delay stormwater runoff as well as the advantages and disadvantages for several types of runoff control measures. It will be up to the developer or the developer's engineer to select the technique that is the most appropriate to the type of project and physical characteristics of the site.

In determining what measures or combination of measures to install, the following parameters should be considered:

1. Soil characteristics (hydrologic soil group, etc.)
2. Subsurface conditions (high water table, bedrock, etc.)
3. Topography (steepness of slope, etc.)
4. Existing drainage patterns
5. Economics
6. Advantages and disadvantages of each technique

Some runoff control techniques are “structural” stormwater management controls meaning that they are physical facilities for runoff abatement. Others are “non-structural” controls, referring to land use management techniques geared toward minimizing storm runoff impacts through control of the type and extent of new development throughout the study area. The Stonycreek River Watershed Stormwater Management Plan is based on the assumption that new development of various types will occur throughout the study area (except as regulated by floodplain regulations) and that structural controls may be required to minimize the runoff implications of the new development.

1. Non-structural Runoff Controls

Non-structural methods of controlling stormwater runoff quantity and quality, such as innovative site planning, impervious area and grading reduction, protection of natural depression areas, temporary ponding on site and other techniques are recommended. Non-structural BMPs are increasingly recognized as a critical feature of stormwater BMP plans, particularly with respect to site design. In most cases, non-structural BMPs shall be combined with structural BMPs to meet all stormwater requirements. The key benefit of non-structural BMPs is that they can reduce the generation of stormwater from the site thereby reducing the size and cost of structural BMPs. In addition, they can provide partial removal of many pollutants. Some non-structural BMPs are found in Table V-6. The non-structural BMPs have been classified into broad categories including, but not limited to:

- Natural area conservation
- Limiting disturbed areas
- Conservation design

Table V-6
Non-Structural Stormwater Best Management Practices

Non-Structural Stormwater Measure	Description
Natural Area Conservation	Conservation of natural areas such as forest, wetlands, or other sensitive areas in a protected easement thereby retaining their existing conditions hydrologic and water quality characteristics.
Disconnection of Rooftop Runoff	Rooftop runoff is disconnected and then directed over an undisturbed area where it may either infiltrate into the soil or filter over it. This is typically obtained by grading the site to promote overland flow or by providing bioretention on single-family residential lots.
Disconnection of Non-Rooftop Runoff	Disconnect surface impervious cover by directing it to undisturbed areas where it is either infiltrated or filtered though the soil
Stream Buffer	Stream buffer effectively treats stormwater runoff. Effective treatment constitutes capturing runoff from pervious and impervious areas adjacent to the buffer and treating the runoff through overland flow across an undisturbed grass or forested area.
Grass Channel (Open Section Roads)	Open grass channels are used to reduce the volume of runoff and pollutants during smaller storms.
Environmentally Sensitive Rural Development	Environmental site design techniques are applied to low density or rural residential development.

2. Structural Runoff Controls:

Structural controls for managing storm runoff can be categorized as either volume controls or rate controls. Volume controls are designed to prevent a certain amount of the total rainfall from becoming runoff by providing an opportunity for the rainfall to infiltrate into the ground. Greater opportunity for infiltration can be provided by minimizing the amount of impervious cover associated with development, by draining impervious areas over undisturbed areas or into specific infiltration devices, and by using grassed swales or channels to convey runoff in lieu of storm sewer systems. Rate controls are designed to regulate the peak discharge of runoff by providing temporary storage of runoff which otherwise would leave the site at an unacceptable peak value. Rate controls, much more so than volume controls, are adaptable to regional considerations for controlling much larger watershed areas than one development site.

a. Innovative BMPs: The use of traditional and innovative best management practices (BMPs) is encouraged to meet the recharge, water quality and water quantity criteria established in this Plan. *Pennsylvania DEP Stormwater Best Management Practices Manual* (December, 2006), should be used to design and maintenance of these practices/facilities.

b. BMPs to Treat Thermally Impacted Stormwater: Runoff from blacktop during hot summer months can provide a "slug" of warm water into the streams, which could affect trout. Therefore, for areas within defined Special Protection subwatersheds

which includes Exceptional Value (EV) and High Quality (HQ) waters, the temperature and quality of stormwater entering streams shall be maintained through the use of BMPs to treat thermally impacted stormwater. To minimize thermal impacts BMPs should be designed to help reduce the temperature of the discharge of the BMP, typically by shading or by providing temporary underground storage. A list of ways in which BMPs can be designed to minimize thermal impacts is found in Table V-7.

TABLE V-7
Minimizing Thermal Impacts

To minimize temperature increases caused by new development in watersheds Stormwater BMP designs should:
• Provide shading for pools and channels (particularly south side) • Maintain existing forested buffers • Bypass available baseflow and/or springflow • Utilize underground storage where possible • Utilize recharge

c. Quantity Control: Proposed conditions development runoff from a site must not exceed the applicable existing conditions rate applied to the subwatershed where the site is located. This runoff control can be obtained in a number of different ways. The following tables indicate an overview of general measures that can be applied to reduce or delay stormwater runoff as well as the advantages and disadvantages for several types of runoff control measures. The Applicant must select the technique that is the most appropriate to the type of project and physical characteristics of the site. Best Management Practices can be utilized to manage water quality, groundwater, recharge and quantity (peak and volume). The runoff control(s) most applicable to a development site may vary widely depending upon site characteristics such as:

- Type of development proposed
- Soil characteristics (hydrologic soil group, etc.)
- Subsurface conditions (high water table, bedrock, etc.)
- Topography (steepness of slope, etc.)
- Existing drainage patterns
- Economics
- Advantages and disadvantages of each technique
- Applicable performance standard

The use of traditional and innovative Best Management Practices (BMPs) is encouraged to meet the recharge, water quality and quantity criteria established in this Plan. The "*Pennsylvania DEP Stormwater Best Management Practices Manual"* (December, 2006) should be referenced for design and maintenance of these practices/facilities.

Table V-8 provides possible on-site stormwater control methods while Table V-9 explains the advantages and limitations of various on-site stormwater control methods.

TABLE V-8
Possible On-Site Stormwater Control Methods

Area	Reducing Runoff	Delaying Runoff
Large Flat Roof	1. Cistern storage 2. Rooftop gardens 3. Pool storage or fountain storage	1. Ponding on roof by constricted downspouts
Parking Lots	1. Porous pavement a. Gravel parking lots b. Porous or punctured asphalt 2. Concrete vaults and cisterns beneath parking lots in high value areas 3. Vegetated ponding areas round parking lots 4. Gravel trenches	1. Grassy strips on parking lots 2. Grassed waterways draining parking lot 3. Ponding and detention measures for impervious areas a. Rippled pavement b. Depressions c. Basins
Residential	1. Cisterns for individual homes or groups of homes. 2. Gravel driveways (porous). 3. Contoured landscape. 4. Groundwater recharge: a. Perforated pipe b. Gravel (sand) c. Trench d. Porous pipe e. Dry wells 5. Vegetated depressions.	1. Reservoir or detention basin 2. Planting a high delaying grass (high roughness) 3. Gravel driveways 4. Grassy gutters or channels 5. Increased length of travel of runoff by means of gutters, diversions, disconnected impervious area (DIA), etc.
General	1. Gravel alleys 2. Porous sidewalks 3. Mulched planters	1. Gravel alleys

Source: *Urban Hydrology for Small Watersheds. Technical Release No. 55.*

TABLE V-9
Advantages and Limitations of Various
On-Site Stormwater Control Methods

BIORETENTION FACILITY	
Advantages:	
1.	If designed properly, has shown ability to remove significant amounts of dissolved heavy metals, phosphorous, TSS, and fine sediments.
2.	Requires relatively little engineering design in comparison to other stormwater management facilities (e.g. sand filters).
3.	Provides groundwater recharge when the runoff is allowed to infiltrate into the subsurface.
4.	Enhances the appearance of parking lots and provides shade and wind breaks, absorbs noise, and improves an area's landscape.
5.	Maintenance on a bioretention facility is limited to the removal of leaves from the bioretention area each fall.
6.	The vegetation recommended for use in bioretention facilities is generally hardier than the species typically used in parking lot landscapes. This is a particular advantage in urban areas where plants often fare poorly due to poor soils and air pollution.
Limitations:	
1.	Low removal of nitrates.
2.	Not applicable on steep, unstable slopes or landslide areas (slopes greater than 20 percent).
3.	Requires relatively large areas.
4.	Not appropriate at locations where the water table is within 6 feet of the ground surface and where the surrounding soil stratum is unstable.
5.	Clogging may be a problem, particularly if the BMP receives runoff with high sediment loads.
CATCH BASIN INSERTS	
Advantages:	
1.	Provides moderate removal of larger particles and debris as pretreatment.
2.	Low installation costs.
3.	Units can be installed in existing traditional stormwater infrastructure.
4.	Ease of installation
5.	Requires no additional land area.
Limitations:	
1.	Vulnerable to accumulated sediments being resuspended at low flow rates.
2.	Severe clogging potential if exposed soil surfaces exist upstream.
3.	Maintenance and inspection of catch basin inserts may be required before and after each rainfall event, excessive cleaning, and maintenance.
4.	Available head to meet design criteria.
5.	Dissolved pollutants are not captured by filter media.
6.	Limited pollutant removal capabilities.
CISTERNS	
Advantages:	
1.	Low installation cost.
2.	Requires little space for installation.
3.	Reduces amount of stormwater runoff
4.	Conserves water usage.
Limitations:	
1.	Limited amount of stormwater runoff can be captured.
2.	Restricted to structure runoff.
3.	Aesthetically unpleasing.

TABLE V-9 (CONT.)

CONSTRUCTED WETLANDS	
Advantages:	
1.	Artificial wetlands offer natural aesthetic qualities, wildlife habitat, erosion control, and pollutant removal.
2.	Artificial wetlands can offer good treatment following treatment by other BMPs, such as wet ponds, that rely upon settling of larger sediment particles (Urbonas, 1992). They are useful for large basins when used in conjunction with other BMPs.
3.	Wetlands that are permanently flooded are less sensitive to polluted water inflows because the ecosystem does not depend upon the polluted water inflow.
4.	Can provide uptake of soluble pollutants such as phosphorous, through plant uptake.
5.	Can be used as a regional facility.
Limitations:	
1.	Although the use of natural wetlands may be more cost effective than the use of an artificial wetland; environmental, permitting and legal issues may make it difficult to use natural wetlands for this purpose.
2.	Wetlands require a continuous base flow.
3.	If not properly maintained, wetlands can accumulate salts and scum which can be flushed out by large storm flows.
4.	Regular maintenance, including plant harvesting, is required to provide nutrient removal.
5.	Frequent sediment removal is required to maintain the proper functioning of the wetland.
6.	A greater amount of space is required for a wetland system than is required for an extended/dry detention basin treating the same amount of area.
7.	Although artificial wetlands are designed to act as nutrient sinks, on occasion, the wetland may periodically become a nutrient source.
8.	Wetlands that are not permanently flooded are more likely to be affected by drastic changes in inflow of polluted water.
9.	Cannot be used on steep unstable slopes or densely populated areas.
10.	Threat of mosquitoes.
11.	Hydraulic capacity may be reduced with plant overgrowth.
DRY WELLS	
Advantages:	
1.	Recommended in Residential Areas
2.	Requires minimal space to install.
3.	Low installation costs.
4.	Reduces amount of runoff.
5.	Provides groundwater recharge.
6.	Can serve small impervious areas like rooftops.
7.	Helps to disconnect impervious surfaces.
Limitations:	
1.	Offers little pretreatment which may cause clogging.
2.	Dry wells should not be installed where hazardous or toxic materials are used, handled, stored or where a spill of such materials would drain into the dry well.
3.	Risk of groundwater contamination in very coarse soils may require groundwater monitoring.
4.	Not suitable on fill sites or steep slopes.
5.	Must have a minimum of 3 to 4 feet between the bottom of the dry well and the seasonal high water table.
6.	Dry wells service a limited drainage area, typically only rooftop runoff.
7.	Dry wells must be located at least 10 feet away, on the down slope side of the structure, from building foundations to prevent seepage.

TABLE V-9 (CONT.)

DRY WELLS (cont.):	
Limitations:	
8.	Stormwater runoff carrying bacteria, sediment, fertilizer, pesticides, and other chemicals may flow directly into the groundwater.
9.	Loss of infiltrative capacity and high maintenance cost in fine soils.
10.	Low removal of dissolved pollutants in very coarse soils.
11.	Soils must be permeable.
12.	Not recommended for use with commercial rooftops unless adequacy of pretreatment is assured.
EXTENDED / DRY DETENTION BASINS OR UNDERGROUND TANKS	
Advantages:	
1.	Modest removal efficiencies for the larger particulate fraction of pollutants.
2.	Removal of sediment and buoyant materials. Nutrients, heavy metals, toxic materials, and oxygen-demanding particles are also removed with sediment substances associated with the particles.
3.	Can be designed for combined flood control and stormwater quality control.
4.	Requires less capital cost and land area when compared to wet pond BMP.
5.	Downstream channel protection when properly designed and maintained.
Limitations:	
1.	Require sufficient area and hydraulic head to function properly.
2.	Generally not effective in removing dissolved and finer particulate size pollutants from stormwater.
3.	Some constraints other than the existing topography include, but are not limited to, the location of existing and proposed utilities, depth to bedrock, location and number of existing trees, and wetlands.
4.	Extended/dry detention basins have moderate to high maintenance requirements.
5.	Sediments can be resuspended if allowed to accumulate over time and escape through the hydraulic control to downstream channels and streams.
6.	Some environmental concerns with using extended/dry detention basins include potential impact on wetlands, wildlife habitat, aquatic biota, and downstream water quality.
7.	May create mosquito breeding conditions and other nuisances.
INFILTRATION BASINS	
Advantages:	
1.	High removal capability for particulate pollutants and moderate removal for soluble pollutants.
2.	Groundwater recharge helps to maintain dry-weather flows in streams.
3.	Can minimize increases in runoff volume.
4.	When properly designed and maintained, it can replicate predevelopment hydrology more closely than other BMP options.
5.	Basins provide more habitat value than other infiltration systems.
Limitations:	
1.	High failure rate due to clogging and high maintenance burden.
2.	Low removal of dissolved pollutants in very coarse soils.
3.	Not suitable on fill slopes or steep slopes.
4.	Risk of groundwater contamination in very coarse soils may require groundwater monitoring.
5.	Should not be used if significant upstream sediment load exists.
6.	Slope of contributing watershed needs to be less than 20 percent.
7.	Not recommended for discharge to a sole source aquifer.
8.	Cannot be located within 100 feet of drinking water wells.
9.	Metal and petroleum hydrocarbons could accumulate in soils to potentially toxic levels.
10.	Relatively large land requirement.
11.	Only feasible where soil is permeable and there is sufficient depth to bedrock and water table.
12.	Need to be located a minimum of 10 feet down gradient and 100 feet up gradient from building foundations because of seepage problems.

TABLE V-9 (CONT.)

INFILTRATION TRENCHES	
Advantages:	
1.	Provides groundwater recharge.
2.	Trenches fit into small areas.
3.	Good pollutant removal capabilities.
4.	Can minimize increases in runoff volume.
5.	Can fit into medians, perimeters, and other unused areas of a development site.
6.	Helps replicate predevelopment hydrology and increases dry weather baseflow.
Limitations:	
1.	Slope of contributing watershed needs to be less than 20 percent.
2.	Soil should have infiltration rate greater than 0.3 inches per hour and clay content less than 30 percent.
3.	Drainage area should be between 1 to 10 acres.
4.	The bottom of infiltration trench should be at least 4 feet above the underlying bedrock and the seasonal high water table.
5.	High failure rates of conventional trenches and high maintenance burden.
6.	Low removal of dissolved pollutants in very coarse soils.
7.	Not suitable on fill slopes or steep slopes.
8.	Risk of groundwater contamination in very coarse soils may require groundwater monitoring.
9.	Cannot be located within 100 feet of drinking water wells.
10.	Need to be located a minimum of 10 feet down gradient and 100 feet up gradient from building foundations because of seepage problems.
11.	Should not be used if upstream sediment load cannot be controlled prior to entry into the trench.
12.	Metals and petroleum hydrocarbons could accumulate in soils to potentially toxic levels.
MEDIA FILTRATION	
Advantages:	
1.	May require less space than other treatment control BMPs and can be located underground.
2.	Does not require continuous base flow.
3.	Suitable for individual developments and small tributary areas up to 100 acres.
4.	Does not require vegetation.
5.	Useful in watersheds where concerns over groundwater quality or site conditions prevent use of infiltration.
6.	High pollutant removal capability.
7.	Can be used in highly urbanized settings.
8.	Can be designed for a variety of soils.
9.	Ideal for aquifer regions.
Limitations:	
1.	Given that the amount of available space can be a limitation that warrants the consideration of a sand filter BMP, designing one for a large drainage area where there is room for more conventional structures may not be practical.
2.	Available head to meet design criteria.
3.	Requires frequent maintenance to prevent clogging.
4.	Not effective at removing liquid and dissolved pollutants.
5.	Severe clogging potential if exposed soil surfaces exist upstream.
6.	Sand filters may need to be placed offline to protect it during extreme storm events.

TABLE V-9 (CONT.)

POROUS PAVEMENT	
Advantages:	
1.	Porous pavements operate in a similar fashion to infiltration trenches and thus provide similar water quality benefits, including reductions in fine-grained sediments, nutrients, organic matter, and trace metals.
2.	In addition to water quality benefits, porous pavements also provide significant reductions in surface runoff with up to 90 percent of rainfall retained within the BMP (Schueler, 1992).
3.	An added benefit provided by the on-site infiltration is the extent to which the stormwater runoff is able to contribute to groundwater recharge.
4.	Reduces pavement ponding.
Limitations:	
1.	Only applicable for low-traffic volume areas.
2.	To maintain effectiveness, porous pavements require frequent maintenance.
3.	Porous pavements are not intended to remove sediments.
4.	Easily clogged by sediments if not situated properly.
5.	Porous pavements are limited to treating small areas (0.25 to 10 acres).
6.	Contributing drainage area slopes should be 5 percent or less to limit the amount of sediments that could potentially lead to clogging of the porous pavement.
7.	On average, porous pavements clog within 5 years.
8.	Underlying soil strata must have an adequate infiltration capacity of at least 0.3 inches per hour but preferably 0.50 in/hr or more. Adequate soil permeability should extend for a depth of at least 4 feet.
9.	The bottom of the reservoir layer should be at least 4 feet above the seasonally high water table. Porous pavements should be no closer than 100 feet from drinking wells and 100 feet upgradient and 10 feet down gradient from building foundations. Due to the risk of groundwater contamination, porous pavements should not be used for gas stations or other areas with a relatively high potential for chemical spills. Similarly, special consideration should be given to the use of porous pavements in wellhead protection areas serviced by sole source aquifers.
10.	The porous pavement should not be located where run-on from adjacent areas can introduce sediments to the pavement surface. Similarly, areas subject to wind-blown sediment loads should be avoided.
11.	Extended rain can reduce the pavement's load bearing capacity.
12.	More expensive than traditional paving surfaces.
STORM DRAIN INSERTS	
Advantages:	
1.	Low installation costs.
2.	Prefabricated for different standard storm drain designs.
3.	Require minimal space to install.
4.	Provides removal of larger particles and debris as pretreatment.
Limitations:	
1.	Some devices may be vulnerable to accumulated sediments being resuspended during heavy storms.
2.	Can only handle limited amounts of sediment and debris.
3.	Maintenance and inspection of storm drain inserts are required before and after each rainfall event.
4.	High maintenance costs.
5.	Hydraulic losses.

TABLE V-9 (CONT.)

VEGETATED FILTER STRIPS	
Advantages:	
1.	Lowers runoff velocity (Schueler, 1987).
2.	Slightly reduces runoff volume (Schueler, 1987).
3.	Slightly reduces watershed imperviousness (Schueler, 1987).
4.	Slightly contributes to groundwater recharge (Schueler, 1987).
5.	Aesthetic benefit of vegetated "open spaces" (Colorado Department of Transportation, 1992).
6.	Preserves the character of riparian zones, prevents erosion along streambanks, and provides excellent urban wildlife habitat (Schueler, 1992).
7.	Provides removal of total suspended solids, total phosphorous, and total nitrogen.
Limitations:	
1.	Filter strips cannot treat high velocity flows, and do not provide enough storage or infiltration to effectively reduce peak discharges to predevelopment levels for design storms (Schueler, 1992). This lack of quantity control dictates use in rural or low-density development.
2.	Requires slope less than 5%.
3.	Requires low to fair permeability of natural subsoil.
4.	Large land requirement.
5.	Often concentrates water, which significantly reduces effectiveness.
6.	Pollutant removal is unreliable in urban settings.
VEGETATED SWALE	
Advantages:	
1.	Relatively easy to design, install and maintain.
2.	Vegetated areas that would normally be included in the site layout, if designed for appropriate flow patterns, may be used as a vegetated swale.
3.	Relatively inexpensive.
4.	Vegetation is usually pleasing to residents.
Limitations:	
1.	Irrigation may be necessary to maintain vegetative cover.
2.	Potential for mosquito breeding areas.
3.	Possibility of erosion and channelization over time.
4.	Requires dry soils with good drainage and high infiltration rates for better pollutant removal.
WET PONDS	
Advantages:	
1.	Wet ponds have recreational and aesthetic benefits due to the incorporation of permanent pools in the design.
2.	Wet ponds offer flood control benefits in addition to water quality benefits.
3.	Wet ponds can be used to handle a maximum drainage area of 10 mi^2.
4.	High pollutant removal efficiencies for sediment, total phosphorus, and total nitrogen are achievable when the volume of the permanent pool is at least three times the water quality volume (the volume to be treated).
5.	A wet pond removes pollutants from water by both physical and biological processes, thus they are more effective at removing pollutants than extended/dry detention basins.
6.	Creation of aquatic and terrestrial habitat.
7.	Sediment forebays in conjunction with wet ponds provide pretreatment by trapping sediment.
1.	Wet ponds may be feasible for stormwater runoff in residential or commercial areas with a combined drainage area greater than 20 acres but no less than 10 acres.
2.	An adequate source of water must be available to ensure a permanent pool throughout the entire year.
3.	If the wet pond is not properly maintained or the pond becomes stagnant; floating debris, scum, algal blooms, unpleasant odors, and insects may appear.

TABLE V-9 (CONT.)

WET PONDS (cont.)	
Limitations:	
1.	Sediment removal is necessary every 5 to 10 years.
2.	Heavy storms may cause mixing and subsequent resuspension of solids.
3.	Evaporation and lowering of the water level can cause concentrated levels of salt and algae to increase.
4.	Cannot be placed on steep unstable slopes.
5.	Pending volume and depth, pond designs may require approval from State Division of Dams Safety.
Note: *Advantages / Limitations adapted from Los Angeles County Development Planning for Storm Water Management Manual, September 2002.*	

TABLE V-10
Suitability of Different Control Measures
in the Stonycreek River Watershed

1.	**Cisterns and Covered Ponds:** Recommended in industrial parks where water could be utilized for fire protection; costs vary on size of cistern and material used; low maintenance costs (usually requires periodic sediment removal). Also may be used in existing or newly developed residential areas. Where pollutants may be contained in runoff, pretreatment methods such as vegetated swales must be incorporated.
2.	**Rooftop Gardens:** Recommended in this watershed.
3.	**Surface Pond Storage:** Recommended where pond sites exist or on more porous soils (A and B) for groundwater recharge; relatively inexpensive to install and maintain; helps entrap sediment to improve the water quality of the receiving stream. Where pollutants may be contained in runoff, pretreatment methods such as vegetated swales must be incorporated.
4.	**Ponding on Roof, Constricted Downspouts:** Possible on large buildings; required structure modifications usually expensive; low maintenance costs unless leaks occur.
5.	**Porous Pavement:** Highly recommended where possible, especially in A and B soils and large parking facilities; promotes groundwater recharge; moderate in expense compared to typical paving; low maintenance costs. Where pollutants may be contained in runoff, pretreatment methods such as vegetated swales must be incorporated.
6.	**Grassed Channels and Vegetated Strips:** Recommended wherever possible throughout the watershed to slow velocity and reduce erosion; minimal slopes recommended; could entrap sediment to improve water quality; low installation and maintenance costs; promotes infiltration.
7.	**Reservoirs or Detention Basin:** Recommended in entire watershed except in "No Detention" areas; moderate installation and maintenance costs. Where pollutants may be contained in runoff, pretreatment methods such as vegetated swales and forebays must be incorporated.
8.	**Groundwater Recharge:** Recommended throughout the watershed particularly in Hydrologic Soil Group A and B. Where pollutants may be contained in runoff, pretreatment methods such as vegetated swales must be incorporated.
9.	**Disconnected Impervious Area (DIA):** Recommended in entire watershed; delays runoff, entraps sediment, reduces velocities, reduces erosion potential; relatively inexpensive installation and maintenance costs.

F. Sub-Regional (Combined Site) Storage and Regional Detention Facilities

Traditionally, the approach to stormwater management has been to control the runoff on an individual site basis. However, there is a growing commitment to finding cost-effective comprehensive control techniques that both preserve and protect the natural drainage system. In other words, two or more landowners and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics adjacent to each other could pool their capital resources to provide for a community stormwater storage facility in the most hydrologically advantageous location.

The goal should be the development and use of the most cost-effective and environmentally sensitive stormwater runoff controls. These controls will significantly improve the capability and flexibility of landowners and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics and communities to control runoff consistent with the Stonycreek River Watershed Stormwater Management Plan.

An advantage to combining efforts is to increase the opportunity to utilize stormwater control facilities to meet other community needs. For example, certain stormwater control facilities could be designed so that recreational facilities such as ball fields, open space, volleyball, etc. could be incorporated. Natural or artificial ponds and lakes could serve both recreational and stormwater management objectives.

To take this concept a step further, peak rate controls could be managed "off-site"; that is, in a location off the property(s) in question. These stormwater management facilities could be constructed in an offsite location more hydrologically advantageous to the watershed. These facilities could be publicly owned detention, retention, lake, pond, or other physical facilities to serve multiple developments. However, water quality must be addressed at the source, and off-site facilities may only serve to mitigate peak flow rates.

Another option in watershed-wide stormwater management is to control runoff using regional facilities. Landowners and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics could pool their capital to build a regional detention basin at a strategic location instead of installing a basin on each individual site.

The potential for locating regional facilities within the Stonycreek River watershed was evaluated. The six parameters used for locating such a facility were:

- Site location's influence on the total watershed hydrology;
- Available undeveloped land;
- Ownership of the land;
- Topography;
- Environmental sensitivity of the locations; and
- Total area and percent of the total contributing area to the basin location.

Four potential regional detention facilities were located in Stonycreek River watershed along Beaver Creek, Beaverdam Creek, Wells Creek and a tributary to Stonycreek River. Modeling results, shown in Table V-11, do provide downstream benefits for flood protection to justify the placement of these

facilities, though Basin #1 and #4 provide limited benefits. Basin #1 is located in the headwaters of the watershed, corresponding to subarea W1060; Basin #2 corresponds to subarea W1160; Basin #3 corresponds to subarea W1180; and Basin #4 corresponds to W1240. A subarea map is provided in Section IV of this Plan.

If sub-regional, combined site storage, or regional detention facilities are to be used water quality and volume controls must be applied onsite and shall be applied as close to the source of runoff as practical. Regardless of location of stormwater management controls each person engaged in acts that impact stormwater runoff must demonstrate how stormwater runoff will be managed to meet the requirements of the Plan and model ordinance. Using a sub-regional, combined site, or regional approach does not exempt landowners and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics from meeting other requirements of the Plan. The management district criteria shall be satisfied and the design shall be consistent with the Plan. The location of any offsite stormwater management facility including a regional facility must be located within the same subwatershed as the site. Additionally, the water quality requirements of this Plan must be addressed on-site at the source. The subwatersheds are identified in section IV of the Plan and in the Management District Map found in Ordinance Appendix D.

It must be demonstrated that using a sub-regional, combined site, or regional approach does not adversely affect health, safety and property to properties downstream of the property in which there is a regulated activity. After consideration of this if it is found necessary to apply peak rate controls onsite to prevent properties downstream from adversely being impacted, then the peak rate controls shall be satisfied onsite.

TABLE V-11
100-Year HMS Flows with Proposed Regional Detention Facilities

Point of Interest	w/o Basins	Basin #1 Only	Basin #2 Only	Basin #3 Only	Basin #4 Only	Basin #2 & #3	Basin #2, #3, & #4	Basin #1, #2, #3 & #4
POI #1	44,921	44,893	40,711	40,593	43,564	36,591	36,493	36,394
POI #2	39,330	39,308	-	-	-	-	-	30,336
POI #3	18,714	-	16,961	-	-	14,830	13,772	13,772
POI #4	15,623	-	-	13,491	-	13,491	12,429	12,429
POI #5	10,251	-	-	-	9,371	-	9,371	9,371

Notes: POI #1 – Mouth of Stonycreek River
POI #2 – Below confluence of Stonycreek River and Beaver Creek
POI #3 – Below confluence of Stonycreek River and Beaverdam Creek
POI #4 – Below confluence of Stonycreek River and Wells Creek
POI #5 – Above confluence of Stonycreek River and Rohoads Creek
"-" – Not applicable

G. Stormwater Quantity Control Exemption

1. Exemptions for Land Cover Activities

The following land use activities are exempt from the drainage plan submission requirements of the Ordinance which is found in Appendix 3:

a. Regulated Activities that create Disconnected Impervious Areas smaller than 500 sq. ft. are exempt from all requirements in the Ordinance found in Appendix 3.

b. Regulated Activities that create Disconnected Impervious Areas equal or greater than 500 sq. ft. and less than 5,000 sq. ft. are exempt from the Peak Rate Control and the SWM Site Plan preparation requirement of the Ordinance found in Appendix 3.

c. Regulated Activities that create Disconnected Impervious Areas equal to or greater than 5,000 sq. ft. and less than 10,000 sq. ft. are exempt only from the peak rate control requirement of the Ordinance found in Appendix 3.

d. Agricultural activity is exempt from the rate control and SWM Site Plan preparation requirements of the Ordinance which is found in Appendix 3, provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

e. Forest management and timber operations are exempt from the rate control and SWM Site Plan preparation requirements of the Ordinance, which is found in Appendix 3, provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

Exemptions from any provisions of the Ordinance found in Appendix 3 shall not relieve the Applicant from the requirements in Sections 301.D. through L.

These criteria shall apply even if the development is to take place in phases. The date of the municipal Ordinance adoption shall be the starting point from which to consider tracts as "parent tracts" upon which future subdivisions and respective earth disturbance computations shall be cumulatively considered.

2. Additional Exemption Criteria

a. Exemption Responsibilities - An exemption shall not relieve the Applicant from implementing such measures as are necessary to protect public health, safety, and property.

b. HQ and EV Streams - An exemption shall not relieve the Applicant from meeting the special requirements for watersheds draining to identified high quality (HQ) or exceptional value (EV) waters and Source Water Protection Areas (SWPA) and requirements for non-structural project design sequencing.

c. Drainage Problems - If a drainage problem is documented or known to exist downstream of or is expected from the proposed activity, then the Municipality may require the Applicant to comply with the Ordinance.

d. Even though the developer is exempt, he is not relieved from complying with other regulations.

SECTION VI

MUNICIPAL ORDINANCE INTRODUCTION

Municipalities within the Commonwealth of Pennsylvania are empowered to regulate land use activities that affect runoff by the authority of the Act of October 4, 1978, 32 P.S., P.L. 864 (Act 167) Section 680.1 et seq., as amended, The "Storm Water Management Act." Act 167 requires that:

- Counties in consultation with the municipalities prepare a watershed stormwater management plan in conformance with the requirements of Act 167 for each watershed within their boundaries.

- Each watershed storm water plan shall include, but is not limited to: a survey of existing runoff characteristics in small as well as large storms, including the impact of soils, slopes, vegetation and existing development; a survey of existing significant obstructions and their capacities; an assessment of projected and alternative land development patterns in the watershed, and the potential impact of runoff quantity, velocity and quality; an analysis of present and projected development in flood hazard areas, and its sensitivity to damages from future flooding or increased runoff; a survey of existing drainage problems and proposed solutions; a review of existing and proposed storm water collection systems and their impacts; an assessment of alternative runoff control techniques and their efficiency in the particular watershed; an identification of existing and proposed State, Federal and local flood control projects located in the watershed and their design capacities; a designation of those areas to be served by storm water collection and control facilities within a ten-year period, an estimate of the design capacity and costs of such facilities, a schedule and proposed methods of financing the development, construction and operation of such facilities, and an identification of the existing or proposed institutional arrangements to implement and operate the facilities; an identification of flood plains within the watershed; criteria and standards for the control of storm water runoff from existing and new development which are necessary to minimize dangers to property and life and carry out the purposes of this act; priorities for implementation of action within each plan; and provisions for periodically reviewing, revising and updating the plan. Additionally, each watershed storm water plan shall contain such provisions as are reasonably necessary to manage storm water such that development or activities in each municipality within the watershed do not adversely affect health, safety and property in other municipalities within the watershed and in basins to which the watershed is tributary; and consider and be consistent with other existing municipal, county, regional and State environmental and land use plans.

- Municipalities implement the plan.

- Any landowner and any person engaged in alteration or development of land which may affect stormwater runoff characteristics shall implement such measures consistent with the plan as are reasonably necessary to prevent injury to health, safety or other property.

The Stormwater Management Act emphasizes locally administered stormwater programs with the watershed municipalities taking the lead role. Implementation and enforcement of the watershed plan standards and criteria will require the municipalities to adopt the appropriate ordinance provisions ordinances that address subdivision and land development. As part of the preparation of the Stonycreek River Watershed Stormwater Management Plan, a model municipal ordinance has been prepared that will implement the Plan provisions presented in the ordinance as a single purpose ordinance that could be adopted by each municipality with minor changes to fulfill the needs of a

particular municipality. The model municipal ordinance that has been prepared is the PA Department of Environmental Protection's Model Stormwater Management Ordinance. This could be adopted essentially "as is" (with some modification) by the municipalities. Provisions would also be required in the Subdivision and Land Development Ordinance to ensure that activities regulated by the ordinance were appropriately referenced.

In addition to adopting the ordinance itself, the municipalities would also have to revise their existing subdivision, land development, and zoning ordinances to incorporate the necessary linking provisions. These linking provisions would refer to any applicable regulated activities within the watershed to the single purpose ordinance. Key provisions of the model stormwater ordinance include the stormwater management standards, performance standards for stormwater management, and maintenance provisions for stormwater facilities.

Finally, the model stormwater ordinances should be understandable, applied fairly and uniformly throughout the watershed, and should not discourage creative solutions to stormwater management problems. It would be desirable for the municipalities to adopt a uniform regulatory approach for the Stonycreek River watershed.

The implementation of the runoff control strategy for development will be through municipal adoption of the appropriate ordinance provisions. The "Stonycreek River Watershed Act 167 Stormwater Management Ordinance" will not completely replace the existing stormwater management ordinance provisions currently in effect in the municipalities. The reasons for this are as follows:

- Not all of the municipalities in the Stonycreek River watershed are completely within the watershed. For those portions of the municipality outside Stonycreek River watershed, the existing ordinance provisions would still apply except for Section 304.A. Rate Controls.

- Permanent and temporary stormwater control facilities are regulated by the Act 167 Ordinance. Stormwater management and erosion and sedimentation control during construction would continue to be regulated under the existing stormwater ordinance and Chapter 102 Erosion and Sediment and Pollution Controls, Title 25 of DEP Regulations.

- The Act 167 Ordinance contains only those minimum stormwater runoff control criterion and standards which are necessary or desirable from a total watershed perspective. Additional stormwater management design criteria (i.e., inlet spacing, inlet type, collection system details, etc.) which should be based on sound engineering practice should be regulated under the current ordinance provisions or as part of the general responsibilities of the municipal engineer.

The following Model Ordinance has been developed specifically for municipalities within the Stonycreek River watershed in order to implement the Stonycreek River Stormwater Management Plan. Municipalities may elect to either create a single-purpose stormwater Ordinance (recommended) or amend existing subdivision or zoning ordinances to implement the associated Stormwater Management Plan.

All of the provisions within this Model Ordinance (unless specifically designated as optional) are required to be part of the municipal stormwater ordinance or other ordinances implementing the requirements of the stormwater management plan.

Organization:

This ordinance contains the following nine articles, each with specific provisions.

Article I - General Provisions: This article includes general administrative provisions including applicable land areas and regulated activities.

Article II - Definitions: This article provides a list of common terms and associated definitions used throughout the ordinance.

Article III - Stormwater Management Standards: This article represents the technical provisions for stormwater management within the Stonycreek River watershed and includes volume control requirements, rate control requirements, exemption criteria, erosion and sediment control requirements, and design requirements.

Article IV - Stormwater Management Site Plan Requirements: This article lists the specific requirements for submittal, content, and review of stormwater management (SWM) site plans required by the ordinance.

Article V - Operation and Maintenance: This article outlines the Applicants' responsibilities for operation and maintenance of stormwater management facilities

Article VI - Fees and Expenses: This article contains the provisions for a municipal review fee.

Article VII - Prohibitions: This article describes prohibited discharges, connections, drains, and alterations.

Article VIII - Enforcement and Penalties: This article describes municipal enforcement procedures, remedies, and the appeals process.

Article IX - References: This article provides reference documents useful for stormwater management.

Appendices: This section of the ordinance contains four appendices necessary to implement the ordinance provisions.

Please note that the Plan and associated ordinance provisions were developed under the authority of and in strict conformance with the requirements of Act 167. These documents were prepared in consultation with a WPAC comprised of designated representatives from each of the watershed municipalities, County Planning and the Conservation District staff. Other advisory members invited to serve on the WPAC include PennDOT, non profit organizations, as well as a number of others.

Within six months following adoption and approval of a watershed stormwater Plan, each municipality is required to adopt or amend stormwater ordinances as laid out in the Plan. These ordinances must regulate development within the municipality in a manner consistent with the watershed stormwater Plan and the provisions of the Act.

ORDINANCE REQUIREMENTS:

The following ordinance provisions must be retained when a municipality either elects to create a single-purpose stormwater ordinance or amends existing subdivision or zoning ordinances to implement the stormwater management plan.

- Article I - General Provisions
- Article II - Definitions
- Article III - Stormwater Management Standards
- Article IV - Stormwater Management Site Plan Requirements
- Article V - Operation and Maintenance
- Article VI - Fees and Expenses
- Article VII - Prohibitions
- Article VIII - Enforcement and Penalties
- Article IX - References
- Appendix A: Operation and Maintenance Agreement
- Appendix B: Disconnected Impervious Area (DIA)
- Appendix C: Stormwater Management for Small Projects
- Appendix D: Stormwater Management District Map

The municipal solicitor should review Article VIII - Enforcement and Penalties, and make any additions as necessary to ensure that effective enforcement can be provided commensurate with the applicable municipal code.

NOTE: If a municipality chooses to incorporate the required stormwater standards and criteria into their own existing ordinances, it must be consistent with the standards and criteria contained in Section V of the plan and the Model Ordinance. However, it is highly recommended that municipalities adopt the Model Ordinance as a standalone stormwater ordinance as future Plan updates would require the adoption of multiple ordinances (those municipal ordinances that contain stormwater management regulations) rather than just the one stormwater Ordinance.

SECTION VII

PRIORITIES FOR IMPLEMENTATION

The Stonycreek River Stormwater Management Plan preparation process is complete with Cambria and Somerset Counties' adoption of the draft Plan and submission of the final Plan to DEP for approval. This sets in motion the mandatory schedule of adoption of ordinances needed to implement stormwater management criteria. The Stonycreek River watershed municipalities had six months from DEP approval to adopt the necessary ordinance provisions.

A. DEP Approval of the Plan

Upon adoption of the Watershed Plan by Cambria and Somerset Counties, the Plan was submitted to DEP for approval. A draft of the Stormwater Management Plan and draft Model Ordinance was sent to DEP prior to adoption of the Plan. The DEP review process involves determination that all of the activities specified in the Scope of Study have been completed. The DEP also reviewed the Plan for consistency with municipal floodplain management plans, State programs that regulate dams, encroachments and other water obstructions, and State and Federal flood control programs. The review process also ensures that the Plan is compatible with other watershed stormwater plans in the basin, and that the Plan is consistent with the policies of Act 167.

B. Publishing the Final Plan

Consistent with the Stonycreek River Watershed Scope of Study, the Cambria County Conservation District will publish additional copies of the study area Plan after DEP approval. One copy of the Plan will be provided to each municipality. Additional separate copies of the Stonycreek River Watershed Act 167 Storm Water Management Ordinance will be published for use by the municipalities.

C. Municipal Adoption of Ordinance to Implement the Plan

The essential ingredient for implementation of the Stormwater Management Plan is the adoption of the necessary ordinance provisions by the Stonycreek River watershed municipalities. Provided as part of the Plan is the Act 167 Stormwater Management Plan Model Ordinance which is a single purpose stormwater Ordinance that could be adopted by each municipality essentially "as is" to implement the Plan. The single purpose Ordinance was chosen for ease of incorporation into the existing structure of municipal ordinances. All that is required of any municipality would be to adopt the Ordinance itself and adopt the necessary provisions for tying into the existing subdivision and land development ordinance and zoning ordinance as outlined in the Municipal Ordinance Matrix in the Appendix. The tying provisions would simply refer any applicable regulated activities within the Stonycreek River watershed from the other ordinances to the single purpose Ordinance. All municipalities are required to adopt the model ordinance or amend existing ordinances to be consistent with the standards and criteria set forth in the Plan. If municipalities do not have the capabilities to review plans for consistency with the standards and criteria set forth in the Plan it shall be the municipalities responsibility to designate a representative organization that is capable of completing the review on the municipalities behalf. It is recommended that the delineation of the watershed subareas and the stormwater management criteria assigned to each subarea be enacted as

part of each municipality's zoning or subdivision ordinance. This way the requirements for management of stormwater will be applicable to all changes in land use and not limited to activities that are subject to subdivision and land development regulations.

D. Level of Government Involvement in Stormwater Management

The existing institutional arrangements for the management of stormwater include federal, state, and county governments, as well as every municipality within the watershed.

In the absence of a single entity with responsibility for all aspects of stormwater management within a watershed, it is clear that the "management" that occurs is primarily a function of a multiple permitting process where a developer attempts to satisfy the requirements of all of the permitting agencies. Each public agency has established its own regulations based on its own objectives and legislative mandates as well as its own technical standards according to its particular stormwater concerns.

The minimum objectives of this Plan and the minimum mandates of Act 167 can be accomplished without significant modification of existing institutional arrangements. Actions must be taken at the municipal level. Participation by the county in the technical review of stormwater management plans is necessary. In addition, there must be maintenance and operation of the computer model (as necessary), and compilation of data required for periodically updating the Plan. In addition, upon adoption of the Plan, all future public facilities, facilities for the provision of public utility services, and facilities owned or financed by state funds will have to be consistent with the Plan, even though they might not otherwise be subject to municipal regulation.

Each municipality shall adopt or amend, and shall implement such ordinances and regulations, including zoning, subdivision and development, building code, and erosion and sedimentation ordinances, as are necessary to regulate development within the municipality in a manner consistent with the applicable watershed stormwater plan and the provisions of the Act. Act 167 requires that this be accomplished within six months of the Plan's adoption and approval. Model Ordinance provisions will be distributed to all of the watershed municipalities. The Cambria County Conservation District and Somerset County Planning Commissions will be available upon request to assist municipalities in the adoption of the Model Ordinance provisions to fit particular municipal ordinance structures.

The primary county level activity will be the establishment of review procedures. The Model Ordinance calls for review of stormwater management plans by a qualified professional. Review by the Cambria and Somerset County Conservation Districts is optional. Evidence that the appropriate state and federal agencies responsible for administering wetland regulatory programs have been contacted for land development sites containing regulated wetlands is also required. The purpose is to ensure that Plan standards have been applied appropriately and that downstream impacts have been adequately addressed. Procedures and capabilities for performing the review function exist within the governmental agencies.

E. County-Wide Coordination

There are possible situations of stormwater management functions and concerns, which may not be adequately addressed within the structure of the existing institutional arrangements or by the adoption and enforcement of new regulations at the municipal level, as outlined above.

For example, the construction of regional storage facilities may offer an economic and technically sound alternative to the construction of individual, on-site detention basins. There is, however, no organization now that is capable of implementing such a concept. To do so would require a multi-municipal entity capable of planning, financing, constructing, operating, and maintaining the shared storage facilities in a manner similar to the management required for the collection, treatment, and disposal of sanitary wastes.

The Stonycreek River watershed is a drainage system. All of its parts are interrelated; what happens upstream affects what happens downstream, and what happens downstream places limitations on what happens upstream. If runoff is not controlled in upstream communities, downstream communities will flood. However, if in a downstream community, the capacity of a drainage channel can be safely increased, more upstream runoff may be released, thus reducing somewhat the cost of required upstream control facilities.

The reduced storm frequency standard proposed in this Plan is the primary standard for managing stormwater on a watershed basis and is a very simple concept that can be implemented on a property-by-property basis. But the same technical tool that allowed the modeling of rainfall routing throughout the watershed and the development of a usable standard for property-level control, is also capable of testing numerous, technically feasible solutions that would work for combinations of properties and for combinations of subareas. Some of these potential solutions may be preferable to those that would result from the application of release rates to individual properties.

There are, of course, ways to work out agreements on a case-by-case basis to permit the accomplishment of almost any objective, whether a public or a private undertaking. However, as the number of stormwater detention and control facilities increases during future years, continuing maintenance to ensure the integrity of structures and their performance will become very important. A proliferation of “special agreements” to handle special situations may make future accountability very difficult.

An ideal structure for the management of stormwater on a watershed basis would be an entity, a regional stormwater management board, capable of dealing with all interrelated elements of the system to achieve the following:

- The best possible technical solutions in the most effective manner;
- The efficient and competent review of stormwater management components of development plans;
- The continued maintenance and proper functioning of all elements of the system;
- The repair and replacement of system components as necessary;
- Continuing monitoring and evaluation of the performance of the drainage system;
- Updating and revision of system requirements and standards as necessary;

- Responsible financial management including an equitable apportionment of operating and capital costs among the system's users and beneficiaries.

It is clear that not all of these objectives can be achieved on a watershed basis through municipal implementation of the stormwater plan, but that the existence of an intermunicipal entity capable of continuous action at the system or watershed level is required.

An optimum management system would be an entity capable of performing similar functions for multiple watersheds. There are a variety of models for such an entity, ranging from assigning new responsibilities to a coordinated team of existing county departments to the creation of a regional stormwater management board to include stormwater functions. Further, under any management system, some of the elements in the process could be contracted out to a private vendor.

The essential concept is that stormwater can be managed like a public utility and that the costs for planning, construction, operation and maintenance, monitoring and evaluation can be equitably shared by all of the system's users.

A basic assumption underlying the concept of user financing of stormwater management is that damage caused by existing and potential stormwater runoff without controls is intolerable. Therefore, it is in the public interest to undertake stormwater management immediately, and such management should not be delayed until federal and state funding is available.

Based on stormwater management experience elsewhere, users (including beneficiaries) can finance the full cost of stormwater management inexpensively and equitably. The cost to each user is calculated based on user's property characteristics. Because this method is based on a formula, it has the advantage of being objective in its application.

F. Correction of Existing Drainage Problems

The development of the watershed plan has provided a framework for the correction of existing drainage problems, a logical first step in the process of implementation of a stormwater management ordinance. It will prevent the worsening of existing drainage problems and prevent the creation of new drainage problems as well. The step-by-step outline below is by no means a mandatory action to be taken by the municipalities with watershed plan adoption options; it is just one method of solving problems uniformly throughout the watershed in order to solve current runoff situations.

1. Prioritize a list of storm drainage problems within the municipalities based on frequency of occurrence, potential for injury, as well as damage history.

2. Develop a detailed engineering evaluation to determine the exact nature of the top priority drainage problems within the municipalities in order to determine solutions cost estimates and a recommended course of municipal action.

3. Incorporate implementation of recommended solutions regarding stormwater runoff in the annual municipal capital or maintenance budget.

G. Culvert Replacement

The General Procedures for Municipalities to determine size of replacement culverts using Act 167 data is as follows:

1. Determine the location and Municipality of obstruction on the Obstruction Map and obtain the obstruction number.

2. From Section 105.161 of DEP's Chapter 105, determine the design storm frequency.

3. From "Obstruction Data" tables included in the Technical Appendix, locate the Municipality and Obstruction number. Identify the flow value (cfs) for the design storm frequency determined in #2 above.

4. Have the culvert sized for this design flow and obtain any necessary approvals/permits.

Note: Any culverts/stream crossings not identified on the Obstruction Map need to have storm flows computed for sizing purposes (i.e., those culverts which were not measured due to lack of maintenance and therefore the inability to determine the actual size of the obstruction).

H. PennVEST Funding

One way in which the completion and implementation of this Plan can be of assistance in addressing storm drainage problems is by opening the avenue of funding assistance through the PennVEST program. The PennVEST Act of 1988, as amended, provides low interest loans to governmental entities for the construction, improvement or rehabilitation of stormwater projects including the transports, storage and infiltration of stormwater and best management practices to address nonpoint source pollution associated with stormwater.

In order to qualify for a loan under PennVEST, the municipality or county:

1. Must be located in a watershed for which there is an existing county adopted and DEP approved stormwater plan with enacted stormwater ordinances consistent with the Plan, or

2. Must have enacted a stormwater control ordinance consistent with the Act.

I. Landowner's/Developer's Responsibilities

Any landowner and any person engaged in the alteration or development of land that may affect stormwater runoff characteristics shall implement such measures consistent with the provisions of the applicable watershed stormwater plan as are reasonably necessary to prevent injury to health, safety or other property. Such measures shall include such actions as are required:

1. To assure the maximum rate of stormwater runoff is no greater after development than prior to development activities; or

2. To manage the quantity, velocity and direction of resulting stormwater runoff in a manner that otherwise adequately protects health and property from possible injury.

SECTION VIII

PLAN REVIEW ADOPTION AND UPDATING PROCEDURES

A. Provisions for Plan Revision

Section 5 of the Stormwater Management Act requires that the Stormwater Management Plan be updated at least every five years. This requirement considers the changes in land use, obstructions, flood control projects, floodplain identification, and management objectives or policy that may take place within the watershed.

It will be necessary to collect and manage the required data in a consistent manner and preferably store it in a central location. This is not only to prepare an updated Plan, but also, if required, to make interim runs on the runoff simulation model to analyze the impact of a proposed major development or a proposed major stormwater management facility.

The following recommendations are the minimum requirements to maintain an effective technical position for periodically reviewing and revising the Plan.

1. It is recommended that the Cambria and Somerset County Board of Commissioners authorize the County Planning Departments to undertake the task of organizing stormwater management plans and supporting data submitted for review. The Planning Departments should also assume responsibility for periodically reviewing, revising, and updating the stormwater management plan.

2. It is recommended that the Cambria and Somerset County Planning Commissions prepare a workable program for the identification, collection and management of the required data. The program should not be limited to the cooperative efforts of the constituent member municipalities within the Stonycreek River watershed, but should also include both state and county agencies concerned with stormwater management.

3. It is recommended that the Watershed Plan Advisory Committee convene biannually or as needed to review the Stormwater Management Plan and determine if the Plan is adequate for minimizing the runoff impacts of new development. At a minimum, the information (to be reviewed by the Committee) will be as follows:

    a. Development activity data as monitored by the Cambria and Somerset County Planning Commissions.

    b. Information regarding additional storm drainage problem areas as provided by the municipal representatives to the WPAC.

    c. Zoning and Subdivision amendments within the watershed.

    d. Impacts associated with any regional or subregional detention alternatives implemented in the watershed.

    e. Adequacy of the administrative aspects of regulated activity review.

f. Additional hydrologic data available through preparation of the Stormwater Management Plan for the Stonycreek River watershed.

The Committee will review the above data and make recommendations to the Counties for revisions to the Stonycreek River Watershed Stormwater Management Plan. Cambria and Somerset Counties will review the recommendations of the Watershed Plan Advisory Committee and determine if revisions are to be made. A revised Plan would be subject to the same rules of adoption as the original Plan. Should the Counties determine that no revisions to the Plan are required for a period of five consecutive years, the Counties will adopt a resolution stating that the Plan has been reviewed and been found satisfactory to meet the requirements of Act 167. The resolution will then be forwarded to the Department of Environmental Protection.

SECTION IX

FORMATION OF THE STONYCREEK RIVER WATERSHED ADVISORY COMMITTEE

The following is a listing of the meetings held by the WPAC during the preparation and adoption of the detailed watershed stormwater management plan. The list of WPAC members is found in the introduction section found in the beginning of Volume II of the Plan just prior to the table of contents.

Advisory Committee meetings and their purposes were as follows:

Meeting	Date	Purpose
1	6/22/2005	Introduction to Stormwater Management; Review Act 167; Distributed data collection forms; coordination with other study initiatives; progress report.
2&3 Combined	3/12/2008	Review of data collection; mapping results; preliminary hydrologic modeling results; and preliminary Management District development and criteria.
4&5 Combined	4/30/2008	Review of goals, Act 167 and NPDES/Act 167 Ordinance; status of project; hydrologic modeling results; Management Districts; next steps; Model Act 167 Stormwater Management Ordinance.
Final	5/27/2009	Review of Draft Plan; discussion of Model Ordinance criteria.

SECTION X

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PLAN APPENDIX 1

PUBLIC COMMENT
&
RESPONSES

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

DATE: 7/8/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER SWM PLAN ORDINANCE COMMENTS

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

STONYCREEK TWP. COMMENTS

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

BOARD OF COMMISSIONERS
STONYCREEK TOWNSHIP

Cambria County
1610 Bedford Street
Johnstown, PA 15902

Phone: 814-266-3111
Fax: 814-266-4843

July 1, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

Dear Mr. Piper:

We have reviewed the draft Stonycreek River Watershed Stormwater Management Ordinance as requested at the April 30, 2008 workshop and in your letter dated May 29, 2008. This letter contains comments regarding the proposed ordinance. Section numbers are provided for reference with the proposed ordinance, unless otherwise noted. We have contacted the EADS Group, Inc. and Mr. Brad Zearfoss, Somerset Planning Commission to assist us in the review of this ordinance. After review and discussion, we offer the following comments:

1. The "x" value in Section 402 should be set to 5,000 square feet. We further suggest that this exemption apply to all impervious areas, not only disconnected impervious areas. Please remove the word "disconnected".
2. The "y" value in Section 402 should be set to 10,000 square feet. We also suggest removing the word "disconnected" from this exemption.
3. The Coxes Creek Ordinance currently allows exemptions for minor subdivisions defined by the Somerset County Subdivision and Land Development Ordinance. We recommend providing this exemption in the proposed ordinance for consistency.
4. The proposed ordinance provides design requirements for BMPs for streambank erosion. The County Conservation District currently reviews erosion and sedimentation BMPs for projects that qualify for an erosion and sedimentation plan. We recommend removing this requirement from the proposed ordinance since it is already reviewed through the Conservation District.
5. Section 308 requires that the 2-, 10-, 25-, 50-, and 100-year design storms are controlled. The Coxes Creek Ordinance requires control of the 2-, 10-, and 25-year design storms. We believe the control of the 50- and 100-year design storms is flood control and not a reasonable requirement for stormwater control. We suggest requiring the control of the 2-, 10-, and 25-year design storms only.
6. Section 308 requires post-development flows be released at rates corresponding to design storms specified in Table 308-1. All of the proposed stormwater districts contain at least one

design storm which requires the post-development flows to be reduced at a design storm less than the post-development design storm. The Coxes Creek Ordinance requires that the post-development flows are released at peak rates that do not exceed the pre-development flows for an equivalent storm. We suggest that the same design storm criteria are applied to all stormwater management districts.

7. Section 310 requires that all storm sewers be able to convey the post-development runoff from a _____-year design storm without surcharging inlets, where appropriate. We suggest using a 10-year design storm for this requirement.
8. Section 310 provides design criteria for the erosion and sedimentation of open channels and point discharges. The County Conservation District currently reviews erosion and sedimentation BMPs for projects that qualify for an erosion and sedimentation plan. We recommend removing this requirement from the proposed ordinance since it is already reviewed through the Conservation District.
9. The proposed ordinance does not include a time frame for application review by the municipality. We recommended including language that would allow the municipality 45 days to review a stormwater application and respond to the developer with a written letter of approval or disapproval.
10. Section 405 provided details for as-built documentation. The Coxes Creek includes similar requirements, but also requires that the applicant notify the municipality of completion of construction within thirty calendar days of completion of construction. We recommend adding similar language to the proposed ordinance.
11. The terms "SWM Site Plan" and "Drainage Plan" are used within the Ordinance. Considerations should be given to clarifying the difference between the two terms or else combining the terms to one.
12. Vertical profiles of open channels do not seem necessary. We recommend deleting this requirement.
13. Section 702.B.f. should exclude the requirement for the locations of utilities within 50 ft. of the project boundary. We suggest that utilities within the project boundary only need to be located. In addition, consider requiring that adjacent land owners be identified on the plan.
14. Section 305F defines stream buffers, however no statement of permitted or prohibited activities are defined. It is intended to prohibit earth disturbance with the buffer?
    a. Definition of Buffer page 7 should include verbage describing regulations within the buffer.
15. Provided that PaDEP approves the impervious limits as set forth in the ordinance by exemptions ("x" to 5,000 sf and "y" to 10,000 sf) new home construction would be exempt from stormwater management. We recommend that a "Homeowner's Guideline" be established to assist in stormwater control on a residential level without requiring an extensive plan by potential residents.
16. Page iii, letter E (Model Ordinance) states if enacting a modified version of this ordinance will make a municipality ineligible for the NPDES general permit (Page 13) for stormwater discharges from small MS4s. Does this mean that if you make ANY changes, the Municipality cannot get any NPDES permits?
17. On page 7 (Model Ordinance), under Earth Disturbance Activity, does "clearing" include brush and trees? Does "earth material" include leaves?

18. On page 10, letter G (Model Ordinance). Is there a statue of limitation on the permission of the adjacent property owner? If the adjacent property owner sells, can the new owner reject the agreement previously done?
19. On page 15, Section 403. Plan Review A (Model Ordinance) it states that a "Qualified Professional" should review the site plans. If the Cambria Conservation District's Erosion & Sediment Pollution Control is already involved in the E&S permits, and now needs to review the site plan for the municipality, wouldn't it be better for the Conservation District to just be in charge of the whole process?
20. On page 19, Section 701 Prohibited Discharges and connections, under C (Model Ordinance).
    a. Should runoff from pastures and fields, yards, and gardens be included?

Please contact this office with any questions.

Sincerely,

William Knipple, President
Stonycreek Township Board of Commissioners

cc: Jeff Haynal – The EADS Group, Inc.
File

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

DATE: 7/9/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER SWM PLAN ORDINANCE COMMENTS

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

STONYCREEK TWP. COMMENTS

SIGNATURE OF OPERATOR:

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120 FAX: (814) 472-0686 E-Mail: cccd@co.cambria.pa.us

Stonycreek Township Supervisors
Somerset County
120 Municipal Road, Friedens, PA 15541-6414

Supervisors: Gregory A. Walker
Gerald W. Walker, Jr.
Jason L. Snyder

Phone: 814-267-3212
Fax: 814-267-6592
Email: Township@floodcity.net

July 1, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

Dear Mr. Piper

We have reviewed the draft Stonycreek River Watershed Stormwater Management Ordinance as requested at the April 30, 2008 workshop and in your letter dated May 29, 2008. This letter contains comments regarding the proposed ordinance. Section numbers are provided for reference with the proposed ordinance, unless otherwise noted. We have contacted the EADS Group, Inc. and Mr. Brad Zearfoss, Somerset Planning Commission to assist us in the review of this ordinance. After review and discussion, we offer the following comments;

1. The "x" value in Section 402 should be set to 5,000 square feet. We further suggest that this exemption apply to all impervious areas, not only disconnected impervious areas. Please remove the word "disconnected".
2. The "y" value in Section 402 should be set to 10,000 square feet. We also suggest removing the word "disconnected" from this exemption.
3. The Coxes Creek Ordinance currently allows exemptions for minor subdivisions defined by the Somerset County Subdivision and Land Development Ordinance. We recommend providing this exemption in the proposed ordinance for consistency.
4. The proposed ordinance provides design requirements for BMPs for streambank erosion. The County Conservation District currently reviews erosion and sedimentation BMPs for projects that qualify for an erosion and sedimentation plan. We recommend removing this requirement from the proposed ordinance since it is already reviewed through the Conservation District.
5. Section 308 requires that the 2-, 10-, 25-, 50-, and 100-year design storms are controlled. The Coxes Creek Ordinance requires control of the 2-, 10-, and 25-year design storms. We believe the control of the 50- and 100-year design storms is flood control and not a reasonable requirement for stormwater control. We suggest requiring the control of the 2-, 10-, and 25-year design storms only.
6. Section 308 requires post-development flows be released at rates corresponding to design storms specified in Table 308-1. All of the proposed stormwater districts contain at least one

design storm which requires the post-development flows to be reduced at a design storm less than the post-development design storm. The Coxes Creek Ordinance requires that the post-development flows are released at peak rates that do not exceed the pre-development flows for an equivalent storm. We suggest that the same design storm criteria are applied to all stormwater management districts.

7. Section 310 requires that all storm sewers be able to convey the post-development runoff from a _____-year design storm without surcharging inlets, where appropriate. We suggest using a 10-year design storm for this requirement.
8. Section 310 provides design criteria for the erosion and sedimentation of open channels and point discharges. The County Conservation District currently reviews erosion and sedimentation BMPs for projects that qualify for an erosion and sedimentation plan. We recommend removing this requirement from the proposed ordinance since it is already reviewed through the Conservation District.
9. The proposed ordinance does not include a time frame for application review by the municipality. We recommended including language that would allow the municipality 45 days to review a stormwater application and respond to the developer with a written letter of approval or disapproval.
10. Section 405 provided details for as-built documentation. The Coxes Creek includes similar requirements, but also requires that the applicant notify the municipality of completion of construction within thirty calendar days of completion of construction. We recommend adding similar language to the proposed ordinance.
11. The Consultant's Stormwater Management Plan Report provides on page VI-4 in "Section VI - Municipal Ordinance Introduction" that NPDES Phase II program affects all "urbanized areas" and that this definition applies to all Stonycreek River Watershed municipalities. The plan also indicates on page III-1 that nineteen of the thirty-six municipalities in the watershed are located within the Johnstown Urbanized Area as designated by the 2000 Census. Not all municipalities in the watershed are MS-4 communities.
    a. This sentence needs to be deleted.
12. The terms "SWM Site Plan" and "Drainage Plan" are used within the Ordinance. Considerations should be given to clarifying the difference between the two terms or else combining the terms to one.
13. Vertical profiles of open channels do not seem necessary. We recommend deleting this requirement.
14. Section 702.B.f. should exclude the requirement for the locations of utilities within 50 ft. of the project boundary. We suggest that utilities within the project boundary only need to be located. In addition, consider requiring that adjacent land owners be identified on the plan.
15. Section 305F defines stream buffers, however no statement of permitted or prohibited activities are defined. It is intended to prohibit earth disturbance with the buffer?
    a. Definition of Buffer page 7 should include verbage describing regulations within the buffer.
16. Provided that PaDEP approves the impervious limits as set forth in the ordinance by exemptions ("x" to 5,000 sf and "y" to 10,000 sf) new home construction would be exempt from stormwater management. We recommend that a "Homeowner's Guideline" be established to assist in stormwater control on a residential level without requiring an extensive plan by potential residents.

17. On page i, under Purpose (Model Ordinance). the last sentence states: This Model Ordinance combines and supersedes previous model municipal ordinances for stormwater management published by DEP in documents 392-0300-001 and 392-0300-003. How can an Ordinance Supersede a previous ordinance? If this is the case, how can you enforce a situation where someone did the proper procedures and studies for stormwater run-off and now you want them to change it? Who is to pay for the improvements?
18. Page iii, letter E (Model Ordinance) states if enacting a modified version of this ordinance will make a municipality ineligible for the NPDES general permit (Page 13) for stormwater discharges from small MS4s. Does this mean that if you make ANY changes, the Municipality cannot get any NPDES permits?
19. On page 7 (Model Ordinance), under Earth Disturbance Activity, does "clearing" include brush and trees? Does "earth material" include leaves?
20. On page 10, letter G (Model Ordinance). Is there a statue of limitation on the permission of the adjacent property owner? If the adjacent property owner sells, can the new owner reject the agreement previously done?
21. On page 15, Section 403. Plan Review A (Model Ordinance) it states that a "Qualified Professional" should review the site plans. If Keith Largent from the Somerset Conservation District's Erosion & Sediment Pollution Control is already involved in the E&S permits, and now needs to review the site plan for the municipality, wouldn't it be better for Keith to just be in charge of the whole process?
22. On page 19, Section 701 Prohibited Discharges and connections, under C (Model Ordinance).
    a. Should runoff from pastures and fields, yards, and gardens be included?

Please contact this office with any questions.

Sincerely,

Printed Name: Gregory A. Walker

Signature: Gregory A. Walker

cc: Jeff Haynal – The EADS Group, Inc.

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

DATE: 7/3/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER SWM PLAN ORDINANCE COMMENTS

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

SOMERSET TWP. COMMENTS

SIGNATURE OF OPERATOR:

FAX NUMBER OF SENDER: (814) 472-0686

Somerset Township

Established 1796
SOMERSET TOWNSHIP MUNICIPAL BUILDING
2209 N. Center Avenue • SOMERSET, PENNSYLVANIA 15501-7443
Phone: (814) 445-4675 • Fax: (814) 443-6751
SOMERSET COUNTY

June 26, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

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    a. Should runoff from pastures and fields, yards, and gardens be included?

Please contact this office with any questions.

Sincerely,

Printed Name: Daniel H Halverson

Signature:

cc: Jeff Haynal – The EADS Group, Inc.

Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

~~814~~ 484-821-0474

DATE: 4-25-08

TO: PAUL DeBARRY FROM: ROBB PIERCE

SUBJECT: COMMENT LETTERS

There are 8 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

LETTERS FROM:

~~SOMERSET~~

- SOMERSET PLANNING
- CAMBRIA PLANNING
- EADS - CITY OF JOHNSTOWN
- CAMBRIA CO. COMMISSIONERS / RODKEY-SOLICITOR
- EADS - ADAMS TWP.

SIGNATURE OF OPERATOR: [signature]

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

SOMERSET COUNTY PLANNING COMMISSION

STONYCREEK WATERSHED STORMWATER MANAGEMENT PLAN
COMMENTS ON DRAFT STORMWATER MANAGEMENT ORDINANCE

1. Additional Review Time Requested. I attended a meeting on March 31st at the Somerset Township municipal building regarding the stormwater management plan and ordinance. The meeting was coordinated by the Somerset Township supervisors, with seven of the twenty-three municipalities within the Stonycreek watershed in Somerset County attending. The municipal officials present felt strongly that not enough time has been provided for reviewing the draft plan (which none of them have) and the draft ordinance (which most of them do not have). They are requesting a minimum of sixty (60) additional days for review to commence once they have received copies of the information – and I concur. This will provide time for the municipal officials and their solicitors and engineers to review the materials. Unless this additional review time is given, I do not believe that any meaningful review of the plan or education of the municipal officials regarding the plan is possible, and I believe that the Somerset County Commissioners would be very hesitant to enact the plan. Also, I believe that the municipal officials would be very resistant to adopt an implementing ordinance which they have not had time to review, understand, and very possibly might not be aware of.

2. Copies of Draft Plan and Ordinance to Municipalities. Neither Somerset County nor our municipalities have received copies of the draft plan, and it is extremely difficult to review the draft ordinance without having this background information. I am requesting that the consultant send copies of the plan to us, and to all of the affected municipalities in Somerset County as soon as possible. I recommend that the plan be sent in hard copy format to the municipal officials, and be made available in digital format as well. Second, the only municipalities that have copies of the draft ordinance are those that attended the March meeting in Richland Township. It was my understanding from that meeting that copies of the ordinance were being sent to the municipalities, but I was advised at the March 31st meeting at Somerset Township that none of them had received the ordinance. Again, the review and comment period should not commence until everybody has received this information. Please ask the consultant to send copies of the draft ordinance to the affected municipalities in Somerset County as soon as possible along with the plan.

3. Additional Municipal Meeting(s). There is a need to hold an additional meeting with the affected Somerset County municipalities to explain the plan and the ordinance. I am requesting that the consultant coordinate with us and supervisor Dan Halverson from Somerset Township to set up a meeting, and that the consultant attend the meeting to present the information and answer questions. As you know, only two of the twenty-

received 4/11/08

three affected Somerset County municipalities attended the March WPAC meeting in Richland, and at this point, many are probably only minimally aware of what the project involves. I believe that this is illustrated by the large number of municipalities in Somerset County who have either not paid their requested local grant match, or who have actually "opted out" of the project, both problems being of serious concern. This meeting for the municipalities should occur they have received the plan and draft ordinance. The municipalities can ask their solicitors and engineers to attend the meeting. I believe that it is very critical to hold this meeting in order to present the information to the municipal officials. Finally, I am willing to meet with municipalities who cannot make the meeting, but it would be essential to have the consultant be present to go over any technical information.

4. Comments on Draft Ordinance. I have received comments on the draft ordinance from the municipal engineer for Somerset Township (see attached) who has reviewed the ordinance on behalf of the Township. Due to the other townships not having copies of the draft ordinance, I have not received any other comments on the draft ordinance. The County does not have an engineer on staff or on retainer to review the ordinance, so my review comments are more general. My comments are:

   - The draft ordinance is excessive, and cannot be realistically administered or enforced by the rural municipalities in Somerset County. Further, the ordinance as proposed would impose unnecessary financial burdens upon homeowners and other builders, and would place these municipalities in an economic disadvantage to other municipalities having little or no stormwater regulations in place. The draft ordinance goes well beyond the language contained in the model ordinance published by the PA DEP, which is in itself excessive for rural Pennsylvania. A part of the land development that would be regulated under the draft ordinance does not even normally fall under the review of the municipal building codes, so much of the regulated activities would occur without being noticed. The draft ordinance absolutely needs to be scaled back, and made more realistic for our local circumstances. This will require that municipal officials and their engineers and solicitors be given an opportunity to provide input on what works in their areas.

   - One recommendation is to use the model stormwater management ordinance developed for the Coxes Creek Stormwater Management Plan, which was approved by the PA DEP. Variations of this ordinance are in place in portions of seven municipalities in Somerset County, and the regulations are generally viewed as reasonable and workable, and are familiar to municipal officials and developers. A copy of this model ordinance is attached.

CAMBRIA COUNTY
PLANNING COMMISSION
(814) 472-2106

401 CANDLELIGHT DRIVE
SUITE 213
EBENSBURG, PA 15931

April 1, 2008

Mr. Robb Piper
Cambria County Conservation District
Candlelight Drive
Ebensburg, Pennsylvania 15931

Dear Robb:

RE: Stonycreek River Watershed
Stormwater Management Plan

I reviewed the above-referenced document and have only the following suggestion: Every effort should be made to allow areas of less than 10,000 square feet to be exempt from the Peak Rate Control and the SWM site plan preparation requirements of this proposed plan and its model ordinance. This requirement is found on page V-33 of Volume I Executive Summary and page 32 Section 402 Exemptions in the model ordinance. This requirement would then be consistent with the exemption found in the recommended model ordinance for the Little Conemaugh River Watershed prepared in April, 1994.

If I can be of any further assistance to you on this matter, please do not hesitate to call me.

Sincerely,

Bradford G. Beigay
Executive Director

APR 0 2 2008

THE EADS GROUP
ENGINEERING ARCHITECTURE and DESIGN SERVICES

April 7, 2008

Cambria County Redevelopment Authority
Attn: Mr. Rob Piper
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

APR 0 9 2008

STONYCREEK RIVER WATERSHED – ACT 167 STORMWATER
CITY OF JOHNSTOWN – REVIEW EXTENSION REQUEST

Mr. Piper,

We have received the draft of the "Stonycreek River Watershed Stormwater Management Ordinance" and reviewed the draft on behalf of the City of Johnstown. At this time, we would like to request a time extension on the comment period regarding the above mentioned Act 167 Ordinance.

The City of Johnstown is located within the Stonycreek River Watershed and the Little Conemaugh Watershed and is an MS-4 Community. This will require the City to have three different stormwater management ordinances. The City is requesting a time extension so that they may review and compare the requirements of each of the ordinances. They would like the extra time to investigate the possibility of implementing one, combined ordinance to address the requirements collectively.

If you have any questions, please feel free to contact our office.

Sincerely,
The EAD Group, Inc.

Stephen M. Sewalk, P.E.

Cc: Frank D'Ettorree - Johnstown Redevelopment Authority
Curt Davis – The City of Johnstown
File
Central

C:\Documents And Settings\Jeff Haynal\Desktop\JRA - Stonycreek Act 167 SW Comments.Doc

■ 1126 Eighth Avenue Altoona, PA 16602 (814) 944-5035 (814) 944-4862 Fax
☐ 15392 Route 322 Clarion, PA 16214 (814) 764-5050 (814) 764-5055 Fax
☐ 450 Aberdeen Drive Somerset, PA 15501 (814) 445-6551 (814) 443-2748 Fax
☐ 11045 Parker Drive North Huntingdon, PA 15642 (412) 754-0801 (412) 754-0860 Fax
☐ 81 Baltimore Street Suite 600 Cumberland, MD 21502 (301) 777-7878 (301) 777-8391 Fax
☐ 227 Franklin St. Suite 208 Johnstown, PA 15901 (814) 535-5388 (814) 535-7654 Fax

Office of County Commissioners

200 South Center Street
Ebensburg, PA 15931
(814) 472-5440

MEMORANDUM

TO: Robb Piper, Executive Director
Cambria County Conservation District

FROM: Randall C. Rodkey, Assistant Solicitor

DATE: March 28, 2008

RE: Stonycreek River Stormwater Management Plan

I have reviewed the two (2) proposed ordinances you sent to me relative to the above.

First, as to the Stormwater Management Ordinance, I have no suggested changes.

As to the ordinance labeled Stonycreek River Watershed, my only comment is that Section 905.A. should be amended to remove the term "misdemeanor" and substitute with the term "summary offense." A violation of a township or borough ordinance is a summary offense as opposed to a misdemeanor.

I, of course, have no opinion as to any of the technical provisions of your ordinances.

Thank you.

RCR/mak

Enclosures

Adams Township Board of Supervisors
P.O. Box 112
Sidman, Pennsylvania 15955

DENNIS J. GDULA
ROY HOFFMAN
RON KAUFFMAN
DENNIS P. RICHARDS
WILLIAM J. SMITH

125 Mary Drive
Sidman, Pennsylvania
814-487-5054
814-487-5623
Fax 814-487-5623
email: adamstwp@adelphia.net

07 April 2008

Cambria County Conservation District
Attention: Mr. Robert W. Piper, Jr., District Manager
401 Candlelight Drive
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED ACT 167 PLAN
ADAMS TOWNSHIP SUPERVISORS
CAMBRIA COUNTY, PENNSYLVANIA

We offer the following comments pertaining to the draft Stonycreek River Watershed Act 167 Plan:

1. In Section 104: (page 5)
   We recommend specifically stating what the regulated activities are, who has to submit a drainage plan, and the exemptions.

2. Reference to Section 310E (page 30)
   Set ___ to include a 10-year conveyance minimum for storm sewers (as required by PennDOT).

3. Section 305F (page 22) defines stream buffers. We suggest defining the permitted and prohibited activities.

   Definition of Buffer: page 7 should include verbage describing regulations within the buffer.

4. Change "SWM Site Plan" (Section 402.A) to "Drainage Plan" (page 32).

5. Section 402 – Page 32
   A. set "x" to 5,000 sq. ft. (single-lot residential developments should not have to submit a plan)
   B. set "x" to 5,000 sq. ft. and "y" to 10,000 sq. ft.

   It is further suggested that projects applying for an exemption under Section 402A (ie, single-lot residential), would be required to follow a "General BMP" guideline which would be found in the Appendices.

6. Section 403, Item No. 17 (page 34)

Vertical profiles of open channels do not seem necessary. We recommend deleting this requirement.

7. Section 702.B.f. (page 39) should exclude the requirement for the locations of utilities within 50 ft. of the project boundary. This requirement unnecessarily adds costs to the developer. We suggest that utilities within the project boundary only need to be located. In addition, consider requiring that adjacent landowners be identified on the plan.

8. Adams Township was required to adopt the Little Conemaugh River Act 167 Stormwater Management Ordinance and will be expected to also adopt the Stonycreek River Act 167 Ordinance. We have prepared a single, comprehensive stormwater ordinance for Adams Township to include both Act 167 plans. The Little Conemaugh watershed release rate map depicts release rates for the different sub-areas with allowable percentages of pre-development runoff. The Stonycreek watershed release rate map utilizes different design storms for pre- and post-development conditions in order to reduce the allowable runoff rates. We request that the Stonycreek watershed map be revised to utilize allowable percentages of the pre-development rate in order to be consistent with the Little Conemaugh River Act 167 ordinance previously adopted.

Respectfully submitted,
Adams Township Supervisors

By: William J. Smith, Chairman

cc: Gregory L. Elliott, RLA - Director of Site Development – The EADS Group, Inc.
William G. Barbin – Solicitor

\\Somserve\architecture\Projects\Adams Township\Correspondence\Piper Memo.doc

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

DATE: 7/3/08

TO: Paul DeBarry FROM: Robb Piper

SUBJECT: Stonycreek River SWM Plan Ordinance Comments

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

Shade Township Comments

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

SHADE TOWNSHIP SUPERVISORS
1221 #1 Road, Cairnbrook, PA 15924
PHONE: (814) 754-4622
FAX: (814) 754-1400

June 26, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

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Please contact this office with any questions.

Sincerely,

Printed Name: JOHN A. TURK, JR

Signature:

cc: Jeff Haynal – The EADS Group, Inc.

CRM/FILE

L. Robert Kimball & Associates
Architects and Engineers
Corporate Headquarters
615 West Highland Avenue, P.O. Box 1000, Ebensburg, PA 15931 Phone: 814-472-7700 Fax: 814-472-7712
www.lrkimball.com

April 8, 2008

Mr. Ryan Barker
Richland Township Supervisors
322 Schoolhouse Road
Johnstown, PA 15904

Re: Review of Stonycreek River Watershed Draft Stormwater Management Ordinance
Richland Township, Cambria County, Pennsylvania
Kimball No. 08-1300-0185-0001

Dear Mr. Barker:

In accordance with your request, I have performed a review of the proposed draft Stormwater Management Ordinance for the Stonycreek River Watershed prepared as part of the Act 167 study for that watershed. As part of my review, I compared the proposed ordinance with the current Richland Township Stormwater Management Ordinance #295 adopted May 27, 2005.

Generally the Stonycreek River Watershed Stormwater Management Ordinance is similar to your current ordinance. The Richland Township Stormwater Management Ordinance would need to be revised to incorporate the Stonycreek River Watershed criteria and Management Districts. The following are some of the more noteworthy differences in the two ordinances. I have provided comments in italics.

1. Section 103 Statutory Authority - portion is reworded.
   The new wording should be OK.
2. Section 104 Applicability - the draft ordinance does not incorporate the numerous additions of your current Ordinance.
   The existing language should be incorporated into a revised ordinance for Richland Township.
3. Section 202 Definitions - there are numerous definition changes including wording and additional definitions.
   Most definition changes and additions are OK. Noteworthy items:
   a. A "Disconnected Impervious Area (DCIA)" has been added.
      This should be added if the exemption criteria adopted of the draft ordinance is adopted.

b. The "Existing Condition" definition was changed to "the dominant land cover during the 5-years period immediately preceding a proposed Regulated Activity. This is a change from "the initial condition of a project site prior to the proposed construction".
I don't see the need for the proposed change in this definition. It creates a place for disagreement and is difficult to document the previous 5 years history and what was dominant. The condition of the project site prior to the proposed construction is straight forward.

4. Section 301.E - was changed from "The existing points of concentrated drainage" onto adjacent property was changed to "Stormwater flows".
This change would add sheet flow to this requirement and in some cases could be difficult to administer.
5. Section 301 General Requirements - has G through U removed with more generalized requirements provided.
Section G, H, I, J, L, O, P, S, and T should be kept. The other sections should be OK to remove.
6. Section 302 Permit Requirements by Other Government Entities - was reduced to a general statement.
This change would be OK.
7. Section 308 Stormwater Management Release Rates - The Stonycreek River Watershed requirements add the 5, 50, and 100 year events to the computations with the 2 year post discharge reduced to the 1 year existing condition discharge. The other events need to reduce post-development discharge to the existing condition discharge for the same year event. The language is greatly expanded in this section.
These changes will require additional design work by the engineer. The 50 year and 100 year events will increase the size of the detention facilities due to the larger storms that need to be addressed. The addition of these larger storms is questioned. Other drainage facilities (ditches, pipes, inlets etc.) do not have the capacity for these larger events and would in some cases never get the runoff to the detention facilities and achieve the proposed benefit. The basin would have the capacity but the water would not necessarily get to it. The design of storm drainage collection facilities to storms as large as 50 yr and 100 yr is not typical due to the extra cost compared to the benefit.
8. Section 308 Stormwater Management Release Rates - an Alternate Criteria is provided for Redevelopment Sites. It either requires that the existing discharge conditions be met for the proposed activity or the impervious area is reduced by 20 percent from the existing.
If I understand this correctly, a developer could reduce existing impervious areas by 20 percent and not perform the computations to show there is not an increase. Otherwise, they would have to go through the computations and document there is not an increase
9. Section 309.F - "No Harm" Option has been removed.
This change would be good.
10. Section 309.G - "Downstream Hydraulic Capacity Analysis" has been removed.
This change would be good and is related to the No Harm Option
11. Section 309.H - "Regional Detention Alternatives" has been removed.
Removal of this section does not preclude the use of regional detention alternatives

12. Section 309 I - "Hardship Option" has been removed.
This change would be good. If the development does not fall under the exemption criteria, the requirements should not be waived.
13. Section 311 Calculation Methodology - allows the use of the Rational Method for drainage areas up to 200 acres. The existing Richland SWM ordinance allows up to a 5-acre drainage area for the use of the Rational Method. Above 5 acres the SCS Method is to be used.
The 200 acres for the Rational Method should not be adopted. The 5-acre rule should be maintained per the current ordinance.
14. Section 311.D - refers to newer sources for rainfall intensity for the Rational Formula, NOAA Atlas 14, or the PA Storm-Duration-Frequency charts from the new PennDOT Drainage Manual Chapter 7 when finalized.
Adoption of current guidance and criteria is appropriate. However, the reference to a draft document should not be included until finalized
15. Section 402 Exemptions - this has changed to only allow areas related to Disconnected Impervious Areas.
This will eliminate most of the previous exemptions provided. If the exemption criteria put in place in 2005 is found to be working by Richland Township, it is suggested that the criteria be maintained in the ordinance.
16. Section 405 Drainage Plan Review - additions made regarding Richland Township review processing would need to be addressed.
These additions to the existing ordinance would need to be carried into a revised ordinance.
17. Section 405.J. is changed to allow the Drainage Plan to be valid for 5 years versus the 6 months of Richland Township.
This time frame should be per Richland Township based upon their experience.

As can be seen from the comments, the Richland Township Stormwater Management Ordinance would require revisions to incorporate the proposed changes and address the Stonycreek River Watershed Management Districts. Also, consideration should be given to include some of the requirements from the Stormwater Management Requirement that pre-dated the current ordinance such as fencing requirement, basin slope requirement, and spillway construction material, to name a few.

Should you have any questions please give me a call. Thank you for this opportunity to assist Richland Township.

Sincerely,

Cameron R. Mock, PE
Senior Project Manager
Civil and Environmental Division

crm

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

DATE: 7/1/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER SWM PLAN ORDINANCE COMMENTS

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

PAINT TOWNSHIP COMMENTS

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

PAINT TOWNSHIP
EVERYONE COMES TO PAINT

Paint Township

June 26, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

Dear Mr. Piper

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Please contact this office with any questions.

Sincerely,

David Blough
Chairman

cc: JeffHaynal-The EADS Group, Inc.

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

DATE: 7/3/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: SAWMILL RIVER SWM PLAN ORDINANCE COMMENTS

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

PAINT BOROUGH COMMENTS

SIGNATURE OF OPERATOR:

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-0686 E-Mail: ccdist@pa.cambria.pa.us

Phone (814) 467-6904
Fax (814) 467-0193

Borough of Paint, Somerset County

119 HOFFMAN AVENUE, WINDBER, PA 15963

June 26, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA a 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

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Sincerely,

Dennis L. Berkey
Council President

cc: Jeff Haynal – The EADS Group, Inc.

CAMBRIA COUNTY Conservation 1950 DISTRICT

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SUBJECT: SAWMILL RIVER SWM PLAN ORDINANCE COMMENTS

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OGLE TOWNSHIP

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

Chartered in 1886

Ogle Township Board of Supervisors

212 Summit Dr. • Windber, Pennsylvania 15963
"Where The Pioneer Spirit Still Lives"
Office • 467-5751 Home • 467-6354

June 26, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

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Sincerely,

Printed Name: Harvey Weyandt Jr

Signature:

cc: Jeff Haynal – The EADS Group, Inc.

CAMBRIA COUNTY Conservation 1950 DISTRICT

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DATE: 7/14/08

TO: Paul DeBarry FROM: Robb Piper

SUBJECT: Stonycreek River Act 167 Phase III Plan

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

Lincoln Twp. Comments

SIGNATURE OF OPERATOR:

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

LINCOLN TOWNSHIP SUPERVISORS

687 Salem Ave
Somerset, Pennsylvania 15501
Somerset County
Office and Fax 814-445-7937
Maintenance Shed Phone: 814-443-2096

June 26, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

Dear Mr. Piper

We have reviewed the draft Stonycreek River Watershed Stormwater Management Ordinance as requested at the April 30, 2008 workshop and in your letter dated May 29, 2008. This letter contains comments regarding the proposed ordinance. Section numbers are provided for reference with the proposed ordinance, unless otherwise noted. We have contacted the EADS Group, Inc. and Mr. Brad Zearfoss, Somerset Planning Commission to assist us in the review of this ordinance. After review and discussion, we offer the following comments:

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Please contact this office with any questions.

Sincerely,

Printed Name: Craig S. Eppley

Signature: _____

cc: Jeff Haynal – The EADS Group, Inc.

KELLER ENGINEERS

Keller Engineers, Inc.
420 Allegheny Street
Post Office Box 61
Hollidaysburg, PA 16648
Phone: (814) 696-7430
Fax: (814) 696-0150

MEMORANDUM

TO: Tom Morisi, Geistown Borough Council representative

FROM: Stephanie Shoenfelt

DATE: April 7, 2008

RE: Drafts - Stormwater Ordinance

We have reviewed the two (2) drafts of stormwater management ordinances. The ordinances appear to be very different and therefore, hard to compare. If the "Stonycreek River Watershed Stormwater Management Ordinance" is chosen by Geistown Borough to be implemented, we would recommend sending it to DEP for approval. The following are our comments.

Stonycreek River Watershed Stormwater Management Ordinance:

- Section 104 Applicability and end of Section 301 states, "The Municipality may, after consultation with DEP, approve measures meeting the State Water Quality Requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, State law including but not limited to Clean Streams Law. This section is vague and appears to be difficult to implement. How would consultation with DEP occur (possible on a regular basis) in a timely manner? Is there any reference to the BMP manual?
- Section 202 Definitions
    - "As-built drawing" definition appears to more accurately describe record drawings. It should be noted that the current definition involves no survey.
    - "Buffer" definition concerns only stream buffers. Since buffer is used commonly in many ordinances to describe landscaped areas between uses and along public right-of-ways, consideration should be given to changing the defined term of stream buffer instead.
    - "Disconnected Impervious Area" is not in the correct alphabetical order.
    - "Emergency Spillway" is defined as a conveyance area that is used to pass peak discharge greater than the maximum design storm controlled by the storm water facility. This definition is vague. Typically it is designed to pass the 100-year storm assuming the primary outlet structure has failed. The 100-year storm is also often accounted for in the design. Storms greater than the 100-year storm are not often accounted for.
    - "Floodplain" and "Floodway" have identical definitions.
    - "Freeboard" definition does not appear to include conveyance facilities. Consideration to changing the definition to say vertical distance between elevation of the design high water and the top of a stormwater management facility.
- Section 301.A. states any areas designed to initially be gravel or crushed stone shall be assumed to be impervious for the purposes of comparison to the exemption criteria. Many

ordinances will state that these areas are assumed to be impervious for all stormwater calculations and not just for comparison to the exemption criteria.

- Section 307. states that in addition to minimize the impact of stormwater runoff on downstream streambank erosion, the requirement is to design the BMP to detain the post-development 2-year, 24-hour design storm to the pre-development 1-year flow and that the post-development 1-year storm takes a minimum of 24 hours and a maximum of 96 hours to drain. It also states the Orifices smaller than 3 inches diameter are not recommended. Many times smaller sites cannot detain the 1 year storm and release it in the timeframe specified. The flows are so minimal that even smaller diameter orifices (less than 3") still release the total storm in less than the minimum time.
- Section 307 appears to indicate that the 2-yr reduction to the 1-yr storm is applicable everywhere, but Table 308-1 indicates different requirements based on districts.
- Section 308.E. states off-site areas that drain through the proposed development are not subject to release rate criteria when determining allowable peak runoff rates; however stormwater facilities shall be designed to convey off-site flows through the site. Section 308.F. states that unimpacted areas bypassing the stormwater management facilities would not be subject to the management district criteria. Why do on-site undisturbed areas have to be conveyed around, but off-site areas can be conveyed through.
- Section 309 is very repetitive of section 308. Can these sections be combined. Only Section 309.F. appears to be new.
- Section 310.B. It is assumed that the emergency spillway is sized for the 100-year storm assuming failure of the primary outlet structure. This should be spelled out in this section if that is the intent.
- Section 310.B. also states that a minimum of 1' of freeboard above the maximum pool elevation computed when the facility functions for the 100-year post-development inflow. Is the when the primary orifice is functioning or when the spillway is used?
- Section 310.D. states that conveyance facilities must be able to convey the 10-year design storm. Typically ordinances state that either the calculated time of concentration should be used or a 5-minute time of concentration should be assumed. This section further states that conveyance facilities to or exiting from stomwater management facilities shall be designed to convey the design flow to or from the structure. This would be the 100-year storm, so when is the 10-year storm used.
- Section 310.E. Is there a recommendation on storm sewer design.
- Section 311.B. refers to Table B-1 in Appendix B of this Ordinance. This table is not in Appendix B.
- Section 311.F. Table F-2 is not in Appendix B as stated in this section.
- Section 402 are there recommendations to completing the exemption section. Are there any exemptions to the entire stormwater management ordinance such as single-family homes, or less than 5,000 SF of impervious. The ordinance does not appear to provide for any.
- Section 405.E. The exact approval time limit should be decided.

Stormwater Management Ordinance, an earlier draft of this ordinance was previously reviewed and edited by Teddie Kreitz of our office and provided for enactment by the Borough of Geistown. The following are the noted changes to this draft:

- Added definition for FEMA
- Added definition for USDA
- Section 301.J.3.a. edited to minimize disturbance to natural slopes over 8% instead of 15%.
- Section 303.A. was added for Areas Tributary to High Quality or Exceptional Value Waters.
- Section 406 Authorization to Construct and Term of Validity was added.

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

484-821-0474

DATE: 6/30/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER SWM PLAN ORDINANCE COMMENTS

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

JENNER TWP. COMMENTS

SIGNATURE OF OPERATOR:

FAX NUMBER OF SENDER: (814) 472-0686

JENNER TOWNSHIP SUPERVISORS

2058 LINCOLN HIGHWAY
Phone (814) 629-5754

BOSWELL, PENNSYLVANIA 15531
Fax (814) 629-9352

June 26, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

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Sincerely,

Printed Name: Shelley W. Darr

Signature: Shelley W Darr

cc: Jeff Haynal – The EADS Group, Inc.

CAMBRIA COUNTY Conservation 1950 DISTRICT

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DATE: 7/3/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: SAWMILL RIVER SWM PLAN ORDINANCE COMMENTS

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ADDITIONAL COMMENTS:

JENNERSTOWN BORO

SIGNATURE OF OPERATOR: _____

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JENNERSTOWN BOROUGH
102 Saylor Street
P.O. Box 164
Jennerstown, Pa. 15547-0164
814-629-7234 Voice
814-629-8136 Fax
office@jennerstownboro.com

June 26, 2008

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Printed Name: Troy W. Frederick

Signature: Troy W. Frederick

cc: Jeff Haynal – The EADS Group, Inc.

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INDIAN LAKE BORO

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

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INDIAN LAKE BOROUGH

1301 CAUSEWAY DRIVE
CENTRAL CITY, PA 15926
814-267-4614
814-754-8161

June 26, 2008

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Attn: Mr. Robert Piper, Jr.
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11. The Consultant's Stormwater Management Plan Report provides on page VI-4 in "Section VI – Municipal Ordinance Introduction" that NPDES Phase II program affects all "urbanized areas" and that this definition applies to all Stonycreek River Watershed municipalities. The plan also indicates on page III-1 that nineteen of the thirty-six municipalities are located within the Johnstown Urbanized Area as designated by the 2000 Census. Not all municipalities in the watershed are MS-4 communities.

    a. This sentence needs to be deleted.

12. The terms "SWM Site Plan" and "Drainage Plan" are used within the Ordinance. Considerations should be given to clarifying the difference between the two terms or else combining the terms to one.

13. Vertical profiles of open channels do not seem necessary. We recommend deleting this requirement.

14. Section 702.B.f should exclude the requirement for the locations of utilities within 50 ft. of the project boundary. We suggest that utilities within the project boundary only need to be located. In addition, consider requiring that adjacent land owners be identified on the plan.

15. Section 305F defines stream buffers, however no statement of permitted or prohibited activities are defined. Is it intended that earth disturbances be prohibited with the buffer?

    a. Definition of Buffer on page 7 should include verbiage describing regulations within the buffer.

16. Provided that PaDEP approves the impervious limits as set forth in the ordinance by exemptions ("x" to 5,000 sf and "y" to 10,000 sf) new home construction would be exempt from Stormwater management. We recommend that a "Homeowner's Guideline be established to assist in stormwater control on a residential level without requiring an extensive SWM plan by potential residents.

17. On page i under Purpose (Model Ordinance), the last sentence states: This Model ordinance combines and supersedes previous model municipal ordinances for stormwater management published by DEP in documents 392-0300-001 and 392-0300-003. An exception for any prior approved stormwater management plans under the ordinance in effect needs to be made clear.

18. Page iii, subsection E (Model Ordinance) states that enacting a modified version of this ordinance will make a municipality ineligible for the NDPES general permit (page 13) for stormwater discharges from small MS4s. Does this mean that if ANY changes are made? Under the presumption that it does not, what are the material provisions of the model ordinance that, if changed, would trigger this provision?

19. On page 7 (Model Ordinance), under Earth Disturbance Activity, does "clearing" include brush and trees? Does "earth material" include leaves and grass clippings?

20. On page 10, letter G (Model Ordinance), "permission" from the adjacent property owner. For this to be effective as to subsequent owners, is it intended that the "permission" be reflected in a deed covenant that must be recorded? If not, this language likely needs to be revised to indicate that the permission must be obtained from the present adjacent owner at the time of plan submission and shall be effective as to subsequent owners and assigns.

21. On page 15, Section 403, Plan Review (Model Ordinance), it states that a "Qualified Professional" should review the site plans. Since Mr. Largent from the Somerset Conservation District's Erosion and Sediment Control division must already review a collateral E&S permit, doesn't it make sense that Mr. Largent review the SWM site plan as well? If so, there is no apparent need for redundant municipal review or municipal certification. We recommend that Mr. Largent be responsible for the review and certification of these plans and that this provision of the model ordinance be revised accordingly.

22. On page 19, Section 701, Prohibited Discharges and Connections, subsection C (Model Ordinance), should runoff from yards, gardens, golf courses, or fields be included?

Please advise if you have any questions regarding these comments.

Sincerely,

Michael D. Miscoe
President
Indian Lake Borough Council

cc: Jeff Haynal - The EADS Group, Inc.

CAMBRIA COUNTY Conservation 1950 DISTRICT SM

FAX TRANSACTION COVER SHEET

DATE: 7/14/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER ACT 167 PHASE II PLAN

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

HOOVERSVILLE BORO COMMENTS

SIGNATURE OF OPERATOR:

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

Borough of Hooversville

BOX 176 HOOVERSVILLE, PENNSYLVANIA 15936
PHONE 814 798-8001

June 26, 2008
Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931
STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW
Dear Mr. Piper

We have reviewed the draft Stonycreek River Watershed Stormwater Management Ordinance as requested at the April 30, 2008 workshop and in your letter dated May 29, 2008. This letter contains comments regarding the proposed ordinance. Section numbers are provided for reference with the proposed ordinance, unless otherwise noted. We have contacted the FADS Group, Inc. and Mr. Brad Zearfoss, Somerset Planning Commission to assist us in the review of this ordinance. After review and discussion, we offer the following comments:

1. The "x" value in Section 402 should be set to 5,000 square feet. We further suggest that this exemption apply to all impervious areas, not only disconnected impervious areas. Please remove the word "disconnected".
2. The "y" value in Section 402 should be set to 10,000 square feet. We also suggest removing the word "disconnected" from this exemption.
3. The Coxes Creek Ordinance currently allows exemptions for minor subdivisions defined by the Somerset County Subdivision and Land Development Ordinance. We recommend providing this exemption in the proposed ordinance for consistency.
4. The proposed ordinance provides design requirements for BMPs for streambank erosion. The County Conservation District currently reviews erosion and sedimentation BMPs for projects that qualify for an erosion and sedimentation plan. We recommend removing this requirement from the proposed ordinance since it is already reviewed through the Conservation District.
5. Section 308 requires that the 2-, 10-, 25-, *50-*, and 100-year design storms are controlled. The Coxes Creek Ordinance requires control of the 2-, 10-, and 25-year design storms. We believe the control of the 50- and 100-year design storms is flood control and not a reasonable requirement for stormwater control. We suggest requiring the control of the 2-, 10-, and 25-year design storms only.
6. Section 308 requires post-development flows be released at rates corresponding to design storms specified in Table 308-1. All of the proposed stormwater districts contain at least one design storm which requires the post-development flows to be reduced at a design storm less than the post-development design storm. The Coxes Creek Ordinance requires that the post- development flows are released at peak rates that do not exceed the pre-development flows

for an equivalent storm. We suggest that the same design storm criteria are applied to all stormwater management districts.

7. Section 310 requires that all storm sewers be able to convey the post-development runoff from a _____-year design storm without surcharging inlets, where appropriate. We suggest using a 10-year design storm for this requirement.
8. Section 310 provides design criteria for the erosion and sedimentation of open channels and point discharges. The County Conservation District currently reviews erosion and sedimentation BMPs for projects that qualify for an erosion and sedimentation plan. We recommend removing this requirement from the proposed ordinance since it is already reviewed through the Conservation District.
9. The proposed ordinance does not include a time frame for application review by the municipality. We recommended including language that would allow the municipality 45 days to review a stormwater application and respond to the developer with a written letter of approval or disapproval.
10. Section 405 provided details for as-built documentation. The Coxes Creek includes similar requirements, but also requires that the applicant notify the municipality of completion of construction within thirty calendar days of completion of construction. We recommend adding similar language to the proposed ordinance.
11. The Consultant's Stormwater Management Plan Report provides on page VI-4 in "Section VI - Municipal Ordinance Introduction" that NPDES Phase II program affects all "urbanized areas" and that this definition applies to all Stonycreek River Watershed municipalities. The plan also indicates on page III-1 that nineteen of the thirty-six municipalities in the watershed are located within the Johnstown Urbanized Area as designated by the 2000 Census. Not all municipalities in the watershed are MS-4 communities.
    a. This sentence needs to be deleted.
12. The terms "SWM Site Plan" and "Drainage Plan" are used within the Ordinance. Considerations should be given to clarifying the difference between the two terms or else combining the terms to one.
13. Vertical profiles of open channels do not seem necessary. We recommend deleting this requirement.
14. Section 702.B.f. should exclude the requirement for the locations of utilities within 50 ft. of the project boundary. We suggest that utilities within the project boundary only need to be located. In addition, consider requiring that adjacent land owners be identified on the plan.
15. Section 305F defines stream buffers, however no statement of permitted or prohibited activities are defined. It is intended to prohibit earth disturbance with the buffer?
    a. Definition of Buffer page 7 should include verbage describing regulations within the buffer.
16. Provided that PaDEP approves the impervious limits as set forth in the ordinance by exemptions ("x" to 5,000 sf and "y" to 10,000 sf) new home construction would be exempt from stormwater management. We recommend that a "Homeowner's Guideline" be established to assist in stormwater control on a residential level without requiring an extensive plan by potential residents.
17. On page i, under Purpose (Model Ordinance). the last sentence states: This Model Ordinance combines and supersedes previous model municipal ordinances for stormwater management published by DEP in documents 392-0300-001 and 392-0300-003. How can an Ordinance Supersede a previous ordinance? If this is the case, how can you enforce a

situation where someone did the proper procedures and studies for stormwater run-off and now you want them to change it? Who is to pay for the improvements?

18. Page iii, letter E (Model Ordinance) states if enacting a modified version of this ordinance will make a municipality ineligible for the NPDES general permit (Page 13) for stormwater discharges from small MS4s. Does this mean that if you make ANY changes, the Municipality cannot get any NPDES permits?
19. On page 7 (Model Ordinance), under Earth Disturbance Activity, does "clearing" include brush and trees? Does "earth material" include leaves?
20. On page 10, letter G (Model Ordinance). Is there a statue of limitation on the permission of the adjacent property owner? If the adjacent property owner sells, can the new owner reject the agreement previously done?
21. On page 15, Section 403. Plan Review A (Model Ordinance) it states that a "Qualified Professional" should review the site plans. If Keith Largent from the Somerset Conservation District's Erosion & Sediment Pollution Control is already involved in the E&S permits, and now needs to review the site plan for the municipality, wouldn't it be better for Keith to just be in charge of the whole process?
22. On page 19, Section 701 Prohibited Discharges and connections, under C (Model Ordinance).
    a. Should runoff from pastures and fields, yards, and gardens be included?

Please contact this office with any questions.

Sincerely,

Printed Name: Kenneth E Karashorosky

Signature: Kenneth E Karashorosky Bros.

cc: Jeff Haynal – The EADS Group, Inc.

FAX TRANSACTION COVER SHEET

DATE: 10/8/08

TO: PAUL DERRY FROM: ROBB PIPER

SUBJECT: STONY CREEK RIVER ACT 167 FLW ORDINANCE PASSETT

There are 2 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

COMMENTS FROM SOMERSET PLANNING

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

SOMERSET COUNTY PLANNING COMMISSION

October 7, 2008

Mr. Rob Piper, Jr.
Cambria County Conservation District
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

Re: Stonycreek River Watershed
Act 167 Stormwater Management Ordinance Review

Dear Mr. Piper:

I have reviewed the draft stormwater management ordinance prepared as part of the Stonycreek River Watershed Stormwater Management Plan. I was copied on a review of the ordinance done by The EADS Group on behalf of the Somerset County municipalities. You should have received their comments and a summary table previously in a letter dated September 25, 2008.

In general, I concur with the comments offered by The EADS Group regarding the draft ordinance. We have found that the model ordinance prepared for the Coxes Creek watershed to be acceptable and workable for the municipalities in that area, and the recommended changes offered by The EADS Group would create a very similar ordinance for the Stonycreek Watershed. It is critical that the model ordinance prepared for the Stonycreek study be realistic and workable for our municipal officials. One issue in particular has been the establishment of realistic thresholds for exemptions. The recommended 5,000 square feet and 10,000 square feet values seem to be acceptable to our municipal officials, and is in line with the already adopted ordinance for the Coxes Creek watershed. The other comments offered by The EADS Group would help to further improve the ordinance.

I look forward to continuing to work with you towards the completion of the Stonycreek River Watershed Stormwater Management Plan. If I can be of further assistance, please contact me.

Sincerely,

Bradley A. Zearfoss
Director

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April 18, 2008

Mr. Rob Piper
Cambria County Conservation District
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

Re: Review of Stonycreek River Watershed Draft Stormwater Management Ordinance
Richland Township, Cambria County, Pennsylvania
Kimball No. 08-1300-0185-0001

Dear Mr. Piper:

In accordance with Cambria County's request, I have performed a review of the proposed draft Stormwater Management Ordinance for the Act 167 Study of the Stonycreek River Watershed, (Draft Ordinance) and the new Pennsylvania Department of Environmental Protection (PADEP) Model Stormwater Management Ordinance, (Model Ordinance) dated February 12, 2008. To assist with my review and understanding, I had a telephone discussion with Mr. Barry A. Newman, MS, PE, Chief, Stormwater Planning and Management, Bureau of Watershed Management, (PADEP)

Generally the new Model Ordinance is drastically different than the Draft Ordinance. The PADEP has greatly simplified the Model Ordinance and has made it compatible with the Best Management Practices Manual.

The following are some of the more notable changes:

1. The number of definitions is greatly reduced.
2. Model Ordinance Section 301.K – states that the "Storage facilities should completely drain both the volume control and the rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm".
3. The Model Ordinance only has a section for Volume Controls (Section 303) and Rate Controls (Section 304) and eliminates the Water Quality Volume (Section 305 of Draft Ordinance), Ground Water Recharge (Infiltration) (Section 306 of Draft Ordinance) and Stream Bank Erosion sections (Section 307 of Draft ordinance). Based on my discussion with Mr. Newman, the Water Quality Volume, Ground Water Recharge and Stream Bank Erosion are addressed by the criteria for the Volume Control and Rate Control, along with

the minimum 24 hour retention up to the 72 hour retention criteria of the Model Ordinance Section 301.K.

4. Removal of the Ground Water Recharge section of the Draft Ordinance (Section 306) eliminates the specific requirement for field infiltration testing to be performed for every project. The Volume Controls of the Model Ordinance (Section 303) address the recharge by causing infiltration from facilities for the minimum of 24 hours and up to 72 hours and encouraging the runoff to be spread over as large an area as possible. This result is the maximum infiltration that site conditions will allow.
5. The Volume Controls of the Model Ordinance (Section 303) provided two methods to implement these requirements. The Design Storm Method requires detailed modeling based on site conditions and is intended for sites larger than one acre. The Simplified Method is recommended for a site one acre or less. It does not required detailed engineering and routing and is independent of site conditions. It also exempts the requirements of the Rate Controls.
6. The Rate Controls (Section 304) greatly condenses Section 308 Stormwater Peak Rate Control and Management Districts of the Draft Ordinance, but accomplishes the same result.
7. Both ordinances have added the requirements of 50 year and 100 year events to Rate Control criteria. This implies that there is to be no increase in discharge from these events documented by engineering computations. The 50 year and 100 year events could increase the size of the detention facilities due to these larger storms. The value of the addition of these larger storms is questioned when other drainage facilities (ditches, pipes, inlets, etc.) do not have the capacity for these larger events and would not in some cases convey the runoff to the detention facilities and achieve the proposed benefit. The detention facility would have the capacity but the runoff would not necessarily get to it. The design of storm drainage collection facilities to storms as large as 50 year and 100 year is not typical due to the extra cost compared to the benefit.
8. The Model Ordinance has removed all references to engineering methodologies (Section 311 of the Draft Ordinance). The reliance is on the designer to use methodologies applicable for the proposed facilities.
9. Section 403 Drainage Plan Contents of the Draft Ordinance has been reduced and references the requirements of the subdivision and land development ordinance for the specific items that need to be included in the plan content.
10. The Model Ordinance provides Appendix B: Disconnected Impervious Area (DIA) that establishes criteria for impervious rooftops and pavement disconnection.
11. Some sections of the Draft Ordinance should be included to provide for an application form, fee schedule, plan checklist, flow charts for the process, and low impact development.

It is recommended that the PADEP Model Ordinance be used to revise the Stonycreek River Watershed Draft Ordinance to make it compatible with the Best Management Practices Manual and the National Pollutant Discharge Elimination System NPDES Phase II Municipal Separate Storm Sewer System (MS4) permitting requirements. The design criteria for the Stonycreek River Watershed Draft Ordinance conflict with the requirements of the PADEP NPDES for Stormwater Discharges Associated with Construction Activities. This change will eliminate that conflict and potentially save revision to municipal stormwater management ordinances later to address this

situation.

Should you have any questions please give me a call. Thank you for this opportunity to assist Cambria County.

Sincerely,

Cameron R. Mock, PE
Senior Engineer/Project Manager
Civil and Environmental Division

crm
cc: Cambria County Commissioners

CRMFG

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April 8, 2008

Mr. Ryan Barker
Richland Township Supervisors
322 Schoolhouse Road
Johnstown, PA 15904

Re: Review of Stonycreek River Watershed Draft Stormwater Management Ordinance
Richland Township, Cambria County, Pennsylvania
Kimball No. 08-1300-0185-0001

Dear Mr. Barker:

In accordance with your request, I have performed a review of the proposed draft Stormwater Management Ordinance for the Stonycreek River Watershed prepared as part of the Act 167 study for that watershed. As part of my review, I compared the proposed ordinance with the current Richland Township Stormwater Management Ordinance #295 adopted May 27, 2005.

Generally the Stonycreek River Watershed Stormwater Management Ordinance is similar to your current ordinance. The Richland Township Stormwater Management Ordinance would need to be revised to incorporate the Stonycreek River Watershed criteria and Management Districts. The following are some of the more noteworthy differences in the two ordinances. I have provided comments in italics.

1. Section 103 Statutory Authority - portion is reworded.
   The new wording should be OK
2. Section 104 Applicability - the draft ordinance does not incorporate the numerous additions of your current Ordinance.
   The existing language should be incorporated into a revised ordinance for Richland Township.
3. Section 202 Definitions - there are numerous definition changes including wording and additional definitions.
   Most definition changes and additions are OK Noteworthy items:
   a. A "Disconnected Impervious Area (DCIA)" has been added.
      This should be added if the exemption criteria adopted of the draft ordinance is adopted.

b. The "Existing Condition" definition was changed to "the dominant land cover during the 5-years period immediately preceding a proposed Regulated Activity. This is a change from "the initial condition of a project site prior to the proposed construction".
I don't see the need for the proposed change in this definition. It creates a place for disagreement and is difficult to document the previous 5 years history and what was dominant. The condition of the project site prior to the proposed construction is straight forward.

4. Section 301.E - was changed from "The existing points of concentrated drainage" onto adjacent property was changed to "Stormwater flows".
This change would add sheet flow to this requirement and in some cases could be difficult to administer.
5. Section 301 General Requirements - has G through U removed with more generalized requirements provided.
Section G, H, I, J, L, O, P, S, and T should be kept. The other sections should be OK to remove.
6. Section 302 Permit Requirements by Other Government Entities - was reduced to a general statement.
This change would be OK.
7. Section 308 Stormwater Management Release Rates - The Stonycreek River Watershed requirements add the 5, 50, and 100 year events to the computations with the 2 year post discharge reduced to the 1 year existing condition discharge. The other events need to reduce post-development discharge to the existing condition discharge for the same year event. The language is greatly expanded in this section.
These changes will require additional design work by the engineer. The 50 year and 100 year events will increase the size of the detention facilities due to the larger storms that need to be addressed. The addition of these larger storms is questioned. Other drainage facilities (ditches, pipes, inlets etc) do not have the capacity for these larger events and would in some cases never get the runoff to the detention facilities and achieve the proposed benefit. The basin would have the capacity but the water would not necessarily get to it. The design of storm drainage collection facilities to storms as large as 50 yr and 100 yr is not typical due to the extra cost compared to the benefit.
8. Section 308 Stormwater Management Release Rates - an Alternate Criteria is provided for Redevelopment Sites. It either requires that the existing discharge conditions be met for the proposed activity or the impervious area is reduced by 20 percent from the existing.
If I understand this correctly, a developer could reduce existing impervious areas by 20 percent and not perform the computations to show there is not an increase. Otherwise, they would have to go through the computations and document there is not an increase
9. Section 309 F - "No Harm" Option has been removed.
This change would be good.
10. Section 309.G - "Downstream Hydraulic Capacity Analysis" has been removed.
This change would be good and is related to the No Harm Option
11. Section 309 H - "Regional Detention Alternatives" has been removed.
Removal of this section does not preclude the use of regional detention alternatives

12. Section 309 I - "Hardship Option" has been removed.
    This change would be good. If the development does not fall under the exemption criteria, the requirements should not be waived.
13. Section 311 Calculation Methodology - allows the use of the Rational Method for drainage areas up to 200 acres. The existing Richland SWM ordinance allows up to a 5-acre drainage area for the use of the Rational Method. Above 5 acres the SCS Method is to be used.
    The 200 acres for the Rational Method should not be adopted. The 5-acre rule should be maintained per the current ordinance
14. Section 311.D - refers to newer sources for rainfall intensity for the Rational Formula, NOAA Atlas 14, or the PA Storm-Duration-Frequency charts from the new PennDOT Drainage Manual Chapter 7 when finalized.
    Adoption of current guidance and criteria is appropriate. However, the reference to a draft document should not be included until finalized
15. Section 402 Exemptions - this has changed to only allow areas related to Disconnected Impervious Areas.
    This will eliminate most of the previous exemptions provided. If the exemption criteria put in place in 2005 is found to be working by Richland Township, it is suggested that the criteria be maintained in the ordinance.
16. Section 405 Drainage Plan Review - additions made regarding Richland Township review processing would need to be addressed.
    These additions to the existing ordinance would need to be carried into a revised ordinance.
17. Section 405.J. is changed to allow the Drainage Plan to be valid for 5 years versus the 6 months of Richland Township.
    This time frame should be per Richland Township based upon their experience

As can be seen from the comments, the Richland Township Stormwater Management Ordinance would require revisions to incorporate the proposed changes and address the Stonycreek River Watershed Management Districts. Also, consideration should be given to include some of the requirements from the Stormwater Management Requirement that pre-dated the current ordinance such as fencing requirement, basin slope requirement, and spillway construction material, to name a few.

Should you have any questions please give me a call. Thank you for this opportunity to assist Richland Township.

Sincerely,

Cameron R. Mock, PE
Senior Project Manager
Civil and Environmental Division

crm

(2)

KELLER ENGINEERS

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MEMORANDUM

TO: Tom Morisi, Geistown Borough Council representative

FROM: Stephanie Shoenfelt

DATE: April 7, 2008

RE: Drafts - Stormwater Ordinance

We have reviewed the two (2) drafts of stormwater management ordinances. The ordinances appear to be very different and therefore, hard to compare. If the "Stonycreek River Watershed Stormwater Management Ordinance" is chosen by Geistown Borough to be implemented, we would recommend sending it to DEP for approval. The following are our comments.

Stonycreek River Watershed Stormwater Management Ordinance:

- Section 104 Applicability and end of Section 301 states, "The Municipality may, after consultation with DEP, approve measures meeting the State Water Quality Requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, State law including but not limited to Clean Streams Law. This section is vague and appears to be difficult to implement. How would consultation with DEP occur (possible on a regular basis) in a timely manner? Is there any reference to the BMP manual?
- Section 202 Definitions
  - "As-built drawing" definition appears to more accurately describe record drawings. It should be noted that the current definition involves no survey.
  - "Buffer" definition concerns only stream buffers. Since buffer is used commonly in many ordinances to describe landscaped areas between uses and along public right-of-ways, consideration should be given to changing the defined term of stream buffer instead.
  - "Disconnected Impervious Area" is not in the correct alphabetical order.
  - "Emergency Spillway" is defined as a conveyance area that is used to pass peak discharge greater than the maximum design storm controlled by the storm water facility. This definition is vague. Typically it is designed to pass the 100-year storm assuming the primary outlet structure has failed. The 100-year storm is also often accounted for in the design. Storms greater than the 100-year storm are not often accounted for.
  - "Floodplain" and "Floodway" have identical definitions.
  - "Freeboard" definition does not appear to include conveyance facilities. Consideration to changing the definition to say vertical distance between elevation of the design high water and the top of a stormwater management facility.
- Section 301.A. states any areas designed to initially be gravel or crushed stone shall be assumed to be impervious for the purposes of comparison to the exemption criteria. Many

ordinances will state that these areas are assumed to be impervious for all stormwater calculations and not just for comparison to the exemption criteria.

- Section 307. states that in addition to minimize the impact of stormwater runoff on downstream streambank erosion, the requirement is to design the BMP to detain the post-development 2-year, 24-hour design storm to the pre-development 1-year flow and that the post-development 1-year storm takes a minimum of 24 hours and a maximum of 96 hours to drain. It also states the Orifices smaller than 3 inches diameter are not recommended. Many times smaller sites cannot detain the 1 year storm and release it in the timeframe specified. The flows are so minimal that even smaller diameter orifices (less than 3") still release the total storm in less than the minimum time.
- Section 307 appears to indicate that the 2-yr reduction to the 1-yr storm is applicable everywhere, but Table 308-1 indicates different requirements based on districts.
- Section 308.E. states off-site areas that drain through the proposed development are not subject to release rate criteria when determining allowable peak runoff rates; however stormwater facilities shall be designed to convey off-site flows through the site. Section 308.F. states that unimpacted areas bypassing the stormwater management facilities would not be subject to the management district criteria. Why do on-site undisturbed areas have to be conveyed around, but off-site areas can be conveyed through.
- Section 309 is very repetitive of section 308. Can these sections be combined. Only Section 309.F. appears to be new.
- Section 310.B. It is assumed that the emergency spillway is sized for the 100-year storm assuming failure of the primary outlet structure. This should be spelled out in this section if that is the intent.
- Section 310.B. also states that a minimum of 1' of freeboard above the maximum pool elevation computed when the facility functions for the 100-year post-development inflow. Is the when the primary orifice is functioning or when the spillway is used?
- Section 310.D. states that conveyance facilities must be able to convey the 10-year design storm. Typically ordinances state that either the calculated time of concentration should be used or a 5-minute time of concentration should be assumed. This section further states that conveyance facilities to or exiting from stomwater management facilities shall be designed to convey the design flow to or from the structure. This would be the 100-year storm, so when is the 10-year storm used.
- Section 310.E. Is there a recommendation on storm sewer design.
- Section 311.B. refers to Table B-1 in Appendix B of this Ordinance. This table is not in Appendix B.
- Section 311.F. Table F-2 is not in Appendix B as stated in this section.
- Section 402 are there recommendations to completing the exemption section. Are there any exemptions to the entire stormwater management ordinance such as single-family homes, or less than 5,000 SF of impervious. The ordinance does not appear to provide for any.
- Section 405.E. The exact approval time limit should be decided.

Stormwater Management Ordinance, an earlier draft of this ordinance was previously reviewed and edited by Teddie Kreitz of our office and provided for enactment by the Borough of Geistown. The following are the noted changes to this draft:

- Added definition for FEMA
- Added definition for USDA
- Section 301.J.3.a. edited to minimize disturbance to natural slopes over 8% instead of 15%.
- Section 303.A. was added for Areas Tributary to High Quality or Exceptional Value Waters.
- Section 406 Authorization to Construct and Term of Validity was added.

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

DATE: 9/29/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER ACT 167 PLAN PHASE II

There are 3 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

CAMTECH ENGINEERS INC. COMMENTS

SIGNATURE OF OPERATOR:

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

Earthtech, Inc.
CONSULTING SCIENTISTS & ENGINEERS

Environmental, Mining & Site Development Services
www.scientificengineers.com

September 29, 2008

Mr. Robert W. Piper, Jr.
District Manager
Cambria County Conservation District
401 Candlelight Drive
Suite 221
Ebensburg, PA 15931

RE: Pennsylvania Model Stormwater Management Ordinance Review

Dear Mr. Piper:

Mr. Bob Deason of this office, asked me to review the draft copy of the Pennsylvania Model Stormwater Management Ordinance, dated March 3, 2008. Upon reviewing the Model Ordinance, I submit the following comments:

1. Section 402 "Plan Submission" – To require 5 copies upon initial plan submission is wasting too much paper. Most of the time, the initial submission requires revisions, thus resulting in four incorrect and out-of-date copies of the plans. Consider requiring, one copy of the plan and associated narrative be submitted to the Municipality for review. Once the landowner has addressed all deficiencies identified by the reviewer and upon notification by the reviewer that all deficiencies are satisfactorily addressed, then have the additional 4 copies submitted and distributed as needed.

2. Section 802 "Inspection" – Consider revising item #3. "During or immediately after cessation of a 10-year or greater storm." Most landowners, or Municipalities for that matter, are not going to know the difference between a 10-year storm or a 2-year storm. Rapid snowmelt events should also be considered. The storm size should be quantified, such as "x" inches of rainfall in a 24-hour period, or after significant rapid snowmelt events.

Mailing Address:	336 Bloomfield St., Suite 201 Johnstown, PA 15904	Office Numbers:	Johnstown:	(814) 266-6402	FAX: (814) 266-6530
			Uniontown:	(724) 439-1313	FAX: (724) 439-0633
			Somerset:	(814) 443-3384	

3. An inspection report should also be considered for large scale developments (Major Subdivisions, Commercial Land Developments, and Industrial Land Development(s). Consider quantifying "large scale" developments. The Qualified Licensed Professional preparing the plans should submit an "Inspection Report Form" along with the Stormwater Site Plan. The inspection form should list the inspections that the landowner is required to make, a "yes" or "no" answer, and a comment. The form can be dated and signed by the landowner or an authorized representative and filed. This would allow the Municipality to "audit" the landowner if neglect to the BMP's is suspected.

4. Appendix A "Operations and Maintenance Agreement" Consider having to notary public signature areas. One notary for the landowner, and one notary for the municipality, on most occasions, the landowner, and Municipality cannot sign an agreement at the same time. That way, both signatures can be notarized on separated occasions.

If you have any questions or require additional information, please contact our office.

Sincerely,

Jason P. Horner, P.E.
Project Manager

JPH/jph

cc: Bob Deason

Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

DATE: 9/29/08

TO: PAUL DEBOBRY FROM: ROBB PITTER

SUBJECT: STONYCREEK RIVER ACT 167 PLAN PHASE II

There are 5 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:
ORDINANCE COMMENT LETTER

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: ccd@co.cambria.pa.us

THE EADS GROUP

ENGINEERING ARCHITECTURE and DESIGN SERVICES

September 25, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, Pennsylvania 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

Dear Mr. Piper,

On behalf of multiple Somerset County municipalities within the Stonycreek River Watershed, we have reviewed the most recent draft Stonycreek River Watershed Stormwater Management Ordinance provided in your letter dated August 13, 2008. This letter contains comments regarding the proposed ordinance. Section numbers are provided for reference with the proposed ordinance, unless otherwise noted. These comments have been forwarded to the municipalities for their review and records. A sample copy of the letter forwarded to the municipalities is enclosed with this letter. The municipalities were requested to forward any objections or modifications of our comments to your attention at the Cambria County Conservation District by October 3, 2008. Our review comments are detailed below:

1. The "x" value in Section 302 should be set to 5,000 square feet. We further suggest that this exemption apply to all impervious areas, not only disconnected impervious areas. Please remove the word "disconnected".

2. The "y" value in Section 302 should be set to 10,000 square feet. We also suggest removing the word "disconnected" from this exemption.

3. The Coxes Creek Ordinance currently allows exemptions for minor subdivisions defined by the Somerset County Subdivision and Land Development Ordinance. We recommend providing this exemption in the proposed ordinance for consistency.

4. It does not appear the Ordinance addresses redevelopment activities. The exemptions provided address projects where regulated activities create impervious areas. Previously, as experienced with the Coxes Creek Ordinance, there have been projects where a parcel is being redeveloped, resulting in no net increase in impervious area. We suggest the ordinance specify how stormwater requirements apply to redevelopment projects.

RECEIVED
SEP 26 2008
CAMBRIA COUNTY CONSERVATION DISTRICT

☐ 1126 Eighth Avenue, Altoona, PA 16602, (814) 944-5035, (814) 944-4862 Fax
☐ 15392 Route 322, Clarion, PA 16214, (814) 764-5050, (814) 764-5055 Fax
☐ 227 Franklin St., Suite 208, Johnstown, PA 15901, (814) 535-5388, (814) 535-7654 Fax
■ 450 Aberdeen Drive, Somerset, PA 15501, (814) 445-6551
☐ 11045 Parker Drive, North Huntingdon, PA 15642, (412) 754-0801, (412) 754-0860 Fax
☐ 81 Baltimore Street, Cumberland, MD 21502, (301) 777-7878

5. Section 304 requires that the 2-, 10-, 25-, 50-, and 100-year design storms are controlled. The Coxes Creek Ordinance requires control of the 2-, 10-, and 25-year design storms. We believe the control of the 50- and 100-year design storms is flood control and not a reasonable requirement for stormwater control. We suggest requiring the control of the 2-, 10-, and 25-year design storms only to remain consistent with the existing Coxes Creek ordinance in the adjacent watershed.

6. Section 304 requires post-development flows be released at rates corresponding to design storms specified in a provided table. All of the proposed stormwater districts contain at least one design storm which requires the post-development flows to be reduced at a peak rate from a design storm less than the post-development design storm. The Coxes Creek Ordinance requires that the post-development flows are released at peak rates that do not exceed the pre-development flows for an equivalent storm. We suggest that the same design storm criteria are applied to all stormwater management districts, providing a uniform requirement throughout the watershed.

7. Section 407 provided details for as-built documentation. The Coxes Creek includes similar requirements, but also requires that the applicant notify the municipality of completion of construction within thirty calendar days of completion of construction. We recommend adding similar language to the proposed ordinance.

8. Provided that PaDEP approves the impervious limits as set forth in the ordinance by exemptions ("x" to 5,000 sf and "y" to 10,000 sf) new home construction would be exempt from stormwater management. We recommend that a "Homeowner's Guideline" be established to assist in stormwater control on a residential level without requiring an extensive plan by potential residents.

9. On Page iii, letter E (Model Ordinance) states if enacting a modified version of this ordinance will make a municipality ineligible for the NPDES general permit (Page 13) for stormwater discharges from small MS4s. Does this mean that if you make ANY changes, the Municipality cannot get NPDES permits?

10. On page 7 (Model Ordinance), under Earth Disturbance Activity, does "clearing" include brush and trees? Does "earth material" include leaves? Clarification should be provided.

11. On page 10, letter G (Model Ordinance). Is there a statue of limitation on the permission of the adjacent property owner? If the adjacent property owner sells, can the new owner reject the agreement previously done?

12. On page 15, Section 403. Plan Review A (Model Ordinance) it states that a "Qualified Professional" should review the site plans. Can a representative from the local Conservation District be designated at the "Qualified Professional" to review the SWM Site Plan while they are reviewing the content for the required E&S Control Plan?

a. Currently, as experienced with the Coxes Creek Ordinance, the Conservation District requests that the Municipality provided their approval of the drainage plan prior to issuing the E&S Approval. The Ordinance, states that the E&S Control Plan be approved prior to the municipality issuing their approval letter. This conflict might be addressed should the Conservation District be involved with the review process of the SWM Site Plan.

13. On page 19, Section 701 Prohibited Discharges and connections, under C (Model Ordinance).
    a. Should runoff from pastures and fields, yards, and gardens be included?

Please contact this office with any questions.

Sincerely,
The EADS Group, Inc. (Somerset)

Jeffrey S. Haynal, EIT

Enclosure

c.c: File 8100-G-06
Eric Critchfield, P.E. – EADS
Benson Borough
Berlin Borough
Boswell Borough
Brothersvalley Township
Central City Borough
Conemaugh Township (Somerset)
Hooversville Borough
Indian Lake Borough
Jenner Township
Jennerstown Borough
Lincoln Township
Ogle Township
Paint Borough
Paint Township
Quemahoning Township
Shade Township
Shanksville Borough
Somerset County Planning Commission
Somerset Township
Stonycreek Township (Somerset)
Stoystown Borough
Windber Borough
Central File

September 25, 2008

Windber Borough
1409 Somerset Avenue
Windber, Pennsylvania 15963

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

Dear Council:

You should have received a letter dated September 3, 2008 from our office regarding an additional review of the draft Stonycreek River Watershed Act 167 Stormwater Management Ordinance. On behalf of your municipality, we have reviewed the most recent draft of this Ordinance. Our comments were provided to Mr. Rob Piper of the Cambria County Conservation District (CCCD) on your behalf.

The revised draft Ordinance is a copy of the statewide Stormwater Model Ordinance, the template from which the Stonycreek River Watershed ordinance was originally created. In general, the model contains only the minimum requirements for stormwater management. The Model was provided for your consideration for approval in place of the more detailed ordinance which was tailored to the municipalities of the Stonycreek River Watershed.

We have enclosed a copy of the review comment letter, dated September 25, 2008, which was forwarded to Mr. Piper, and a revised summary table of our comments. Please note there is no column to compare the proposed consultant ordinance with the model ordinance, as they are now the same document. The summary table compares the existing requirements of the Coxes Creek ordinance to those of the proposed ordinance. If you have any objections to our comments provided to the Conservation District. Please modify our comment letter and provide the modified comment letter to our company and the Conservation District **no later than October 3, 2008**.

Most of the comments submitted to Mr. Piper were provided with the last review. Several of the comments were omitted because they did not apply to the most recent draft. For these reasons, a workshop was not held with EADS and the various municipalities to discuss the comments.

If you have any questions, please contact us.

Sincerely,
The EADS Group, Inc.

Jeffrey S. Haynal, EIT

SEP 26 2008

c.c.: File 8100-G-06
Rob Piper, Jr. - CCCD
Eric Critchfield, P.E. - EADS Central

☐ 1126 Eighth Avenue, Altoona, PA 16602, (814) 944-5035, (814) 944-4862 Fax
☐ 15392 Route 322, Clarion, PA 16214, (814) 764-5050, (814) 764-5055 Fax
☐ 227 Franklin St., Suite 208, Johnstown, PA 15901, (814) 535-5388, (814) 535-7654 Fax
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☐ 11045 Parker Drive, North Huntingdon, PA 15642, (412) 754-0801, (412) 754-0860 Fax
☐ 81 Baltimore St., Suite 600, Cumberland, MD 21502, (301) 777-7878, (301) 777-8391 Fax

THE EADS GROUP

ENGINEERING ARCHITECTURE and DESIGN SERVICES

Memorandum

To: File
From: Jeff Haynal and F. Scott Rugh, P.E.
Date: March 26, 2008
Subject: Stonycreek River Watershed
Comments on DRAFT (Act 167) Stormwater Management Ordinance

Should the form of the Ordinance remain as drafted, we offer the following additional comments:

1. The Coxes Creek Act 167 Stormwater Management Ordinance was adopted in 2005. See attached copy. Since this Ordinance has been found to be workable and is now familiar to municipal officials and developers, we recommend following the format of the Coxes Creek Ordinance. The stormwater districts shown in Table 308-1 can be added to the Coxes Creek Ordinance.

2. Reference to Section 310E (page 30)
Set ___ to include a 25-year conveyance minimum for storm sewers.

3. Is it legal to impose the seemingly arbitrary discharge reductions on certain communities in the study area? This requirement is in effect a betterment in reducing the runoff below existing conditions.

4. In Section 104: (page 5)
We recommend specifically stating what the regulated activities are, who has to submit a drainage plan, and the exemptions.

5. Change "SWM Site Plan" (Section 402.A) to "Drainage Plan" (page 32).

6. Section 402 – Page 32
   A. set "x" to 5,000 sq. ft.
   B. set "x" to 5,000 sf and "y" to 10,000 sf

   The above values for "x" and "y" are the values used in the Coxes Creek Ordinance.
   Also, projects classified for an exemption under Section 402A, would be required to follow a "General BMP" guideline which would be found in the Appendices.

7. Section 403 (page 34)
Vertical profiles of open channels do not seem necessary. We recommend deleting this requirement.

8. Section 305F defines stream buffers, however no statement of permitted or prohibited activities are defined. It is intended to prohibit earth disturbance with the buffer.

   Definition of Buffer page 7 should include verbage describing regulations within the buffer.

9. Section 702.B.f. should exclude the requirement for the locations of utilities within 50 ft. of the project boundary. We suggest that utilities within the project boundary only need to be located. In addition, consider requiring that adjacent land owners be identified on the plan.

cl/Scott/Comment

SOMERSET COUNTY PLANNING COMMISSION

STONYCREEK WATERSHED STORMWATER MANAGEMENT PLAN
COMMENTS ON DRAFT STORMWATER MANAGEMENT ORDINANCE

1. Additional Review Time Requested. I attended a meeting on March 31st at the Somerset Township municipal building regarding the stormwater management plan and ordinance. The meeting was coordinated by the Somerset Township supervisors, with seven of the twenty-three municipalities within the Stonycreek watershed in Somerset County attending. The municipal officials present felt strongly that not enough time has been provided for reviewing the draft plan (which none of them have) and the draft ordinance (which most of them do not have). They are requesting a minimum of sixty (60) additional days for review to commence once they have received copies of the information – and I concur. This will provide time for the municipal officials and their solicitors and engineers to review the materials. Unless this additional review time is given, I do not believe that any meaningful review of the plan or education of the municipal officials regarding the plan is possible, and I believe that the Somerset County Commissioners would be very hesitant to enact the plan. Also, I believe that the municipal officials would be very resistant to adopt an implementing ordinance which they have not had time to review, understand, and very possibly might not be aware of.

2. Copies of Draft Plan and Ordinance to Municipalities. Neither Somerset County nor our municipalities have received copies of the draft plan, and it is extremely difficult to review the draft ordinance without having this background information. I am requesting that the consultant send copies of the plan to us, and to all of the affected municipalities in Somerset County as soon as possible. I recommend that the plan be sent in hard copy format to the municipal officials, and be made available in digital format as well. Second, the only municipalities that have copies of the draft ordinance are those that attended the March meeting in Richland Township. It was my understanding from that meeting that copies of the ordinance were being sent to the municipalities, but I was advised at the March 31st meeting at Somerset Township that none of them had received the ordinance. Again, the review and comment period should not commence until everybody has received this information. Please ask the consultant to send copies of the draft ordinance to the affected municipalities in Somerset County as soon as possible along with the plan.

3. Additional Municipal Meeting(s). There is a need to hold an additional meeting with the affected Somerset County municipalities to explain the plan and the ordinance. I am requesting that the consultant coordinate with us and supervisor Dan Halverson from Somerset Township to set up a meeting, and that the consultant attend the meeting to present the information and answer questions. As you know, only two of the twenty-

three affected Somerset County municipalities attended the March WPAC meeting in Richland, and at this point, many are probably only minimally aware of what the project involves. I believe that this is illustrated by the large number of municipalities in Somerset County who have either not paid their requested local grant match, or who have actually "opted out" of the project, both problems being of serious concern. This meeting for the municipalities should occur they have received the plan and draft ordinance. The municipalities can ask their solicitors and engineers to attend the meeting. I believe that it is very critical to hold this meeting in order to present the information to the municipal officials. Finally, I am willing to meet with municipalities who cannot make the meeting, but it would be essential to have the consultant be present to go over any technical information.

4. Comments on Draft Ordinance. I have received comments on the draft ordinance from the municipal engineer for Somerset Township (see attached) who has reviewed the ordinance on behalf of the Township. Due to the other townships not having copies of the draft ordinance, I have not received any other comments on the draft ordinance. The County does not have an engineer on staff or on retainer to review the ordinance, so my review comments are more general. My comments are:

   - The draft ordinance is excessive, and cannot be realistically administered or enforced by the rural municipalities in Somerset County. Further, the ordinance as proposed would impose unnecessary financial burdens upon homeowners and other builders, and would place these municipalities in an economic disadvantage to other municipalities having little or no stormwater regulations in place. The draft ordinance goes well beyond the language contained in the model ordinance published by the PA DEP, which is in itself excessive for rural Pennsylvania. A part of the land development that would be regulated under the draft ordinance does not even normally fall under the review of the municipal building codes, so much of the regulated activities would occur without being noticed. The draft ordinance absolutely needs to be scaled back, and made more realistic for our local circumstances. This will require that municipal officials and their engineers and solicitors be given an opportunity to provide input on what works in their areas.

   - One recommendation is to use the model stormwater management ordinance developed for the Coxes Creek Stormwater Management Plan, which was approved by the PA DEP. Variations of this ordinance are in place in portions of seven municipalities in Somerset County, and the regulations are generally viewed as reasonable and workable, and are familiar to municipal officials and developers. A copy of this model ordinance is attached.

FAX TRANSACTION COVER SHEET

DATE: 8/22/08

TO: PAUL DEBNEY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER ACT 167 PHASE II PLAN
AUG. MAILING MODEL ORDINANCE COMMENTS

There are 2 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

SIGNATURE OF OPERATOR:

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

CAMBRIA COUNTY
PLANNING COMMISSION
(814) 472-2106

401 CANDLELIGHT DRIVE
SUITE 213
EBENSBURG, PA 15931

August 19, 2008

Mr. Robert W. Piper, Jr.
Cambria County Conservation District
401 Candlelight Drive
Ebensburg, Pennsylvania 15931

Dear Robb:

RE: The Stonycreek River (Act 167) Stormwater Management Plan Ordinance Review

As per your request, I have the following comments on the above-referenced ordinance:

1. Under Section 302 EXEMPTIONS I would suggest the following:

   - Regulated activities that create Disconnected Impervious Areas smaller than 5,000 sq. ft. are exempt from Peak Rate Control and SWM Site Plan preparation requirements.

   - Regulated activities that create Disconnected Impervious Areas equal to or greater than 5,000 sq. ft. and less than 10,000 sq. ft. are exempt only from the peak rate control requirements.

2. Several sections in the model ordinance reference local subdivision regulations (either municipal or County). In Cambria County, some municipalities do not have subdivision regulations and there are no County subdivision regulations. In those cases, I would delete any reference to local subdivision regulations.

Sincerely,

Bradford G. Beigay
Executive Director

RECEIVED

AUG 21 2008

CAMBRIA COUNTY
CONSERVATION DISTRICT

FAX TRANSACTION COVER SHEET

~~484~~ 484-821-0474

DATE: 4-25-08

TO: PAUL DeBARRY FROM: ROBB PIERCE

SUBJECT: COMMENT LETTERS

There are 8 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

LETTERS FROM:

~~SOMERSET~~

- SOMERSET PLANNING
- CAMBRIA PLANNING
- EADS - CITY OF JOHNSTOWN

CAMBRIA CO. COMMISSIONERS / RODKEY - SOLICITOR

EADS - ADAMS TWP.

SIGNATURE OF OPERATOR: [signature]

FAX NUMBER OF SENDER: (814) 472-0686

SOMERSET COUNTY PLANNING COMMISSION

STONYCREEK WATERSHED STORMWATER MANAGEMENT PLAN
COMMENTS ON DRAFT STORMWATER MANAGEMENT ORDINANCE

1. Additional Review Time Requested. I attended a meeting on March 31st at the Somerset Township municipal building regarding the stormwater management plan and ordinance. The meeting was coordinated by the Somerset Township supervisors, with seven of the twenty-three municipalities within the Stonycreek watershed in Somerset County attending. The municipal officials present felt strongly that not enough time has been provided for reviewing the draft plan (which none of them have) and the draft ordinance (which most of them do not have). They are requesting a minimum of sixty (60) additional days for review to commence once they have received copies of the information – and I concur. This will provide time for the municipal officials and their solicitors and engineers to review the materials. Unless this additional review time is given, I do not believe that any meaningful review of the plan or education of the municipal officials regarding the plan is possible, and I believe that the Somerset County Commissioners would be very hesitant to enact the plan. Also, I believe that the municipal officials would be very resistant to adopt an implementing ordinance which they have not had time to review, understand, and very possibly might not be aware of.

2. Copies of Draft Plan and Ordinance to Municipalities. Neither Somerset County nor our municipalities have received copies of the draft plan, and it is extremely difficult to review the draft ordinance without having this background information. I am requesting that the consultant send copies of the plan to us, and to all of the affected municipalities in Somerset County as soon as possible. I recommend that the plan be sent in hard copy format to the municipal officials, and be made available in digital format as well. Second, the only municipalities that have copies of the draft ordinance are those that attended the March meeting in Richland Township. It was my understanding from that meeting that copies of the ordinance were being sent to the municipalities, but I was advised at the March 31st meeting at Somerset Township that none of them had received the ordinance. Again, the review and comment period should not commence until everybody has received this information. Please ask the consultant to send copies of the draft ordinance to the affected municipalities in Somerset County as soon as possible along with the plan.

3. Additional Municipal Meeting(s). There is a need to hold an additional meeting with the affected Somerset County municipalities to explain the plan and the ordinance. I am requesting that the consultant coordinate with us and supervisor Dan Halverson from Somerset Township to set up a meeting, and that the consultant attend the meeting to present the information and answer questions. As you know, only two of the twenty-

Received 4/11/08

three affected Somerset County municipalities attended the March WPAC meeting in Richland, and at this point, many are probably only minimally aware of what the project involves. I believe that this is illustrated by the large number of municipalities in Somerset County who have either not paid their requested local grant match, or who have actually "opted out" of the project, both problems being of serious concern. This meeting for the municipalities should occur they have received the plan and draft ordinance. The municipalities can ask their solicitors and engineers to attend the meeting. I believe that it is very critical to hold this meeting in order to present the information to the municipal officials. Finally, I am willing to meet with municipalities who cannot make the meeting, but it would be essential to have the consultant be present to go over any technical information.

4. Comments on Draft Ordinance. I have received comments on the draft ordinance from the municipal engineer for Somerset Township (see attached) who has reviewed the ordinance on behalf of the Township. Due to the other townships not having copies of the draft ordinance, I have not received any other comments on the draft ordinance. The County does not have an engineer on staff or on retainer to review the ordinance, so my review comments are more general. My comments are:

   - The draft ordinance is excessive, and cannot be realistically administered or enforced by the rural municipalities in Somerset County. Further, the ordinance as proposed would impose unnecessary financial burdens upon homeowners and other builders, and would place these municipalities in an economic disadvantage to other municipalities having little or no stormwater regulations in place. The draft ordinance goes well beyond the language contained in the model ordinance published by the PA DEP, which is in itself excessive for rural Pennsylvania. A part of the land development that would be regulated under the draft ordinance does not even normally fall under the review of the municipal building codes, so much of the regulated activities would occur without being noticed. The draft ordinance absolutely needs to be scaled back, and made more realistic for our local circumstances. This will require that municipal officials and their engineers and solicitors be given an opportunity to provide input on what works in their areas.

   - One recommendation is to use the model stormwater management ordinance developed for the Coxes Creek Stormwater Management Plan, which was approved by the PA DEP. Variations of this ordinance are in place in portions of seven municipalities in Somerset County, and the regulations are generally viewed as reasonable and workable, and are familiar to municipal officials and developers. A copy of this model ordinance is attached.

CAMBRIA COUNTY
PLANNING COMMISSION
(814) 472-2106

401 CANDLELIGHT DRIVE
SUITE 213
EBENSBURG, PA 15931

April 1, 2008

Mr. Robb Piper
Cambria County Conservation District
Candlelight Drive
Ebensburg, Pennsylvania 15931

Dear Robb:

RE: Stonycreek River Watershed
Stormwater Management Plan

I reviewed the above-referenced document and have only the following suggestion: Every effort should be made to allow areas of less than 10,000 square feet to be exempt from the Peak Rate Control and the SWM site plan preparation requirements of this proposed plan and its model ordinance. This requirement is found on page V-33 of Volume I Executive Summary and page 32 Section 402 Exemptions in the model ordinance. This requirement would then be consistent with the exemption found in the recommended model ordinance for the Little Conemaugh River Watershed prepared in April, 1994.

If I can be of any further assistance to you on this matter, please do not hesitate to call me.

Sincerely,

Bradford G. Beigay
Executive Director

THE EADS GROUP

ENGINEERING ARCHITECTURE and DESIGN SERVICES

April 7, 2008

Cambria County Redevelopment Authority
Attn: Mr. Rob Piper
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

APR 0 9 2008

STONYCREEK RIVER WATERSHED – ACT 167 STORMWATER
CITY OF JOHNSTOWN – REVIEW EXTENSION REQUEST

Mr. Piper,

We have received the draft of the "Stonycreek River Watershed Stormwater Management Ordinance" and reviewed the draft on behalf of the City of Johnstown. At this time, we would like to request a time extension on the comment period regarding the above mentioned Act 167 Ordinance.

The City of Johnstown is located within the Stonycreek River Watershed and the Little Conemaugh Watershed and is an MS-4 Community. This will require the City to have three different stormwater management ordinances. The City is requesting a time extension so that they may review and compare the requirements of each of the ordinances. They would like the extra time to investigate the possibility of implementing one, combined ordinance to address the requirements collectively.

If you have any questions, please feel free to contact our office.

Sincerely,
The EAD Group, Inc.

Stephen M. Sewalk, P.E.

Cc: Frank D'Ettorree - Johnstown Redevelopment Authority
Curt Davis – The City of Johnstown
File
Central

C:\Documents And Settings\Jeff Haynal\Desktop\JRA - Stonycreek Act 167 SW Comments.Doc

■ 1126 Eighth Avenue, Altoona, PA 16602, (814) 944-5035, (814) 944-4862 Fax
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☐ 227 Franklin St. Suite 208, Johnstown, PA 15901, (814) 535-5388, (814) 535-7654 Fax

Office of County Commissioners

200 South Center Street
Ebensburg, PA 15931
(814) 472-5440

MEMORANDUM

TO: Robb Piper, Executive Director
Cambria County Conservation District

FROM: Randall C. Rodkey, Assistant Solicitor

DATE: March 28, 2008

RE: Stonycreek River Stormwater Management Plan

I have reviewed the two (2) proposed ordinances you sent to me relative to the above.

First, as to the Stormwater Management Ordinance, I have no suggested changes.

As to the ordinance labeled Stonycreek River Watershed, my only comment is that Section 905.A. should be amended to remove the term "misdemeanor" and substitute with the term "summary offense." A violation of a township or borough ordinance is a summary offense as opposed to a misdemeanor.

I, of course, have no opinion as to any of the technical provisions of your ordinances.

Thank you.

RCR/mak

Enclosures

Adams Township Board of Supervisors
P.O. Box 112
Sidman, Pennsylvania 15955

DENNIS J. GDULA
ROY HOFFMAN
RON KAUFFMAN
DENNIS P. RICHARDS
WILLIAM J. SMITH

125 Mary Drive
Sidman, Pennsylvania
814-487-5054
814-487-5823
Fax 814-487-5823
email: adamstwp@adelphia.net

07 April 2008

Cambria County Conservation District
Attention: Mr. Robert W. Piper, Jr., District Manager
401 Candlelight Drive
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED ACT 167 PLAN
ADAMS TOWNSHIP SUPERVISORS
CAMBRIA COUNTY, PENNSYLVANIA

We offer the following comments pertaining to the draft Stonycreek River Watershed Act 167 Plan:

1. In Section 104: (page 5)
   We recommend specifically stating what the regulated activities are, who has to submit a drainage plan, and the exemptions.

2. Reference to Section 310E (page 30)
   Set ___ to include a 10-year conveyance minimum for storm sewers (as required by PennDOT).

3. Section 305F (page 22) defines stream buffers. We suggest defining the permitted and prohibited activities.

   Definition of Buffer: page 7 should include verbage describing regulations within the buffer.

4. Change "SWM Site Plan" (Section 402.A) to "Drainage Plan" (page 32).

5. Section 402 – Page 32
   A. set "x" to 5,000 sq. ft. (single-lot residential developments should not have to submit a plan)
   B. set "x" to 5,000 sq. ft. and "y" to 10,000 sq. ft.

   It is further suggested that projects applying for an exemption under Section 402A (ie, single-lot residential), would be required to follow a "General BMP" guideline which would be found in the Appendices.

6. Section 403, Item No. 17 (page 34)

Vertical profiles of open channels do not seem necessary. We recommend deleting this requirement.

7. Section 702.B.f. (page 39) should exclude the requirement for the locations of utilities within 50 ft. of the project boundary. This requirement unnecessarily adds costs to the developer. We suggest that utilities within the project boundary only need to be located. In addition, consider requiring that adjacent landowners be identified on the plan.

8. Adams Township was required to adopt the Little Conemaugh River Act 167 Stormwater Management Ordinance and will be expected to also adopt the Stonycreek River Act 167 Ordinance. We have prepared a single, comprehensive stormwater ordinance for Adams Township to include both Act 167 plans. The Little Conemaugh watershed release rate map depicts release rates for the different sub-areas with allowable percentages of pre-development runoff. The Stonycreek watershed release rate map utilizes different design storms for pre- and post-development conditions in order to reduce the allowable runoff rates. We request that the Stonycreek watershed map be revised to utilize allowable percentages of the pre-development rate in order to be consistent with the Little Conemaugh River Act 167 ordinance previously adopted.

Respectfully submitted,
Adams Township Supervisors

By: William J. Smith, Chairman

cc: Gregory L. Elliott, RLA - Director of Site Development – The EADS Group, Inc.
William G. Barbin – Solicitor

\\Somserve\architecture\Projects\Adams Township\Correspondence\Piper Memo.doc

FAX TRANSACTION COVER SHEET

DATE: 10/3/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER ACT 167 RAU ORDINANCE PHASE II

There are 3 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:
COMMENTS FOR:
1) DALE BOROUGH
2) JOHNSTOWN (CITY)

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: ccod@co.cambria.pa.us

THE EADS GROUP

ENGINEERING ARCHITECTURE and DESIGN SERVICES

September 30, 2008

Cambria County Conservation District
Attention: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, Pennsylvania 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW
DALE BOROUGH

Dear Mr. Piper:

On behalf of Dale Borough, we have reviewed the draft Stonycreek River Watershed Act 167 Stormwater Management Ordinance. After careful consideration, we offer the following comments:

1. Dale Borough is a concentrated, urbanized area. The ability to create "disconnected" impervious area is limited. Should the use of "disconnected" impervious areas not be feasible, the amount of "disconnected" impervious area would, in effect, be equal to zero square feet. Under Section 302 – Exemptions, this would qualify for an exemption, since the amount would be less than the "(x)" threshold.

   a.) Is this the intent of the exemption?
   b.) Is the concept of "disconnected" impervious areas intended to promote infiltration? It appears developers will be persuaded to the create less "disconnected" impervious area in order to avoid the requirements of peak rate control and SWM Site Plan preparation. Please confirm.

2. The exemptions of Section 302 address the creation of impervious area. Most of Dale Borough is developed, therefore it is anticipated that most projects will be redevelopment projects, which already consist of a majority of impervious area. Are projects which do not create impervious area exempt from peak rate control and the preparation of a SWM Site Plan? Please clarify.

3. Section 304 requires that design-storms up to the 100-year event are controlled. Typical parcels in Dale Borough are approximately one-tenth acre in area. It does not appear to be feasible to require flood control on project sites already constrained by the size of the parcel. It is suggested design storms up to the 25-year event be controlled.

Please contact this office with any questions.

Sincerely,
THE EADS GROUP, INC. (Johnstown)

By: Jeffrey S. Haynal, E.I.T.

Cc: Dale Borough
Steve Sewalk – EADS
File No. 2202-G-01
Central File

RECEIVED
OCT 0 2 2008
CAMBRIA COUNTY CONSERVATION DISTRICT

☐ 1126 Eighth Avenue, Altoona, PA 16602, (814) 944-5035, (814) 944-4161 Fax
☐ 15392 Route 322, Clarion, PA 16214, (814) 764-5050, (814) 764-5055 Fax
☐ 450 Aberdeen Drive, Somerset, PA 15501, (814) 445-6551, (814) 443-2748 Fax
☐ 11045 Parker Drive, North Huntingdon, PA 15642, (412) 754-0801, (412) 754-8391 Fax
☐ 81 Baltimore Street Suite 600, Cumberland, MD 21502, (301) 777-7878
■ 227 Franklin St. Suite 208, Johnstown, PA 15901, (814) 535-5388

THE EADS GROUP

ENGINEERING ARCHITECTURE and DESIGN SERVICES

September 30, 2008

Cambria County Conservation District
Attention: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, Pennsylvania 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW
CITY OF JOHNSTOWN

Dear Mr. Piper:

On behalf of the City of Johnstown, we have reviewed the draft Stonycreek River Watershed Stormwater Management Ordinance provided with your letter dated August 13, 2008. Comments were previously submitted by the City comparing the proposed Ordinance to the existing Little Conemaugh River Act 167 Stormwater Ordinance. We offer the following comment on the most recent draft ordinance:

1. The Draft Ordinance appears to be the State Model Ordinance, which specifies the minimum requirements for stormwater control. A portion of the City is in the Little Conemaugh River Watershed, which has an approved Act 167 Stormwater Ordinance in place. This existing Ordinance was "tailored" from the Model Ordinance for the local conditions, and appears to be in greater detail than the provided Model Ordinance. For consistency within the City, it is suggested that the Stonycreek River Watershed Requirements be set equal to those of the approved Little Conemaugh Ordinance.

   A representative from our firm previously contacted your office to inform you that the City was interested in combining the Little Conemaugh River Act 167 Plan with the requirements of the MS-4 Ordinance and the proposed Stonycreek River Ordinance. The concept of a combined ordinance was generally well-received by your office at that time. By permitting the City to apply the requirements of the Little Conemaugh River Ordinance to the Stonycreek River Watershed portion of the City, efforts to create a uniform Ordinance would be reduced. A uniform ordinance throughout the City would allow the City to more effectively manage stormwater projects and may also reduce opposition to Stormwater Management by future developers.

In summary, the City of Johnstown is requesting the Little Conemaugh River Act 167 requirements be applied to the Stonycreek River Watershed portion of the City, in place of adopting an additional Ordinance.

Please contact me with any questions.

RECEIVED

OCT 0 2 2008

CONSERVATION DISTRICT

Sincerely,
THE EADS GROUP, INC. (Johnstown)

By: Jeffrey S. Haynal, E.I.T.

Cc: File No. 1067-SW-01
Curt Davis, City Manager
Frank D'Ettorree – JRA
Steve Sewalk, P.E. – EADS

Zufall/Sanitary/JeffH/2008-09-30CCCDAct167StonycreekRiverWatershed

☐ 1126 Eighth Avenue, Altoona, PA 16602, (814) 944-9035
☐ 15392 Route 322, Clarion, PA 16214, (814) 764-5050, (814) 764-5055 Fax
☐ 450 Aberdeen Drive, Somerset, PA 15501, (814) 445-6551, (814) 443-2748 Fax
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☐ 81 Baltimore Street Suite 600, Cumberland, MD 21502, (301) 777-7878
■ 227 Franklin St. Suite 208, Johnstown, PA 15901, (814) 535-5388, Fax

FAX TRANSACTION COVER SHEET

DATE: 7/1/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER SWM PLAN ORDINANCE COMMENTS

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

CONEMAUGH TOWNSHIP, SOMERSET COUNTY COMMENTS

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

CONEMAUGH TOWNSHIP SUPERVISORS

SOMERSET COUNTY

BOARD OF SUPERVISORS:

STEVEN M. BUNCICH, Chairman
WAYNE A. KAUFFMAN, Vice Chairman
ALBERT E. ZUCCOLOTTO, Asst. Sec.-Treas.

OFFICES LOCATED AT:
1120 Tire Hill Road, Johnstown, PA 15905
Phone: (814) 288-1400 Fax: 288-2135
www.contwpsupers.us
Email: supers@contwpsupers.us

Date: June 26, 2008

RECEIVED

JUL 01 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

Dear Mr. Piper:

We have reviewed the draft Stonycreek River Watershed Stormwater Management Ordinance as requested at the April 30, 2008 workshop and in your letter dated May 29, 2008. This letter contains comments regarding the proposed ordinance. Section numbers are provided for reference with the proposed ordinance, unless otherwise noted. We have contacted the EADS Group, Inc. and Mr. Brad Zearfoss, Somerset Planning Commission to assist us in the review of this ordinance. After review and discussion, we offer the following comments:

1. The "x" value in Section 402 should be set to 5,000 square feet. We further suggest that this exemption apply to all impervious areas, not only disconnected impervious areas. Please remove the word "disconnected".
2. The "y" value in Section 402 should be set to 10,000 square feet. We also suggest removing the word "disconnected" from this exemption.
3. The Coxes Creek Ordinance currently allows exemptions for minor subdivisions defined by the Somerset County Subdivision and Land Development Ordinance. We recommend providing this exemption in the proposed ordinance for consistency.
4. The proposed ordinance provides design requirements for BMPs for streambank erosion. The County Conservation District currently reviews erosion and sedimentation BMPs for projects that qualify for an erosion and sedimentation plan. We recommend removing this requirement from the proposed ordinance since it is already reviewed through the Conservation District.
5. Section 308 requires that the 2-, 10-, 25-, 50-, and 100-year design storms are controlled. The Coxes Creek Ordinance requires control of the 2-, 10-, and 25-year design storms. We believe the control of the 50- and 100-year design storms is flood control and not a reasonable requirement for stormwater control. We suggest requiring the control of the 2-, 10-, and 25-year design storms only.
6. Section 308 requires post-development flows be released at rates corresponding to design storms specified in Table 308-1. All of the proposed stormwater districts contain at least one design storm which requires the post-development flows to be reduced at a design storm less than the post-development design storm. The Coxes Creek Ordinance requires that the post-development flows are released at peak rates that do not exceed the pre-development flows

for an equivalent storm. We suggest that the same design storm criteria are applied to all stormwater management districts.

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11. The Consultant's Stormwater Management Plan Report provides on page VI-4 in "Section VI - Municipal Ordinance Introduction" that NPDES Phase II program affects all "urbanized areas" and that this definition applies to all Stonycreek River Watershed municipalities. The plan also indicates on page III-1 that nineteen of the thirty-six municipalities in the watershed are located within the Johnstown Urbanized Area as designated by the 2000 Census. Not all municipalities in the watershed are MS-4 communities.
    a. This sentence needs to be deleted.
12. The terms "SWM Site Plan" and "Drainage Plan" are used within the Ordinance. Considerations should be given to clarifying the difference between the two terms or else combining the terms to one.
13. Vertical profiles of open channels do not seem necessary. We recommend deleting this requirement.
14. Section 702.B.f. should exclude the requirement for the locations of utilities within 50 ft. of the project boundary. We suggest that utilities within the project boundary only need to be located. In addition, consider requiring that adjacent land owners be identified on the plan.
15. Section 305F defines stream buffers, however no statement of permitted or prohibited activities are defined. It is intended to prohibit earth disturbance with the buffer?
    a. Definition of Buffer page 7 should include verbage describing regulations within the buffer.
16. Provided that PaDEP approves the impervious limits as set forth in the ordinance by exemptions ("x" to 5,000 sf and "y" to 10,000 sf) new home construction would be exempt from stormwater management. We recommend that a "Homeowner's Guideline" be established to assist in stormwater control on a residential level without requiring an extensive plan by potential residents.
17. On page i, under Purpose (Model Ordinance). the last sentence states: This Model Ordinance combines and supersedes previous model municipal ordinances for stormwater management published by DEP in documents 392-0300-001 and 392-0300-003. How can an Ordinance Supersede a previous ordinance? If this is the case, how can you enforce a

situation where someone did the proper procedures and studies for stormwater run-off and now you want them to change it? Who is to pay for the improvements?

18. Page iii, letter E (Model Ordinance) states if enacting a modified version of this ordinance will make a municipality ineligible for the NPDES general permit (Page 13) for stormwater discharges from small MS4s. Does this mean that if you make ANY changes, the Municipality cannot get any NPDES permits?
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20. On page 10, letter G (Model Ordinance). Is there a statue of limitation on the permission of the adjacent property owner? If the adjacent property owner sells, can the new owner reject the agreement previously done?
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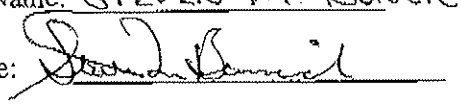
22. On page 19, Section 701 Prohibited Discharges and connections, under C (Model Ordinance).
    a. Should runoff from pastures and fields, yards, and gardens be included?

Please contact this office with any questions.

Sincerely,

Printed Name: STEVEN M. RUNCICH

Signature: 

cc: Jeff Haynal – The EADS Group, Inc.

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

DATE: 7/8/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER SWM PLAN ORDINANCE COMMENTS

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

BERLIN BORO COMMENTS

SIGNATURE OF OPERATOR: _____

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: cccd@co.cambria.pa.us

Phone: (814) 267-3837
Fax: (814) 267-3017

Berlin was settled in 1768, and incorporated into a town in 1837. It is 2400 feet above sea level and is the most beautifully situated town in Somerset County – "The healthiest place on earth."

The Borough of Berlin

700 North Street
Berlin, Somerset County, Pennsylvania 15530

July 2, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

Dear Mr. Piper:

We have reviewed the draft Stonycreek River Watershed Stormwater Management Ordinance as requested at the April 30, 2008 workshop and in your letter dated May 29, 2008. This letter contains comments regarding the proposed ordinance. Section numbers are provided for reference with the proposed ordinance, unless otherwise noted. We have contacted the EADS Group, Inc. and Mr. Brad Zearfoss, Somerset Planning Commission to assist us in the review of this ordinance. After review and discussion, we offer the following comments:

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reasonable requirement for stormwater control. We suggest requiring the control of the 2-, 10-, and 25-year design storms only.

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    a. Should runoff from pastures and fields, yards, and gardens be included?

Please contact this office with any questions.

Sincerely,

BOROUGH OF BERLIN

John F. Long
Borough Council President

cc: Jeff Haynal – The EADS Group, Inc.

CAMBRIA COUNTY Conservation 1950 DISTRICT

FAX TRANSACTION COVER SHEET

484-821-0474

DATE: 7/1/08

TO: PAUL DEBARRY FROM: ROBB PIPER

SUBJECT: STONYCREEK RIVER SWM PLAN ORDINANCE COMMENTS

There are 4 pages including this cover sheet. If not properly received, please telephone (814) 472-2120 immediately.

ADDITIONAL COMMENTS:

WINDBER BORO COMMENTS

SIGNATURE OF OPERATOR:

FAX NUMBER OF SENDER: (814) 472-0686

401 Candlelight Drive, Suite 221, Ebensburg, PA 15931, Telephone (814) 472-2120, FAX: (814) 472-0686, E-Mail: ccod@co.cambria.pa.us

WINDBER BOROUGH

1409 Somerset Ave. Windber, PA. 15963
(814) 467-9014
FAX (814) 467-7354

June 26, 2008

Cambria County Conservation District
Attn: Mr. Robert Piper, Jr.
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931

STONYCREEK RIVER WATERSHED
ACT 167 STORMWATER MANAGEMENT ORDINANCE REVIEW

Dear Mr. Piper

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22. On page 19, Section 701 Prohibited Discharges and connections, under C (Model Ordinance).
    a. Should runoff from pastures and fields, yards, and gardens be included?

Please contact this office with any questions.

Sincerely,

Printed Name: FRED OLIVEROS

Signature: Fred Oliveros

cc: Jeff Haynal – The EADS Group, Inc.

PLAN APPENDIX 2

MUNICIPAL ORDINANCE MATRIX

STONYCREEK RIVER WATERSHED MUNICIPAL ORDINANCE MATRIX								
(STORMWATER MANANGEMENT ACT 167 PLAN) February 2008								
			Within the Subdivision and Land Development Ordinance					
Township/Borough	Zoning	Subdivision Land Dev.	Stormwater	Flood Plain	Road	Grading	Erosion Sedimentation	Other
CAMBRIA COUNTY								
Adams Township	yes	yes	yes	no	yes	yes	no	old ordinance
Conemaugh Township (Cambria County)	yes	yes						no ordinance on file
Daisytown Borough	no	no						na
Dale Borough	no	no						na
Ferndale Borough	yes	no						na
Geistown Borough	yes	yes						no ordinance on file
Johnstown City	yes	yes	no	no	yes	yes	no	old ordinance
Lorain Borough	yes	no						na
Lower Yoder Township	yes	yes						no ordinance on file
Richland Township	yes	yes						no ordinance on file
Scalp Level Borough	no	no						na
Southmont Borough	yes	yes						no ordinance on file
Stonycreek Township (Cambria County)	yes	yes	no	no	yes	yes	no	old ordinance
Upper Yoder Township	yes	yes	no	no	yes	yes	no	old ordinance
Westmont Borough	yes	yes	yes	no	yes	yes	no	old ordinance
SOMERSET COUNTY								
Allegheny Township	no	yes						na
Benson Borough	no	no						na
Berlin Borough	no	no						na
Boswell Borough	yes	no	yes	yes	yes	yes	yes	old ordinance
Brothers Valley Township	no	no						na
Central City Borough	no	no						na
Conemaugh Township	yes	yes	yes	yes	yes	yes	yes	old ordinance
Hooversville Borough	no	no						na
Indian Lake Borough	yes	no	yes	no	no	no	no	no ordinance
Jenner Township	portions	no	yes	no	no	no	no	old ordinance
Jennerstown Borough	yes	no						na
Lincoln Township	no	no						na
Ogle Township	no	no						na
Paint Bourough	yes	no						na
Paint Township	no	yes	yes	yes	yes	yes	yes	old ordinance
Quemahoning Township	portions	no	no	no	no	no	no	old ordinance
Shade Township	no	no						na
Shanksville Bourogh	no	no						na
Somerset Township	portions	no	yes	no	no	no	no	old ordinance
Stonycreek Township	no	no						na
Stoystown Borough	no	no						na
Windber Borough	yes	yes	yes	yes	no	no	no	old ordinance

PLAN APPENDIX 3

MODEL ORDINANCE

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Watershed Management

DOCUMENT NUMBER: 363-0300-003

TITLE: Pennsylvania Model Stormwater Management Ordinance

EFFECTIVE DATE: Upon final publication in the *Pennsylvania Bulletin*.

AUTHORITY: Storm Water Management Act, October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et. seq., as amended.

POLICY: The Department of Environmental Protection, with assistance from others, recommends use of this Model Ordinance. Counties should use this Ordinance as a template for preparing municipal stormwater management ordinances when preparing Act 167 stormwater management plans. Municipalities without an otherwise suitable stormwater management ordinance should adapt and enact this Model Ordinance to meet National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permitting requirements. Other municipalities may adapt and enact this Ordinance.

PURPOSE: The purposes of this Ordinance are: to provide a template for developing municipal stormwater management ordinances in watershed stormwater management plans prepared under the Pennsylvania Storm Water Management Act (1978 Act 167); to be the Model Ordinance for enactment or amendment of ordinances by municipalities designated as urbanized under the federal NPDES Phase II rule (i.e. MS4 Municipalities); and to provide a template for any other municipality engaged in preparation and enactment or amendment of a stormwater management ordinance. Enactment of the Model Ordinance establishes municipal authority to administer, regulate, and enforce proper implementation and maintenance of stormwater management Best Management Practices (BMPs) and design standards such as the ones presented in the *Pennsylvania Stormwater Best Management Practices Manual* No. 363-0300-002 (DEP, 2006). This Model Ordinance combines and supersedes previous model municipal ordinances for stormwater management published by DEP in documents 392-0300-001 and 392-0300-003.

APPLICABILITY: This policy applies to any staff member of the DEP involved with the Storm Water Management Act, the Stormwater Planning and Management Program, or the NPDES MS4 Permitting Program.

DISCLAIMER: The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory or statutory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of DEP to give these policies and procedures that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

PAGE LENGTH: 33 Pages

LOCATION: Volume 34, Tab 25

INSTRUCTIONS FOR MUNICIPALITIES IMPLEMENTING A STORMWATER ORDINANCE WITHOUT A STORMWATER MANAGEMENT PLAN PURSUANT TO 1978 ACT 167

When the Model Stormwater Management Ordinance is implemented other than through an approved Act 167 Storm Water Management Plan, the following suggestions apply:

A. Section 104, Statutory Authority. The secondary authority should be cited as the authority for implementing the ordinance requirements. The primary authority is not applicable and should be deleted. In addition, this section should cite the applicable municipal class code for enforcement purposes.

B. Article II - Definitions
- Municipality: Insert municipal name and county, as indicated.
- Stormwater Management Plan: Delete, definition not applicable.

C. Article III - Stormwater Management Standards should be used as an example of performance standards that will help the municipality to: properly manage stormwater runoff, meet state water quality requirements, meet state and federal anti-degradation requirements, improve impaired waters, meet Total Maximum Daily Loads (TMDL's), and meet state water quality requirements for special protection designated watersheds. In Section 302, Exemptions, the blanks labeled "x" and "y" must be replaced by numerical values. Values from 250 to 1,000 are suggested for "x", and values from 1,000 to 5,000 are suggested for "y".

D. The municipal solicitor should review Article VIII-Enforcement and Penalties, and make any additions necessary to ensure effective enforcement is provided commensurate with the applicable municipal code.

E. The municipality may revise other articles or sections of this ordinance as it deems appropriate; however, enacting a modified version of this ordinance will make a municipality ineligible for the NPDES general permit (PAG-13) for stormwater discharges from small MS4s.

INSTRUCTIONS FOR MUNICIPALITIES IMPLEMENTING STORMWATER PLANS PURSUANT TO 1978 ACT 167

When the Model Stormwater Management Ordinance is enacted as part of the implementation of an approved Act 167 Stormwater Management Plan, the following suggestions apply:

A. The municipal solicitor should review Article VIII - Enforcement and Penalties, and make any additions as necessary to ensure that effective enforcement can be provided commensurate with the applicable municipal code.

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STONYCREEK RIVER WATERSHED

STORMWATER MANAGEMENT

ORDINANCE

ORDINANCE NO.

[Municipal Name], __[County Name]_ COUNTY,

PENNSYLVANIA

Adopted at a Public Meeting Held on

_____, 20__

ARTICLE I - GENERAL PROVISIONS

Section 101. Short Title

This Ordinance shall be known and may be cited as the "(Name of municipality and name of watershed plan, if applicable) Stormwater Management Ordinance."

Section 102. Statement of Findings

The governing body of the Municipality finds that:

A. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases non-point source pollution of water resources.

B. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety and welfare and the protection of people of the Commonwealth, their resources and the environment.

C. Stormwater is an important water resource, which provides groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.

D. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES).

Section 103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the Municipality and its watershed by minimizing the harms and maximizing the benefits described in Section 102 of this Ordinance, through provisions designed to:

A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code Chapter 93 to protect, maintain, reclaim and restore the existing and designated uses of the waters of this Commonwealth.

B. Preserve the natural drainage systems as much as possible.

C. Manage stormwater runoff close to the source.

D. Provide procedures and performance standards for stormwater planning and management.

E. Maintain groundwater recharge, to prevent degradation of surface and groundwater quality and to otherwise protect water resources.

F. Prevent scour and erosion of stream banks and streambeds.

G. Provide proper operation and maintenance of all permanent Stormwater Management (SWM) Best Management Practices (BMPs) that are implemented within the Municipality.

H. Provide standards to meet NPDES permit requirements.

Section 104. Statutory Authority

A. Primary Authority:

The municipality is empowered to regulate these activities by the authority of the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, the "Storm Water Management Act" and the (appropriate municipal code).

B. Secondary Authority:

The Municipality also is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

Section 105. Applicability

All Regulated Activities and all activities that may affect stormwater runoff, including Land Development and Earth Disturbance Activity, are subject to regulation by this Ordinance.

Section 106. Repealer

Any other ordinance provision(s) or regulation of the Municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Section 107. Severability

In the event that a court of competent jurisdiction declares any section or provision of this Ordinance invalid, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

Section 108. Compatibility with Other Requirements

Approvals issued and actions taken under this Ordinance do not relieve the Applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation or ordinance.

ARTICLE II - DEFINITIONS

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.

C. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

Agricultural Activity – Activities associated with agriculture such as agricultural cultivation, agricultural operation, and animal heavy use areas. This includes the work of producing crops including tillage, land clearing, plowing, disking, harrowing, planting, harvesting crops, or pasturing and raising of livestock and installation of conservation measures. Construction of new buildings or impervious area is not considered an Agricultural Activity.

Applicant - A landowner, developer or other person who has filed an application to the Municipality for approval to engage in any Regulated Activity at a project site in the Municipality.

Best Management Practice (BMP) - Activities, facilities, designs, measures or procedures used to manage stormwater impacts from Regulated Activities, to meet State Water Quality Requirements, to promote groundwater recharge and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "non-structural". In this Ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural Stormwater BMPs are permanent appurtenances to the project site.

Capture – Collecting runoff to be stored for reuse or allowed to slowly infiltrate into the ground.

Conservation District - A conservation district, as defined in section 3(c) of the Conservation District Law (3 P. S. § 851(c)), as amended, that has the authority under a delegation agreement executed with the Department to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

Design Storm - The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g. a 5-year-storm) and duration (e.g. 24 hours), used in the design and evaluation of stormwater management systems. Also see Return Period.

Detention Volume - The volume of runoff that is captured and released into the waters of this Commonwealth at a controlled rate.

DEP - The Pennsylvania Department of Environmental Protection.

Development Site (Site) - See Project Site.

Disconnected Impervious Area (DIA) - An impervious or impermeable surface which is disconnected from any stormwater drainage or conveyance system and is redirected or directed to a pervious area which allows for infiltration, filtration, and increased time of concentration as specified in Appendix B, Disconnected Impervious Area.

Disturbed Area - An unstabilized land area where an Earth Disturbance Activity is occurring or has occurred.

Earth Disturbance Activity - A construction or other human activity which disturbs the surface of the land, including, but not limited to, clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; the moving, depositing, stockpiling, or storing of soil, rock or earth materials.

Erosion - The natural process by which the surface of the land is worn away by water, wind or chemical action.

Existing Condition - The dominant land cover during the five (5) year period immediately preceding a proposed Regulated Activity.

FEMA - Federal Emergency Management Agency.

Floodplain - Any land area susceptible to inundation by water from any natural source or delineated by applicable FEMA maps and studies as being a special flood hazard area. Also includes areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania DEP Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by PADEP).

Floodway - The channel of the watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year floodway, it is assumed – absent evidence to the contrary – that the floodway extends from the stream to 50 feet from the top of the bank of the stream.

Forest Management/Timber Operations - Planning and activities necessary for the management of forestland. These include conducting a timber inventory, preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation and reforestation.

Geotextile - A fabric manufactured from synthetic fiber that is used to achieve specific objectives, including infiltration, separation between different types of media (i.e., between soil and stone), or filtration.

Hotspot - Areas where land use or activities generate highly contaminated runoff, with concentrations of pollutants that are higher than those that are typically found in stormwater (e.g., vehicle salvage yards and recycling facilities, vehicle fueling stations, fleet storage areas, vehicle equipment and cleaning facilities, and vehicle service and maintenance facilities).

Hydrologic Soil Group (HSG) - Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSG's (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The NRCS defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report that can be obtained from local NRCS offices or conservation district offices. Soils become less pervious as the HSG varies from A to D (NRCS[3,4]).

Impervious Surface (Impervious Area) - A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to, roofs, additional indoor living spaces, patios, garages, storage sheds and similar structures, and any new streets or sidewalks. Decks, parking areas, and driveway areas are not counted as impervious areas if they do not prevent infiltration.

Infiltration - Movement of surface water into the soil, where it is absorbed by plant roots, evaporated into the atmosphere, or percolated downward to recharge groundwater.

Karst - A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

Land Development (Development) - Inclusive of any or all of the following meanings: (i) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) a group of two or more buildings, or (b) the division or allocation of land or space between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features; (ii) any subdivision of land; (iii) development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

Low Impact Development - A land development and construction approach that uses various land planning, design practices, and technologies to simultaneously conserve and protect natural resource systems, and reduce infrastructure costs.

Municipality - (municipality name), (county name) County, Pennsylvania.

NRCS - USDA Natural Resources Conservation Service (previously SCS).

Peak Discharge - The maximum rate of stormwater runoff from a specific storm event.

Pervious Surface (Pervious Area) - Any area not defined as impervious.

Project Site - The specific area of land where any Regulated Activities in the Municipality are planned, conducted or maintained.

Qualified Professional - Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by the Ordinance.

Regulated Activities - Any Earth Disturbances Activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff.

Regulated Earth Disturbance Activity - Activity involving Earth Disturbance subject to regulation under 25 Pa. Code Chapter 92, Chapter 102, or the Clean Streams Law.

Retention Volume/Removed Runoff - The volume of runoff that is captured and not released directly into the surface waters of this Commonwealth during or after a storm event.

Return Period - The average interval, in years, within which a storm event of a given magnitude can be expected to occur one time. For example, the 25-year return period rainfall would be expected to occur on average once every 25 years; or stated in another way, the probability of a 25-year storm occurring in any one year is 0.04 (i.e. a 4% chance).

Runoff - Any part of precipitation that flows over the land.

Sediment - Soils or other materials transported by surface water as a product of erosion.

Small Project – A small project is defined as a regulated activity that creates disconnected impervious areas equal to or greater than 500 sq. ft. and less than 5,000 sq. ft.

State Water Quality Requirements - The regulatory requirements to protect, maintain, reclaim, and restore water quality under Pennsylvania Code Title 25 and the Clean Streams Law.

Stormwater - Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

Stormwater Management Facility - Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff. Typical stormwater management facilities include, but are not limited to, detention and retention basins, open channels, storm sewers, pipes, and infiltration facilities.

Stormwater Management Plan - The (name of stormwater management plan) for managing stormwater runoff adopted by the County of (county name) as required by the Act of October 4, 1978, P.L. 864, (Act 167), as amended, and known as the "Storm Water Management Act".

Stormwater Management Best Management Practices - Is abbreviated as **BMPs** or **SWM BMPs** throughout this Ordinance.

Stormwater Management Site Plan - The plan prepared by the Developer or his representative indicating how storm water runoff will be managed at the development site in accordance with this Ordinance. **Stormwater Management Site Plan** will be designated as **SWM Site Plan** throughout this Ordinance.

Subdivision - As defined in The Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247.

USDA - United States Department of Agriculture.

Void Ratio - The ratio of the volume of void space to the volume of solid substance in any material.

Waters of this Commonwealth – Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

Watershed - Region or area drained by a river, watercourse or other surface water of the Commonwealth.

Wetland - Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

ARTICLE III - STORMWATER MANAGEMENT STANDARDS

Section 301. General Requirements

A. For all Regulated Activities, unless preparation of an SWM Site Plan is specifically exempted in Section 302:

1. Preparation and implementation of an approved SWM Site Plan is required.

2. No Regulated Activities shall commence until the municipality issues written approval of an SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.

B. SWM Site Plans approved by the Municipality, in accordance with Section 406, shall be on site throughout the duration of the Regulated Activity.

C. The Municipality may, after consultation with DEP, approve measures for meeting the State Water Quality Requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, State law including but not limited to the Clean Streams Law.

D. For all Regulated Earth Disturbance Activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the Regulated Earth Disturbance Activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under the Pennsylvania Code Title 25 and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual* (E&S Manual)[2], Commonwealth of Pennsylvania, Department of Environmental Protection, No. 363-2134-008 (2000), as amended and updated.

E. For all Regulated Activities, implementation of the Volume Controls in Section 303 is required with the exception of regulated activities that meet the exemption criteria found in Section 302.A of this Ordinance.

F. Impervious Areas:

1. The measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in stages.

2. For development taking place in stages, the entire development plan must be used in determining conformance with this Ordinance.

3. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance.

G. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written permission of the adjacent property owner(s). Such stormwater flows shall be subject to the requirements of this Ordinance.

H. All regulated activities shall include such measures as necessary to:

1. Protect health, safety, and property;

2. Meet State Water Quality Requirements as defined in Article II;

3. Meet the water quality goals of this Ordinance by implementing measures to:

a. Minimize disturbance to floodplains, wetlands, natural slopes over 8%, and existing native vegetation.

b. Preserve and maintain trees and woodlands. Maintain or extend riparian buffers and protect existing forested buffer. Provide trees and woodlands adjacent to impervious areas whenever feasible.

c. Establish and maintain non-erosive flow conditions in natural flow pathways.

d. Minimize soil disturbance and soil compaction. Over disturbed areas, replace topsoil to a minimum depth equal to the original depth or 4 inches, whichever is greater. Use tracked equipment for grading when feasible.

e. Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.

4. To the maximum extent practicable, incorporate the techniques for Low Impact Development Practices described in "The Pennsylvania Stormwater Best Management Practices Manual" (SWM Manual)[1].

I. The design of all facilities over Karst shall include an evaluation of measures to minimize adverse effects.

J. Infiltration BMPs should be spread out, made as shallow as practicable, and located to maximize use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.

K. Storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.

L. For all Regulated Activities, SWM BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all

requirements under Pennsylvania Code Title 25, the Clean Streams Law, and the Storm Water Management Act.

M. The design storm volumes to be used in the analysis of peak rates of discharge should be obtained from the Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2, U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland, 20910. NOAA's Atlas 14[5] can be accessed at Internet address: http://hdsc.nws.noaa.gov/hdsc/pfds/.

N. Various BMPs and their design standards are listed in the SWM Manual.[1]

O. The applicant may meet the Rate Controls criteria in Section 304 through off-site stormwater management measures as long as the proposed measures are in the same subwatershed as shown in Ordinance Appendix D. Off-site stormwater control measures may only be sought if it is shown that on-site stormwater control measures cannot be physically accomplished. This does not relieve the applicant from meeting the Volume Controls criteria in Section 303 on-site.

Section 302. Exemptions

A. Regulated Activities that create impervious areas smaller than 500 sq. ft. are exempt from all requirements in this Ordinance.

B. Regulated Activities that create impervious areas equal to or greater than 500 sq. ft. and less than 5,000 sq. ft. are exempt from the Peak Rate Control and the SWM Site Plan preparation requirement of this Ordinance, but should comply with the small project requirements found in Appendix C of the Ordinance.

C. Regulated Activities that create impervious areas equal to or greater than 5,000 sq. ft. and less than 10,000 sq. ft. are exempt only from the peak rate control requirement of this Ordinance.

D. Agricultural activity is exempt from the rate control and SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

E. Forest management and timber operations are exempt from the rate control and SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

Additional Exemption Criteria

1. Exemption Responsibilities - An exemption shall not relieve the Applicant from implementing such measures as are necessary to protect public health, safety, and property.

2. HQ and EV Streams - An exemption shall not relieve the Applicant from meeting the special requirements for watersheds draining to identified high quality (HQ) or exceptional value (EV) waters and Source Water Protection Areas (SWPA) and requirements for non-structural project design sequencing.

3. Drainage Problems - If a drainage problem is documented or known to exist downstream of or is expected from the proposed activity, then the Municipality may require the Applicant to comply with the Ordinance.

4. Even though the developer is exempt, he is not relieved from complying with other regulations.

Exemptions from any provisions of this Ordinance shall not relieve the Applicant from the requirements in Sections 301.D. through L.

Section 303. Volume Controls

The low impact development practices provided in the SWM Manual[1] shall be utilized for all Regulated Activities to the maximum extent practicable.

Water volume controls shall be implemented using the *Design Storm Method* in Subsection 1 or the *Simplified Method* in Subsection 2 below. For Regulated Activities that create 10,000 square feet or less of impervious cover that do not require hydrologic routing to design the stormwater facilities, this Ordinance establishes no preference for either methodology; therefore, the Applicant may select either methodology on the basis of economic considerations, the intrinsic limitations on applicability of the analytical procedures associated with each methodology, and other factors.

1. *The Design Storm Method* (CG-1 in the SWM Manual[1]) is applicable to any size of Regulated Activity. This method requires detailed modeling based on site conditions.

    a. Do not increase the post-development total runoff volume for all storms equal to or less than the 2-year, 24-hour duration precipitation.

    b. For modeling purposes:

        i. Existing (pre-development) non-forested pervious areas must be considered meadow or its equivalent.

        ii. Twenty (20) percent of existing impervious area, when present, shall be considered meadow in the model for existing conditions.

2. *The Simplified Method* (CG-2 in the SWM Manual[1]) provided below is independent of site conditions and should be used if the Design Storm Method is not followed. This method is not applicable to Regulated Activities greater than 10,000 square feet or for projects that require design of stormwater storage facilities. For new impervious surfaces:

   a. Stormwater facilities shall capture at least the first two inches (2") of runoff from all new impervious surfaces.

   b. At least the first one inch (1.0") of runoff from new impervious surfaces shall be permanently removed from the runoff flow (i.e., it shall not be released into the surface waters of this Commonwealth). Removal options include reuse, evaporation, transpiration, and infiltration.

   c. Wherever possible, infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases at least the first one-half inch (0.5") of the permanently removed runoff should be infiltrated.

   d. This method is exempt from the requirements of Section 304, Rate Controls.

Section 304. Rate Controls

A. Areas not covered by a Release Rate Map from an approved Act 167 Stormwater Management Plan:

   Post-development discharge rates shall not exceed the predevelopment discharge rates for the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year storms. If it is shown that the peak rates of discharge indicated by the post-development analysis are less than or equal to the peak rates of discharge indicated by the pre-development analysis for 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storms, then the requirements of this section have been met. Otherwise, the Applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement.

B. Areas covered by a Release Rate Map from an approved Act 167 Stormwater Management Plan:

   For the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year storms, the post-development peak discharge rates will follow the applicable approved management district or release rate map. The approved management district map for the Stonycreek River watershed is found in Appendix D. The stormwater management district criteria for the Stonycreek River watershed is found in Table 1. For any areas not shown on the release rate maps or management district maps, the post-development discharge rates shall not exceed the predevelopment discharge rates.

TABLE 1
Stormwater Management Districts in the Stonycreek River Watershed

District	Proposed Condition Design Storm	(reduce to)	Existing Condition Design Storm
A	2-year		1-year
	5-year		5-year
	10-year		10-year
	25-year		25-year
	50-year		50-year
	100-year		100-year
B-1	5-year		2-year
	10-year		5-year
	25-year		10-year
	50-year		25-year
	100-year		100-year
B-2	2-year		2-year
	25-year		10-year
	50-year		25-year
	100-year		100-year

ARTICLE IV - STORMWATER MANAGEMENT (SWM) SITE PLAN REQUIREMENTS

Section 401. Plan Requirements

The following items shall be included in the SWM Site Plan:

A. Appropriate sections from the Municipal Subdivision and Land Development Ordinance, and other applicable local ordinances, shall be followed in preparing the SWM Site Plans. In instances where the Municipality lacks Subdivision and Land Development regulations, the content of SWM Site Plans shall follow the County's Subdivision and Land Development Ordinance.

B. The Municipality shall not approve any SWM Site Plan that is deficient in meeting the requirements of this Ordinance. At its sole discretion and in accordance with this Article, when a SWM Site Plan is found to be deficient, the Municipality may either disapprove the submission and require a resubmission, or in the case of minor deficiencies the Municipality may accept submission of modifications.

C. Provisions for permanent access or maintenance easements for all physical SWM BMPs, such as ponds and infiltration structures, as necessary to implement the operation and maintenance plan discussed in item E.9 below.

D. The following signature block for the Municipality:

"(Municipal Official or designee), on this date (date of signature), has reviewed and hereby certifies that the SWM Site Plan meets all design standards and criteria of the Municipal Ordinance No. (Number assigned to the Ordinance)."

E. The SWM Site Plan shall provide the following information:

1. The overall stormwater management concept for the project.

2. A determination of Site Conditions in accordance with the SWM Manual[1]. A detailed site evaluation shall be completed for projects proposed in areas of carbonate geology or karst topography, and other environmentally sensitive areas such as brownfields.

3. Stormwater runoff design computations, and documentation as specified in this Ordinance, or as otherwise necessary to demonstrate that the maximum practicable measures have been taken to meet the requirements of this Ordinance, including the recommendations and general requirements in Section 301.

4. Expected project time schedule.

5. A soil erosion and sediment control plan, where applicable, as prepared for and submitted to the approval authority.

6. The effect of the project (in terms of runoff volumes, water quality, and peak flows) on surrounding properties and aquatic features and on any existing stormwater conveyance system that may be affected by the project.

7. Plan and profile drawings of all SWM BMPs including drainage structures, pipes, open channels, and swales.

8. SWM Site Plan shall show the locations of existing and proposed on-lot wastewater facilities and water supply wells.

9. The SWM Site Plan shall include an operation and maintenance (O&M) plan for all existing and proposed physical stormwater management facilities. This plan shall address long-term ownership and responsibilities for operation and maintenance as well as schedules and costs for O&M activities.

Section 402. Plan Submission

A. ____ (Typically Five (5)) copies of the SWM Site Plan shall be submitted as follows:

1. ____ (Typically Two (2)) copies to the Municipality.

2. ____ (Typically One (1)) copy to the Municipal Engineer (when applicable).

3. ____ (Typically One (1)) copy to the County Conservation District (optional).

4. ____ (Typically One (1)) copy to the County Planning Commission/Office.

B. Additional copies shall be submitted as requested by the Municipality or DEP.

Section 403. Plan Review

A. The SWM Site Plan shall be reviewed by a Qualified Professional for the Municipality for consistency with the provisions of this Ordinance. Review by the County Conservation District is optional. After review, the Qualified Professional shall provide a written recommendation for the municipality to approve or disapprove the SWM Site Plan. If it is recommended to disapprove the SWM Site Plan, the Qualified Professional shall state the reasons for the disapproval in writing. The Qualified Professional also may recommend approval of the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing. The SWM Site Plan review and recommendations shall be completed within the time allowed by the Municipalities Planning Code for reviewing subdivision plans.

B. The Municipality shall notify the Applicant in writing within 45 calendar days whether the SWM Site Plan is approved or disapproved. If the SWM Plan involves a Subdivision and Land Development Plan, the notification period is 90 days. If a longer notification period is provided by other statute, regulation, or ordinance, the Applicant will be so notified by the Municipality. If the Municipality disapproves the SWM Plan, the Municipality shall cite the reasons for disapproval in writing.

Section 404. Modification of Plans

A modification to a submitted SWM Site Plan that involves a change in SWM BMPs or techniques, or that involves the relocation or redesign of SWM BMPs, or that is necessary because soil or other conditions are not as stated on the SWM Site Plan as determined by the Municipality, shall require a resubmission of the modified SWM Site Plan in accordance with this Article.

Section 405. Resubmission of Disapproved Storm Water Management Site Plans

A disapproved SWM Site Plan may be resubmitted, with the revisions addressing the Municipality's concerns, to the Municipality in accordance with this Article. The applicable review fee must accompany a resubmission of a disapproved SWM Site Plan.

Section 406. Authorization to Construct and Term of Validity

The Municipality's approval of an SWM Site Plan authorizes the Regulated Activities contained in the SWM Site Plan for a maximum term of validity of five years following the date of approval. The Municipality may specify a term of validity shorter than five years in the approval for any specific SWM Site Plan. Terms of validity shall commence on the date the Municipality signs the approval for an SWM Site Plan. If an approved SWM Site Plan is not completed according to Section 407 within the term of validity, then the Municipality may consider the SWM Site Plan disapproved and may revoke any and all permits. SWM Site Plans that are considered disapproved by the Municipality shall be resubmitted in accordance with Section 405 of this Ordinance.

Section 407. As-Built Plans, Completion Certificate and Final Inspection

A. The Developer shall be responsible for providing as-built plans of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted to the Municipality.

B. The as-built submission shall include a certification of completion signed by a Qualified Professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. If any licensed Qualified Professionals contributed to the construction plans, then a licensed Qualified Professional must sign the completion certificate.

C. After receipt of the completion certification by the Municipality, the Municipality may conduct a final inspection.

ARTICLE V - OPERATION AND MAINTENANCE

Section 501. Responsibilities of Developers and Landowners

A. The Municipality shall make the final determination on the continuing maintenance responsibilities prior to final approval of the SWM Site Plan. The Municipality may require a dedication of such facilities as part of the requirements for approval of the SWM Site Plan. Such a requirement is not an indication that the Municipality will accept the facilities. The Municipality reserves the right to accept or reject the ownership and operating responsibility for any portion of the stormwater management controls.

B. Facilities, areas, or structures used as Stormwater Management BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.

C. The Operation and Maintenance Plan shall be recorded as a restrictive deed covenant that runs with the land.

D. The Municipality may take enforcement actions against an owner for any failure to satisfy the provisions of this Article.

Section 502. Operation and Maintenance Agreements

The owner is responsible for Operation and Maintenance of the SWM BMPs. If the owner fails to adhere to the Operation and Maintenance Agreement, the Municipality may perform the services required and charge the owner appropriate fees. Non-payment of fees may result in a lien against the property.

Section 503. Stormwater Management Easements

A. Stormwater management easements are required for all areas used for off-site stormwater control, unless a waiver is granted by the Municipality.

B. Stormwater management easements shall be provided by the Applicant or property owner if necessary for access for inspections and maintenance or the preservation of stormwater runoff conveyance, infiltration, and detention areas and other stormwater controls and BMPs by persons other than the property owner. The purpose of the easement shall be specified in any agreement under Section 502.

ARTICLE VI - FEES AND EXPENSES

Section 601. General

The Municipality may include all costs incurred in the review fee charged to an Applicant.

The review fee may include but not be limited to costs for the following:

A. Administrative/clerical processing.

B. Review of the SWM Site Plan.

C. Attendance at meetings.

D. Inspections.

ARTICLE VII - PROHIBITIONS

Section 701. Prohibited Discharges and Connections

A. Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter the waters of this Commonwealth is prohibited.

B. No person shall allow, or cause to allow, discharges into surface waters of this Commonwealth which are not composed entirely of stormwater, except (1) as provided in subsection C below, and (2) discharges allowed under a state or federal permit.

C. The following discharges are authorized unless they are determined to be significant contributors to pollution to the waters of this Commonwealth:

- Discharges from fire fighting activities	- Flows from riparian habitats and wetlands
- Potable water sources including water line flushing	- Uncontaminated water from foundations or from footing drains
- Irrigation drainage	- Lawn watering
- Air conditioning condensate	- Dechlorinated swimming pool discharges
- Springs	- Uncontaminated groundwater
- Water from crawl space pumps	- Water from individual residential car washing
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used	- Routine external building wash down (which does not use detergents or other compounds)

D. In the event that the Municipality or DEP determines that any of the discharges identified in Subsection C, significantly contribute to pollution of the waters of this Commonwealth, the Municipality or DEP will notify the responsible person(s) to cease the discharge.

Section 702. Roof Drains

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs and to the maximum extent practicable satisfy the criteria for Disconnected Impervious Areas.

Section 703. Alteration of SWM BMPs

No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, or structures, without the written approval of the Municipality.

ARTICLE VIII - ENFORCEMENT AND PENALTIES

Section 801. Right-of-Entry

Upon presentation of proper credentials, the Municipality may enter at reasonable times upon any property within the Municipality to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

Section 802. Inspection

SWM BMPs should be inspected by the landowner, or the owner's designee (including the Municipality for dedicated and owned facilities) according to the following list of minimum frequencies:

1. Annually for the first 5 years.

2. Once every 3 years thereafter.

3. During or immediately after the cessation of a 10-year or greater storm.

Section 803. Enforcement

A. It shall be unlawful for a person to undertake any Regulated Activity except as provided in an approved SWM Site Plan, unless specifically exempted in Section 302.

B. It shall be unlawful to violate Section 703 of this Ordinance.

C. Inspections regarding compliance with the SWM Site Plan are a responsibility of the Municipality.

Section 804. Suspension and Revocation

A. Any approval or permit issued by the Municipality may be suspended or revoked for:

1. Non-compliance with or failure to implement any provision of the approved SWM Site Plan or Operation and Maintenance Agreement.

2. A violation of any provision of this Ordinance or any other applicable law, Ordinance, rule or regulation relating to the Regulated Activity.

3. The creation of any condition or the commission of any act during the Regulated Activity which constitutes or creates a hazard or nuisance, pollution, or which endangers the life or property of others.

B. A suspended approval may be reinstated by the Municipality when:

1. The Municipality has inspected and approved the corrections to the violations that caused the suspension.

2. The Municipality is satisfied that the violation has been corrected.

C. An approval that has been revoked by the Municipality cannot be reinstated. The Applicant may apply for a new approval under the provisions of this Ordinance.

D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the Municipality may provide a limited time period for the owner to correct the violation. In these cases, the Municipality will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the Municipality may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

Section 805. Penalties

[Municipalities should ask their solicitors to provide appropriate wording for this section.]

A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction shall be subject to a fine of not more than $_____ for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.

B. In addition, the Municipality, may institute injunctive, mandamus or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.

Section 806. Appeals

A. Any person aggrieved by any action of the Municipality or its designee, relevant to the provisions of this Ordinance, may appeal to the Municipality within thirty (30) days of that action.

B. Any person aggrieved by any decision of the Municipality, relevant to the provisions of this Ordinance, may appeal to the County Court Of Common Pleas in the county where the activity has taken place within thirty (30) days of the Municipality's decision.

ARTICLE IX - REFERENCES

1. Pennsylvania Department of Environmental Protection (DEP). No. 363-0300-002 (2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual.* Harrisburg, PA.

2. The Pennsylvania Department of Environmental Protection (DEP). 363-2134-008 (2000), as amended and updated. *Erosion and Sediment Pollution Control Program Manual*. Harrisburg, PA.

3. United States Department of Agriculture (USDA), National Resources Conservation Service (NRCS). *National Engineering Handbook*. Part 630: Hydrology, 1969-2001. Originally published as the *National Engineering Handbook*, Section 4: Hydrology. Available online at: http://www.wcc.nrcs.usda.gov/hydro/hydro-techref-neh-630.html.

4. United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). 1986. *Technical Release 55: Urban Hydrology for Small Watersheds*, 2nd Edition. Washington, D.C.

5. US Department of Commerce (USDC), National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), Hydrometeorological Design Studies Center. 2004-2006. *Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2*, Silver Spring, Maryland, 20910. Internet address: http://hdsc.nws.noaa.gov/hdsc/pfds/.

(Ordinance Name)

(Ordinance Number)

ENACTED and ORDAINED at a regular meeting of the

_____

on this _____ day of _____, 20_____.

This Ordinance shall take effect immediately.

_____

(Name) (Title)

_____

(Name) (Title)

_____

(Name) (Title)

ATTEST:

_____

Secretary

APPENDIX A

OPERATION AND MAINTENANCE AGREEMENT
STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES
(SWM BMPs)

THIS AGREEMENT, made and entered into this _____ day of _____, 20___, by and between _____, (hereinafter the "Landowner"), and _____, _____ County, Pennsylvania, (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of _____ County, Pennsylvania, Deed Book _____ at Page _____, (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the SWM BMP Operation and Maintenance Plan approved by the Municipality (hereinafter referred to as the "Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the Municipality, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

WHEREAS, the Municipality requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.

2. The Landowner shall operate and maintain the BMPs as shown on the Plan in good working order in accordance with the specific maintenance requirements noted on the approved SWM Site Plan.

3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper

credentials, to inspect the BMPs whenever necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the BMPs per paragraph 2, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.

5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create or affect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality.

8. The Municipality shall inspect the BMPs at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of _____ County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

_____

For the Landowner:

_____

ATTEST:

_____ (City, Borough, Township)

County of _____, Pennsylvania

I, _____, a Notary Public in and for the County and State aforesaid, whose commission expires on the _____ day of _____, 20_____, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day of _____, 20_____, has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS _____ day of _____, 20_____.

_____ _____

NOTARY PUBLIC **(SEAL)**

APPENDIX B

DISCONNECTED IMPERVIOUS AREA (DIA)

B.1. Rooftop Disconnection

When rooftop downspouts are directed to a pervious area that allows for infiltration, filtration, and increased time of concentration, the rooftop may qualify as completely or partially Disconnected Impervious Area (DIA) and a portion of the impervious rooftop area may be excluded from the calculation of total impervious area.

A rooftop is considered to be completely or partially disconnected if it meets the requirements listed below:

- The contributing area of rooftop to each disconnected discharge is 500 square feet or less, and
- The soil, in proximity of the roof water discharge area, is not designated as hydrologic soil group "D" or equivalent, and
- The overland flow path from roof water discharge area has a positive slope of 5% or less.

For designs that meet these requirements, the portion of the roof that may be considered disconnected depends on the length of the overland path as designated in Table B.1.

Table B.1: Partial Rooftop Disconnection

Length of Pervious Flow Path *	Roof Area Treated as Disconnected
(ft)	(% of contributing area)
0 – 14	0
15 – 29	20
30 – 44	40
45 – 59	60
60 – 74	80
75 or more	100

* Flow path cannot include impervious surfaces and must be at least 15 feet from any impervious surfaces.

B.2. Pavement Disconnection

When pavement runoff is directed to a pervious area that allows for infiltration, filtration, and increased time of concentration, the contributing pavement area may qualify as a DIA that may be excluded from the calculation of total impervious area. This applies generally only to small or narrow pavement structures such as driveways and narrow pathways through otherwise pervious areas (e.g., a walkway or bike path through a park).

Pavement is disconnected if the pavement, or area adjacent to the pavement, meets the requirements below:

- The contributing flow path over impervious area is not more than 75 feet, and
- The length of overland flow is greater than or equal to the contributing length, and
- The soil is not designated as hydrologic soil group "D" or equivalent, and
- The slope of the contributing impervious area is 5% or less, and
- The slope of the overland flow path is 5% or less.

If the discharge is concentrated at one or more discrete points, no more than 1,000 square feet may discharge to any one point. In addition, a gravel strip or other spreading device is required for concentrated discharges. For non-concentrated discharges along the edge of the pavement, this requirement is waived; however, there must be a provision for the establishment of vegetation along the pavement edge and temporary stabilization of the area until vegetation becomes stabilized.

REFERENCE

Philadelphia Water Department. 2006. *Stormwater Management Guidance Manual.* Section 4.2.2: ***Integrated Site Design.*** Philadelphia, PA.

APPENDIX C

Optional Stormwater Management for Small Projects

Applicability: Stormwater management procedures for projects with between five hundred (500) square feet and (4,999) square feet of proposed impervious area. All of the proposed impervious area that is created by a regulated activity must be disconnected impervious area, otherwise the Applicant cannot use this document to meet stormwater management requirements, and is therefore responsible for meeting all stormwater management requirements of the Ordinance. Disconnected impervious area and regulated activities are defined in Section C.2 of this document.

Note: This small projects document is not to be used to plan for multiple lots without obtaining prior written approval from the Municipality. Approvals and actions associated with this document do not relieve the Applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law or ordinance.

STORMWATER MANAGEMENT PROCEDURES
FOR SMALL PROJECTS

Introduction

This handbook has been developed to allow homeowners to comply with stormwater management criteria for new projects to meet the requirements of the Act 167 Stormwater Management Ordinance of the Municipality including sizing, designing, locating, and installing on-lot measures, referred to herein as "Best Management Practices" (BMPs). Pennsylvania Act 167 was authorized on October 4, 1978 (32 P.S., P.L. 864) and gave Pennsylvania municipalities the power to regulate activities that affect stormwater runoff and surface and groundwater quantity and quality.

Individual home construction projects on single-family lots which result in between 500 square feet and 4,999 square feet of proposed impervious area (including the building footprint, driveway, sidewalks, and parking areas) are not required to submit formal stormwater management (SWM) site plans to the Municipality or County; however, they must attempt to address water quality and infiltration goals as outlined in this small projects document. If the guidelines presented in this brochure are followed, the individual homeowner will not require professional services to comply with these water quality and infiltration goals.

Section C.1 describes requirements and outlines the method for designing a suitable BMP, and a description of what needs to be included on the simple sketch plan. Section C.2 presents definitions of key terms. Section C.3 presents options of BMPs that can be considered for on-lot stormwater management. An example of how to obtain the size and dimensions of a BMP is explained in Section C.4.

The stormwater management method for small projects requires:

- The first 1" of rainfall runoff from proposed impervious surfaces to be captured (see definition of captured in Section C.2).

The purpose of this small projects document is to help reduce stormwater runoff in the community, to maintain groundwater recharge, to prevent degradation of surface and groundwater quality, and to otherwise protect water resources and public safety.

What needs to be sent to the Municipality?

Even though a formal SWM site plan is not required for individual lot owners, the small projects worksheet found in Table C-4 and a simple sketch plan containing the features described in Step 4 of Section C.1 needs to be submitted to the Municipality, and if applicable, the contractor prior to construction.

C.1 Determination of Simplified Approach Volume Requirements

All proposed impervious areas must be included in the determination of the amount of new impervious areas and the size of proposed BMPs needed to control stormwater. Proposed impervious areas on an individual residential lot include: roof area, pavement, sidewalks, driveways, patios, porches, permanent pools, or parking areas. Sidewalks, driveways, or patios that are constructed with gravel or pervious pavers that will not be converted to an impervious surface in the future need not be included in this calculation. Therefore, the amount of proposed impervious area can be reduced for proposed driveways, patios, and sidewalks through the use of gravel, pervious pavement, and turf pavers. All proposed impervious areas must be constructed so that runoff is conveyed to a BMP; no runoff can be directed to storm sewers, inlets, or other impervious areas (i.e., street).

In addition, the use of low impact development is recommended to further minimize the effect of the new construction on water, land, and air. Low impact development is a method of development that incorporates design techniques that include: minimizing the amount of land disturbance, reducing impervious cover, disconnecting gutters and directing runoff to vegetated areas to infiltrate, and redirecting the flow of runoff from impervious driveways to vegetated areas instead of to the street or gutter.

The amount of impervious area that needs to be controlled may be reduced by disconnecting impervious areas as discussed below as a BMP and as found in Ordinance Appendix B.

Below are the steps that must be undertaken to meet the Ordinance requirements. The results obtained for each step must be included in the Small Projects Worksheet found in Table C-4:

STEP 1 – Determine the total area of all proposed impervious surfaces that will need to drain to one or more BMPs. Determine locations where BMPs need to be placed so that runoff from all of the proposed impervious surfaces can be captured. Select the BMPs to be used and determine the requirements of each from Section C.3. For instance, the back half of a garage may drain 200 square feet of roof to a rain barrel, and the front half of a garage may drain 200 square feet of roof and 540 square feet of driveway to an infiltration trench. Then, obtain the required storage volume and surface area needed for each of the proposed BMPs from the appropriate heading below.

For Rain Barrels/Cisterns

STEP 2 –Select the proposed impervious area value in Column 1 of Table C-1 that is closest to, but not less than, the determined value.

STEP 3 – Determine the volume that needs to be provided in cubic feet and gallons to satisfy the volume requirements using Columns 2 and 3 in Table C-1.

Table C-1: Calculating Rain Barrel/Cistern Storage Volume for 1" Rainfall[1]

Column 1	Column 2	Column 3
Proposed Impervious Area (square feet)	**Volume of Rain Barrel/Cistern[2] (cubic feet)**	**Volume of Rain Barrel/Cistern (gallons)**
I	V_{RBcf}	V_{RBgal}
Sum of all Proposed Impervious Areas	$(1*(1/12)*I)/0.75=V_{RBcf}$	$V_{RBcf} * 7.48=V_{RBgal}$
50	6	42
100	11	83
200	22	166
300	33	249
400	44	332
500	56	416
600	67	499
700	78	582
800	89	665
900	100	748
1,000	111	831
1,100	122	914
1,200	133	997
1,300	144	1,081
1,400	156	1,164
1,500	167	1,247
1,600	178	1,330
1,700	189	1,413
1,800	200	1,496
1,900	211	1,579
2,000	222	1,662
2,100	233	1,745
2,200	244	1,829
2,300	256	1,912
2,400	267	1,995
2,500	278	2,078
2,600	289	2,161
2,700	300	2,244
2,800	311	2,327
2,900	322	2,410
3,000	333	2,494
3,100	344	2,577
3,200	356	2,660
3,300	367	2,743
3,400	378	2,826
3,500	389	2,909
3,600	400	2,992
3,700	411	3,075
3,800	422	3,158
3,900	433	3,242
4,000	444	3,325
4,100	456	3,408
4,200	467	3,491
4,300	478	3,574
4,400	489	3,657
4,500	500	3,740
4,600	511	3,823
4,700	522	3,906
4,800	533	3,990
4,900	544	4,073
4,999	556	4,155

[1]The typical volume of a rain barrel is between 50-200 gallons, so more than 1 rain barrel may be needed. Larger volumes may require a cistern.
[2]Assume that the rain barrel/cistern is 25% full

For Rain Gardens/Bioretention or Dry Well #1:

STEP 2 – Select the proposed impervious area value in Column 1 of Table C-2 that is closest to, but not less than, the determined value.

STEP 3 – Using the value from Column 1 determined in Step 2, select the depth (D) of the proposed BMP, and then simply determine the surface area needed for that depth from Column 2 of Table C-2.

Note: The arrows under Column 2 in Table C-2 indicate which range of depths is appropriate for each BMP. To determine the depth based on the area, select an area that corresponds to the value in Column 1 that is closest to, but not more than the area to be used. To determine the area based on the depth, select a depth that is closest to, but not less than, the depth that is to be used.

Table C-2: Calculating Rain Garden/Bioretention and Dry Well #1 Storage Volume and Surface Area for 1" Rainfall

Column 1	Column 2							
Proposed Impervious Area (square feet)	**Surface Area of Rain Garden/Bioretention or Dry Well #1** Acceptable Depths for Each BMP are indicated by the arrows below **(square feet)**							
	Area Required for a BMP with a Depth(D) of 0.5'	*Area Required for a BMP with a Depth(D) of 1.0'*	*Area Required for a BMP with a Depth(D) of 1.5'*	*Area Required for a BMP with a Depth(D) of 2.0'*	*Area Required for a BMP with a Depth(D) of 2.5'*	*Area Required for a BMP with a Depth(D) of 3.0'*	*Area Required for a BMP with a Depth(D) of 3.5'*	*Area Required for a BMP with a Depth(D) of 4.0'*
	Rain Garden /Bioretention (0.5'-1.0')		**Dry Well #1 (1.5'-4.0')**					
I	*A(sf)*							
Sum of all Proposed Impervious Areas	A = Volume/D, where Volume[1] = (1/12)**I*							
100	17	8	6	4	3	3	2	2
200	33	17	11	8	7	6	5	4
300	50	25	17	13	10	8	7	6
400	67	33	22	17	13	11	10	8
500	83	42	28	21	17	14	12	10
600	100	50	33	25	20	17	14	13
700	117	58	39	29	23	19	17	15
800	133	67	44	33	27	22	19	17
900	150	75	50	38	30	25	21	19
1,000	167	83	56	42	33	28	24	21
1,100	183	92	61	46	37	31	26	23
1,200	200	100	67	50	40	33	29	25
1,300	217	108	72	54	43	36	31	27
1,400	233	117	78	58	47	39	33	29
1,500	250	125	83	63	50	42	36	31
1,600	267	133	89	67	53	44	38	33
1,700	283	142	94	71	57	47	40	35
1,800	300	150	100	75	60	50	43	38
1,900	317	158	106	79	63	53	45	40
2,000	333	167	111	83	67	56	48	42
2,100	350	175	117	88	70	58	50	44
2,200	367	183	122	92	73	61	52	46
2,300	383	192	128	96	77	64	55	48
2,400	400	200	133	100	80	67	57	50
2,500	417	208	139	104	83	69	60	52
2,600	433	217	144	108	87	72	62	54
2,700	450	225	150	113	90	75	64	56
2,800	467	233	156	117	93	78	67	58
2,900	483	242	161	121	97	81	69	60
3,000	500	250	167	125	100	83	71	63
3,100	517	258	172	129	103	86	74	65
3,200	533	267	178	133	107	89	76	67
3,300	550	275	183	138	110	92	79	69
3,400	567	283	189	142	113	94	81	71
3,500	583	292	194	146	117	97	83	73
3,600	600	300	200	150	120	100	86	75
3,700	617	308	206	154	123	103	88	77
3,800	633	317	211	158	127	106	90	79
3,900	650	325	217	163	130	108	93	81
4,000	667	333	222	167	133	111	95	83
4,100	683	342	228	171	137	114	98	85
4,200	700	350	233	175	140	117	100	88
4,300	717	358	239	179	143	119	102	90
4,400	733	367	244	183	147	122	105	92
4,500	750	375	250	188	150	125	107	94
4,600	767	383	256	192	153	128	110	96
4,700	783	392	261	196	157	131	112	98
4,800	800	400	267	200	160	133	114	100
4,900	817	408	272	204	163	136	117	102
4,999	833	417	278	208	167	139	119	104

[1]Assume that the rain garden/bioretention or the dry well #1 are 0% full

For Infiltration Trench or Dry Well #2:

STEP 2 – Select the proposed impervious area value in Column 1 of Table C-3 that is closest to, but not less than, the determined value.

STEP 3 – Using the value from Column 1 determined in Step 2, select the depth (D) of the proposed BMP, and then simply determine the surface area needed from Column 2 of Table C-3.

Note: The arrows under Column 2 in Table C-3 indicate which range of depths is appropriate for each BMP. To determine the depth based on the area, select an area that corresponds to the value in Column 1 that is closest to, but not less than, the area to be used. To determine the area based on the depth, select a depth that is closest to, but not less than, the depth that is to be used.

Table C-3: Calculating Infiltration Trench and Dry Well #2 Storage Volume and Surface Area for 1" Rainfall

Column 1	Column 2							
Total Proposed Impervious Area (square feet)	**Surface Area of Infiltration Trench or Dry Well #2** Acceptable Depths for Each BMP are indicated by the arrows below **(square feet)**							
	Area Required for a BMP with a Depth(D) of 1.5′	*Area Required for a BMP with a Depth(D) of 2.0′*	*Area Required for a BMP with a Depth(D) of 2.5′*	*Area Required for a BMP with a Depth(D) of 3.0′*	*Area Required for a BMP with a Depth(D) of 3.5′*	*Area Required for a BMP with a Depth(D) of 4.0′*	*Area Required for a BMP with a Depth(D) of 4.5′*	*Area Required for a BMP with a Depth(D) of 5.0′*
	Dry Well #2 (1.5'-4.0')		**Infiltration Trench (2.0'-5.0')**					
I	*A(sf)*							
Sum of all Proposed Impervious Areas	A = Volume/D, where Volume[1] = ((1/12)**I*)/0.4							
100	14	10	8	7	6	5	5	4
200	28	21	17	14	12	10	9	8
300	42	31	25	21	18	16	14	13
400	56	42	33	28	24	21	19	17
500	69	52	42	35	30	26	23	21
600	83	63	50	42	36	31	28	25
700	97	73	58	49	42	36	32	29
800	111	83	67	56	48	42	37	33
900	125	94	75	63	54	47	42	38
1,000	139	104	83	69	60	52	46	42
1,100	153	115	92	76	65	57	51	46
1,200	167	125	100	83	71	63	56	50
1,300	181	135	108	90	77	68	60	54
1,400	194	146	117	97	83	73	65	58
1,500	208	156	125	104	89	78	69	63
1,600	222	167	133	111	95	83	74	67
1,700	236	177	142	118	101	89	79	71
1,800	250	188	150	125	107	94	83	75
1,900	264	198	158	132	113	99	88	79
2,000	278	208	167	139	119	104	93	83
2,100	292	219	175	146	125	109	97	88
2,200	306	229	183	153	131	115	102	92
2,300	319	240	192	160	137	120	106	96
2,400	333	250	200	167	143	125	111	100
2,500	347	260	208	174	149	130	116	104
2,600	361	271	217	181	155	135	120	108
2,700	375	281	225	188	161	141	125	113
2,800	389	292	233	194	167	146	130	117
2,900	403	302	242	201	173	151	134	121
3,000	417	313	250	208	179	156	139	125
3,100	431	323	258	215	185	161	144	129
3,200	444	333	267	222	190	167	148	133
3,300	458	344	275	229	196	172	153	138
3,400	472	354	283	236	202	177	157	142
3,500	486	365	292	243	208	182	162	146
3,600	500	375	300	250	214	188	167	150
3,700	514	385	308	257	220	193	171	154
3,800	528	396	317	264	226	198	176	158
3,900	542	406	325	271	232	203	181	163
4,000	556	417	333	278	238	208	185	167
4,100	569	427	342	285	244	214	190	171
4,200	583	438	350	292	250	219	194	175
4,300	597	448	358	299	256	224	199	179
4,400	611	458	367	306	262	229	204	183
4,500	625	469	375	313	268	234	208	188
4,600	639	479	383	319	274	240	213	192
4,700	653	490	392	326	280	245	218	196
4,800	667	500	400	333	286	250	222	200
4,900	681	510	408	340	292	255	227	204
4,999	694	521	417	347	298	260	231	208

[1]Assume a void ratio of 40%.

For Disconnected Rooftop Areas:

STEP 2 – Select the proposed impervious area value in Column 1 of Table C-4 that is closest to, but not less than, the determined value. Using the value from Column 1, select the corresponding soil group in column 2 determined from Map III-4, and corresponding slope in column 3 which is the slope of the path the stormwater from the roof travels along, from Table C-4.

STEP 3 – Using the value from Column 3 determined in Step 2, use column 4 to select the length of the flow path that is closest to, but not less than the value, and then simply determine the roof area treated as disconnected from Column 5 of Table C-4. Therefore, the value from Column 5 is the percentage of the total impervious area that can be excluded.

Table C-4: Calculating Rooftop Disconnected Impervious Area Percentage

Impervious Rooftop Area (square feet)	Soil Group	Slope (%)	Length of Flow Path (ft)*	Roof Area Treated as Disconnected (% of Contributing Area)
0-500	A, B, or C or equivalent	0-5	0-14	0
			15-29	20
			30-44	40
			45-59	60
			60-74	80
			≥75	100
		≥5	≥0	0
	D	≥0	≥0	0
≥500	A, B, C, D, or equivalent Soils	≥0	≥0	0

*Flow path cannot include impervious surfaces and must be at least 15 feet from any impervious surfaces.

For Pavement Disconnection:

STEP 2 – Select the contributing flow path value, which is the length of the impervious portion of the flow path that stormwater runoff from pavement travels along, in Column 1 of Table C-5 and the corresponding length of overland flow which is the total length that the stormwater runoff travels along the flow path, and the soil group determined from Map III-4, located in columns 2 and 3 respectively, from Table C-5.

STEP 3 – Using the value from Column 3 determined in Step 2, select the slope of the contributing impervious area and slope of the overland flow path in Columns 4 and 5, respectively, and then simply determine if the pavement section is eligible for disconnection from Column 6. If the pavement is eligible for disconnection, then the area of the pavement may be excluded from the total impervious area.

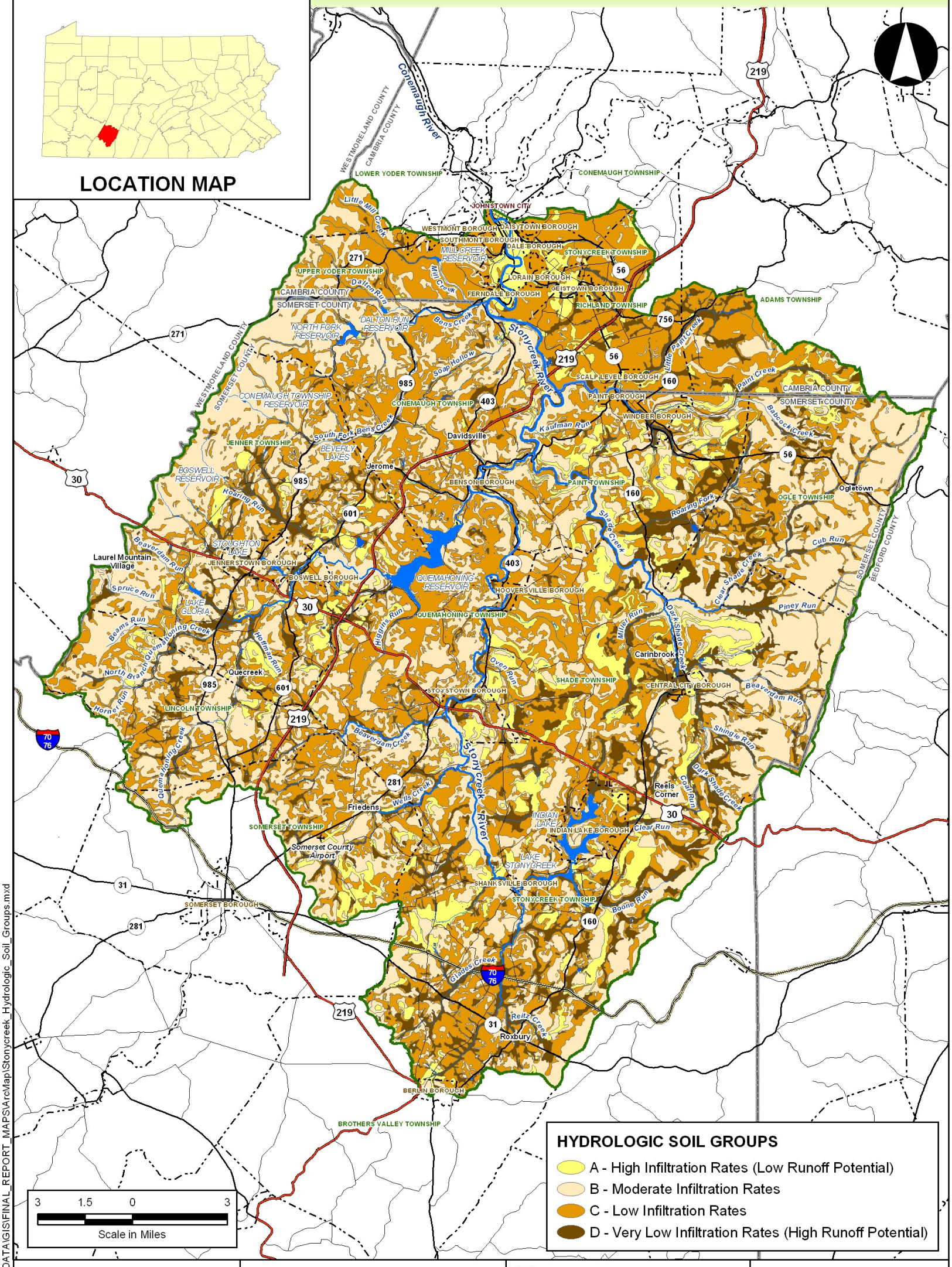
Note: If the discharge is concentrated at one or more discrete points, no more than 1,000 square feet may discharge to any one point. In addition, a gravel strip or other spreading device is required for concentrated discharges. For non-concentrated discharges along the edge of the pavement, this requirement is waived; however, there must be a provision for the establishment of vegetation along the pavement edge and temporary stabilization of the area until vegetation becomes stabilized.

Table C-5: Calculating Pavement Disconnection Eligibility

Contributing Flow Path (feet)	Length of Overland Flow (feet)	Soil Group	Slope of Contributing Impervious Area (%)	Slope of Overland Flow Path (%)	Eligible for Pavement Disconnection (Yes/No)
0-75	Length of Overland Flow Equal to or Greater Than Contributing Flow Path	A, B, or C or equivalent	0-5	0-5	Yes
			5+	5+	No
		D	0+	0+	No
	Length of Overland Flow less than Contributing Flow Path	A, B, C, D, or equivalent Soils	0+	0+	No
75+	0+	A, B, C, D, or equivalent Soils	0+	0+	No

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN

LOCATION MAP



FILE: I:\WBData\Projects\2005\1719\00\DATA\GIS\FINAL_REPORT_MAPS\ArcMap\Stonycreek_Hydrologic_Soil_Groups.mxd

Map III-4
HYDROLOGIC SOIL GROUPS

Prepared For:
Cambria County Conservation District
401 Candlelight Drive, Suite 221
Ebensburg, PA 15931
Phone: (814) 472-2120
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Legend

- WATERSHED BOUNDARY
- STREAMS
- WATER BODIES
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES

Roads

- Interstate
- US Federal Highway
- PA State Route
- Other State Road

NOTE:
Portions of this map were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this ACT 167 Plan to correct all of the mapping data.

SOURCES:
Watershed Boundary - PADEP Modified by BLE
State Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies -Derived from USFWS NWI Wetlands data
Hydrologic Soil Groups - USDA/ NRCS Soil Survey Geographic (SSURGO) Database

Borton Lawson
ENGINEERING ARCHITECTURE

Northeast Pennsylvania
613 Baltimore Drive
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3893 Adler Place
Bethlehem, PA 18017
Tel: 484-821-0470

PREPARED BY: WSB CHECKED BY: SJD
DATE: 6/22/2006 PROJECT #: 2005-1719-00

STEP 4 - Sketch a simple site plan as shown in Figure C-1 that includes:

- Name and address of the owner of the property, and or name and address of the individual preparing the plan, along with the date of submission.

- Location of proposed structures, driveways, or other paved areas with approximate size in square feet.

- Location, orientation, and dimensions of all proposed BMPs. For all rain gardens/bioretention, infiltration trenches, and dry wells, the length, width, and depth must be included on the plan. For rain barrels or cisterns the volume must be included.

- Location of any existing or proposed on-site septic system and/or potable water wells showing rough proximity to infiltration facilities.

- Location of any existing waterbodies such as; streams, lakes, ponds, wetlands, or other waters of the Commonwealth within fifty (50) feet of the project site, and the distance to the project site and/or BMPs. It is recommended that the project or BMPs be located at least than fifty (50) feet away from a perennial or intermittent stream. If an existing buffer is legally prescribed (i.e., deed, convenant, easement, etc.), the existing buffer shall be maintained.

- Location of all existing structures including buildings, driveways, and roads within fifty (50) feet of the project site.

Fill in the small projects worksheet found in Table C-4, then submit the worksheet and the simple site sketch to the Municipality.

Figure C-1: Typical Dry Well Configuration filled with Stone Fill (Left) and Structural Prefabricated Chamber (Right)

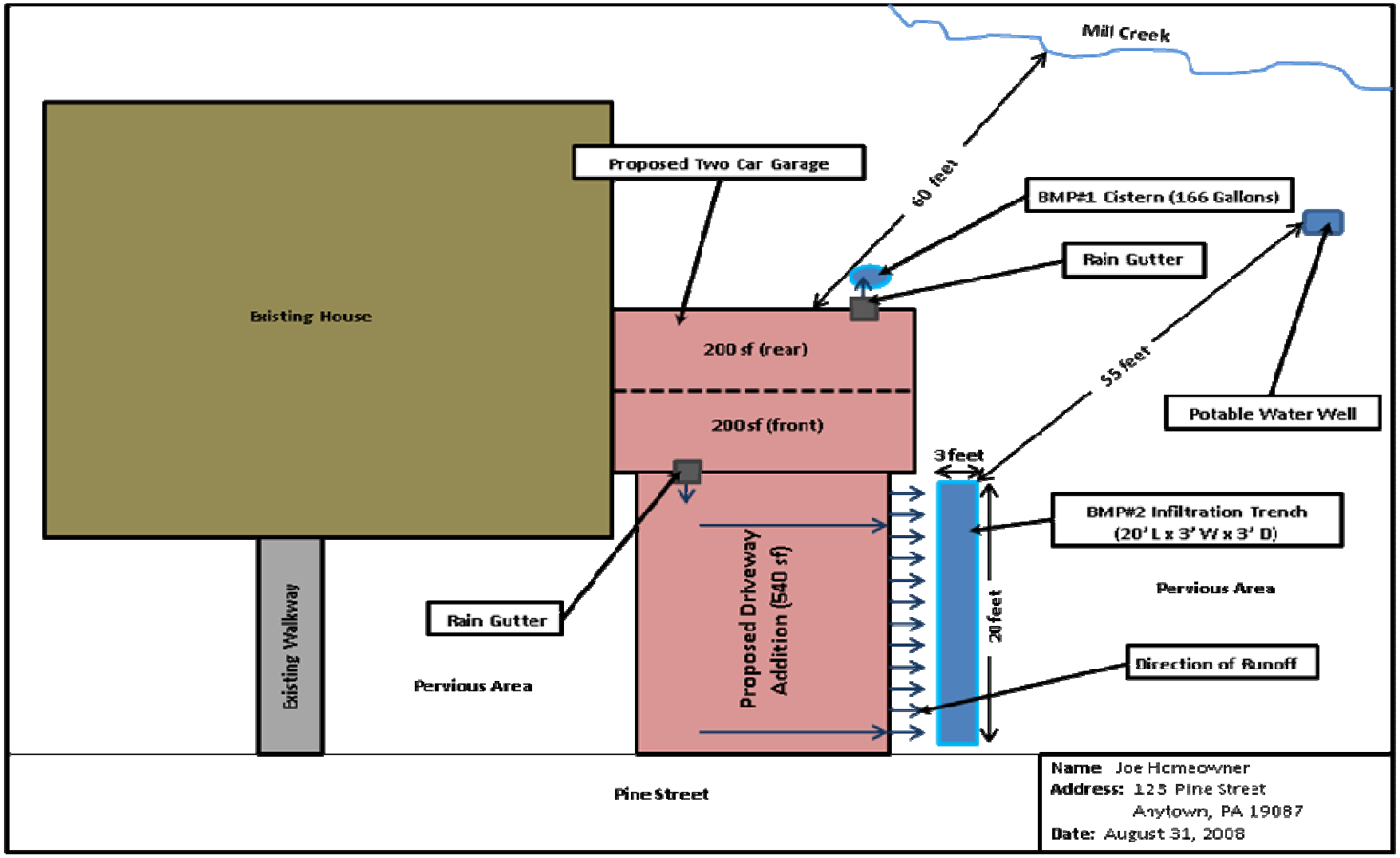


Table C-4: Small Projects Worksheet

Small Projects Worksheet			
STEP 1			
Proposed Impervious Surface for BMP #1	**Proposed Impervious Surface for BMP #2**	**Proposed Impervious Surface for BMP #3**	
STEPS 2&3			
Rain Barrel or Cistern			
Proposed Impervious Surface from Column 1 in Table C-1	**Volume from Column 2 or 3 in Table C-1**		
Rain Garden/Bioretention or Dry Well #1			
Proposed Impervious Surface from Column 1 in Table C-2	**Area of BMP from Column 2 in Table C-2**	**Depth of BMP from Column 2 in Table C-2**	**Types of Material to Be Used**
Infiltration Trench or Dry Well #2			
Proposed Impervious Surface from Column 1 in Table C-3	**Area of BMP from Column 2 in Table C-3**	**Depth of BMP from Column 2 in Table C-3**	**Types of Material to Be Used**
Note: For additional BMPs, use additional sheets			

C.2 Definitions

Best Management Practice (BMP) - Activities, facilities, designs, measures or procedures used to manage stormwater impacts from Regulated Activities, to meet State Water Quality Requirements, to promote groundwater recharge and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "non-structural". In this Ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural Stormwater BMPs are permanent appurtenances to the project site.

Capture – Collecting runoff to be stored for reuse or allowed to slowly infiltrate into the ground.

Disconnected Impervious Area (DIA) - An impervious or impermeable surface which is disconnected from any stormwater drainage or conveyance system and is redirected or directed to a pervious area which allows for infiltration, filtration, and increased time of concentration as specified in Appendix B, Disconnected Impervious Area.

Earth Disturbance Activity - A construction or other human activity which disturbs the surface of the land, including, but not limited to, clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; the moving, depositing, stockpiling, or storing of soil, rock or earth materials.

Geotextile - A fabric manufactured from synthetic fiber that is used to achieve specific objectives, including infiltration, separation between different types of media (i.e., between soil and stone), or filtration.

Hotspot - Areas where land use or activities generate highly contaminated runoff, with concentrations of pollutants that are higher than those that are typically found in stormwater (e.g., vehicle salvage yards and recycling facilities, vehicle fueling stations, fleet storage areas, vehicle equipment and cleaning facilities, and vehicle service and maintenance facilities).

Impervious Surface (Impervious Area) - A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to, roofs, additional indoor living spaces, patios, garages, storage sheds and similar structures, and any new streets or sidewalks. Decks, parking areas, and driveway areas are not counted as impervious areas if they do not prevent infiltration.

Infiltration - Movement of surface water into the soil, where it is absorbed by plant roots, evaporated into the atmosphere, or percolated downward to recharge groundwater.

Low Impact Development - A land development and construction approach that uses various land planning, design practices, and technologies to simultaneously conserve and protect natural resource systems, and reduce infrastructure costs.

Pervious Surface (Pervious Area) - Any area not defined as impervious.

Regulated Activities - Any Earth Disturbances Activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff.

Runoff - Any part of precipitation that flows over the land.

Stormwater - Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

Void Ratio - The ratio of the volume of void space to the volume of solid substance in any material.

C.3 Description of BMPs

The following is a description of several types of BMPs that could be implemented. The requirements of each BMP as described below are taken directly from the PA Stormwater BMP Manual (December 2006). Refer to Chapter 6 of the PA BMP Manual which can be found on the PA Department of Environmental Protection's website for specifications and steps for construction for the following BMPs. A list of routine maintenance for each of the BMPs described below is also included at the end of this section.

Disconnected Impervious Area (DIA)

Disconnected Impervious Area (DIA) may be used as a stormwater BMP for certain situations. When stormwater is disconnected from a rooftop by allowing the roof to drain to a pervious surface, and it meets certain conditions, then the initial impervious area may not be subtracted from the total impervious area. This applies specifically to rooftops and pavement. Reference Ordinance Appendix B for a more detailed description, and the requirements and applicability of DIA as a BMP.

Rain Barrels/Cisterns

Rain barrels are large containers that collect drainage from roof leaders and temporarily store water to be released to lawns, gardens, and other landscaped areas after the rainfall has ended. Rain barrels are typically between 50 and 200 gallons in size. The stored water can also be used as a non-potable water supply. Cisterns are larger than rain barrels having volumes of 200 gallons or more, and can be placed on the surface or underground. Figures C-2 and C-3 show examples of rain barrels and cisterns, respectively, that could be used. Rain barrels and cisterns are manufactured in a variety of shapes and sizes. All of these facilities must make provisions for the following items:

- There must be a means to release the water stored between storm events in order for the necessary storage volume to be available for the next storm.
- Stormwater must be kept from entering other potable systems, and pipes and storage units must be clearly marked "Do Not Drink."
- An overflow outlet should be placed a few inches below the top with an overflow pipe to divert flow away from structures.
- Use screens to filter debris, and covers (lids) to prevent mosquitoes.
- Make sure cisterns are watertight and do not leak.
- Rain barrels are typically assumed to be 25% full to calculate volume since they are not always emptied before each storm.*

Figure C-2: Rain Barrels

Source (pic on left): http://www.rfcity.org/Eng/Stormwater/YourProperty/YourProperty.htm
Source (pic on right): :http://www.floridata.com/tracks/transplantedgardener/Rainbarrels.cfm

*This 25% has already been taken into account in Table 3.

Figure C-3: Cisterns

Source (for both pics): Pennsylvania Stormwater BMP Manual (2006)

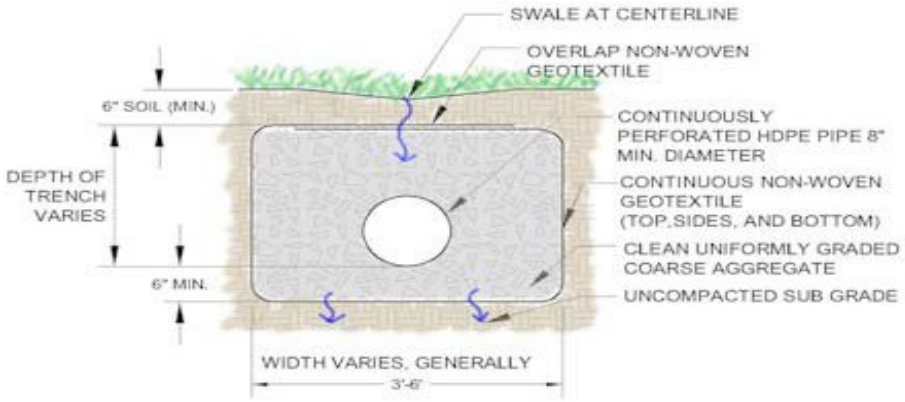
Infiltration Trench

An infiltration trench is a long, narrow, rock-filled trench with or without a perforated pipe that receives stormwater runoff and has no outlet. Runoff is stored in the void space between the stones and in the pipe and infiltrates through the bottom and into the underlying soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Figure C-4 shows a typical infiltration trench configuration. Infiltration trenches shall incorporate or make provisions for the following elements:

- Perforated pipe is to be set level.
- The width is limited to between **3 and 8 feet**, and the depth ranges from **2 to 5 feet**.
- Trench should be wrapped in nonwoven geotextile (see definition in Section C.2) on the top, sides, and bottom.
- There should be a positive overflow that allows stormwater that cannot be stored or infiltrated to be discharged into a nearby vegetated area.

- Roof downspouts may be connected to infiltration trenches, but should contain a cleanout to collect sediment and debris before entering the infiltration area.
- Infiltration testing is recommended to ensure that the soil is capable of infiltrating stormwater. A description of how an infiltration test is performed is found in Appendix C of the *Pennsylvania Stormwater Best Management Practices Manual* (Document No. 363-0300-002), December 30, 2006.
- It is recommended that there be a 2-foot clearance above the regularly occurring seasonal high water table and a minimum depth to bedrock of 2 feet.
- The infiltration trench should be at least 50 feet from individual water supply wells, 100 feet from community or municipal water supply wells, and 50 feet from any septic system component. It should not be located near hotspots (see definition in Section C.2).
- The infiltration trench should be located so that it presents no threat to sub-surface structures such as building foundations and basements.
- Protect infiltration areas from compaction.
- The ratio of the collected area to the footprint of the facility should be as small as possible with a ratio of less than 5:1 preferred.

Figure C-4: Typical Infiltration Trench



Source: Pennsylvania Stormwater BMP Manual (2006)

Rain Garden/Bioretention Area

A rain garden (bioretention area) is an excavated depression area on the surface of the land in which native vegetation is planted to filter and use stormwater runoff. Runoff ponds on top of the surface of the rain garden and then infiltrates into an enhanced soil below the surface where plants can use the water to grow. Bioretention also improves water quality, vegetation filters the water, and the root systems encourage or promote infiltration. Figure C-5 shows a typical rain garden. Key elements of a rain garden include:

- Ponding depths of **1 foot** or less (recommended).
- A combination of native shrubs, grasses or mulch, trees, and flowers that can tolerate dry and wet weather also known as facultative plants (FAC). A list of

types of plants to use in the bioretention area is shown below in Table C-5. The plants shown below are taken from the PA Wildlands Conservancy plant list, and the plant list found in Appendix B of the PA BMP Manual. The PA Wildlands Conservancy plant list is found at: http://www.wildlandspa.org/TDE_CMS/database/UserFiles/File/weblist%202008.pdf, and the PA BMP Manual is found at: http://www.depweb.state.pa.us/watershedmgmt/cwp/view.asp?a=1437&q=529063&watershedmgmtNav=%7C. When using the PA BMP Manual plant list, check the Wetland indicator column for plants with a FAC designation. When using the PA Wildlands Conservancy list check the culture column for plants that can tolerate both wet and dry conditions, denoted by the abbreviations W and DR.

- Only shrubs, grasses, trees, and flowers should be used; vegetables should not be planted in the bioretention area.
- An overflow area where, if the bioretention area were to overflow, the water would flow over pervious area (i.e., grass, meadow), and would not cause harm to property
- An overflow such as a domed riser to allow excess flow from large storms to travel to other substantial infiltration areas or pervious areas.
- Typical side slopes of 3:1 are recommended, with 2:1 being the maximum.
- The soil/planting mix depth should be between 1.5 feet and 6 feet deep.

Figure C-5: Typical Rain Garden/Bioretention Area

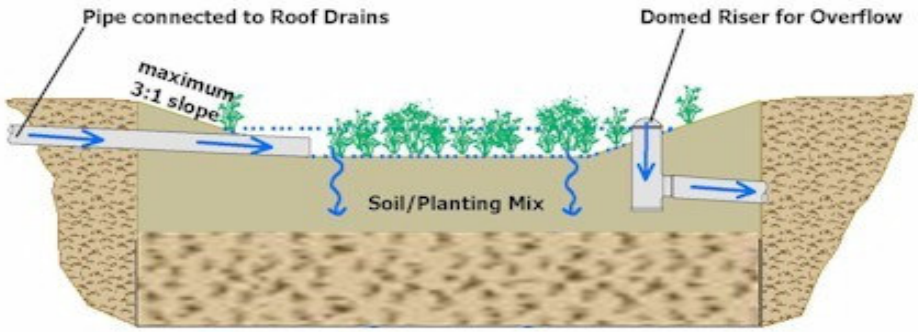
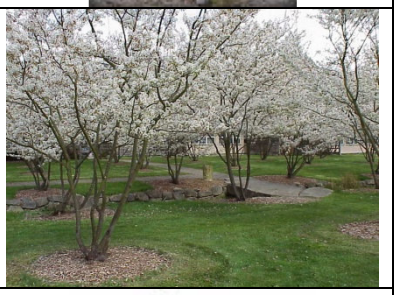


Table C-5: Plant List for Use in a Bioretention/Rain Garden

Common Name	Scientific Name	Plant Type	Photos
Red Maple	Acer rubrum	Tree	
Grey Birch	Betula populifolia	Tree	
Shadbush Serviceberry	Amelanchier canadensis	Tree	
Eastern Cotton-wood	Populus grandidentata	Tree	
Virginia Sweetspire	Itea virginica	Shrub	
Red-Twig Dogwood	Cornus sericea (stolonifera) 'Arctic Fire'	Shrub	

Southern Arrow-wood	Viburnum dentatum	Shrub	
Black Choke Berry	Aronia melanocarpa	Shrub	
Great Blue Lobelia	Lobelia siphilitica	Perennial	
Dwarf Pink false aster	Boltonia asteroides 'Nana'	Perennial	
White false aster	Boltonia asteroides 'Snowbank'	Perennial	
Switchgrass	Panicum virgatum	Grass	

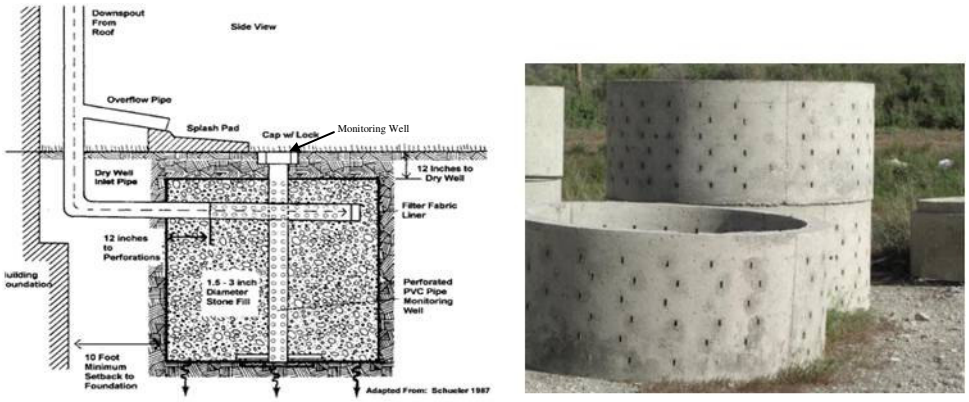
Source: Pennsylvania Stormwater BMP Manual (2006)

Dry Wells

A dry well, also referred to as a seepage pit is a subsurface storage facility that temporarily stores and infiltrates runoff from the roofs of buildings or other impervious surfaces. A dry well can be either a structural prefabricated chamber (Dry Well #1) or an excavated pit filled with stone fill (Dry Well #2). Dry wells discharge the stored runoff via infiltration into the surrounding or underlying soils. Figure C-6 shows a typical prefabricated dry well and a typical dry well configuration with stone fill. The following elements shall be incorporated into all dry well designs:

- These facilities should be located a minimum of ten (10) feet from the building foundation to avoid foundation seepage problems and are not recommended if their installation would create a risk for basement flooding.
- Construction of a dry well should be performed after surface soils in all other areas of the site are stabilized to avoid clogging.
- During construction, compaction of the subgrade soil in the bottom of the dry well should be avoided, and construction should be performed only with light machinery.
- Depth of a dry well should be between **1.5 feet and 4 feet**. Gravel fill should consist of stone of an average of one and one half to three (1.5 – 3.0) inches in diameter with the gravel fill wrapped in a nonwoven geotextile that separates the stone fill from the surrounding soil.
- At least 1 foot of soil needs to be placed over the top of the dry well.
- Dry wells should be inspected at least four (4) times annually as well as after large storm events.
- Dry wells should have overflow pipes to allow high volumes of runoff to connect to other on-site substantial infiltration areas or pervious areas.
- Every dry well needs to have at least one monitoring well.
- Infiltration testing is recommended to ensure that the underlying soil is capable of infiltrating the needed volume of stormwater.

Figure C-6: Typical Dry Well Configuration filled with Stone Fill (DRY WELL #2) (Left) and Structural Prefabricated Chamber (DRY WELL #1) (Right)



Source (for pic on left): http://www.seagrant.sunysb.edu/pages/BMPsForMarinas.htm
Source (for pic on right): http://www.copelandconcreteinc.net/1800652.html

Routine Maintenance for BMPs

- Vegetation along the surface of an infiltration trench should be maintained in good condition, and any bare spots should be revegetated as soon as possible.
- Vehicles shouldn't be parked or driven on an infiltration trench, and care should be taken to avoid excessive compaction by mowers.
- Any debris such as leaves blocking flow from reaching an infiltration trench or bioretention/rain garden should be routinely removed.
- While vegetation is being established, pruning and weeding may be required for a bioretention/rain garden.
- Mulch in a bioretention/rain garden needs to be re-spread when erosion is evident. Once every two to three years or after major storms the entire area may require mulch replacement.
- At least twice a year the landowner needs to inspect the bioretention/rain garden for sediment buildup and vegetative conditions.
- During periods of extended drought, the bioretention/rain garden requires watering.
- Trees and shrubs in a bioretention/rain garden need to be inspected at least twice per year by the landowner to evaluate their health. If they are in poor health, they need to be replaced.
- Dry wells need to be inspected by the landowner at least four times a year and after significant rainfalls, and debris/trash, sediment, and any other waste material need to be removed and disposed of at suitable disposal/recycling sites and in compliance with local, state, and federal waste regulations.
- For dry wells, gutters need to be regularly cleaned out, and proper connections must be maintained to facilitate the effectiveness of the dry well.
- The filter screen for the dry well that intercepts roof runoff must be replaced as necessary.
- Dry wells that are damaged need to be fixed or replaced within two weeks of being damaged.

- If an intermediate sump box exists in conjunction with a dry well, it must be cleaned out at least once per year.
- Rain barrels and cisterns need to be cleared of debris routinely at least every three months and after significant storms to allow stormwater from gutters to enter them.
- Gutters that directly convey rain water to dry wells, rain barrels, and cisterns need to be routinely cleared of trash and debris at least every three months and after significant storms.
- Rain barrels and cisterns must be kept covered.
- Rain barrels and cisterns should be routinely emptied so that they are only ¼ of the way full to allow for storage of additional rainwater.
- Overflow outlets from rain barrels and cisterns must be kept free and clear of debris.
- Rain barrels and cisterns that are damaged need to be fixed or replaced within two weeks of being damaged.

C.4 Example

Simplified Approach Volume Determination:

Joe Homeowner wants to build a 400 square foot two car garage, and a 540 square foot (30' L x 18' W) impervious driveway that is graded so that the stormwater runoff drains to the grassy area along one edge of the driveway. (A duplicate of Table C-1 is provided below in Table C-6, a duplicate of Table C-3 is provided below in Table C-7 and outlines the steps of this example) a duplicate of Figure C-1 (Figure C-7) and a duplicate of Table C-4 are provided in Table C-8.

STEP 1 - Determine the total area of all proposed impervious surfaces to drain to each BMP:

Garage Roof (Front)	10 ft. x 20 ft.	=	200 sq. ft
Garage Roof (Rear)	10 ft. x 20 ft.	=	200 sq. ft.
Driveway (Front)	30 ft. x 18 ft.	=	540 sq. ft.

Total Proposed Impervious Surface			**940 sq. ft.**

Note: If the driveway used pervious pavement (i.e., paving blocks), then the total impervious area would only be 400 square feet, and no stormwater management practices would need to control runoff from the driveway.

Select a BMP or combination of BMPs from Section C.3 to be used to satisfy the volume requirement. Determine the length, width, depth and other requirements for the BMPs in Section C.3. A BMP needs to be placed to catch runoff from the back of the garage, and a BMP needs to be placed to capture runoff from the front of the garage and the driveway. Figure C-7 shows the direction the runoff flows and the locations where the BMPs are to be placed.

Joe Homeowner would like to use a rain barrel (BMP #1) to capture the runoff from the rear of the garage and an infiltration trench (BMP #2) to capture runoff from the front of the garage and the driveway.

STEP 2 and 3 for BMP #1 (Rain Barrel/Cistern)

STEP 2 - Select the proposed impervious area value for BMP #1, the rain barrel or cistern, in Column 1 that is closest to, but not less than 200 in Table C-6:

The value in Column 1 that is closest to but is not less than 200 is 200.

STEP 3 - Determine the volume that BMP #1 must be to satisfy the volume requirements using Columns 2 and 3 in Table C-6:

The volume in gallons of the rain barrel/cistern to be used as BMP #1, assuming the rain barrel/cistern is 25% full, is determined by finding the row in Column 3 that corresponds to the impervious area value determined in Step 1. Therefore, the volume of BMP #1, the rain barrel/cistern must be $\geq$ 166 gallons. A combination of rain barrels could be used in succession as shown in Figure C-2, or a cistern could be used.

Table C-6: Example – Calculating Storage Volume for Rain Barrel/Cistern[1]

Column 1	Column 2	Column 3
Proposed Impervious Area (square feet)	**Volume of Rain Barrel/Cistern[2] (cubic feet)**	**Volume of Rain Barrel/Cistern (gallons)**
I	V_{RBcf}	V_{RBgal}
Sum of all Proposed Impervious Areas	$(1*(1/12)*I)/0.75=V_{RBcf}$	$V_{RBcf} * 7.48=V_{RBgal}$
50	6	42
100	11	83
200	22	166
300	33	249
400	44	332
500	56	416
600	67	499
700	78	582
800	89	665
900	100	748
1000	111	831
1100	122	914
1200	133	997
1300	144	1,081
1400	156	1,164
1500	167	1,247
1600	178	1,330
1700	189	1,413
1800	200	1,496
1900	211	1579
2000	222	1662
2100	233	1745
2200	244	1829
2300	256	1912
2400	267	1995
2500	278	2,078
2600	289	2161
2700	300	2244
2800	311	2327
2900	322	2410
3000	333	2494
3100	344	2577
3200	356	2,660
3300	367	2743
3400	378	2826
3500	389	2909
3600	400	2992
3700	411	3075
3800	422	3158
3900	433	3,242
4000	444	3325
4100	456	3408
4200	467	3491
4300	478	3574
4400	489	3657
4500	500	3740
4600	511	3,823
4700	522	3906
4800	533	3990
4900	544	4073
4999	555	4,155

[1]The typical volume of a rain barrel is between 50-200 gallons, so more than 1 rain barrel may be needed. Larger volumes may require a cistern.
[2]Assume that the rain barrel/cistern is 25% full

STEPS 2 and 3 for BMP #2 (Infiltration Trench)

STEP 2 - Select the proposed impervious area value for BMP #2, the infiltration trench, using Column 1 in Table C-7:

Find the row in Column 1 that is closest to but not less than 740 (200 from the front of the garage + 540 from the driveway). Therefore, the value selected is 800.

STEP 3 - Utilizing the value from Column 1 determined above, and the surface area that the proposed BMP will occupy, identify the proposed depth and corresponding surface area needed using Column 2 in Table C-7:

Joe Homeowner would like to place the infiltration trench along the edge of the driveway that the runoff drains to, so it would have a length of 20 feet. The smallest width that can be used, as stated in the infiltration trench requirements in Section C.3, is 3 feet. Therefore, the area of the infiltration trench is:

$$20 * 3 = 60 \text{ square feet}$$

To find the minimum depth of the trench, move toward the right side of the table from 800 square feet in Column 1 to Column 2, and find the column with a value of as close to but not more than 60 square feet, which is 56 square feet. Then obtain the minimum depth of the facility by reading the depth from the column heading at the top of the table. Therefore, the depth of the trench would need to be 3.0 feet.

Selected BMPs: Rain barrel(s) ≥ 166 gallons and a 20' L x 3' W x 3.0' D infiltration trench

STEP 4 – Make a sketch of the site plan as shown in Figure C-7, and fill in the small projects worksheet found as shown in Table C-8.

Table C-7: Example – Calculating Storage Volume Surface Area and Depth for Infiltration Trench

Column 1	Column 2							
Total Proposed Impervious Area (square feet)	**Surface Area of Infiltration Trench or Dry Well #2** Acceptable Depths for Each BMP are indicated by the arrows below **(square feet)**							
	Area Required for a BMP with a Depth(D) of 1.5'	*Area Required for a BMP with a Depth(D) of 2.0'*	*Area Required for a BMP with a Depth(D) of 2.5'*	*Area Required for a BMP with a Depth(D) of 3.0'*	*Area Required for a BMP with a Depth(D) of 3.5'*	*Area Required for a BMP with a Depth(D) of 4.0'*	*Area Required for a BMP with a Depth(D) of 4.5'*	*Area Required for a BMP with a Depth(D) of 5.0'*
	Infiltration Trench (2.0'-5.0') / **Dry Well #2 (1.5'-4.0')**							
I	*A(sf)*							
Sum of all Proposed Impervious Areas	A = Volume/D, where Volume[1] = ((1/12)**I*)/0.4							
100	14	10	8	7	6	5	5	4
200	28	21	17	14	12	10	9	8
300	42	31	25	21	18	16	14	13
400	56	42	33	28	24	21	19	17
500	69	52	42	35	30	26	23	21
600	83	63	50	42	36	31	28	25
700	97	73	58	49	42	36	32	29
2 800	111	83	67	**3** 56	48	42	37	33
900	125	94	75	63	54	47	42	38
1000	139	104	83	69	60	52	46	42
1100	153	115	92	76	65	57	51	46
1200	167	125	100	83	71	63	56	50
1300	181	135	108	90	77	68	60	54
1400	194	146	117	97	83	73	65	58
1500	208	156	125	104	89	78	69	63
1600	222	167	133	111	95	83	74	67
1700	236	177	142	118	101	89	79	71
1800	250	188	150	125	107	94	83	75
1900	264	198	158	132	113	99	88	79
2000	278	208	167	139	119	104	93	83
2100	292	219	175	146	125	109	97	88
2200	306	229	183	153	131	115	102	92
2300	319	240	192	160	137	120	106	96
2400	333	250	200	167	143	125	111	100
2500	347	260	208	174	149	130	116	104
2600	361	271	217	181	155	135	120	108
2700	375	281	225	188	161	141	125	113
2800	389	292	233	194	167	146	130	117
2900	403	302	242	201	173	151	134	121
3000	417	313	250	208	179	156	139	125
3100	431	323	258	215	185	161	144	129
3200	444	333	267	222	190	167	148	133
3300	458	344	275	229	196	172	153	138
3400	472	354	283	236	202	177	157	142
3500	486	365	292	243	208	182	162	146
3600	500	375	300	250	214	188	167	150
3700	514	385	308	257	220	193	171	154
3800	528	396	317	264	226	198	176	158
3900	542	406	325	271	232	203	181	163
4000	556	417	333	278	238	208	185	167
4100	569	427	342	285	244	214	190	171
4200	583	438	350	292	250	219	194	175
4300	597	448	358	299	256	224	199	179
4400	611	458	367	306	262	229	204	183
4500	625	469	375	313	268	234	208	188
4600	639	479	383	319	274	240	213	192
4700	653	490	392	326	280	245	218	196
4800	667	500	400	333	286	250	222	200
4900	681	510	408	340	292	255	227	204
4999	694	521	417	347	298	260	231	208

[1]Assume a void ratio of 40%

Figure C-7: Typical Dry Well Configuration filled with Stone Fill (Left) and Structural Prefabricated Chamber (Right)

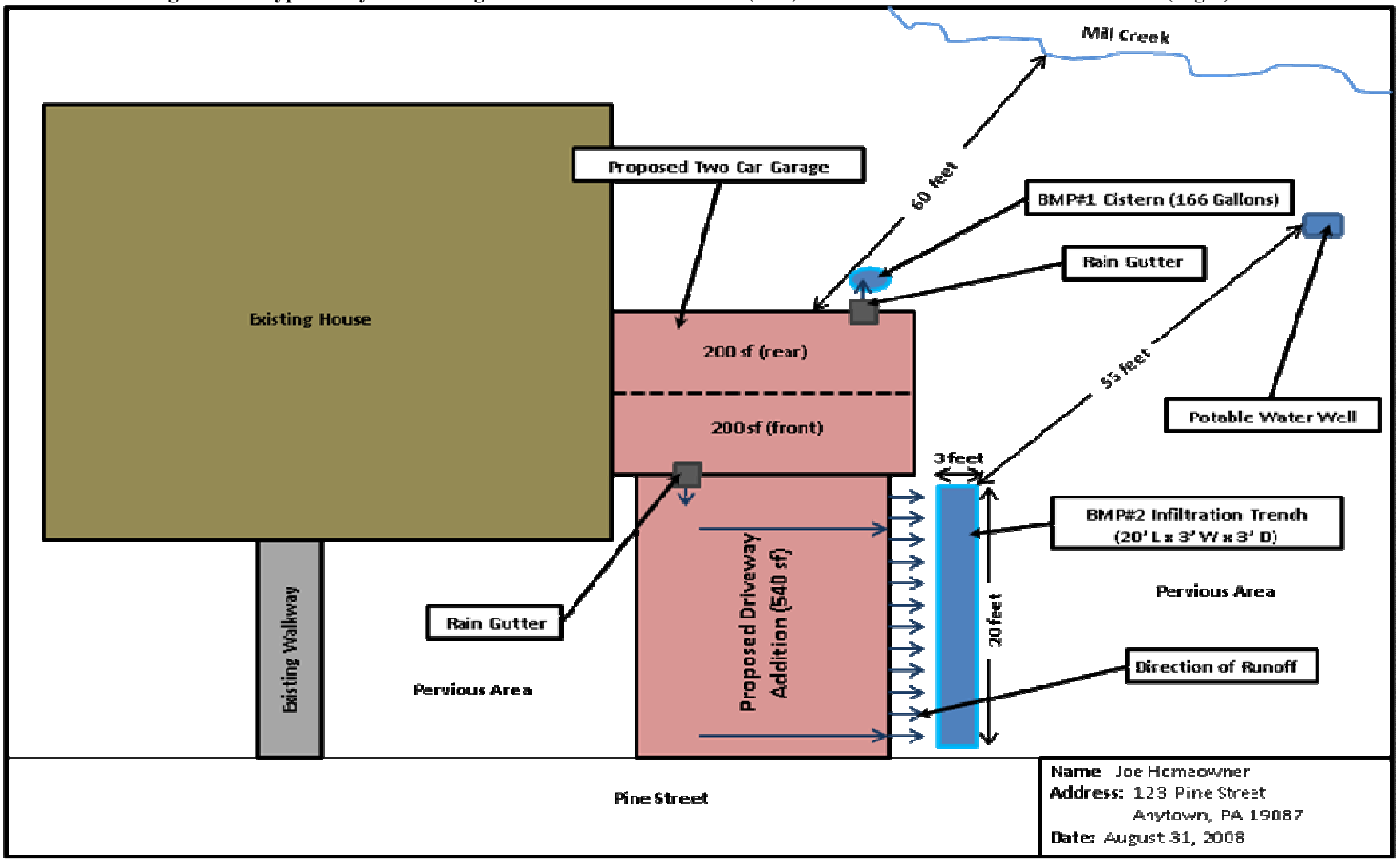


Table C-8: Example – Small Projects Worksheet with Results

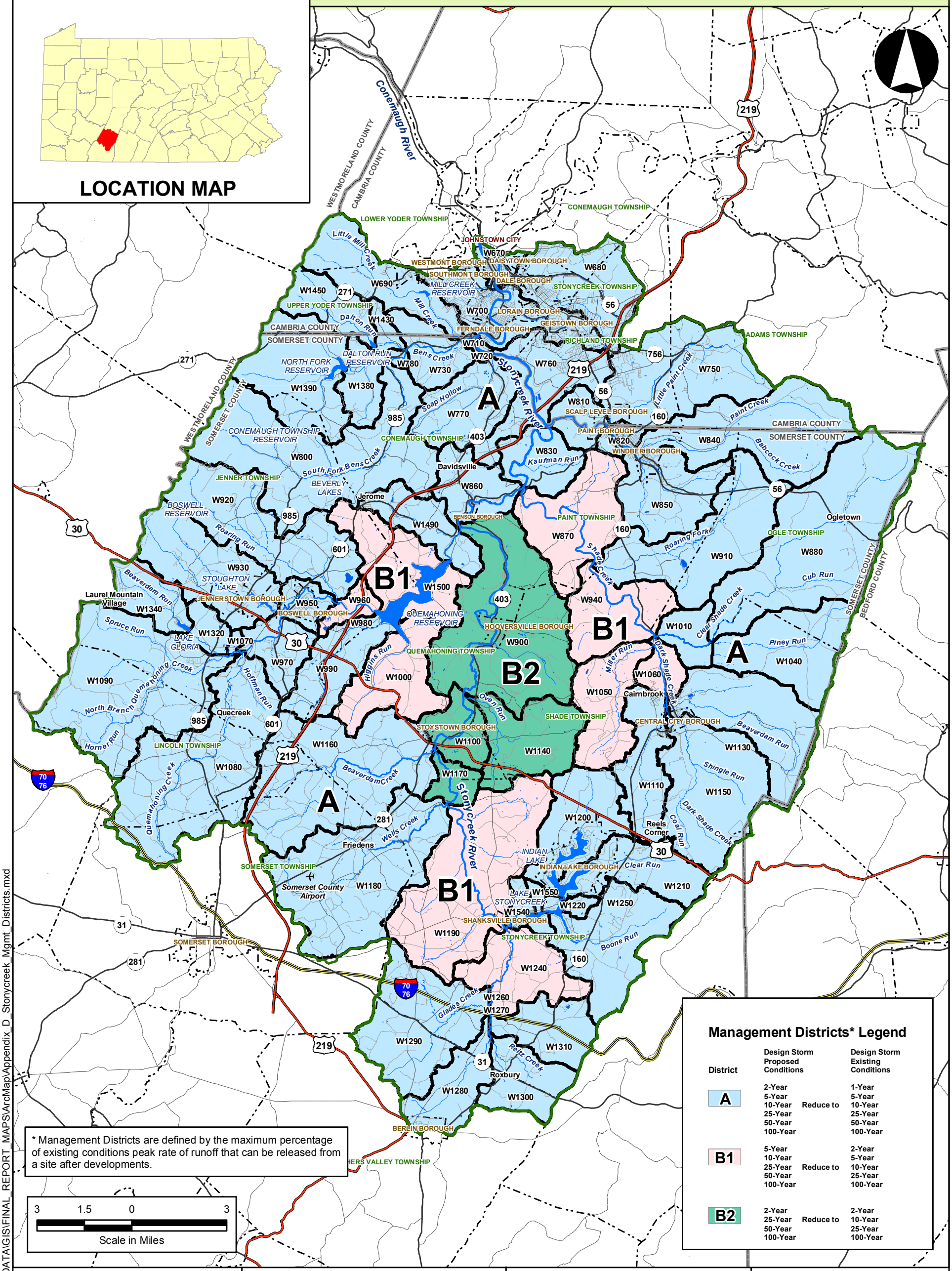
Small Projects Worksheet			
STEP 1			
Proposed Impervious Surface for BMP #1	**Proposed Impervious Surface for BMP #2**	**Proposed Impervious Surface for BMP #3**	
200	740		
STEPS 2&3			
Rain Barrel or Cistern			
Proposed Impervious Surface from Column 1 in Table C-5	**Volume from Column 2 or 3 in Table C-5**		
200	166		
Rain Garden/Bioretention or Dry Well #1			
Proposed Impervious Surface from Column 1 in Table C-2	**Area of BMP from Column 2 in Table C-2**	**Depth of BMP from Column 2 in Table C-2**	**Types of Material to Be Used**
Infiltration Trench or Dry Well #2			
Proposed Impervious Surface from Column 1 in Table C-6	**Area of BMP from Column 2 in Table C-6**	**Depth of BMP from Column 2 in Table C-6**	**Types of Material to Be Used**
800	56	3	Infiltration Trench, Uniformly Graded Aggregate, HDPE 8" pipe, Geotextile material, Grass planted on top
Note: For additional BMPs, use additional sheets			

APPENDIX D

MANAGEMENT DISTRICTS MAP

STONYCREEK RIVER - CAMBRIA AND SOMERSET COUNTIES
ACT 167 STORMWATER MANAGEMENT PLAN

LOCATION MAP



Management Districts* Legend

District	Design Storm Proposed Conditions		Design Storm Existing Conditions
A	2-Year 5-Year 10-Year 25-Year 50-Year 100-Year	Reduce to	1-Year 5-Year 10-Year 25-Year 50-Year 100-Year
B1	5-Year 10-Year 25-Year 50-Year 100-Year	Reduce to	2-Year 5-Year 10-Year 25-Year 100-Year
B2	2-Year 25-Year 50-Year 100-Year	Reduce to	2-Year 10-Year 25-Year 100-Year

* Management Districts are defined by the maximum percentage of existing conditions peak rate of runoff that can be released from a site after developments.

3 1.5 0 3

Scale in Miles

Management Districts Map

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Legend

- WATERSHED BOUNDARY
- STREAMS
- WATER BODIES
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- SUBAREAS

Roads

- Interstate
- US Federal Highway
- PA State Route
- Other State Road
- Local Roads

NOTE:
Portions of this map were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this ACT 167 Plan to correct all of the mapping data.

SOURCES:
Watershed Boundary - PADEP Modified by BLE
State and Local Roads - PennDOT
County Boundaries - PennDOT
Municipal Boundaries - PennDOT
Streams - PaDEP
Water Bodies -Derived from USFWS NWI Wetlands data
Management Districts/ Subareas - Delineated by BLE

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Date: 5/15/2009 PROJECT #: 2005-1719-00

FILE: \\Athens\d\Projects\2005\1719\00\DATA\GIS\FINAL_REPORT_MAPS\ArcMap\Appendix_D_Stonycreek_Mgmt_Districts.mxd