

Clarion County Planning Commission

Act 167 County-Wide Watershed
Stormwater Management Plan for Clarion County
Phase I – Scope of Study

NOVEMBER 2008



[BUILDING RELATIONSHIPS.
DESIGNING SOLUTIONS.]

TABLE OF CONTENTS



INTRODUCTION	1
STORMWATER RUNOFF – ITS PROBLEMS AND ITS SOLUTIONS.....	1
PENNSYLVANIA STORMWATER MANAGEMENT ACT (ACT 167).....	1
ACT 167 PLANNING FOR CLARION COUNTY.....	2
BENEFITS OF THE PLAN	2
APPROACH FOR THE DEVELOPMENT OF THE STORMWATER MANAGEMENT PLAN	3
THE NEED FOR A COMPREHENSIVE APPROACH FOR STORMWATER MANAGEMENT.....	4
PREVIOUS PLAN EFFORTS.....	4
GENERAL COUNTY DESCRIPTION.....	5
POLITICAL JURISDICTIONS	5
NATURAL CHARACTERISTICS.....	6
WATER RESOURCES.....	6
CLIMATE.....	7
GEOLOGY	8
BEDROCK FORMATIONS.....	8
SLOPES	10
SOILS	10
FLOODPLAIN DATA.....	11
LAND USE.....	11
EXISTING PATTERNS	11
TRANSPORTATION	13
GENERAL DEVELOPMENT PATTERNS.....	14
PHASE I PLANNING PROCESS.....	15
AGREEMENT BETWEEN PADEP AND CLARION COUNTY	15
ENGINEERING CONSULTANT SELECTION.....	15
CREATION AND DISTRIBUTION OF A QUESTIONNAIRE FORM.....	15
ESTABLISHMENT OF A WATERSHED PLAN ADVISORY COMMITTEE (WPAC)	15
WATERSHED PLAN ADVISORY COMMITTEE MEETINGS	17
PHASE I REPORT.....	17
SUBMISSION OF PHASE I REPORT TO PADEP.....	17
QUESTIONNAIRE DISCUSSION.....	17
QUESTIONNAIRE RESULTS	17
PHASE II DISCUSSION.....	18
ITEMS TO BE ADDRESSED IN PHASE II.....	18
GENERAL WORK PLAN	20
PHASE II AGREEMENT.....	20
CONSULTANT SELECTION	20
QUESTIONNAIRE	20
WATERSHED PLAN ADVISORY COMMITTEE (WPAC)	20
MUNICIPAL ENGINEERS PARTICIPATION.....	21
LEGAL ADVISORY PARTICIPATION.....	21
STANDARDS.....	21
ROLES OF COUNTY AND CONSULTANT	21
WORK SCHEDULE	22
REFERENCES.....	22

HRG Project Number: 4319.001

LIST OF APPENDICES

APPENDIX A – Questionnaire Form

APPENDIX B – Questionnaire Summary

APPENDIX C – Phase II Scope of Work

APPENDIX D – Phase II Cost Proposal

APPENDIX E – Phase II Proposed Schedule

APPENDIX F – Clarion County Map

APPENDIX G – Clarion County Designated Watersheds



INTRODUCTION

STORMWATER RUNOFF – ITS PROBLEMS AND ITS SOLUTIONS

The water that runs off the land into surface waters during and immediately following a rainfall event is referred to as stormwater. In a watershed undergoing urban expansion, the volume of stormwater resulting from a particular rainfall event increases because of the reduction of pervious land area (i.e., natural land covered by pavement, concrete, or buildings). That is, the alteration of natural land cover and land contours by residential, commercial, industrial, forestry, and farmland uses results in decreased infiltration of rainfall and an increased rate and volume of stormwater runoff.

The need for stormwater management in Pennsylvania has been demonstrated repeatedly in the past. As the population of an area increases, land development is inevitable, and the alteration of natural ground surfaces results in decreased infiltration of rainfall. As a result of continued development, the volume and rate of stormwater runoff increases causing environmental impacts including flooding, stream channel erosion and siltation, water quality degradation, and reduced groundwater recharge. Cumulative effects of development in some areas of a watershed can result in flooding of natural watercourses with associated costly property damages.

History has shown that individual land development projects are often viewed as separate incidents and not necessarily part of the bigger picture of urbanization. This has also been the case when the individual land development projects are scattered throughout a watershed (within many different municipalities). The cumulative nature of individual land surface changes dramatically affects runoff and flooding conditions. This cumulative effect of development in some areas has resulted in flooding of both small and large streams with associated property damages and even causing loss of life. Therefore, given the distributed and cumulative nature of the land alteration process, a comprehensive approach must be taken if a reasonable and practical management and implementation approach or strategy is to be successful.

PENNSYLVANIA STORMWATER MANAGEMENT ACT (ACT 167)

Recognizing the need to deal with the serious and growing problem of extensive damage from uncontrolled stormwater runoff, the Pennsylvania General Assembly enacted Act 167. The statement of legislative findings at the beginning of the Pennsylvania Stormwater Management Act (Act 167) sums up the critical interrelationship among development, accelerated runoff, and floodplain management.

Specifically, this statement points out that:

“Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases flood 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 floodplain management and flood control efforts in downstream communities, reduces groundwater recharge, and threatens public health and safety. 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 the environment.”

In past years, stormwater management had been oriented primarily toward addressing the increase in peak runoff rates discharging from individual development sites to protect property immediately downstream. Minimal attention had been given to the effects on locations further downstream (frequently because they were located in another municipality) or to designing stormwater control within the context of an entire watershed. Management of stormwater has typically been regulated on a municipal level with little or no consistency among adjoining municipalities in the same watershed regarding the types or degree of control to be practiced. Since many municipalities do not have stormwater management ordinances or controls, the impacts from stormwater runoff may be exacerbated from additional development.

Act 167 changed this approach by instituting a comprehensive program of stormwater planning and management on a watershed level. The Act requires Pennsylvania counties to prepare and adopt stormwater management plans for each watershed located in the county, as designated by the Pennsylvania Department of Environmental Protection (PADEP). Most importantly, these plans are to be prepared in consultation with municipalities located in the county, working through a Watershed Plan Advisory Committee (WPAC). Due to a recent change in PADEP Act 167 policy, in lieu of providing plans for each designated watershed, Act 167 plans are now being created on a county-wide basis. The plans are intended to provide stormwater standards and criteria throughout the county for the control of stormwater runoff. The new PADEP policy also stresses the opportunity for municipalities to retrofit existing sites to improve existing water quality impairments, problem area flooding, erosion and to maintain or increase groundwater recharge rates. Furthermore, the plan's goals and objectives will be developed and implemented to be consistent with the anti-degradation criteria of the PA Clean Streams Law and the federal National Pollutant Discharge Elimination System (NPDES) Phase II requirements.

The types and degree of control that are prescribed in the stormwater management plan will be based on existing and future development patterns and hydrologic characteristics of the individual watershed within the county. The plan, more specifically the standards and criteria, are to be developed from the technical evaluations performed in the analysis process, in order to respond to the "cause and effect" nature of existing and potential storm runoff impacts in each watershed. The final product of the Act 167 planning process will be a comprehensive stormwater management plan, to be developed and implemented with a firm sensitivity to the overall needs (e.g., financial, legal, political, technical, etc.) of the municipalities in Clarion County.

ACT 167 PLANNING FOR CLARION COUNTY

Given the above history and information, the county-wide watershed planning process for Clarion County must be designed with the individual watershed characteristics in mind, as well as the resources (technical, political, and economic) of the County. The Phase I - Scope of Study presents the concept and approach that has been developed to fully meet these requirements, as well as the specific requirements of Act 167, for this county-wide watershed stormwater management project.

BENEFITS OF THE PLAN

The purpose and benefit of the study and plan is to provide all of the municipalities in Clarion County with an accurate and consistent plan implementation strategy and procedures for comprehensive stormwater management. Currently, there is a great deal of variance within the municipalities regarding implementation and enforcement of stormwater management regulations. Given the nature of storm runoff and its impacts, a critical objective of sound stormwater management planning is to provide for consistency of stormwater management

requirements throughout Clarion County. Therefore, the primary objective of the technical study and planning process is to develop a technical and institutional support document to encourage and/or support the consistency of regulations based on county-wide and watershed-wide consideration. The primary goal of those regulations would be to restore, reclaim, protect and maintain the water quality of Clarion County.

The county-wide planning approach recommended by PADEP also provides the municipalities with a considerable amount of useable technical information, such as detailed watershed runoff simulation models, that can be used for other stormwater management purposes. Therefore, as a result of developing the plan, municipalities and Clarion County, will realize benefits and/or products that are useable for other planning purposes. For example, land use updates and environmental data management are necessary for effective planning in a specific watershed. The technical component of the plan will provide unique environmental database management benefits for both the county and municipal use.

In addition, technical support information provided as a part of specific watershed modeling effort can be used by public works officials to begin the design and regulatory permitting efforts for bridge replacement and floodplain management analysis. Further, the stream encroachment permit process, which involves the need to supply detailed stream flow data as a part of the application process, can be more efficiently and cost-effectively developed using a calibrated watershed model. Therefore, the benefits of the watershed planning process are extensive, even beyond the important functions of developing comprehensive stormwater management strategies and ordinance provisions.

A new initiative from PADEP indicates that the plan may investigate and provide solutions to correct existing problems. Specifically, the plan will identify and summarize problem areas; provide much of the hydrology that will be required in the design of proposed solutions; provide potential conceptual solutions to correct these problems; and will specify possible funding streams for project implementation.

APPROACH FOR THE DEVELOPMENT OF THE STORMWATER MANAGEMENT PLAN

In order to implement county-wide comprehensive planning and management of stormwater runoff, it was necessary to review the major watersheds within Clarion County during Phase I. The management of stormwater throughout the municipalities will be improved by their involvement throughout the planning process.

In order to initiate municipal level involvement in the overall development of the plan, a Watershed Plan Advisory Committee (WPAC) was formed and consists of the Clarion County Planning Commission, municipalities, the County Conservation District and other interested organizations. Two meetings with the WPAC were held during Phase I to obtain their general commitment to the project and to distribute questionnaires. Discussions from these meetings and an evaluation of the questionnaires, in conjunction with in-house knowledge from Clarion County and PADEP, determined to what level this plan should be created.

THE NEED FOR A COMPREHENSIVE APPROACH FOR STORMWATER MANAGEMENT

The goal of Clarion County's Act 167 planning process is to provide a county-wide comprehensive program to assist in the planning and management of stormwater. With coordination of the thirty-four (34) municipalities in Clarion County, the resulting stormwater management plan will address severe and ongoing stormwater related problems in critical

areas throughout the County. Furthermore, cooperating member municipalities will be able to adopt stormwater management controls that will have a collectively beneficial impact on the waters of Clarion County and those "problem" areas that presently remain unmanaged.

Clarion County has received Phase I funding from PADEP and is highly dependent on gaining support from the municipalities in the early stages of plan development. Phase II will result in the final stormwater management plan and model ordinance. More specifically, the development process for the stormwater management plan is as follows:

Phase I - Scope of Study - Establishing procedures used to prepare the Plan. These procedures are determined by an overall survey of:

- Specific watershed characteristics and hydrologic conditions.
- Stormwater related problems and significant obstructions.
- Alternative measures for control.
- Goals and objectives of the Plan.
- Solution strategy for problems identified.
- Cost.

Phase II - The Plan - The technical assessment and development of the model ordinance that includes:

- Watershed modeling and planning.
- Development of technical standards and criteria for stormwater management.
- Conceptual solutions to identify problem areas.
- Identification of administrative procedures for implementation of the plan.
- Public Hearing.
- Adoption by Clarion County.
- Approval by PADEP.
- Adoption by all thirty-four (34) municipalities.
- Municipal implementation.

PREVIOUS PLAN EFFORTS

There has been one previous Act 167 Plans prepared for Clarion County. The Piney Creek Watershed was studied in 1991 with the completion of the following Plan:

- Clarion County Planning Commission, *Act 167 Storm Water Management Scope of Study, Piney Creek Watershed*, May 1991.

In addition, the following relevant documents have been prepared and will provide a valuable source of information for the development of the Plan:

- Clarion County Planning Commission, *Clarion County Comprehensive Plan, Volume I - Citizen Involvement and Vision Building*, 1999.
- Clarion County Planning Commission, *Clarion County Comprehensive Plan, Volume II - Background Studies*, 2000.
- Clarion County Planning Commission, *Clarion County Comprehensive Plan*, 2004.

GENERAL COUNTY DESCRIPTION

Clarion County is located in northwest Pennsylvania adjacent to Forest, Jefferson, Armstrong, Butler, and Venango Counties. The County began settling after 1801 with Pennsylvania born Scots-Irish, Germanic and English heritage by way of southwestern portion of the State. Clarion County was formed from Venango and Armstrong Counties in 1839. Settlement began in the southern portion of the County. The iron industry was strong between 1830 and 1860. After the Civil War, oil wells began to appear. Since then, clay mining and coal mining were the major natural resource industries.

The general character of the surface is hilly -- almost mountainous -- near the water courses, and undulating in the uplands. Here and there on the line of the dividing ridges rise bold, isolated knobs, usually stream sources. Their crests are in most cases cleared and cultivated to the summit. The average elevation of the county is about 1,300' above sea level. The lowest point in the county is at the mouth of Redbank at 851'; the highest is southeast of Fryburg at 1,775'. The summits in southern portion are typically higher than those in the north.

POLITICAL JURISDICTIONS

The County is comprised of 34 municipalities. The political jurisdictions include 22 townships and 12 boroughs with Clarion Borough the county seat. Clarion County is classified as a sixth class county and is ranked 53rd in the state of 67 counties, with a population of 41,775 in its 602.5 square miles (69.3 persons per square mile) according to the 2000 census. The municipalities in Clarion County are as follows:

Boroughs	Population	Land Area (miles²)	Townships	Population	Land Area (miles²)
Calensburg Boro	224	0.2	Ashland Twp	1,081	22.6
Clarion Boro	6,185	1.5	Beaver Twp	1,753	33.7
East Brady Boro	1,038	0.8	Brady Twp	62	1.7
Foxburg Boro	275	0.3	Clarion Twp	3,273	31.5
Hawthorn Boro	587	1.1	Elk Twp	1,519	31.3
Knox Boro	1,176	0.6	Farmington Twp	1,986	62
New Bethlehem Boro	1,057	0.5	Highland Twp	633	19.1
Rimersburg Boro	1,051	0.4	Knox Twp	1,045	17.5
Shippenville Boro	505	0.4	Licking Twp	479	17.4
Sligo Boro	728	1.4	Limestone Twp	1,773	37.7
St Petersburg Boro	405	0.3	Madison Twp	1,442	27.1
Strattanville Boro	542	0.5	Millcreek Twp	415	28.9
			Monroe Twp	1,587	29.5
			Paint Twp	1,778	20.5
			Perry Twp	1,064	29
			Piney Twp	516	17.8
			Porter Twp	1,466	44.5
			Redbank Twp	1,502	30.1
			Richland Twp	553	15.1
			Salem Twp	852	16.1
			Toby Twp	1,166	28.9
			Washington Twp	2,037	32.5
			CLARION COUNTY	41,755	602.5

NATURAL CHARACTERISTICS

WATER RESOURCES

Clarion County lies entirely within the Ohio River drainage basin. All precipitation which falls in Clarion County is channeled by gravity into nine major drainage basins.

"Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the commonwealth shall conserve and maintain them for the benefit of all the people."
 --The Constitution of the Commonwealth of Pennsylvania, Article I, Section 27

WATERSHEDS

Act 167 has designated nine watersheds within the County included in this study are:

Act 167 Designated Watershed	Watershed Area (square miles)		
	Total within State	Total Within County	
Allegheny River	1555.99	58.87	10%
Clarion River	823.58	190.71	31%
Deer Creek	74.11	74.11	12%
East Sandy Creek	103.14	24.81	4%
Licking Creek	52.05	52.05	8%
Piney Creek	74.10	71.30	12%
Redbank Creek	175.56	98.26	16%
Tionesta Creek	478.40	18.56	3%
Toms, Cather, Maxwell, Blyson & McCanna Runs	40.17	23.95	4%

LAKES

There are several impoundments located within the County. Piney Hydroelectric Dam operated by Brookfield Power impounds approximately 16 miles of the Clarion River forming Piney Lake, an 800-acre lake with a normal maximum pool elevation of 1,093ft-msl. Completed circa 1924, the dam is constructed of reinforced concrete and has a maximum height and total length of 139' and 771', respectively. The maximum depth of Piney Lake at the dam is 89'. Kahle Lake is a 251-acre reservoir owned by the Commonwealth of Pennsylvania and managed by the Fish & Boat Commission and is located on the Venango-Clarion County Border. Marie-Eileen Lake is approximately 0.033 square kilometers located in Ashland Township.

SURFACE WATER QUALITY

The Pennsylvania Chapter 93 Water Quality Standards classify all surface waters according to their water quality criteria and protected water uses. Selected waterbodies that exhibit exceptional water quality and other environmental features are referred to as "Special Protection Waters", which includes High Quality and Exceptional Value designations. Certain activities in those watersheds that could adversely affect surface water are more stringently regulated to prevent degradation.

The named streams within the County with protected use classification are listed below:

SPECIAL PROTECTION WATERSHEDS		
Exceptional Value Waters		
Blyson Run		
McCanna Run (Pendleton Run)		
High Quality Value Waters		
Cather Run	Woods Run	Canoe Creek
Maxwell Run	Stroup Run	Beaver Creek
Mill Creek	Trap Run	Turkey Creek

A complete list of all the streams within the County and their Chapter 93 classifications are listed in Appendix G.

IMPAIRED STREAMS

The Stream Integrated List represents stream assessments in an integrated format for the Clean Water Act Section 305(b) reporting and Section 303(d) listing. Streams are bodies of flowing surface water that collectively form a network that drains a basin. PA DEP protects 4 stream water uses:

- aquatic life
- fish consumption
- potable water supply
- recreation

The 305(b) stream segments have been evaluated for attainment of those uses. If a stream segment is not attaining any one of its 4 uses, it is then considered non-attaining. In Clarion County, the non-attaining streams all were for aquatic life and fish consumption.

The following table lists the source causes of the pollution leading to identification of non-attaining streams in Clarion County:

SOURCE CAUSE	MILES	%
Abandoned Mine Drainage - Metals, pH, Siltation & Other Inorganics	142.39	75%
Grazing Related Agric - Siltation	15.58	8%
Source Unknown - Mercury	12.24	6%
Petroleum Activities - Metals & pH; Abandoned Mine Drainage - Metals & pH	12.40	7%
	182.61	

As shown, a considerable number of the County's streams (over 182 miles) are impaired. The overwhelming cause is abandoned mined drainage (AMD). It is noted that no source cause lists activities due to development. A complete list of impaired streams and their causes are included in the Appendix.

CLIMATE

Clarion County is situated in the Central Mountain Plateau Climatic Divisions and the climate is classified as continental. As with most of Pennsylvania, the area is mostly affected by weather systems that develop in the Central Plains or mid-west and are carried by prevailing westerly winds. Canada is the primary source of cold air and the Gulf of Mexico is the main source of moisture. In general, the winters in Clarion County are cold and the summers are warm and sometimes hot. Average summer temperature is 66°F while the maximum temperatures

experienced in the summer is over 100°F. The County's average winter temperature is about 26°F while the minimum temperatures experienced often dips below 0°F. There are about 130 frost-free days during the year in Clarion County. Annual precipitation is more than 43". The average annual snowfall amounts to about 40" a year with snow covering the surface for an average of 80 days.

GEOLOGY

Clarion County's present day surface forms were created through several geologic forces acting over many thousands of years. The land emerged from a prehistoric inland sea essentially as a plain comprised of water-deposited materials. Through the action of time and pressure, the earlier deposits of sand, clay, silt, and carboniferous (plant) materials were formed into the sandstone, shale, limestone, and coal strata which make up the bedrock stratigraphy of the area.

Clarion County is located within two sections of the Appalachian Plateaus Physiographic Provinces – the High Plateau Section and the Pittsburgh Low Plateau Section.

High Plateau Section – The small portion of the County lies within this Section toward the southwestern corner. The High Plateau Section consists of broad, rounded to flat uplands cut by deep angular valleys. The uplands are underlain by flat-lying sandstones and conglomerates. Local relief between valley bottoms and adjacent uplands can be as much as 1,000', but is generally in the area of half that amount. Elevations in the Section range from 980' to 2,360'. Drainage of the area has a dendritic pattern. The western boundary of the Section is the Late Wisconsinan glacial border. The area between this border and the Allegheny River a few miles to the east was glaciated by pre-Wisconsinan glaciers. A large part of the Section is covered by trees of the Allegheny National Forest.

Pittsburg Low Plateau Section – This section consists of a smooth undulating upland surface cut by numerous, narrow, relatively shallow valleys. The uplands are developed on rocks containing the bulk of the significant bituminous coal in Pennsylvania. The landscape reflects this by the presence of some operating surface mines, many old stripping areas, and many reclaimed stripping areas. The local relief on the uplands is generally less than 200'. Local relief between valley bottoms and upland surfaces may be as much as 600'. Valley sides are usually moderately steep except in the upper reaches of streams where the side slopes are fairly gentle. Elevations range from 660 to 1,700'.

BEDROCK FORMATIONS

The majority of the bedrock formations in Clarion County belong to the Pennsylvanian Age with the river valley bottom belonging to the Mississippian Age. The bedrock formations are shown on the following table with specific details listed from the Pennsylvania Geological Survey, *Geologic Map of Pennsylvania, 4th series, 1980*.

Map Symbol	Formation Name	Formation Age	Geologic Description
Pcg	Glenshaw Formation	Pennsylvanian	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.
Pa	Allegheny Formation	Pennsylvanian	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.
Pp	Pottsville Formation	Pennsylvanian	Predominantly gray sandstone and conglomerate; also contains thin beds of shale, claystone, limestone, and coal; minable coals and commercially valuable high-alumina clays present locally.
Msc	Shenango Formation through Cuyahoga Group, undivided	Mississippian	Includes the Shenango Formation (Ms) and Cuyahoga Group (Mc), which are described separately below.
Ms	Shenango Formation	Mississippian	Light-gray sandstone and some beds of medium-gray shale and siltstone; upper third of formation is more shaly; contains a few marine fossils.
Mc	Cuyahoga Group,	Mississippian	Medium-gray siltstone and dark-gray shale containing interbedded light-gray, flaggy sandstone. Includes, in descending order: Meadville Shale, Sharpville Sandstone, and Orangeville Shale; marine fossils common.
MDso	Shenango Formation through Oswayo Formation, undivided	Mississippian and Devonian	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.
Mbc	Burgoon Sandstone through Cuyahoga Group, undifferentiated	Mississippian	Informal unit including elements of Burgoon Sandstone and Shenango Formation plus Cuyahoga Group; correlation uncertain; contains sedimentary structures and trace fossils characteristic of tidal flats; called "Pocono" by earlier workers.

SLOPES

The slope of the land is an indication of the developability and use of land. Clarion County's land area is comprised of varying degrees of slope, ranging from nearly level plateaus to severe sloping along the rivers of the County. The general characteristics and development potentials and limitations of each category of slope are described as follows:

0-8% slope; 343 square miles; 57% of the County. Flat to moderate; capable of all normal development for residential, commercial, and industrial uses; involves minimum amount of earth moving; suited to row crop agriculture, provided that terracing, contour planting, and other conservation practices are followed.

8-16% slope; 157 square miles; 26% of the County. Rolling terrain and moderate slopes; generally suited only for residential development; site planning requires considerable skill; care is required in street layout to avoid long sustained gradients; drainage structures must be properly designed and installed to avoid erosion damage; generally suited to growing of perennial forage crops and pastures with occasional small grain plantings.

16-24% slope; 72 square miles; 12% of the County. Steep slopes; generally unsuited for most urban development; individual residences may be possible on large lot areas, uneconomical to provide improved streets and utilities; overly expensive to provide public services; foundation problems and erosion usually present; agricultural uses should be limited to pastures and tree farms.

24%->slope; 30 square miles; 5% of the County. Severe and precipitous slopes; no development of an intensive nature should be attempted; land not to be cultivated; permanent tree cover should be established & maintained; adaptable to open space uses (recreation, game farms, & watershed protection).

SOILS

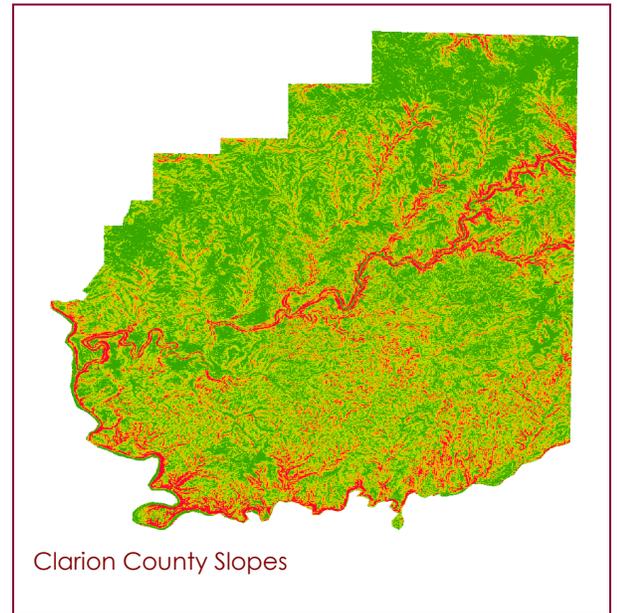
A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern. Characteristics for the soil associations are described as follows:

Soil Associations:

Cavode-Armagh-Gilpin; Somewhat wet soils on flats and well-drained soils on slopes, chiefly in the northwest part of the county.

Clymer-Cook-Dekalb; Soils on ridgetops and slopes, chiefly in the northeastern part of the county.

Dekalb Soils; Stony soils chiefly located along the Clarion River.



Gilpin-Ernest; Soils on ridges and steep slopes in the southern part of the county.

Gilpin-Rayne-Ernest; Soils on ridges, flats and slopes in the upland portions of the southern third of the county.

Holston-Monongahela; Soils on benches along Redbank and other creeks. These soils have good natural drainage and are free from gravel.

Wheeling-Sciotoville; Soils on benches underlain by gravel, chiefly along the Allegheny River. These soils have good natural drainage and are typically farmed.

Hydric Soils; The analysis of hydric soils has recently become an important consideration when performing almost any kind of development review. These soils are important to identify and locate because they provide an approximate location where wet areas may be found. Wetland areas are lands where water resources are the primary controlling environmental factor as reflected in hydrology, vegetation, and soils. Thus, the location of hydric soils is one indication of the potential existence of a wetland area. Wetland areas are now protected by the Pennsylvania Department of Environmental Protection and should be examined before deciding on any type of development activity. Refer to NRCS for data concerning the approximate location of hydric soils throughout Clarion County.

FLOODPLAIN DATA

According to the Federal Emergency Management Agency (FEMA) Community Status Book Report, all of the municipalities in Clarion County participate in the National Flood Program except Brady Township, and the Boroughs of Callensburg, Rimersburg, Shippenville, St. Petersburg and Strattanville.

LAND USE

EXISTING PATTERNS

The way land is used effects stormwater runoff from its rate and volume to its quality. The 2004 *Clarion County Comprehensive Plan* classified all the land uses within the county as shown on the following table:

2000 Clarion County Land Use		
Classification	Area	
	Square Miles	Percentage
Residential	4.43	0.73%
Industrial	1.06	0.18%
Low Intensity	559.63	92.84%
Commercial	2.27	0.38%
State Lands	35.37	5.87%
Total	602.76	100.00%

It is noted that the "Low Intensity" classification includes agriculture, mining areas and low-density rural residential areas outside major corridors. The data shows that the vast majority of the county's land is undeveloped. PA DCED indicates that approximately 86.7% of the County's

total land area is undeveloped, with most of this percentage devoted to forest and agricultural uses while 13.3% of its land considered developed. The Comprehensive Plan did examine land use in both 1968 and 1999-2000 survey at a County-wide scale which revealed only three areas of major change. Each of them represents major corridors connecting I-80 to population centers on the Route 322 corridor. The first area is PA Route 338 from Exit 7 to the Borough of Knox where there are four commercial clusters and one concentration of industrial use. The second area is Route 66 from Exit 8 to Shippenville that is virtually continual industrial and commercial uses from the interchange to one mile north and from Route 322 south for about three-quarters of a mile. Finally, Exit 9 is now dominated by commercial uses from I-80 to the Clarion Borough line.

The following land uses were examined and analyzed:

INDUSTRY

Although it is a relatively small portion of the County, industrial activities can be a potential source of water pollution. Manufacturing industries within Clarion County tend to process natural resources, adding value to local raw materials as the largest number of employers continues to be the lumber and wood industries. A good proportion of Clarion's manufacturing employment is in the wood products sector (about 45% of all 1997 employment). The health care, retail and hospitality sectors are also important industries in the County. Perhaps most notably, Clarion University is an important economic force in the County. Its students help keep Clarion Borough vibrant. Also, the staff and faculty contribute greatly to the overall economy.

FARMLANDS

In 1972, the United States Secretary of Agriculture assigned the Soil Conservation Service the task of inventorying the prime and unique farmlands and farmlands of state and local importance. This inventory was designed to assist planners and other officials in their decision making to avoid unnecessary, irrevocable conversion of good farmland to other uses. On the United States Department of Agriculture's important farmland inventory map, the farmlands are categorized into four classifications: prime farmland, unique farmland, additional farmland of statewide importance, and additional farmland of local importance. The definitions of each are explained below, with the total acreage of each category contained within Clarion County indicated in parenthesis:

Prime Farmland (89,162 acres; 24.3%); Land best suited for producing food, feed, forage, fiber, and oilseed crops. The land could be cropland, pastureland, rangeland, or forest land but cannot be already developed or covered by a waterbody. This farmland has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, according to modern farming methods.

Unique Farmland (0 acres); Land other than prime farmland that is used for the production of specific high-value food and high fiber crops. Examples of such crops are: citrus, cranberries, and grapes.

Additional Farmland of Statewide Importance (118,169 acres; 32.3%); Land, in addition to prime and unique farmlands, of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. These lands do not qualify for prime and unique farmland, but meet certain soil characteristics standards, as determined by capability classes assigned to each soil type.

Additional Farmland of Local Importance (0 acres); Land identified by local agencies or officials as having local importance in the production of food, feed, fiber, forage, and oilseed crops, even though they were not identified as having statewide importance.

It is calculated that 56% of Clarion County's land area is classified as "important farmland" and over 24% of the "important farmland" can be labeled "prime farmland". The importance of identifying these areas and planning accordingly is significant. The loss of good farmland is often accompanied by such environmental problems as surface water runoff and interference with the natural recharging of groundwater. Furthermore, when prime agricultural areas are no longer available, farmers will be forced to move to marginal lands, usually on steeper slopes with less fertile soils which are more apt to erode and less likely to produce. Clearly, decision makers must be able to make informed judgments about the development of farmland. Actions that put high quality agricultural areas into irreversible uses should only be initiated if the actions are carefully considered and are clearly for the benefit of public good.

The County Comprehensive Plan showed 147 square miles (24.4% of the County) was in agricultural use in 1997. Between 1969 and 1997, the County lost over 28 square miles of agricultural lands.

FORESTS & PUBLIC LANDS

Over 62% of the County land is identified as forest. Of the approximately 375 square miles of forest, public owned land makes up a considerable amount of forest lands. There are three State Game Lands within the County:

State Game Land	Acres
63	3413
72	2025
74	6320
total	11,758

In addition, Cook Forest State Park is a Pennsylvania State Park on 7,182 acres in Farmington Township. In total, public lands account for 5% of the entire county.

SURFACE MINED LANDS

Bituminous coal deposits underlie western and north-central Pennsylvania, including Clarion County, where it has been extracted from the land and used primarily for electric-power generation. Since the 1830's, bituminous coal has been mined in the County mostly through surface mining techniques where the overburden (soils and other bedrock layers) is removed and relocated to expose the coal for extraction. This process has drastically changed the County's landscape, negatively influencing the hydrologic process. Since the discovery of petroleum in northwestern Pennsylvania, the source of energy has transferred from coal to oil. Coal production has steadily declined after WWII leaving many of the coal mining lands abandoned by their owners.

Abandoned mine sites have left dangerous highwalls, open pits, coal refuse spoil piles, old mine openings, and miles of streams polluted by abandoned mine drainage. Past coal mining practices have led to erosion, landslides, polluted water supplies, destruction of fish and wildlife habitat, and an overall reduction in natural beauty. Abandoned mines leak acidic, metal-contaminated waters into nearby waterways and the ground water.

The pollution is from abandoned strip and deep mines where mining was conducted before the regulation of the industry and further aggravated by mining practices at the time. Most strip mines were not backfilled or planted allowing water to infiltrate through acidic spoil, settle into impoundments and contaminate groundwater supplies. Strip mine activities often removed the outcrop barrier allowing groundwater to flow unimpeded to the surface over the old strip pit. The refuse produced from mining activities (consisting of high sulfur material) was usually just stockpiled, another source of pollution. The problems caused by Abandoned Mine Sites can be classified in several categories:

SAFETY PROBLEMS - Abandoned mine land (AML) sites have contributed to deaths in several states. Highwalls, open shafts, dilapidated mine structures, and water-filled pits present serious health and safety threats.

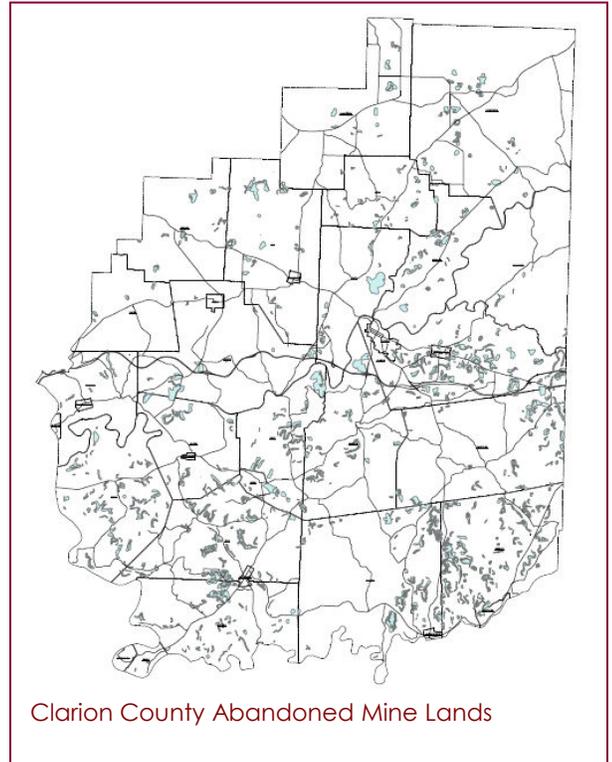
ECONOMIC PROBLEMS -These lands are often located in the most economically depressed areas of our nation. All that remains in many once populated mining communities are scarred lands and a few residents who are willing to commute to larger cities for employment. The AML sites make it difficult to compete for industry and tourism.

AESTHETIC PROBLEMS - The sparse vegetation (if any), stagnant water and illegal trash dumps characterization of AML sites have a negative effect on everyone. The appearance of the site tends to depress land value and detract from the tax base. The environmental scars contribute to an apathetic attitude toward the condition of these areas.

WATER PROBLEMS - Acid run-off and sedimentation from abandoned mine sites contaminate thousands of miles of streams nationwide. This contaminated water eventually serves as potable water supply; therefore, an increase in water treatment costs is needed. Acid mine drainage also leads to increased road maintenance costs, due to the corrosive effects of this drainage on culverts. Streams and drainage systems are often clogged by sedimentation from abandoned mine sites, which, in turn, may cause flooding as a secondary result.

The Surface Mining Conservation and Reclamation Act of 1971, and the Federal Surface Mining Control and Reclamation Act of 1977 have generated regulations intended to eliminate and control adverse conditions resulting from mining operations. Still today, the County lives with the legacy of coal mining. According to PA DEP, there are 393 documented Abandoned Mine Land sites and 2,135 un-reclaimed AML Features which cover 15,227 acres in Clarion County.

In Clarion County there have been many reclamation projects completed and more are in progress. According to DEP, a total of 60 reclamation projects involving 1,620 acres have been undertaken at a cost of \$9,611,036 in Clarion County.



TRANSPORTATION

Transportation in the county has influenced the hydrology of the watersheds. Of the 1,406 miles of roadway, the 28 miles of Interstate 80 that crosses the County are the most important. Route 322 is the second most important and crosses the county east-west. Route 66 is the principal north-south route and is classified as a minor arterial roadway. Route 68 is a minor arterial roadway connecting East Brady to Clarion to the northeast. Route 208 parallels I-80 from Grove City in the west, then heads northeast through Knox ending at Route 36. Route 36 traverses the northeast corner of Clarion County running northwest to southeast.

These major thoroughfares and crossroads provide a critical transportation and commuting link for County residents. However, these routes create an increase of impervious surfaces throughout the watershed. These impervious surfaces create more surface runoff and are non-point source pollution during precipitation events. This increases the stress on the drainage systems in the watershed, reduces water quality, and exacerbates streambank erosion, especially at already-known problem areas.

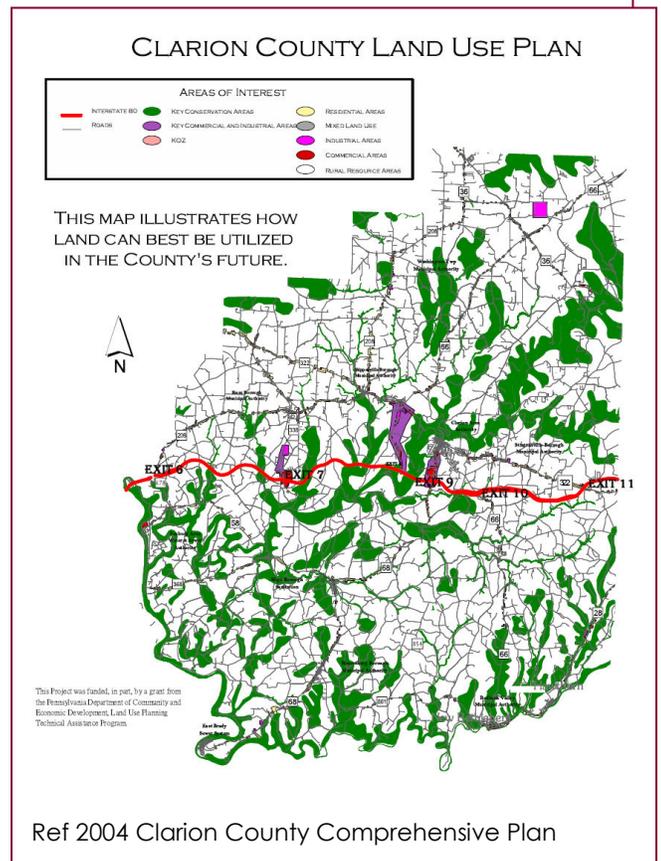
Only one rail line operates in the County (Knox and Kane Railroad) which is used solely for freight traffic and traffic is sporadic. The Clarion County Airport is the only airport in the County. There are no commercial services at the 5,000' field which has 8,000 operations per year, consisting of business and personal (recreational) use.

FUTURE GROWTH PATTERNS

The "core" area of the County is the Borough of Clarion. The 2004 Clarion County Comprehensive Plan identifies "Areas of Interest" which logically follow transportation routes from existing population centers that have public utility services. The core extends into the surrounding Townships of Clarion, Paint, Highland, Limestone and Monroe.

Industrial and commercial growth is identified along routes which intersect I-80 creating interchanges. Specifically, industrial growth is planned for Route 68 from I-80 north toward Clarion, Route 338 from I-80 toward Knox, and along Paint Boulevard from I-80 to Route 322.

It is important to note that the majority of the County is planned as Rural Resource and Key Conservation Areas. The Conservation Areas are important areas adjacent to streams, rivers or have steep slopes and other development constraints. Rural Resource Areas allow for growth through low intensive land uses thereby preserving the rural character of agriculture and forest areas.



PHASE I PLANNING PROCESS

AGREEMENT BETWEEN PADEP AND CLARION COUNTY

An agreement for a Phase I Watershed Stormwater Management Plan Grant for all watersheds of Clarion County was made between the Pennsylvania Department of Environmental Protection and Clarion County on September 11, 2007.

The agreement was made in order for Clarion County to prepare a Stormwater Management Plan in two phases. The first phase (Phase I) is the preparation and submission of a Scope of Study to PADEP for their review and approval. The Scope of Study generally consists of a determination of the level of effort and cost required by Clarion County to satisfactorily complete the second phase (Phase II). Phase II includes the preparation and adoption of the Stormwater Management Plan based on the level of effort identified in Phase I.

The Phase I agreement termination date is June 30th, 2008.

ENGINEERING CONSULTANT SELECTION

In order to assist in the preparation of Phase I, the Clarion County Commissioners selected Herbert, Rowland & Grubic Inc. to provide stormwater planning services to Clarion County and completed this Phase I report.

CREATION AND DISTRIBUTION OF A QUESTIONNAIRE FORM

HRG created the "Clarion County Phase I Act 167 Stormwater Management Plan Questionnaire Form" which was distributed by the Clarion County Regional Planning Commission at various times throughout the Phase I process. All municipalities and other interested citizen groups and public organizations were encouraged to complete the form. The purpose of the 7-page Questionnaire Form was to gather various pieces of information to help determine the level of commitment from each municipality, to reveal what the major stormwater issues were that affected each municipality, and to determine the location of existing problem areas, significant obstructions, and stormwater management facilities.

ESTABLISHMENT OF A WATERSHED PLAN ADVISORY COMMITTEE (WPAC)

An additional purpose of the Questionnaire Form was to gather contact information for representatives of each of the municipalities as well as other concerned organizations, groups, or citizens that would be interested in participating in the Watershed Plan Advisory Committee (WPAC). The purpose of the WPAC is to serve as an access for municipal input, assistance, voicing of concerns and questions, and to serve as a mechanism to ensure that the inter-municipal coordination and cooperation is secured.

As part of a new initiative by PADEP, it is their position that if a representative from each municipality does not volunteer to join the WPAC, then the head of each governing body will be the appointed member to the WPAC. As an appointed member, that member will be provided all correspondence, be considered an active member, and their name will be included in a list as a member of the WPAC contained within the Plan. The head of each governing body will also be asked to assist their municipality in adoption of the provisions and requirements of the final Plan.

WPAC Member	Organization
Bruce Mchenry	Ashland Township
Daryl Wetzel	Beaver Township
Judy Runyan	Brady Township
Randy Larkin/ Arnold Kepple	Callensburg Borough
Joanne Vavrek / Bob Ragon/Brad Stutzman	Clarion Borough
Bergen Dilley	Clarion Township
Steve Heginbotham	East Brady Borough
Keith Etzel	Elk Township
Nancy Mellon	Farmington Township
Jay Croyle/Ed Lowry	Foxburg Borough
Dennis Bish	Hawthorn Borough
Gene Lerch	Highland Township
Jack Bish Jr	Knox Borough
Jacqui Blose	Knox Township
Michael J. Robertson	Licking Township
Bill Fiscus	Limestone Township
Nancy Murray	Madison Township
James Daniels	Millcreek Township
Bob Lewis	Monroe Township
Terry Mateer	New Bethlehem Borough
Randy Vossburg	Paint Township
Lenny Allen	Perry Township
Jesse J. Myers	Piney Township
Rodger L. Travis	Porter Township
Kenneth Allison	Redbank Township
Jack Stewart	Richland Township
Gary Fowler	Rimersburg Borough
Larry Truitt	Salem Township
Michael Cotherman	Shipperville Borough
Dean Steiner	Sligo Borough
William Logue	St. Petersburg Borough
Ron George/ Russell Davis	Strattanville Borough
Bill Salizzoni	Toby Township
Eric Bauer	Washington Township
Trudy Alexander	Conservation District
Bernie Spozio	NRCS
Tim Bruno	PA DEP

Members - Head of Governing Body – Appointed WPAC Member

WATERSHED PLAN ADVISORY COMMITTEE MEETINGS

Two (2) Watershed Plan Advisory Committee meetings were held during the Phase I process. The purposes of the meetings were to gather information and provide education to the WPAC.

WPAC Meeting #1 was held on January 31st, 2008. The meeting provided an overview of the Act 167 process, provided expectations and potential results and outcomes of the Plan, provided an explanation of the Questionnaire Form, began the formation of the WPAC membership and concluded with a question and answer period.

WPAC Meeting #2 was held on May 27th, 2008. Prior to the meeting, a draft copy of the Phase I report was supplied to the WPAC for their review. The purpose of this meeting was to summarize the Phase I report, outline the tasks to be completed during Phase II, and address any comments or concerns of the WPAC from their review of the draft Phase I report.

PHASE I REPORT

The Phase I Report is a scope of study to assist Clarion County in the preparation and finalization of a Phase II Act 167 Stormwater Management Plan. This Phase I Report identifies the scope and provides estimated fees to complete the identified Phase II tasks.

SUBMISSION OF PHASE I REPORT TO PADEP

The Phase I Report – Scope of Study was submitted to the Pennsylvania Department of Environmental Protection for their review and approval in June 2008. Finalization of the Phase I Report will lead to an additional contract between Clarion County and PADEP for the completion of a Phase II Report.

EXISTING WATERSHED PLAN DISCUSSION

PINEY CREEK

The Phase I Scope of Study was completed in 1992 by Clarion County. A Phase 2 Plan was never completed. Data included in the Scope of Work is largely incomplete and outdated.

QUESTIONNAIRE DISCUSSION

QUESTIONNAIRE RESULTS

The Questionnaire was designed to solicit input from each municipality and other interested organizations, relative to specific problem areas throughout Clarion County, as well as the needs they may see for stormwater management in their particular municipality. The Questionnaire was distributed, along with an educational handout during the WPAC#1 meeting in Phase I. The Questionnaire included a map of the individual municipalities and was used to identify locations of problem areas, significant obstructions, and existing or proposed stormwater management facilities. (A copy of the Questionnaire is included as Appendix A of this document.) In addition, the information contained within the Questionnaires was instrumental in determining the scope of Phase II planning.

Because the most important part of the Act 167 planning process is the implementation of the final provisions and standards of the PLAN, another reason for utilizing this Questionnaire is to develop interest in stormwater management issues by the municipalities. Attempting to obtain municipal “buy-in” of the project was a key element during the entire Phase I process.

Obtaining support from these municipalities early in the process will ensure a better end product and hopefully ease the process of adoption and implementation by each municipality within Clarion County.

Questionnaires were received from 26 out of the 34 municipalities in Clarion County. Through analysis of the results of the Questionnaires it was determined that there were many stormwater issues that were important. One question asked "What is the most important stormwater related issue to your municipality?" The responses were varied due to the particularities of the municipalities, but centered on common themes. Flooding and erosion were the most common themes. Some of the questions used a sliding scale to rate the respondents' attitudes toward stormwater issues. On average, the respondents are somewhat supportive of this project (3.6 out of 5). Of the typical types of stormwater issues presented, the most important issues are (in order) Peak Flows, Water Quality, and Stream Bank Protection. Where questions dealt with the level of severity, both stream bank erosion and street flooding were the leading issues.

The Questionnaire also requested the identification of problem areas, significant obstructions and stormwater management systems. A map was provided to locate the areas. Respondents identified over 96 problem areas, 33 significant obstructions and about 22 stormwater management systems. The identified problem areas, as well as the significant obstructions, will form the basis for the watersheds scheduled for detailed study and modeling in Phase II. A review of the listed areas reveals typical problems mostly dealing with flooding and roadway erosion. Acid mine drainage (pollution) was another cited problem.

A summary of the results of the Questionnaires can be found in Appendix B.

PHASE II DISCUSSION

ITEMS TO BE ADDRESSED IN PHASE II

During Phase I, the WPAC made several decisions regarding certain specific items that should be addressed during the Phase II planning process and the Phase II Final Plan. Refer to Appendix C of this report for a detailed breakdown of the Phase II Scope of Work.

A summary of the specific tasks and subtask shall be as follows:

Task A – Data Collection/Review/Analysis

- SubTask A.1 – Data Collection
- SubTask A.2 – Municipal Ordinance Reviews/Evaluations
- SubTask A.3 – Data Preparation for Technical Analysis

Task B – Technical Analysis

- SubTask B.1 – Implement Volume Controls
- SubTask B.2 – Implement Rate Controls
- SubTask B.3 – Model Subwatersheds of Designated Watersheds
- SubTask B.4 – Provide Conceptual Solutions for Existing Problem Areas
- SubTask B.5 – Goals, Objectives, and Compilation of All Technical Standards
- SubTask B.6 – Implementation of Technical Standards and Criteria
- SubTask B.7 – Economic Analysis
- SubTask B.8 – Regulations for Activities Impacting Stormwater Runoff
- SubTask B.9 – Water Quality Impairments

Task C – Public/Municipal Participation

Task D – Plan Preparation and Implementation

SubTask D.1 – PLAN Report Preparation

SubTask D.2 – Model Ordinance Preparation

SubTask D.3 – PLAN Adoption

One of the most critical issues during Phase I was the determination of which and how many of the PADEP designated watersheds would be modeled during Phase II. Only subwatershed areas with problem areas or significant development pressures will be modeled in Phase II. Problem areas generally include flooding, stream channel and bank erosion, property damage, etc. A total of 127 problem areas and obstructions were identified from the Questionnaire and are distributed among the County's watersheds as shown in the table below:

Act 167 Designated Watershed	Problem area	Obstr.	Total	
Allegheny River	17	1	18	14.2%
Clarion River	29	9	38	29.9%
Deer Creek	13	2	15	11.8%
East Sandy Creek	0	0	0	0.0%
Licking Creek	31	3	34	26.8%
Piney Creek	0	12	12	9.4%
Redbank Creek	4	4	8	6.3%
Tionesta Creek	0	0	0	0.0%
Toms, Cather, Maxwell, Blyson & McCanna Runs	2	0	2	1.6%
	96	31	127	

When viewed on a map, the areas are concentrated mostly in the central portion of the County and the southeastern portion of the County. Through analysis of these identified areas, the following table illustrates the proposed extent of detailed study:

Watershed	Study	Extent	Notes
Allegheny River	Limited	Tributaries to Allegheny River	Detailed study of areas tributary to identified areas.
Clarion River	Limited	Upper portion of watershed	Contains the most identified areas & growth identified
Deer Creek	Limited	Paint & Little Paint Creeks	Detailed study of areas tributary to identified areas.
East Sandy Creek	No	None	Limited identified areas & growth identified
Licking Creek	Limited	Cherry Run, Little & Licking Creeks	Detailed study of areas tributary to identified areas.
Piney Creek	Limited	Piney Creek	Detailed study of areas tributary to identified areas.
Redbank Creek	No	None	
Tionesta Creek	No	None	
Toms, Cather, Maxwell, Blyson & McCanna Runs	No	None	

As part of the Phase II work, standards will be created to be included in the Plan to address activities impacting stormwater runoff such as timber harvesting and oil/gas development. These regulations are not meant to discourage the activities, but instead make sure that they are completed in a proper manner with due regard to stormwater management.

GENERAL WORK PLAN

PHASE II AGREEMENT

Upon completion and submission of the Phase I report to PADEP, Clarion County and PADEP will enter into an agreement to complete the Phase II portion of the project. Funding for the project should be allocated by PADEP prior to the beginning of any of the Phase II tasks. A 75% reimbursement procedure will be implemented between Clarion County and PADEP during the Phase II project.

CONSULTANT SELECTION

It is recommended that Clarion County secure an engineering consultant to assist in completing at least the technical analysis task of the Phase II project. A qualified consultant knowledgeable in the Act 167 process (including adoption and implementation procedures), stormwater issues in the County, and municipalities within the County, will benefit the County during the Phase II process.

QUESTIONNAIRE

A Questionnaire Form was distributed during and subsequent to the first WPAC meeting during Phase I. The Questionnaire (see Appendix A) solicited information on problem areas, obstructions, existing and proposed stormwater facilities, and flood control facilities. Other information requested relates to municipal ordinances, support for the plan, relative importance of various plan criteria, and interest in best management practices (BMPs). The municipalities were also asked to appoint a WPAC representative. The data collected through the Questionnaire will assist in technical and non-technical aspects of the planning process and in scoping the overall Plan. The problem areas and significant obstructions indicated in the Questionnaires will need to be analyzed during Phase II and will become the basis of required subwatershed area modeling.

WATERSHED PLAN ADVISORY COMMITTEE (WPAC)

During the Phase I portion of this project, a WPAC was formed. Many of the WPAC members indicated their willingness to volunteer to join the committee through the Questionnaire Form. In addition, letters were mailed to each municipality requesting them to appoint at least one person from their individual municipality to become a member of the committee. This letter was in response to Section 6(a) of the Pennsylvania Management Act (Act 167), which states "The county shall establish, in conjunction with each watershed stormwater planning program, a watershed plan advisory committee composed of at least one representative from each municipality within the watershed, the county soil and water conservation district and such other agencies or groups as are necessary and proper to carry out the purposes of the committee." Also stated in the letter was PADEP's position that if a representative from a municipality was not appointed, then the head of the governing body will be appointed to the WPAC.

It is intended that the WPAC will continue to serve as the primary source of plan guidance for the overall planning process throughout Phase II. The committee members will also serve as the primary contact point for the municipalities/organizations that they represent. It is anticipated

that each of these municipalities/organizations will continue to have representation in the WPAC.

Through the Questionnaire Form, the WPAC identified the following organizations as possible WPAC participants:

- The Pennsylvania Department of Transportation
- Toby Creek Watershed Association

These organizations and entities were contacted and invited to join the WPAC during Phase I. Additional stakeholders may be identified during Phase II. If appropriate, an invitation to join the WPAC will be extended to these entities.

MUNICIPAL ENGINEERS PARTICIPATION

Two of the WPAC meetings will focus on the more technical aspects of the Plan. These elements include modeling, technical analysis, and development of management criteria. This meeting will be encouraged to be attended by municipal engineers and will focus solely on the engineering aspects of the Plan as opposed to the more general objectives and overall contents of the Plan.

LEGAL ADVISORY PARTICIPATION

Another WPAC meeting will have a purpose to incorporate information between municipal solicitors into the Plan. This committee will focus on implementation of the Model Ordinance from a legal and regulatory framework standpoint.

STANDARDS

The Plan will include criteria for a comprehensive stormwater management strategy that includes two elements:

- Peak Rate Control Management
- Volume Control Management

Peak Rate Control Management – Implementation of Release Rates for various subwatersheds will be developed based on collected data, modeling, engineering judgment, and committee input.

Volume Control Management – Implementation of Control Guidance 1 and Control Guidance 2 from the *Pennsylvania Stormwater Best Management Practices Manual*.

ROLES OF COUNTY AND CONSULTANT

The division of work and responsibilities between Clarion County and the Consultant should be determined prior to the beginning of Phase II tasks. Generally, the County may serve as project coordinator and be responsible for non-technical aspects of the Plan. This may include appropriate data collection, plan composition, ordinance analysis, and assisting the Consultant with field data collection.

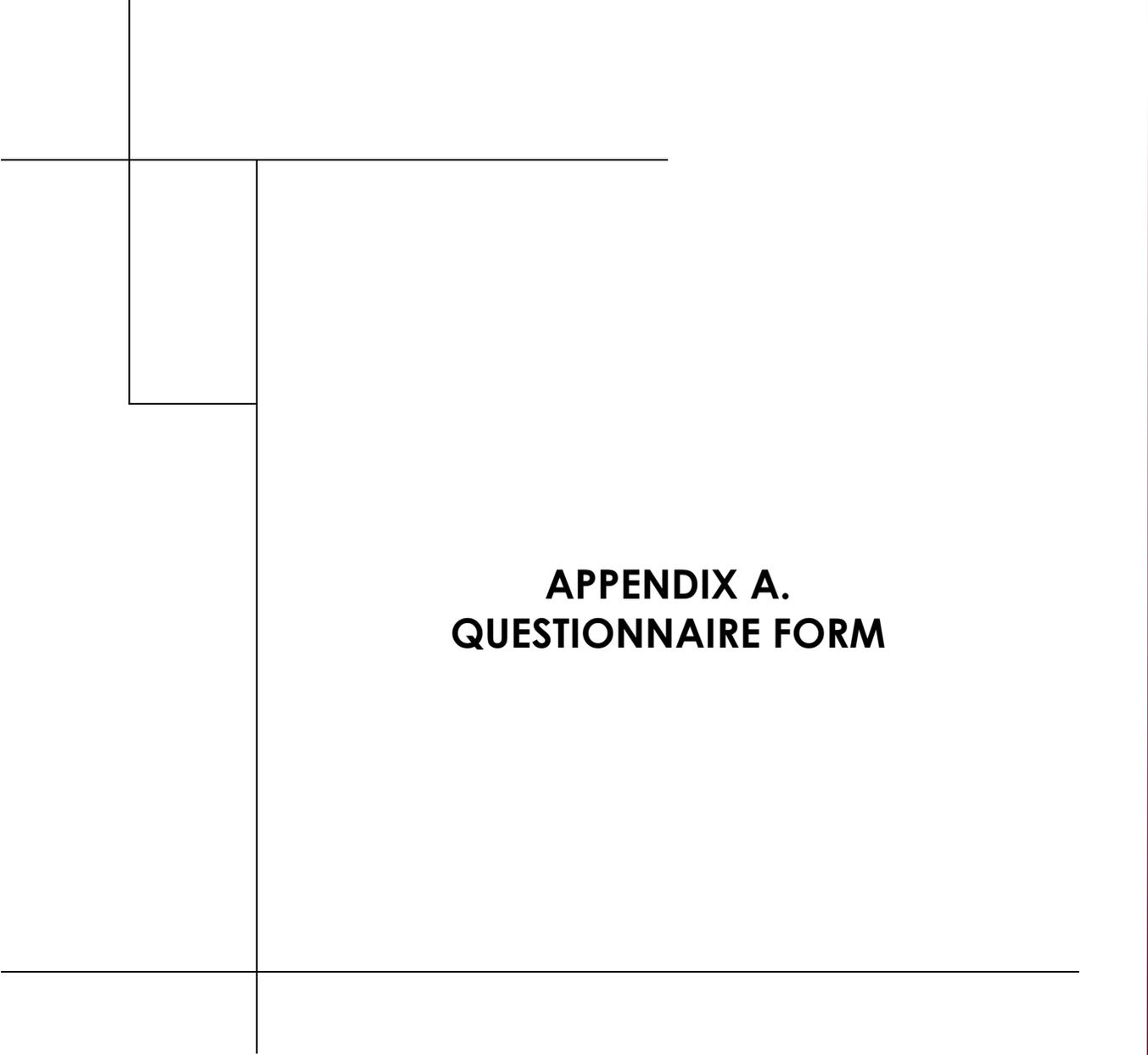
The Consultant would be responsible for technical aspects of the Plan. This includes data review, problem area and significant obstruction analysis, hydrologic modeling, development of technical criteria, and economic analysis. The Consultant would compose technical components of the Plan text and provide draft and final project mapping.

WORK SCHEDULE

A work schedule should be developed early in the Phase II process in conjunction with Clarion County and the Consultant. The work schedule will be formulated to set target dates for various tasks with the intention of completing the project for PADEP review within the Phase II contract period.

REFERENCES

1. Clarion County Planning Commission, *Clarion County Comprehensive Plan, Volume I - Citizen Involvement and Vision Building*, 1999.
2. Clarion County Planning Commission, *Clarion County Comprehensive Plan, Volume II – Background Studies*, 2000.
3. Clarion County Planning Commission, *Clarion County Comprehensive Plan*, 2004.
4. United States Department of Agriculture Soil Conservation Service, *Soil Survey of Clarion County, Pennsylvania*, 1955.
5. Maryland Department of the Environment, *2000 Maryland Stormwater Design Manual Volumes I & II*, 2000.
6. Pennsylvania Association of Conservation Districts, *Pennsylvania Handbook of Best Management Practices for Developing Areas*, November 14, 1997.
7. Pennsylvania Department of Environmental Protection – Bureau of Watershed Management, *Pennsylvania Stormwater Best Management Practices Manual*, December 2006.
8. Pennsylvania Department of Environmental Protection – Bureau of Watershed Management, *Pennsylvania Model Stormwater Management Ordinance*, January 2007.
9. Pennsylvania Department of Conservation and Natural Resources – Bureau of Topographic and Geological Survey, *Geologic Map of Pennsylvania, 4th series*, 1980.
10. Pennsylvania Department of Conservation and Natural Resources – Bureau of Topographic and Geological Survey, *Map 13 - Physiologic Provinces of Pennsylvania, 4th edition*, 2000.



**APPENDIX A.
QUESTIONNAIRE FORM**

Clarion COUNTY WATERSHEDS

Act 167 Stormwater Management Plan

QUESTIONNAIRE

PLEASE COMPLETE THE FOLLOWING AND RETURN THE QUESTIONNAIRE AND MARKED UP MAP TO:

DOUGLAS E. WEIKEL, PE

Herbert, Rowland & Grubic, Inc.

474 Windmere Drive

State College PA 16801

(An addressed envelope with postage is provided for your convenience.)

PERSON COMPLETING QUESTIONNAIRE

	Municipality
	Name
	Phone
	e-mail

1. DOES YOUR MUNICIPALITY HAVE?

	Yes	No	Location/Date
Comprehensive Plan	<input type="checkbox"/>	<input type="checkbox"/>	
Zoning Ordinance	<input type="checkbox"/>	<input type="checkbox"/>	
Subdivision/Land Development Ordinance	<input type="checkbox"/>	<input type="checkbox"/>	
Floodplain Regulations *	<input type="checkbox"/>	<input type="checkbox"/>	
Stormwater Management Regulations *	<input type="checkbox"/>	<input type="checkbox"/>	
Erosion Control Regulations *	<input type="checkbox"/>	<input type="checkbox"/>	
Drainage Regulations *	<input type="checkbox"/>	<input type="checkbox"/>	

*For the above regulations, please list where the regulation is found in the "Location" column.

Use the following abbreviations:

CP = comprehensive plan

ZO = zoning ordinance

BC = building code

SO = seperate ordinance

SL = subdivision/land development ordinance

2. IS YOUR MUNICIPALITY CONSIDERED AN MS4 MUNICIPALITY UNDER THE CURRENT NPDES PHASE II STORMWATER REGULATIONS? (PLEASE CIRCLE ONE)

Yes	No
-----	----

IF YES, IS YOUR MS4 MUNICIPALITY CURRENTLY IN COMPLIANCE WITH THE NPDES PHASE II PERMIT?

Yes	No
-----	----

3. THE WATERSHED PLAN WILL ADDRESS FIVE KEY STORMWATER CONSIDERATIONS. THESE FIVE ARE LISTED BELOW. PLEASE INDICATE HOW IMPORTANT YOU BELIEVE IT IS TO ADDRESS EACH CONSIDERATION.

CONSIDERATION		Very Important				Not Important
		5	4	3	2	1
Peak Flows	Increased flows from stormwater runoff contribute to stream erosion, localized ponding and flooding, may cause damage to infrastructure (roads, sewers, etc.).	<input type="checkbox"/>				
Water Quality	Dissolved and un-dissolved pollutants washed off the land surface – negative impacts to recreation, aesthetics and in-stream habitat.	<input type="checkbox"/>				
Groundwater Recharge	Increased runoff decreases amount of rain that becomes groundwater; decreased groundwater supplies may have negative effects on well water supplies and decrease or dry up stream baseflow in dry periods.	<input type="checkbox"/>				
Stream Erosion	Eroding banks and beds may undercut roads and utilities, damages in-stream habitat, clog culverts and bridges.	<input type="checkbox"/>				
Flooding	Larger scale overbank flows such as the 100-year flood associated with extreme storm events	<input type="checkbox"/>				

4. WOULD YOU LIKE TO SEE INFORMATION ON ANY OF THE FOLLOWING PRESENTED AT A WATERSHED PLAN ADVISORY COMMITTEE MEETING?

	Yes	Maybe	No
Best Management Practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Model/Implemented Ordinances	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Information on Act 167 reimbursements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other topics you would like to have considered: _____			

5. WHAT IS THE MOST IMPORTANT STORMWATER RELATED ISSUE TO YOUR MUNICIPALITY?

6. THE FOLLOWING LISTS THE TYPES OF STORMWATER RELATED PROBLEMS YOUR MUNICIPALITY MAY BE EXPERIENCING. FOR EACH PROBLEM TYPE, PLACE A CHECK MARK IN THE COLUMN THAT BEST DESCRIBES THE SEVERITY, FREQUENCY AND CAUSE. IF YOUR MUNICIPALITY IS EXPERIENCING A PROBLEM NOT LISTED, PLEASE LIST IT IN THE SPACE MARKED "OTHER".

PROBLEM	SEVERITY			FREQUENCY (YEARS)				CAUSE				
	Severe	Moderate	None	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown
Stream Flooding	<input type="checkbox"/>											
Street Flooding	<input type="checkbox"/>											
Property Flooding	<input type="checkbox"/>											
Soil Erosion	<input type="checkbox"/>											
Sediment in Streams	<input type="checkbox"/>											
Stream Bed/Bank Erosion	<input type="checkbox"/>											
Scour at Outfalls	<input type="checkbox"/>											
Property/Infrastructure Damage	<input type="checkbox"/>											
Pollution	<input type="checkbox"/>											
Habitat/Resource Damage	<input type="checkbox"/>											
Other	<input type="checkbox"/>											

7. STORMWATER MANAGEMENT PLANS ARE REQUIRED UNDER THE PENNSYLVANIA STORMWATER MANAGEMENT ACT, ACT 167. AUTHORIZATION TO PROCEED WITH THIS PLAN AS REQUIRED BY ACT 167 HAS BEEN GIVEN BY THE COUNTY. THE LONG-TERM GOAL OF THIS PLAN WILL BE TO MAINTAIN EXISTING HYDROLOGIC CONDITIONS INCLUDING GROUNDWATER LEVELS, WATER QUALITY, STREAM BASE FLOW AND STREAM STORM FLOWS. WITH THIS IN MIND, WHAT LEVEL OF SUPPORT WILL YOUR MUNICIPALITY OR AGENCY PROVIDE FOR THIS PROJECT?

Strongly Support				Strongly Oppose
5	4	3	2	1
<input type="checkbox"/>				

8. WILL YOUR MUNICIPALITY/AGENCY ATTEND WATERSHED PLAN ADVISORY COMMITTEE MEETINGS? MEETINGS ARE EXPECTED TO BE HELD APPROXIMATELY 4 TIMES PER YEAR FOR APPROXIMATELY 2 YEARS. (PLEASE CIRCLE ONE)

Yes		No	
If yes, who will attend meetings on behalf of your municipality or organization?			
Name			
Address			
Phone			
e-mail			

9. WOULD YOU SUGGEST ANY OTHER AGENCIES OR ORGANIZATIONS THAT SHOULD BE INCLUDED ON THE WATERSHED PLAN ADVISORY COMMITTEE? IF SO, PLEASE GIVE CONTACT INFORMATION BELOW:

Name	
Organization	
Address	
Phone	
e-mail	

10. DO YOU KNOW OF ANY EXISTING OR PROPOSED FLOOD CONTROL PROJECTS IN YOUR MUNICIPALITY? (please circle one)

Yes	No
If yes, please describe the project(s) below:	

11. ARE EXISTING (PUBLIC OR PRIVATE) STORMWATER MANAGEMENT FACILITIES (OUTFALLS, BASINS, ETC.) BEING MAINTAINED (I.E. REMOVAL OF DEBRIS FROM OUTLET STRUCTURES, ADEQUATE CONTROL OF VEGETATION, CAPACITY MAINTENANCE, ETC.)? (please circle one)

Yes	No
If yes, please describe the locations(s) below:	

12. PLEASE PROVIDE ANY INPUT YOU FEEL IS RELEVANT REGARDING CURRENT WATERSHED MANAGEMENT PROCEDURES.

--

13. THE FOLLOWING TABLE REQUESTS INFORMATION ON PROBLEM AREAS AND OBSTRUCTIONS. PLEASE PLACE A CHECK MARK IN THE “P” COLUMN IF THE SITE IS A PROBLEM AREA OR PLACE A CHECK MARK IN THE “O” COLUMN IF THE SITE IS AN OBSTRUCTION.

Problem Areas - Areas of ponding or flooding, erosion, stream channel or bank erosion, property damage, safety concerns, etc.

Obstructions - Bridges, pipes, culverts, dams or other physical barriers to stream flow that restrict the channel flow and typically cause ponding or flooding upstream of the structure.

In the “Description” column describe the type, location, & size of the Problem Area or Obstruction, (i.e. “undersized 36-inch CMP where Main Street crosses Sandy Creek”. For each site listed, place the Number of the site at the appropriate location on the enclosed map of your Municipality (attached at the end of this packet). If a solution to the Problem Area or Obstruction is proposed, describe the solution in the “Solution” column. Please copy this sheet if additional space is needed.

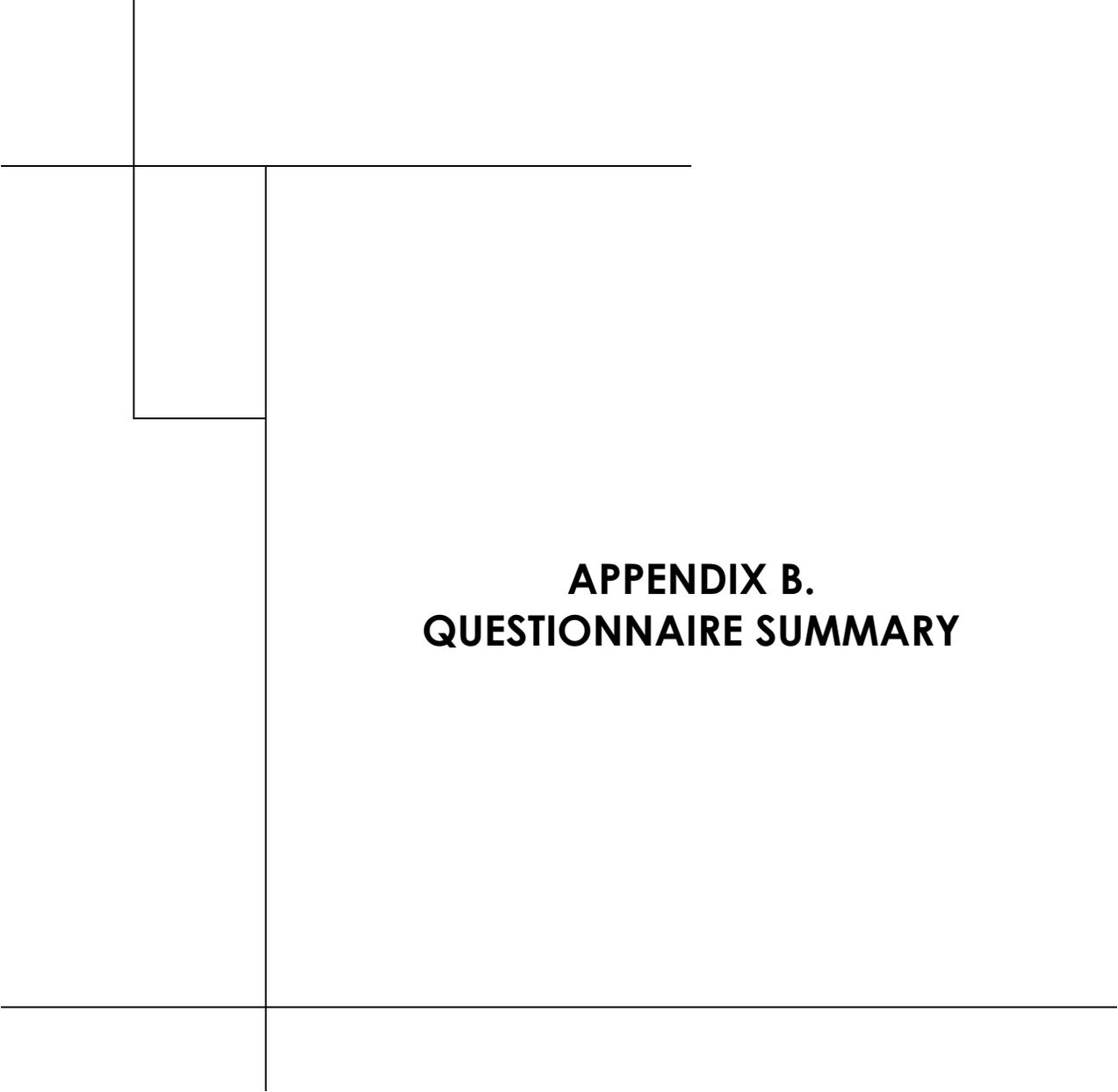
Number	Problem	Obstruction	Description	Solution
1	<input type="checkbox"/>	<input type="checkbox"/>		
2	<input type="checkbox"/>	<input type="checkbox"/>		
3	<input type="checkbox"/>	<input type="checkbox"/>		
4	<input type="checkbox"/>	<input type="checkbox"/>		
5	<input type="checkbox"/>	<input type="checkbox"/>		
6	<input type="checkbox"/>	<input type="checkbox"/>		
7	<input type="checkbox"/>	<input type="checkbox"/>		
8	<input type="checkbox"/>	<input type="checkbox"/>		
9	<input type="checkbox"/>	<input type="checkbox"/>		
10	<input type="checkbox"/>	<input type="checkbox"/>		
11	<input type="checkbox"/>	<input type="checkbox"/>		
12	<input type="checkbox"/>	<input type="checkbox"/>		

Please copy this sheet if additional space is needed.

14. THE FOLLOWING REQUESTS INFORMATION ON EXISTING OR PROPOSED STORM SEWER SYSTEMS OR MANAGEMENT FACILITIES. THESE ARE STORM SEWER SYSTEMS, PERMANENT STORMWATER DETENTION PONDS, UNDERGROUND DETENTION FACILITIES OR OTHER SYSTEMS OR FACILITIES INTENDED TO COLLECT, CONVEY OR DETAIN STORMWATER. PLEASE LETTER EACH SITE SEQUENTIALLY AND PLACE THE LETTER CORRESPONDING TO EACH SITE AT THE APPROPRIATE LOCATION ON THE ENCLOSED MAP OF YOUR MUNICIPALITY. PLEASE COPY THIS SHEET IF ADDITIONAL SPACE IS NEEDED.

Letter	Description
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	

Please copy this sheet if additional space is needed.



**APPENDIX B.
QUESTIONNAIRE SUMMARY**

Summary Table of information provided by the WPAC through the Questionnaire Form:

MUNICIPALITY/AGENCY	Q1							Q2		Q3					Q7	Q8	Q10	Q11
	Comp Plan	Zoning Ord	SALDO	Floodplain Regs	SWM Regs	E&S Regs	Drainage Regs	MS4	In compliance	Peak Flow Rates	Water Quality	Groundwater Recharge	Stream Bank Protection	Flooding	Support Project	WPAC	Flood Control Projects	Maintained SW Facilities
Ashland Township	Y	N	N	Y	N	N	N	N		2	3	3	3	3	2	Y	N	Y
Beaver Township		N	N					N	N	5	5	5	5	5	2	Y	N	
Brady Township																		
Callensburg Borough	Y	N	N	N	N	N	N	N		1	1	1	1	1	1	N	N	Y
Clarion Borough	Y	Y	Y	Y	Y	N	N	N		4	5	5	4	4	5	Y	N	Y
Clarion Township																		
East Brady Borough	N	N	N	N	N	N	N	N		5	5	5	5	5	4	Y	N	N
Elk Township	N	N	N	N	N	N	N	N		5	4	4	5	5	3	Y	N	Y
Farmington Township	N	N	N	Y	N	N	N	N		5	5	3	5	2	5	Y	N	Y
Foxburg Borough	Y	N	N	Y	N	N	N			5	5	5	5	5	3		N	Y
Hawthorn Borough	N	N	N	N	N	N	N	N		4	4	2	4	2	5	Y	N	N
Highland Township	N	N	Y	N	N	N	N	N		4	4	1	4	1	4	Y	N	N
Knox Borough	Y	N	Y	Y	Y	Y	Y	N		5	5	3	5	5	5	Y	N	Y
Knox Township																		
Licking Township																		
Limestone Township	Y	N	Y	Y	N	N	N	N		5	4	2	3	5				
Madison Township	N	N	N	Y	N	N	N	Y		5	3	3	5	5	2	Y	N	N
Millcreek Township	Y	Y	Y	Y	Y	N	N	N		5	5	5	5	5	5	Y	N	N
Monroe Township																		
New Bethlehem Borough	Y	Y	Y	Y	N	N	Y	N		5	1	2	5	5	5	Y	N	Y
Paint Township	Y	N	N	Y	N	N	N	N		5	5	2	3	3	3	N	N	Y
Perry Township	N	N	N	N	N	N	N	N		5	5	5	4	3	4	Y	N	Y
Piney Township																		
Porter Township	N	N	Y	N	N	N	N	N		4	3	4	4	3	4	Y	N	
Redbank Township																		
Richland Township	Y	N	N	Y	N	N	N	N		1	1	1	1	1		Y	N	N
Rimersburg Borough	N	N	N	N	N	N	N	N		5	5	5	5	5	4	Y	N	N
St. Peterburg Borough	Y	N	N	N	N	N	N	N		4	5	5	4	4	5	Y	N	Y
Salem Township	N	N	N	N	N	N	N	Y	N	4	3	2	4	4	2	Y	N	N
Shipperville Borough	N	N	N	N	N	N	N	N		3	4	3	3	5	4	Y	N	N
Sligo Borough	N	N	N	Y	N	N	N	N		5	5	3	5	5	5	Y	N	N
Strattanville Borough	N	N	N	N	N	N	N	N		1	1	1	1	1	2	N	N	Y
Toby Township	Y	N	Y	N	N	N	N	N		5	5	5	5	5	3	Y	N	N
Washington Township																		
Conservation District																		

Municipal Response % **76%** **4.1 3.9 3.3 4.0 3.7 3.6**

- Question 1. Does your Municipality have the following regulations?
- Question 2. Is your Municipality considered an MS4? In compliance? Interested in intermunicipal cooperation?
- Question 3. How important (5 - Very Important) to (1- Not Important) are the following issues?
- Question 7. How much support will your Municipality provide (5- Strongly Support) to (1- Strongly Oppose)?
- Question 8. Will your Municipality participate in the WPAC (Yes or No)?
- Question 11. Are there existing or proposed flood control projects in your Municipality (Yes or No)?
- Question 10. Are existing stormwater management facilities being maintained (Yes or No)?

MUNICIPALITY/AGENCY	Q5. WHAT IS THE MOST IMPORTANT STORMWATER ISSUE?
Ashland Township	PIPE FLOWS
Beaver Township	
Brady Township	
Callensburg Borough	
Clarion Borough	I&I IN SANITARY SEWER, TROUT RUN WATERSHED IMPACT, UNIVERSITY MANOR STORMWATER AND GROUNDWATER OVERLOAD
Clarion Township	
East Brady Borough	
Elk Township	100 YR FLOOD (CULVERTS DESIGNED FOR MINOR STORMS)
Farmington Township	STORMWATER ISSUES DUE TO DEVELOPMENT
Foxburg Borough	I&I IN SANITARY SEWER
Hawthorn Borough	ROADS & SWALES
Highland Township	EROSION OF TWP ROADWAY TO CLARION RIVER, EROSION DAMAGE TO EARTH AND STONE CAUSEWAY
Knox Borough	OVERLOADING SYSTEM CAUSING FLOODING
Knox Township	
Licking Township	
Limestone Township	ROADWAY FLOODING AND EROSION, BASEMENT FLOODING
Madison Township	EROSION, WATER RUNOFF, AND FLOODING
Millcreek Township	
Monroe Township	
New Bethlehem Borough	FLOODING OF REDBANK CREEK
Paint Township	
Perry Township	RUNOFF FROM STRIP MINING, ALLEGHENY RIVER
Piney Township	
Porter Township	
Redbank Township	
Richland Township	
Rimersburg Borough	
St. Peterburg Borough	WATER QUALITY, GROUNDWATER RECHARGE
Salem Township	
Shippenville Borough	
Sligo Borough	FLOODING OF LICKING CREEK AND ITS TRIBS.
Strattanville Borough	
Toby Township	
Washington Township	
Conservation District	

Summary Table of Problem Areas provided by the WPAC through the Questionnaire Form:

ID	MUNICIPALITY	LOCATION	DESCRIPTION	PROPOSED SOLUTION
P1	ASHLAND TWP	VARIOUS THROUGHOUT	252 ROAD CROSSINGS	
P2	TOBY TWP	SR 3012 / TWP 378	SEVERE FLOODING	STREAM DREDGING
P3	TOBY TWP	SR 3012 / SR 68	FLOODING	LARGER CULVERT
P4	TOBY TWP	TWP 448	FLOODING	LARGER CULVERT
P5	TOBY TWP	TWP 452	FLOODING	ADDITIONAL CULVERT
P6	TOBY TWP	TWP 481	FLOODING	ADDITIONAL CULVERT
P7	TOBY TWP	TWP 376	EROSION / STREAM MIGRATION	DREDGING, ADDITIONAL CULVERT, RAISE ROADWAY
P8	TOBY TWP	SR 3012 / SR 68	FLOODING	
P9	TOBY TWP	TWP 373	FLOODING	
P10	TOBY TWP	TWP 374	ROADWAY DESTRUCTION, MUDSLIDES	
P11	TOBY TWP	TWP 377	FLOODING, SINKHOLE IN ROAD	
P12	TOBY TWP	TWP 368	FLOODING, ROADWAY DAMAGE	RAISE ROADWAY, ADDITIONAL CULVERT
P13	TOBY TWP	TWP 353	FLOODING	
P14	TOBY TWP	TWP 352		ERADICATE BEAVERS
P15	TOBY TWP	TWP 305		LARGER CULVERT
P16	TOBY TWP	SR 3012		LARGER CULVERT, REROUTE CHANNEL
P17	CLARION BORO	TROUT RUN		DREDGING
P18	CLARION BORO	UNIVERSITY MANOR	INADEQUATE STORM SEWER	INCREASE INLETS, PIPING
P19	CLARION BORO	S FIFTH AVE CORRIDOR	FLOODING	
P20	CLARION BORO	TROESE ADDITION	FLOODING	INCREASE INLETS, PIPING
P21	CLARION BORO	6TH AVE. AT SOUTH ST. TO BARDER ST	INADEQUATE STORM SEWER	LARGER PIPING, ADDITIONAL INLETS
P22	CLARION BORO	7TH AVE SOUTH ST - BARDER ST	NO INLETS	INSTALL STORM SEWER SYSTEM
P23	CLARION BORO	PENN AVE - FERN ST.- FRAMPTON ST.	NO STORM SEWERS	INSTALL STORM SEWER SYSTEM
P24	CLARION BORO	SHERIDAN RD.	ROADWAY DESTRUCTION, NO DRAINAGE	ADD DRAINAGE
P25	CLARION BORO	TOBY HILL RT 966	OBSTRUCTION BY DEBRIS	INSTALL PIPING TO LIMIT DEBRIS - INCREASE CLEANING
P26	CLARION BORO	SOUTH ST. AT HASKELL PL.	FLOODING	INSTALL INLETS, PIPING
P27	CLARION BORO	CAMPBELL AVE. - E. 8 AVE.	LIMITED STORM SEWER	EXPAND STORM SEWER SYSTEM
P28	FOXBURG BORO	SUMMIT AVE	POOR DRAINAGE	INSTALL STORM DRAINS
P29	HIGHLAND TWP	HIGHLAND DRIVE	EROSION	ROADWAY GRADING
P30	SLIGO BORO		CHANNEL BACKFILL	
P31	SLIGO BORO	FRONT STREET	FLOODING	
P32	SLIGO BORO	LICKING CREEK AT BORO LIMITS	STRIP MINE RUNOFF	
P33	SLIGO BORO	THROUGHOUT BORO	ACID MINE DRAINAGE	
P34	SLIGO BORO	CRAIGS RUN	ACID MINE DRAINAGE	
P35	SLIGO BORO	FRONT STREET	ARTISAN SPRING	
P36	ST PETERSBURG BORO	MAIN ST.	FLOODING	
P37	ST PETERSBURG BORO	MAIN ST.	FLOODING FROM CHESTNUT ST	
P38	ST PETERSBURG BORO	EMLENTON ST.	FLOODING	
P39	ST PETERSBURG BORO	SR 478	FLOODING WATER SUPPLY	
P40	PAINT TWP	INT OF SYCAMORE AND WOODLAND	PONDING WATER	ADDITIONAL CURBING, INLETS, STORM SEWER
P41	PAINT TWP	SR 322	ROAD FLOODING	

ID	MUNICIPALITY	LOCATION	DESCRIPTION	PROPOSED SOLUTION
P42	PAINT TWP	PAINT MILLS RD	OUTFLOW SCOUR	
P43	PAINT TWP	SR 4029	FLOODING, EROSION, ROADWAY DAMAGE	IMPROVED ROAD DRAINAGE
P44	PAINT TWP	MCCLAIN WATSON RD	FLOODING	LARGER CULVERT
P45	PAINT TWP	MEYERS RD	EROSION	
P46	PAINT TWP	BRENIMAN RD	EROSION	IMPROVED DRAINAGE
P47	PAINT TWP	OAKWOOD LANE	FLOODING	
P48	PAINT TWP	MCCLAIN RD, WATSON RD, GLOSSER RD	FLOODING	ADDITIONAL CULVERT
P49	PAINT TWP	MCCLAIN WATSON ROAD	EROSION AND FLOODING	
P50	PAINT TWP	MEYERS RD	EROSION AND FLOODING	MINE RECLAMATION
P51	PAINT TWP	BENNER ROAD	FLOODING	ADDITIONAL MAINTENANCE
P52	PAINT TWP	MARRIANNE	FLOODING	ADDITIONAL MAINTENANCE
P53	PAINT TWP	SR 322 AND DOE RUN	FLOODING	
P54	PAINT TWP	WILLOW LN	FLOODING	
P55	PAINT TWP	DOE RUN RD	FLOODING	REDIRECT WATER
P56	PAINT TWP	SR 0066	FLOODING	ADDITIONAL STORM SEWER
P57	PAINT TWP	SR 322	FLOODING	
P58	PAINT TWP	RIDGEWOOD CT	FLOODING	ADDITIONAL STORM SEWER
P59	PAINT TWP	STEINER RD	EROSION	INSTALL ENERGY DISSIPATERS
P60	PAINT TWP	AMSLER AVE	POOR DRAINAGE	
P61	PAINT TWP	SR 0066	FLOODING	
P62	PAINT TWP	SYCAMORE	FLOODING	PAVE CURB AND GUTTER
P63	PAINT TWP	RIDGEWOOD ROAD	FLOODING	ADDITIONAL INLETS
P64	NEW BETHLEM BORO	LEASURE RUN	FLOODING	STREAM DREDGING
P65	NEW BETHLEM BORO	MOUTH LEASURE RUN	FLOODING	STREAM DREDGING
P66	NEW BETHLEM BORO	KECK AVE AND EAST WASHINGTON ST	FLOODING	INSTALL CHANNEL
P67	NEW BETHLEM BORO	SR 0066	FLOODING	RETAINING WALL REPLACEMENT
P68	PERRY TOWNSHIP	STEPHENS RD	FLOODING	RAISE ROADWAY
P69	PERRY TOWNSHIP	FREEDOM RUN	FLOODING	DEBRIS REMOVAL
P70	PERRY TOWNSHIP	STEPHENS RD	EXCESSIVE RUNOFF FROM FARMS	CONSTRUCT SWALE
P71	PERRY TOWNSHIP	MONTEREY RD	ALLEGHENY RIVER FLOODING FROM ICE	RELOCATE ROAD TO OLD RAIL BED
P72	PERRY TOWNSHIP	BARTOW RD	ROADWAY FLOODING	CONSTRUCT STONE OVERFLOW ON BRIDGE
P73	PERRY TOWNSHIP	BLACK FOX ROAD	STREAM BANK EROSION	GABION BASKETS
P74	PERRY TOWNSHIP	HILLVILLE RD	EROSION / BRIDGE DESTRUCTION	UTILIZE OLD RAILROAD BRIDGE
P75	PERRY TOWNSHIP	TERWILLIGER RD	STREAM BANK EROSION	RIP RAP / GABION
P76	PERRY TOWNSHIP	PINE HOLLOW RD	STREAM BANK EROSION	RIP RAP / GABION
P77	PERRY TOWNSHIP	BARTLEY RD	STREAM BANK EROSION / ROAD DAMAGE	RIP RAP / GABION
P78	PERRY TOWNSHIP	MATHILDAVILLE RD	EROSION / BRIDGE DESTRUCTION	INSTALL NEW CULVERT
P79	PERRY TOWNSHIP	TERWILLIGER RD	SWALE EROSION	UNDERDRAIN
P80	MILLCREEK TWP	FISHER-SIGEL RD	UNDERSIZED PIPE CAUSES FLOODING	LARGER PIPE
P81	MILLCREEK TWP	SPRING DRIVE	PIPE CAUSES PONDING AND FLOODING	PIPE AT DIFFERENT ANGLE
P82	MILLCREEK TWP	OLD ST N	PIPE CAUSES PONDING AND FLOODING	LARGER PIPE

ID	MUNICIPALITY	LOCATION	DESCRIPTION	PROPOSED SOLUTION
P83	EAST BRADY BORO	5TH & PERDUM STS	DITCH WASHOUTS	INSTALL NEW INLET & PIPE
P84	EAST BRADY BORO	4TH & PERDUM STS	WASHOUT @ INLET, BROKEN PIPE	INSTALL NEW INLET & PIPE
P85	EAST BRADY BORO	4th & PERDUM STS	DITCH WASHOUTS	INSTALL NEW INLET & PIPE
P86	EAST BRADY BORO	6TH ST & 1ST ST	OUTLET PIPE ON ROADWAY	INSTALL NEW STORM DRAINS
P87	EAST BRADY BORO	WALLACE & 1ST ST	LARGE HOLE BESIDE INLET	REPAIR INLET
P88	EAST BRADY BORO	BRADY ST	DITCH WASHOUTS; PLUGGED CULVERTS	OPEN CULVERTS, RE-ESTABLISH DITCH
P89	EAST BRADY BORO	1ST & PROSPECT ST	OVERBANK FLOW ON ROADWAY	NEW STORM DRAINS
P90	EAST BRADY BORO	1ST ST	WATER NOT GETTING TO INLETS	RE-ESTABLISH DITCH
P91	RIMERSBURG BORO	MILL ST	WASHED OUT ROADWAY EDGES	INSTALL NEW STORM DRAINS
P92	RIMERSBURG BORO	CHERRY ST	WASHED OUT DITCH LINES	NEED DITCH LINES RE-ESTABLISHED
P93	HAWTHORN BORO	MAIN ST.	CULVERT	REPLACE
P94	HAWTHORN BORO	MAPLE ST	CULVERT	REPLACE
P95	HAWTHORN BORO	WALNUT ST	CULVERT	REPLACE
P96	HAWTHORN BORO	PINE AVE	FARM FIELD RUNOFF	DITCH

Summary Table of Obstructions provided by the WPAC through the Questionnaire Form:

ID	MUNICIPALITY	LOCATION	DESCRIPTION
O1	ASHLAND TWP		3 BRIDGES
O2	HIGHLAND TWP	MCCLEARY ROAD	EARTH AND STONE ROADWAY CAUSEWAY
O3	SLIGO BORO	LICKING RUN AND ANDERSON RUN	STREAM DAM
O4	KNOX BORO	HUSTON AVE AND BEATTY AVE	FLOODING
O5	KNOX BORO	N MAIN ST AND WHITE AVE	PONDING
O6	KNOX BORO	JR HIGH SCHOOL	FLOODING
O7	ST PETERSBURG BORO	RAILROAD ST	18" CULVERT CAUSING EROSION
O8	ST PETERSBURG BORO	PUMP STATION RD	FLOODING AND EROSION
O9	PAINT TWP	BANNER RD	DAMAGED CULVERT
O10	PAINT TWP	HEARST BRIDGE	DEBRIS BUILD UP ON CULVERT
O11	PAINT TWP	STEINER ROAD	ADDITIONAL MAINTENANCE
O12	LIMESTONE TWP	KEMMER RD	CULVERT
O13	LIMESTONE TWP	SPRING RD	CULVERT
O14	LIMESTONE TWP	LENWOOD RD	CULVERT
O15	LIMESTONE TWP	CURLL RD	CULVERT
O16	LIMESTONE TWP	DEER HOLLOW RD	CULVERT
O17	LIMESTONE TWP	SUTTON RD	BRIDGE AND PIPE
O18	LIMESTONE TWP	CURTAIN BOTTOM RD	CULVERT
O19	LIMESTONE TWP	SANDY FLAT RD.	CULVERT
O20	LIMESTONE TWP	FENSTERMAKER RD	CULVERT
O21	LIMESTONE TWP	LIMESTONE RD	CULVERT
O22	LIMESTONE TWP	CEMETERY RD	CULVERT
O23	LIMESTONE TWP	SR 2015	CULVERT
O24	NEW BETHLEM BORO	LEASURE RUN	BRIDGE - SAND BAR REMOVAL
O25	NEW BETHLEM BORO	SR 0028	BRIDGE - SAND BAR REMOVAL
O26	NEW BETHLEM BORO	WATER ST	STORM DRAIN
O27	NEW BETHLEM BORO	WOOD ST AND PINE ST	STORM DRAIN
O28	PERRY TOWNSHIP	COLLIER RD	EROSION- 3 CULVERTS
O29	PERRY TOWNSHIP	LIME PLANT RD	CULVERT
O30	PERRY TOWNSHIP	MONTEREY RD	EROSION, ROAD DAMAGE

O31	PERRY TOWNSHIP	TERWILLIGER RD	EROSION
-----	----------------	----------------	---------

Summary Table of Stormwater Facilities provided by the WPAC through the Questionnaire Form:

MUNICIPALITY	LOCATION	DESCRIPTION
FOXBURG BOROUGH	SR 0058 AND SOUTH PALMER ST	STORM DRAIN
FOXBURG BOROUGH	SR 0058	STORM DRAIN
FOXBURG BOROUGH	MAIN ST	STORM DRAIN DISCHARGE
KNOX BOROUGH		STORM DRAIN DISCHARGE
KNOX BOROUGH		STORM DRAIN DISCHARGE
KNOX BOROUGH		STORM DRAIN DISCHARGE
KNOX BOROUGH	SR 0338	STORM DRAIN DISCHARGE
PAINT TOWNSHIP	LINCOLN CT	STORM SEWER
PAINT TOWNSHIP	SR 322	UNDERGROUND DETENTION
PAINT TOWNSHIP	ALISON DR	STORM SEWER AND DETENTION POND
PAINT TOWNSHIP	SR 0066	DETENTION POND
PAINT TOWNSHIP	SR 322	STORWATER SYSTEM
PAINT TOWNSHIP	MCLAIN WATSON RD	STORWATER SYSTEM
PAINT TOWNSHIP	SR 322	STORWATER SYSTEM
PAINT TOWNSHIP	SR 322	STATE STORMWATER SYSTEM
PAINT TOWNSHIP	MILLS RD	STORMDRAIN DISCHARGE
PAINT TOWNSHIP	PAINT MILLS RD	STORMWATER SYSTEM
PAINT TOWNSHIP	SR 322 AND SR 0066	STATE STORMWATER SYSTEM
PAINT TOWNSHIP	SR 0066	FLOODED PROPERTY
NEW BETHLEM BOROUGH	VARIOUS THROUGHOUT	INLETS

MADISON TWP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding	x											
Street Flooding												
Property Flooding		x										
Soil Erosion		x										
Sediment in Streams		x										
Stream Bed/Bank Erosion		x										
Scour at Outfalls			x									
Property/Infrastructure Damage		x										
Pollution		x										
Habitat/Resource Damage		x										
Other												

ASHLAND TWP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		x				x						x
Street Flooding			x	x								
Property Flooding		x				x		x				
Soil Erosion		x				x			x			
Sediment in Streams	x				x			x				
Stream Bed/Bank Erosion		x					x			x		
Scour at Outfalls		x				x				x		
Property/Infrastructure Damage			x									
Pollution		x					x	x				
Habitat/Resource Damage			x									
Other												

TOBY TWP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding	x						x	x	x	x		
Street Flooding			x									
Property Flooding	x						x	x	x	x		
Soil Erosion	x						x	x	x			
Sediment in Streams	x						x	x	x			
Stream Bed/Bank Erosion	x						x	x	x			
Scour at Outfalls		x					x	x	x			
Property/Infrastructure Damage	x						x	x	x	x		
Pollution	x						x	x	x			
Habitat/Resource Damage	x						x	x	x			
Other												

CLARION BOROUGH

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X			X			X				
Street Flooding	X			X				X	X			
Property Flooding		X		X				X	X			
Soil Erosion		X		X				X				
Sediment in Streams			X					X				
Stream Bed/Bank Erosion		X		X				X				
Scour at Outfalls		X						X				
Property/Infrastructure Damage		X		X				X	X			
Pollution		X										X
Habitat/Resource Damage		X										X
Other												

FOXBURG BOROUGH

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding		X			X				X			
Property Flooding		X			X				X			
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

HIGHLAND TWP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding												
Street Flooding (EROSION)	X			X					X			
Property Flooding												
Soil Erosion												
Sediment in Streams		X		X								
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

SLIGO BOROUGH

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding	x				x			x	x		x	
Street Flooding		x		x				x	x			
Property Flooding		x						x	x			
Soil Erosion			x									
Sediment in Streams	x							x	x			
Stream Bed/Bank Erosion		x						x	x			
Scour at Outfalls												
Property/Infrastructure Damage		x							x			
Pollution	x							x	x			
Habitat/Resource Damage	x							x				
Other												

KNOX BOROUGH

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		x			x			x				
Street Flooding		x			x					x		
Property Flooding		x			x			x				
Soil Erosion			x									
Sediment in Streams		x			x			x				
Stream Bed/Bank Erosion		x			x			x				
Scour at Outfalls			x									
Property/Infrastructure Damage			x									
Pollution			x									
Habitat/Resource Damage			x									
Other												

STRATTANVILLE BOROUGH

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			x									
Street Flooding			x									
Property Flooding			x									
Soil Erosion			x									
Sediment in Streams			x									
Stream Bed/Bank Erosion			x									
Scour at Outfalls			x									
Property/Infrastructure Damage			x									
Pollution			x									
Habitat/Resource Damage			x									
Other												

ST PETERSBURG BOROUGH

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding			X									
Property Flooding		X			X				X			
Soil Erosion		X			X				X			
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls		X		X						X		
Property/Infrastructure Damage		X			X				X			
Pollution			X									
Habitat/Resource Damage			X									
Other												

CALLENSBURG BOROUGH

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding			X									
Property Flooding			X									
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other												

PAINT TWP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X		X								X
Street Flooding		X		X								
Property Flooding		X		X				X		X		
Soil Erosion		X		X								
Sediment in Streams		X		X								
Stream Bed/Bank Erosion		X		X								
Scour at Outfalls		X		X				X		X		X
Property/Infrastructure Damage		X		X								
Pollution		X		X				X		X		
Habitat/Resource Damage		X		X								X
Other												

RICHLAND TWP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding			X									
Property Flooding			X									
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other												

LIMESTONE TOWNSHIP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding	X			X				X	X	X		
Street Flooding		X		X				X	X	X		
Property Flooding		X		X				X	X	X		
Soil Erosion		X		X				X	X	X		
Sediment in Streams	X			X				X	X	X		
Stream Bed/Bank Erosion		X		X				X	X	X		
Scour at Outfalls		X		X				X	X	X		
Property/Infrastructure Damage		X		X				X	X	X		
Pollution		X		X				X	X			
Habitat/Resource Damage		X		X				X	X			
Other												

FARMINGTON TWP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X					X	X				
Street Flooding			X									
Property Flooding			X									
Soil Erosion		X			X			X				
Sediment in Streams			X									
Stream Bed/Bank Erosion		X			X			X				
Scour at Outfalls		X			X			X				
Property/Infrastructure Damage		X				X		X				
Pollution			X									
Habitat/Resource Damage			X									
Other			X									

NEW BETHLEHEM BOROUGH

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding	x				x			x				
Street Flooding		x		x					x			
Property Flooding		x			x			x				
Soil Erosion			x									
Sediment in Streams	x							x				
Stream Bed/Bank Erosion	x							x				
Scour at Outfalls	x							x				
Property/Infrastructure Damage	x				x			x				
Pollution			x									
Habitat/Resource Damage			x									
Other			x									

MILLCREEK TWP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		x								x		x
Street Flooding			x									
Property Flooding		x								x		
Soil Erosion									x	x		
Sediment in Streams		x							x			
Stream Bed/Bank Erosion	x											x
Scour at Outfalls		x										x
Property/Infrastructure Damage			x									
Pollution			x									
Habitat/Resource Damage			x									
Other			x									

EAST BRADY BORO

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		x		x				x	x			
Street Flooding			x									
Property Flooding			x									
Soil Erosion		x			x			x	x	x		
Sediment in Streams			x									
Stream Bed/Bank Erosion		x						x	x			
Scour at Outfalls			x									
Property/Infrastructure Damage		x						x	x	x		
Pollution			x									
Habitat/Resource Damage			x									
Other												

RIMERSBURG BORO

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding												
Street Flooding												
Property Flooding												
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

BEAVER TOWNSHIP

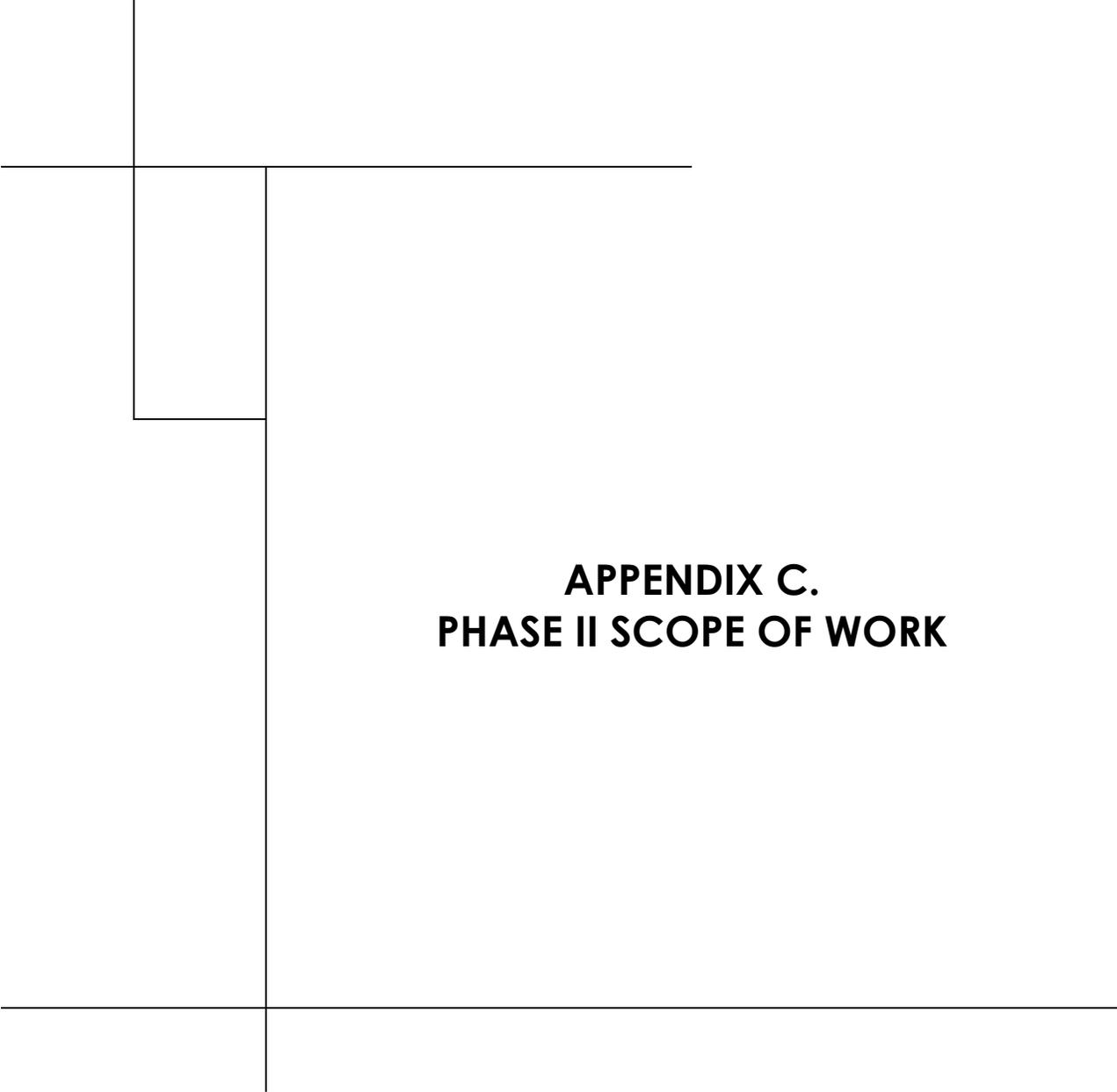
PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X			X			X				
Street Flooding			X									
Property Flooding		X						X				
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

HAWTHORN BOROUGH

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X						X				
Street Flooding		X						X				
Property Flooding		X						X				
Soil Erosion		X						X				
Sediment in Streams		X						X				
Stream Bed/Bank Erosion		X						X				
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution		X						X				
Habitat/Resource Damage			X									
Other			X									

ELK TOWNSHIP

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		x			x							
Street Flooding		x				x						
Property Flooding		x			x							
Soil Erosion		x			x							
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls		x			x							
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage			x			x						
Other												



**APPENDIX C.
PHASE II SCOPE OF WORK**

Phase II Scope of Work

The COUNTY shall prepare Phase II of the PLAN in accordance with the tasks described in this Appendix C. For the purpose of carrying out work described in this Appendix C, the County Planning Commission shall be considered as the COUNTY and shall assume all responsibilities deemed to be assumed by COUNTY. The COUNTY, with the help of the consultant, will accomplish the technical and non-technical components of the PLAN.

The final Phase II Report and associated Model Ordinance shall be considered as the PLAN.

The Pennsylvania Department of Environmental Protection shall be considered as the DEPARTMENT.

The selected engineering firm shall be considered as the CONSULTANT.

The Phase II contract between Clarion County and The Pennsylvania Department of Environmental Protection shall be considered as the AGREEMENT.

Project Administration

The COUNTY shall be responsible for, but not limited to, overall administration of all tasks, including the preparation of invoices and progress reports, organizing and/or attending meetings, attending to budgeting and organizational matters, and participating in teleconferences regarding the PLAN.

This task also covers the administrative work required to initiate the AGREEMENT between the DEPARTMENT and the COUNTY, and to initiate selection of a CONSULTANT and, upon selection, to initiate contracts between the COUNTY and the CONSULTANT and to lay out a framework for the critical coordination aspect with the municipalities. Activities include defining the framework for accomplishing various elements of the PLAN, scheduling of time and defining the budget, progress reporting procedures and formats, and finalizing the work schedule. It will also include the preparation for and holding the Phase II start-up meeting between the DEPARTMENT, the COUNTY, and the CONSULTANT.

This task also includes the delineation of work for Phase II between the COUNTY and the CONSULTANT.

Project Billing

The COUNTY shall complete all of the tasks (A through D) and report the progress and status of the PLAN. The COUNTY shall prepare and submit quarterly invoices and report the status of work accomplished to the DEPARTMENT pursuant to the terms and conditions specified in the AGREEMENT.

TASK A - Data Collection/Review/Analysis

SubTask A.1 - Data Collection

This task will involve the necessary efforts to gather, review, and analyze the required data to complete the technical and institutional planning steps for the PLAN. The CONSULTANT and COUNTY will work jointly to collect data from county offices, municipalities, and local, state, and federal agencies that will aid in preparation of the PLAN. The data will consist of information concerning existing and future conditions throughout Clarion County. All data collection activities will be accomplished by gathering available information from the WPAC or from the Questionnaire Form that was distributed to the municipalities during Phase I.

Data to be collected will include, but may not be limited to (and will be based on available information and/or questionnaire results):

1. Comprehensive land use plans.
2. Existing municipal ordinances.
3. Stormwater-related problems areas and proposed conceptual solutions.
4. Existing and proposed flood control projects.
5. Existing and proposed stormwater control facilities.
6. A listing of existing and proposed stormwater collection and control facilities, including a designation of those areas to be served by stormwater collection and control facilities within a 10-year period, an estimate of the design capacity and costs of such facilities, a schedule and the 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, where this information is readily available.
7. Soils.
8. Geology.
9. Significant water obstructions.
10. Topographic and other readily available mapping.
11. Aerial photographs.
12. Previously completed engineering and planning studies.
13. Stream flow and rain gauge data and other water quality information.
14. FEMA FIS floodplain information.

Necessary field investigations will be accomplished to gather and/or confirm the data. This task also involves the review and preliminary analysis of the technical data that has been obtained for consistency and usability. It also includes the review of the institutional data collected through the Phase I Questionnaire Form process for consistency and usability in the final PLAN.

Problem Areas and Obstructions Inspection/Summary/Proposed Solutions

A detailed investigation will be performed to evaluate any problem areas and obstructions identified during Phase I. Those problem areas and obstructions recognized as "significant" would be field evaluated. Detailed modeling will be completed for the subwatershed where these "significant" problem areas or obstructions occur (SubTask B.3), then these sites shall be designated as points-of-interest, and associated design storm flows will be developed. A collection of past studies/investigations including any PennDOT hydrologic computations, if possible, will be compiled and reviewed for proposed solutions. The PLAN will summarize these problem areas and obstructions,

provide proposed solutions, and will specify possible sources of funding to pursue for implementation. The PLAN will make suggestions for other programs/activities to deal with the issues raised during the planning process. The identification of the problem areas will help in assessing the stormwater management rate controls needed for the subwatersheds.

Although the identification of the problem areas will help in assessing the stormwater management rate controls needed for the subwatersheds, the Act 167 program will not provide funds to correct infrastructure problems or implement conceptual solutions. It will however, provide for a systematic approach and help to identify potential sources of funding to correct the problems, and will, through the preparation and implementation of stormwater ordinances, provide administrative means to correct existing problems and prevent future problems from uncontrolled runoff from future development and activities that may affect stormwater.

Review of Existing Plans/Studies/Reports/Programs

A comprehensive review of related documents and/or programs will be performed and a coordinated list of goals and objectives from each of the documents will be developed.

Anticipated Product

The product will include the information listed above, gathered and organized in such a way as to be usable for both short and long term municipal and county stormwater planning (including updates). A final data summary will be prepared that will identify and/or catalogue the collected data and funding streams.

SubTask A.2 - Municipal Ordinance Reviews/Evaluations

This task will involve the detailed evaluation of the provided municipal ordinances in order to prepare a municipal ordinance comparison matrix. This matrix is intended to display (for both the actual preparation of the implementation PLAN and also for the municipal education process), the current stormwater management provisions in the various municipal ordinances for all municipalities within Clarion County. The objectives and the preparation of the matrix are to easily and effectively see the similarities and differences, as well as the consistency/inconsistency, between the various municipal ordinances in the County. The matrix will be used to develop ordinance provision recommendations for the various municipalities.

Anticipated Product

The product will be a complete matrix of stormwater management ordinance provisions for the municipalities, which identify the current status of ordinance provisions as they relate to stormwater management.

SubTask A.3 - Data Preparation for Technical Analysis

This task involves the engineering work necessary to transform the information collected under SubTask A.1 into a Geographic Information System (GIS) database that can be used for the later technical tasks and map (plate) production. Included will be the preparation of "land characteristics" GIS data layers for modeling and display purposes. All data will be incorporated into the GIS database on an as needed basis.

The GIS data layers will include:

- Base Mapping – Existing base map information (roads, streams, municipal boundaries, text, etc.) will be collected and the most accurate data will be utilized to develop the County's base map. All data will be projected into the coordinate system utilized by Clarion County. All data from various sources will be merged into a seamless base map.
- Land Use/Land Cover Information – Current aerial (photographic and/or digital images), available GIS land use files, and zoning maps will be collected and formatted into the format required for hydrologic modeling based on NRCS (formerly SCS) land use classifications. Land development projects completed subsequent to existing data will be added as necessary.
- Future Land Use Conditions – Future projected planning information will be overlaid on the existing land use conditions mapping to determine the future land use scenario for development at a 10-year build-out condition.
- Soils Information – The County Soils Survey maps will be modified and/or prepared to illustrate NRCS hydrologic soils groups instead of individual soil types. Overlay mapping will be necessary to prepare the hydrologic soils group map necessary for modeling.
- Digital Elevation Models – Digital Elevation Models (DEMs) will be utilized and evaluated for watershed and subwatershed delineation and to assign slope category information to the subwatersheds for which detailed modeling will be completed. The DEMs will be merged to form a seamless watershed map and projected to the appropriate coordinate system.
- Digital Raster Graphics (DRGs) – Ortho digital USGS topographical maps will be compiled and utilized to evaluate NRCS land use classifications and to determine the location of significant obstructions and problem areas.
- Geology – If available, digital geologic maps that include pertinent geologic features (limestone, sandstone, etc.) will be developed for the County and be extracted and displayed as part of the PLAN.
- Obstructions – Obstructions will be located on the appropriate base map and data or attributes will be attached or linked to the locations.
- Problem Areas, Flood Control Structures, Stormwater Management Facilities – These items will be located on the appropriate base map and data or attributes will be attached or linked to the locations.
- Floodplains – Available FEMA FIS floodplain data will be transposed to the appropriate base map and displayed with the development in Clarion County.

A summary of data sources will be supplied (simplified Metadata) and will include data type (coverage, shape file, image), source, projection, and year.

Delineation of Subwatersheds

As required, the watersheds and subwatersheds will be delineated by the CONSULTANT on a base map at the scale that results in a manageable map size and adequate detail. Subwatersheds will be established based on the collected data and results of field

reconnaissance. This breakdown of the watersheds by major tributary drainage courses and points-of-interest will be the basis for the hydrologic and hydraulic analyses. The CONSULTANT will determine the size of the subwatersheds; however delineations of subwatersheds smaller than three (3) square miles requires the COUNTY's concurrence.

The subwatersheds will be delineated based on the following:

1. The location of existing regionally significant stormwater management problems, as identified by the WPAC in the Questionnaire Form, during the field reconnaissance, or from data compiled in any previous studies or reports.
2. The location of significant regional stormwater and flood control obstructions such as highway bridges and culverts, or stormwater control facilities.
3. Confluence points of tributaries, as deemed appropriate and significant relative to regional stormwater management planning based on engineering judgment and good modeling practice.
4. Other points of interest, such as stream gage or water quality monitoring stations, locations of water quality concerns, potential flood control project sites, significant outfall locations downstream of existing developments, or where significant development is anticipated and projected to occur.

This task will also include mapping of relevant regional watershed planning information onto GIS data layers. This mapped information will include:

1. Floodplain Areas - The approximate floodplain limits plotted over the watershed base map or the highlighting of those stream segments for which FEMA detailed or approximate Flood Insurance Studies are available.
2. Regionally significant stormwater obstructions and their capacities - "Significant" obstructions will be those that are identified in the Questionnaire Form and/or which are confirmed by the CONSULTANT as being areas where insufficient capacity exists to pass the necessary storm flows, thereby resulting in a flooding hazard to persons or property, or those obstructions that would act as regionally significant impoundments that may affect watershed modeling and the watershed stormwater response.
3. Storm Sewer Systems - Areas where significant storm sewer systems exist will be indicated generally on the final base map.
4. Existing local, state, and federal flood protection and stormwater management facilities.
5. Proposed stormwater facilities within the 10-year planning period - Where known and confirmed by the municipalities through the Questionnaire Form completions process.
6. Regionally Stormwater Related "Problems" - Those areas indicated in the Questionnaire Form and where confirmed by the CONSULTANT through technical modeling/analysis (for example, flooding points or areas of streambank erosion).

Anticipated Product

The product will be completed GIS watershed data layers and maps. The maps completed for this task will be preliminary and will be modified and finalized as a part of the final PLAN preparation efforts.

TASK B - Technical Analysis

The technical analysis will describe the analytical processes involved with developing a strategy to regulate existing and new land development and activities that may affect stormwater runoff. Since stormwater runoff has a direct impact on flooding, water quality, and groundwater recharge, this analysis will consider the following objectives:

- Implement non-point source pollution removal methodologies.
- Preserve and restore natural stormwater runoff regimes and natural course, current, and cross section of Waters of the Commonwealth, to the maximum extent practicable.
- Preserve, protect, maintain, and restore groundwater recharge and recharge areas.
- Protect stream channel and land areas from erosion.
- Restore and preserve flood carrying capacity of streams.
- Manage extreme flood events.

These objectives will be accomplished under SubTasks B.1 to B.9.

SubTask B.1 - Implement Volume Controls

Establish the Design Storm Method (Control Guidance 1 in *The Pennsylvania Stormwater Best Management Practices Manual*) and the Simplified Method (Control Guidance 2 in *The Pennsylvania Stormwater Best Management Practices Manual*) consistent with the Department of Environmental Protection, Bureau of Watershed Management's *Pennsylvania Model Stormwater Management Ordinance*.

SubTask B.2 - Implement Rate Controls

Establish a minimum 100% release rate for all lands contained within Clarion County. More restrictive release rates may be developed in subwatersheds with existing problem areas or intense development pressures.

SubTask B.3 - Model Subwatersheds of Designated Watersheds

This task involves the hydrologic modeling, quantitative computations, and evaluations necessary to analyze runoff characteristics of the subwatersheds under existing and future conditions. It will also establish the need and extent of release rates for the subwatersheds. The upper Clarion River watershed as well as portions of the Allegheny River and Licking and Deer Creek watersheds will be modeled to determine peak flow rates. Subwatersheds chosen will be based on existing problem areas or future development pressures based on input provided by the WPAC. Existing and future land use and land cover will be used to determine existing and future peak rates of discharge. Input data including rainfall information, drainage network layouts and capacities, travel times within subwatersheds, significant obstructions, and GIS based data will be added to develop the selected hydrologic model.

Model Calibration

The individual subwatershed models will be run to get preliminary results. The models will be calibrated to verify the results. Calibration efforts will include the adjustment of the model parameters to accurately simulate natural runoff conditions of the subwatershed. Consideration will be given to all calibration techniques including, but not limited to: use of any available gaging information, comparison with rainfall and runoff information from similar watersheds, comparison with Flood Insurance Study information, and regression analyses. As necessary, calibration will be performed at multiple points within the subwatersheds to assure the most accurate modeling.

Design Storm Selection

Subsequent to calibration of the model, the model will be run for the 2-, 10-, 25-, 50- and 100-year storm events under various durations. An analysis on downstream impacts during these storms will be performed to determine the required design storm(s) based on the subwatershed hydrologic response of the five (5) storms.

Model Runs

The calibrated models will be run for the selected subwatersheds under the determined design storm(s) for both the existing and future projected land uses.

This will also involve the detailed evaluation of modeling results to perform a problem identification analysis (i.e., a "cause and effect" analysis). This will concentrate on identifying the downstream storm runoff impacts of projected future land development projects. This evaluation will consider both the increases in current downstream storm runoff problems, as well as anticipated projected downstream runoff problems.

This work step also consists of performing a technical evaluation of the hydrologic analysis for existing and future land use conditions (estimated 10-year build out) and recommending standards and criteria to regulate land development activity which impacts stormwater runoff. This subtask may also involve performing a release rate analysis and a preliminary distributed storage analysis, and developing criteria and standards for the management of both overbank flooding events (2-, 10- and 25-year storms) and the extreme flooding events (50- and 100-year storms), to be determined by the WPAC.

SubTask B.4 - Provide Conceptual Solutions for Existing Problem Areas

Based on the results of SubTask B.3, this information will be used to develop alternative conceptual solutions for the problem areas identified in the Questionnaire Form and other problems areas as identified by the WPAC. Problem areas may generally consist of flooding, stream channel or bank erosion, property damage, detention basin (retrofitting), etc. The developed solutions will be conceptual in nature (i.e. no final engineering or specification will be completed). These conceptual solutions will be presented as recommendations to the municipalities. It will be up to the individual municipality's discretion whether or not to implement the conceptual solutions to the problem areas. The municipality will also be responsible to acquire funding sources to implement the final solutions.

SubTask B.5 - Goals, Objectives, and Compilation of All Technical Standards

Stormwater problems will be restated as goals and objectives for the Act 167 planning process. The goals and objectives need to:

- Satisfy all regulatory requirements (including correcting water quality impairments related to stormwater or urbanization appearing in the EPA 303(b) and (d) lists, or impairments associated with approved TMDLs).
- Meet the purpose and policy of Act 167.
- Meet regulatory and permit requirements associated with the NPDES MS4 program.
- Meet local requirements and objectives established by the WPAC.

When restated as engineering performance standards for the PLAN, the goals and objectives become the basis for the standards and criteria for regulation and control of land development and activities that may affect stormwater.

The standards and criteria will provide a basis for the selection and application of analytical methodologies and BMPs for the implementation of stormwater controls.

The candidate stormwater management strategies that meet the identified goals and objectives (i.e. show how the proposed standards and criteria for the Final Report and Model Ordinance meet the goals and objectives set by the WPAC) will be prepared and presented to the WPAC.

The proposed standards and criteria need to address the following control requirements:

1. Apply to all areas covered by the PLAN.
2. Establish release rate percentages (if applicable) or other levels of control of runoff.
3. Specify design flood frequencies and computational methodologies for design of stormwater management measures.
4. Provide specifications for construction and maintenance of stormwater management systems (if applicable).
5. Provide conceptual solutions to both regional and local problems areas.
6. Summary and prioritization strategies for long-term potential solutions.
7. Identify funding sources for correction of existing problems related to infrastructure.
8. Maintain consistency with concurrent studies including a summary of what tasks will be completed so as to avoid duplication of effort.
9. Provide a fee schedule for: submissions of permit applications, review of permit applications, construction inspections, periodic inspections, and enforcement actions.
10. An implementation strategy, including funding, for retrofit measures, if necessary.

The recommendations will be presented in layman's language, keeping in mind that they are directed towards local municipalities and are to address solutions to stormwater management issues. The technical standards and criteria developed as a part of this task will apply to all areas covered by the PLAN.

Water quality BMP information will be presented including recommendations for the implementation of water quality BMPs for land development and activities to minimize stormwater impacts from land development and activities. This educational effort will primarily involve discussions, presentations, and handouts on BMP technology to municipal officials during regularly scheduled WPAC meetings. Information available from PADEP and other sources will be distributed.

Methods for controlling stormwater runoff quantity and quality will be evaluated and included in the Model Ordinance.

SubTask B.6 - Implementation of Technical Standards and Criteria

This subtask will involve the identification of the necessary ordinance provisions for each municipality. Included will be the modification of the Model Ordinance and/or recommendations for updating existing municipal ordinances, including but not limited to, subdivision and land development, zoning, erosion and sediment control, and building code ordinances to effectively implement the technical standards and criteria for stormwater management throughout Clarion County. A design example will be provided to show how to incorporate the various aspects of the Model Ordinance into the stormwater management design process.

Anticipated Product

The product will be the charts, tables, figures, plates, and graphs needed to present the technical analysis including evaluation of both water quantity and water quality requirements. The product will also include modeling results, the technical interpretation of the modeling results, and the definition of the technical standards and criteria for use in the preparation of the PLAN. The product will also include the identification of necessary recommended municipal ordinance provisions to implement the technical standards, including a complete stormwater management Model Ordinance.

SubTask B.7 - Economic Analysis

This subtask will involve an economic analysis of implementing the technical standards and provisions of the PLAN. A design example will be created and estimated costs will be associated with the design example to demonstrate how implementation of the standards and provisions can be cost effective to developers. An example of each of the major types of development will be developed including residential, commercial and industrial.

Anticipated Product

The product will be the design example.

SubTask B.8 - Regulations for Activities Impacting Stormwater Runoff

This subtask will involve the research and development of standards and provisions regarding regulating activities that may impact stormwater runoff. These activities may include, but are not limited to: timber harvesting, oil & gas mining, and agriculture. The activities will only be regulated in regards to stormwater management controls and protecting water quality requirements to ensure the protection of health, safety, and property of the people and Waters of the Commonwealth.

Anticipated Product

The product will be a section in the Model Ordinance addressing activities that may impact stormwater runoff.

SubTask B.9 - Water Quality Impairments

This subtask involves the research and identification of water quality impairments throughout Clarion County from the 303(b) and 303(d) lists and designated Total Maximum Daily Loads (TMDLs).

Anticipated Product

The product will be to identify how to protect the existing uses and for waters not attaining, how to improve the water quality to the designated use.

TASK C – Public/Municipal Participation

SubTask C.1 - Meetings

Coordination efforts and/or activities will continue throughout the duration of the project and will be organized to include the necessary meetings with the COUNTY, CONSULTANT, DEPARTMENT, and WPAC.

In addition to the WPAC, several meetings will focus on technical and legal issues. These meetings are to educate and solicit input and comment from the public, municipal governments (elected officials, engineers, and solicitors), and other interest groups such as watershed associations.

As previously indicated, the WPAC consists of representatives from each municipality in Clarion County, as well as the Clarion County Conservation District, and other interested groups. The WPAC meetings will be held to provide education on the planning process and to receive advice from the municipal officials to assure the PLAN fits the needs of the municipalities while soliciting valuable technical and institutional data and other information. The advisory role of the WPAC during the development of the PLAN is vital to the ultimate adoption and implementation process.

Two meetings of the WPAC will focus on the technical issues focusing on the municipal engineers from each municipality and any invited engineering, technical, or scientific individuals. The meetings will provide a technical forum to assist the COUNTY and CONSULTANT during the preparation of the technical portions of the PLAN by evaluating watershed modeling, water quality efforts, and the establishing of overall technical standards.

Another WPAC meeting will include the solicitors representing each municipality. This meeting will be convened to educate the municipal solicitors on the ordinance adoption and implementation requirements of the PLAN and to receive comments and direction in the finalization of the Model Ordinance.

A BMP Workshop for the municipalities and municipal engineers will be developed and conducted. The presentation of the workshop shall be based on *The Pennsylvania Stormwater Best Management Practices Manual*. The workshop will contain one or more examples showing the design and construction of BMPs, including design calculations, review procedures, and approval of permit applications.

The following describes proposed WPAC meetings and public hearing schedules including the purpose of each meeting:

Note WPAC #1 and WPAC #2 Meetings were held during Phase I.

Meeting	Purpose of Meeting	Meeting Schedule
WPAC 3	Review Phase I, discuss problem areas and obstructions from Questionnaire Form, present GIS maps and data, and review overall goals of Phase II.	Beginning of Phase II
WPAC 4 & WPAC-E	Review the project status, review technical aspects of the PLAN, including initial modeling runs, calibration efforts, and review of technical standards (Control Guidance 1 & 2). Purpose is to receive comments and direction in the development of the Model Ordinance.	Middle of Task B
WPAC 5 & WPAC-E	Present final technical modeling results, present technical standards and criteria; discuss water quality issues, and preliminary ordinance provisions for the municipalities. Review final modeling runs and present draft PLAN and address previous comments.	End of Task B
WPAC 6 & WPAC-L & Public Hearing & BMP Workshop	Present final draft and review municipal implementation procedures. Educate the municipal solicitors on the ordinance adoption and implementation requirements of the PLAN. Conduct the public hearing as required by Act 167 to present the final PLAN to the public. Educate municipalities on implementing stormwater quality through the BMP Workshop.	End of Phase II
Municipal Workshop	Municipal Implementation Workshop: Provide assistance to municipalities on implementation of the PLAN including adaptation, enactment, and implementation of the ordinances and other action items.	Within 3 months of DEP's approval of the PLAN
Public Workshop	Public Implementation Workshop: Provide introduction and overview of the PLAN to public.	Within 6 months of DEP's approval of the PLAN

This task will also involve the production and distribution of a meeting agenda and meeting minutes updating the WPAC members, municipal officials, interest groups and the public on the program, status, and issues of the PLAN. The agenda and minutes will be created for each meeting during Phase II.

Anticipated Product

The product will include correspondence and meeting notes/minutes from the individual committee meetings. In addition, the presentation materials prepared for the individual committee meetings will constitute a defined product of this subtask for the overall project.

TASK D - PLAN Preparation and Implementation

SubTask D.1 - Final Phase II Report Preparation

Components of the previous task and subtasks will be included, or at least referred to in the PLAN. In this way the PLAN shall contain such provisions as are reasonably necessary to manage stormwater such that storm runoff from land development or other activities in each municipality shall not adversely affect health, safety, property, and water quality. In addition, the PLAN shall consider and be consistent with other existing municipal, county, regional and state environmental and land use plans and local and state laws and regulations. The PLAN shall include the following:

- A description of the hydrologic characteristics of the subwatersheds; the existing and future land uses and their impacts on stormwater runoff and stormwater collection systems; the available runoff control techniques and their efficiencies in the subwatersheds; a list of significant obstructions; and available FEMA FIS floodplain information. The available floodplain information will either be included in the PLAN or their sources will be referenced.
- Based upon the results of the subwatershed modeling, the technical evaluation resulting in the criteria and standards governing the use of stormwater management controls throughout the subwatersheds. An important aspect of the technical components of the PLAN will be the delineation of subwatersheds with specific management strategies. This determination will be accomplished based upon an evaluation of any land development activities on critical drainage points throughout Clarion County. Peak discharge tables will be compiled for the critical drainage points from the hydrologic model runs involved in the modeling effort. BMP tables and data on their effectiveness and applicability will be presented or referenced.
- The tables for the rainfall depths for various frequency durations which are computed as part of the hydrologic modeling.
- Approximate floodplain limits for areas where detailed FIS studies are available. Where detailed flood control engineering plans for proposed remedial measures are available from municipality, county, or private agencies, a summary analysis and evaluation of those plans will be included in the PLAN. Where detailed plans are not available, preliminary recommendations relating to such measures will be provided.
- Recommendations for solutions to the existing drainage problems will only be conceptual in nature indicating the type of approach needed and inter-municipal cooperation issues. Identification of sites for potential restoration and/or protection projects that would qualify for Pennsylvania's "Growing Greener" Funds will be identified.
- Recommendations for new drainage facilities to prevent future problems due to new land development and a discussion regarding inter-municipal arrangements for funding the projects will also be discussed.
- Priorities for Implementation. The conclusions and recommendations of the goals and objectives of the PLAN will be summarized. Recommended actions will be

listed according to agency, municipality, or individual responsible for each action. Priority of recommended actions will be based on chronological order, importance, hydrologic significance, or other factors as may be appropriate. This will include type and location of potential watershed projects that could be considered under Pennsylvania's "Growing Greener" grant program.

- **PLAN Update.** As a part of the implementation strategy for the PLAN, specific steps and/or procedures will be established for pursuing and completing the PLAN as required by Act 167. Specific circumstances will be identified and described in the PLAN document that will "trigger" a decision to update. For example, land development circumstances (such as major changes in the type and/or amount of proposed land development, and in excess of that which was assumed for the preparation of the original PLAN) will be identified as reasons for pursuing an update of the PLAN prior to the required 5-year time frame identified in Act 167.

The preliminary outline for the PLAN is as follows:

Part I

Section I	-	Introduction
Section II	-	Clarion County Description
Section III	-	Significant Problem Areas and Obstructions
Section IV	-	Watershed Level Stormwater Management Planning
Section V	-	Technical Analysis
Section VI	-	Existing Municipal Regulations
Section VII	-	Economic Impact of Stormwater Management Standards
Section VIII	-	Goals, Objectives, and Additional Recommendations
Section IX	-	PLAN Implementation and Update Procedures
Section X	-	References

Part II

Model Ordinance

Plates:

- Existing Land Use Basemap.
- Future (10-year) Land Use Basemap.
- Subwatersheds used for hydrologic analysis including information on applicable release rate management strategies.
- Hydrologic soil groups and development and floodplains.
- Stream obstructions, flooding, and problem areas.
- Areas where storm sewer networks exist (if available) and projected future storm sewer networks.

Anticipated Product

The product will be the final Phase II Report. The Phase II Report will be prepared in both digital and paper formats.

SubTask D.2 - Model Ordinance Preparation

A Model Ordinance which includes the provisions and standards developed during Phase II will be created consistent with the Department of Environmental Protection Pennsylvania Model Stormwater Management Ordinance. The WPAC will make a determination on whether drainage and construction standards will be included.

Anticipated Product

The product will be the final Model Ordinance. The Model Ordinance will be prepared in both digital and paper formats.

SubTask D.3 - PLAN Adoption

The PLAN will include the final Phase II Report and the Model Ordinance. One copy of the draft PLAN will be transmitted to the official agency and governing body of each involved municipality, each member of the WPAC, and the DEPARTMENT by official correspondence. The involved municipalities, WPAC, and DEPARTMENT will then review the draft PLAN. Their review will include an evaluation of the PLAN's consistency with other plans and programs affecting stormwater management. The reviews and comments will be submitted to the COUNTY by official correspondence. The review comments will be received, tabulated, and responded to appropriately and the draft PLAN will be revised accordingly.

Prior to final PLAN adoption, and as necessary, meetings will be held with each municipality individually as identified in WPAC meetings and municipal training schedule; to identify specific ordinance changes and method(s) of incorporation of the standards and criteria into municipalities' existing ordinance framework. In addition, the meeting(s) can also serve to provide clarification of any remaining questions or concerns that municipalities may have concerning the implementation of the PLAN.

The COUNTY will hold a public hearing concerning the PLAN. A notice for the public hearing will be published at least two (2) weeks before the hearing date. The public hearing notice will contain a brief summary of the principal provisions of the PLAN and a reference to the sites and/or website where copies of the PLAN may be examined or purchased at cost. The COUNTY will review the comments received at the public hearing and appropriate modifications in the PLAN will be made as applicable.

The Clarion County Commissioners will vote by resolution on the adoption of the PLAN. The resolution will have to be carried by an affirmative vote of at least a majority of the Commissioners, and should refer expressly to the maps, charts, textual matter, and other materials intended to comprise the PLAN. Upon positive resolution, this action will then be recorded on the adopted PLAN.

The COUNTY will then submit to the DEPARTMENT a letter of transmittal, and three (3) copies of the adopted PLAN, along with a digital version and GIS data layers, the review by the official Planning agency and/or governing body of each municipality, Clarion County Planning Commission, regional Planning agencies (Section 6(c) of Act 167), public hearing notice and minutes (Section 8(a) of Act 167), and the resolution of adoption of the PLAN by the COUNTY (Section 8(b) of Act 167). The letter of transmittal will state that the COUNTY has complied with all procedures outlined in Act 167 and will request DEPARTMENT to approve the adopted PLAN. The COUNTY will also submit to the DEPARTMENT a current list of all names, addresses, and phone numbers of the municipalities, municipal engineers, and solicitors located in Clarion County. Subsequent to the DEPARTMENT's approval of PLAN, fifty (50) copies of PLAN will be printed and distributed.

As desired by the County, the adopted PLAN could be posted on the COUNTY's and/or CONSULTANT's websites.

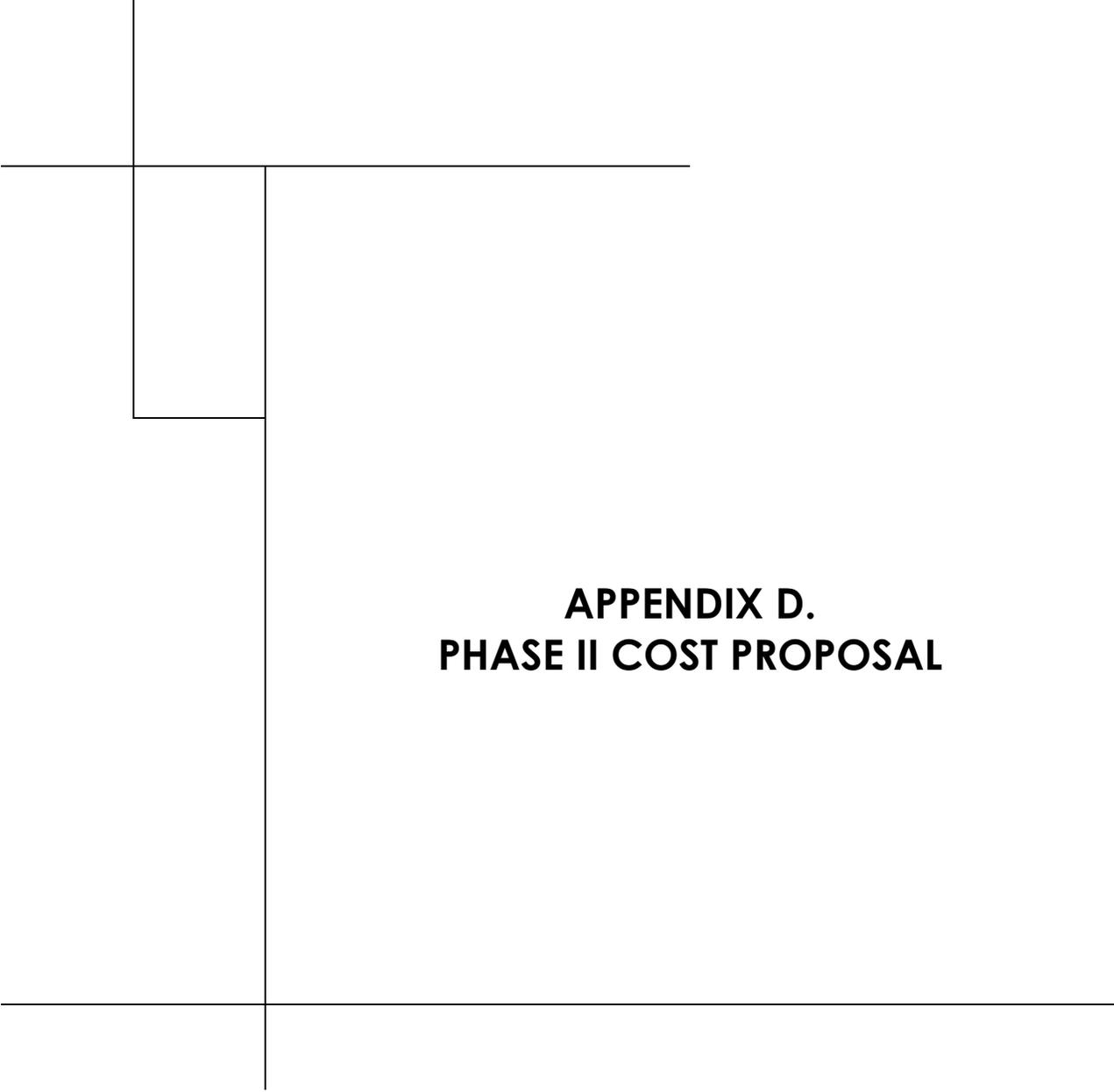
All backup material including hydrologic and hydraulic analyses of the subwatersheds will be retained at the COUNTY office for future use during PLAN updates or any other reference.

Anticipated Product

The product of this subtask will include the official documentation regarding PLAN adoption and implementation process, including the necessary documentation from the COUNTY certifying the adoption of the PLAN, an adopted PLAN, and associated Plates.

The Plan will contain, at a minimum, the following items:

1. A survey of existing runoff characteristics in minor as well as large storms, including the impact of soils, slopes, vegetation, and existing development.
2. A survey of existing significant obstructions, their capacities, and associated storm return periods.
3. An assessment of projected and alternative land development patterns in Clarion County, and the potential impact of runoff quantity, velocity, and quality.
4. An analysis of existing and future development in flood hazard areas, and its sensitivity to damages from future flooding or increased runoff.
5. A survey of existing drainage problems and proposed conceptual solutions.
6. A review of existing and proposed stormwater collection systems and their impacts.
7. An assessment of alternative runoff control techniques and their efficiency in the individual subwatershed.
8. An identification of existing and proposed local, State, and Federal flood control projects located in Clarion County and their design capacities.
9. A designation of those areas to be served by stormwater collection and control facilities within a ten (10) 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.
10. An identification of FIS delineated floodplains throughout Clarion County.
11. Criteria and standards for the control of stormwater runoff from existing and future development which are necessary to minimize dangers to property and life and carry out the purposes of Act 167.
12. A BMP Workshop to inform engineers and local officials about enhanced water quality and groundwater recharge stormwater management techniques (information on BMPs is also to be included or referenced in the PLAN).
13. Priorities for implementation of conceptual solutions.
14. Provisions for periodically reviewing, revising, and updating the PLAN.
15. Provisions as are reasonably necessary to manage stormwater such that land development or activities in each municipality do not adversely affect health, safety, and property in other municipalities of Clarion County and in drainage basins to which the watershed is tributary.
16. Consideration for consistency with other existing municipal, county, regional, and State environmental and land use plans.



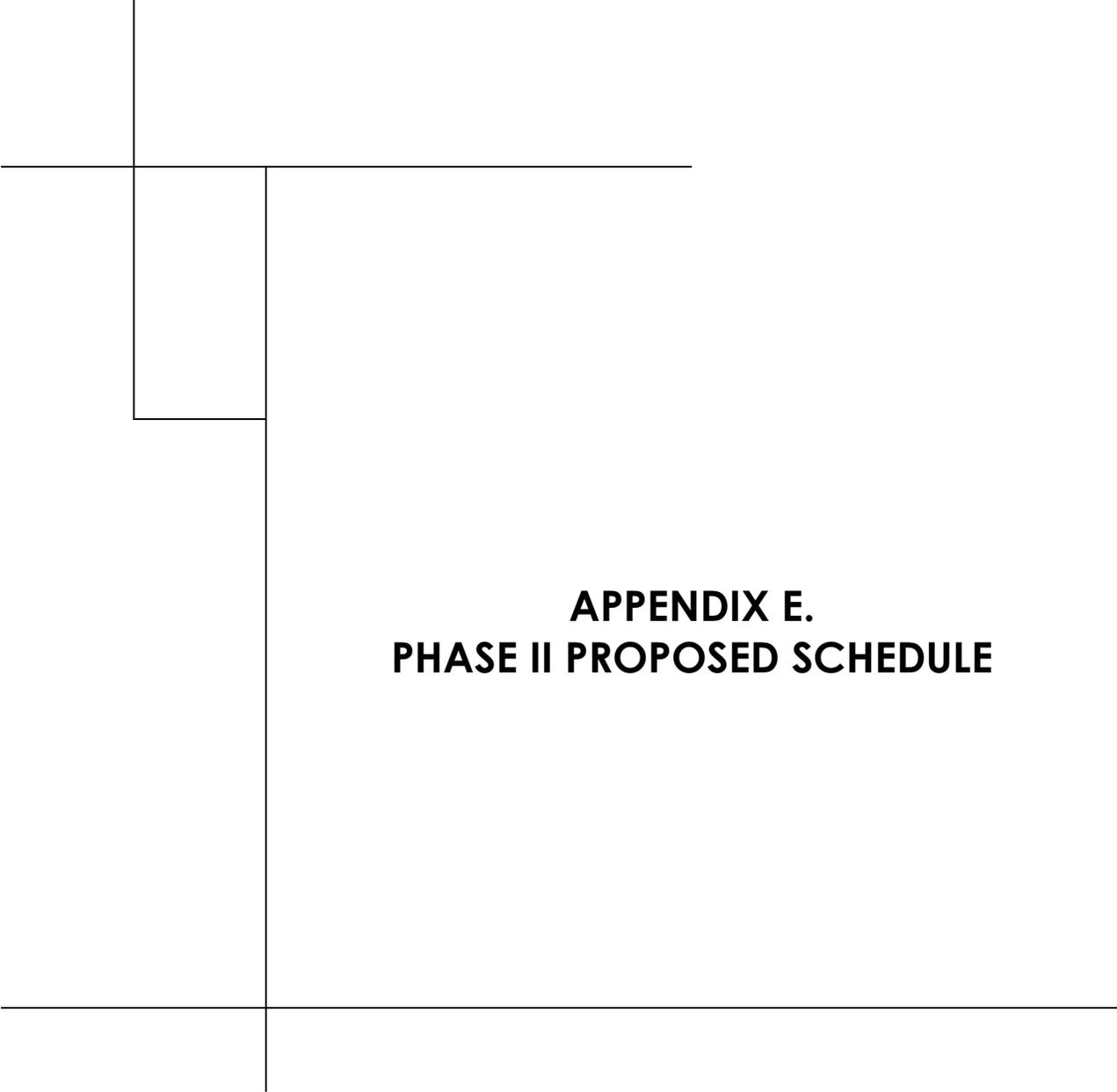
**APPENDIX D.
PHASE II COST PROPOSAL**

Phase II Cost Proposal

The estimated cost associated with completing the Phase II work is Two Hundred Fifty Seven Thousand Three Hundred Nineteen Dollars (\$257,310.00) as per the following breakdown:

COST ESTIMATE BY TASK			
	TIME	EXPENSES	TOTAL
Task A – Data Collection/Review/Analysis	\$29,994	\$480	\$30,474.00
Task B – Technical Analysis	\$115,006	\$2,019	\$117,025.00
Task C – Public/Municipal Participation	\$41,118	\$5,414	\$46,532.00
Task D – PLAN Preparation and Implementation	\$30,912	\$5,379	\$36,291.00
Task E – Project Management & Administration	\$29,952	\$1,475	\$31,427.00
PHASE II PROJECT TOTALS	\$246,982.00	\$14,767.00	\$261,749.00

COST ESTIMATE BY FISCAL YEAR			
Fiscal Year			
2008-2009	\$70,000	\$5,500	\$75,500.00
2009-2010	\$125,000	\$5,500	\$130,500.00
2010-2011	\$51,982	\$3,767	\$55,749.00
PHASE II PROJECT TOTALS	\$246,982.00	\$14,767.00	\$261,749.00



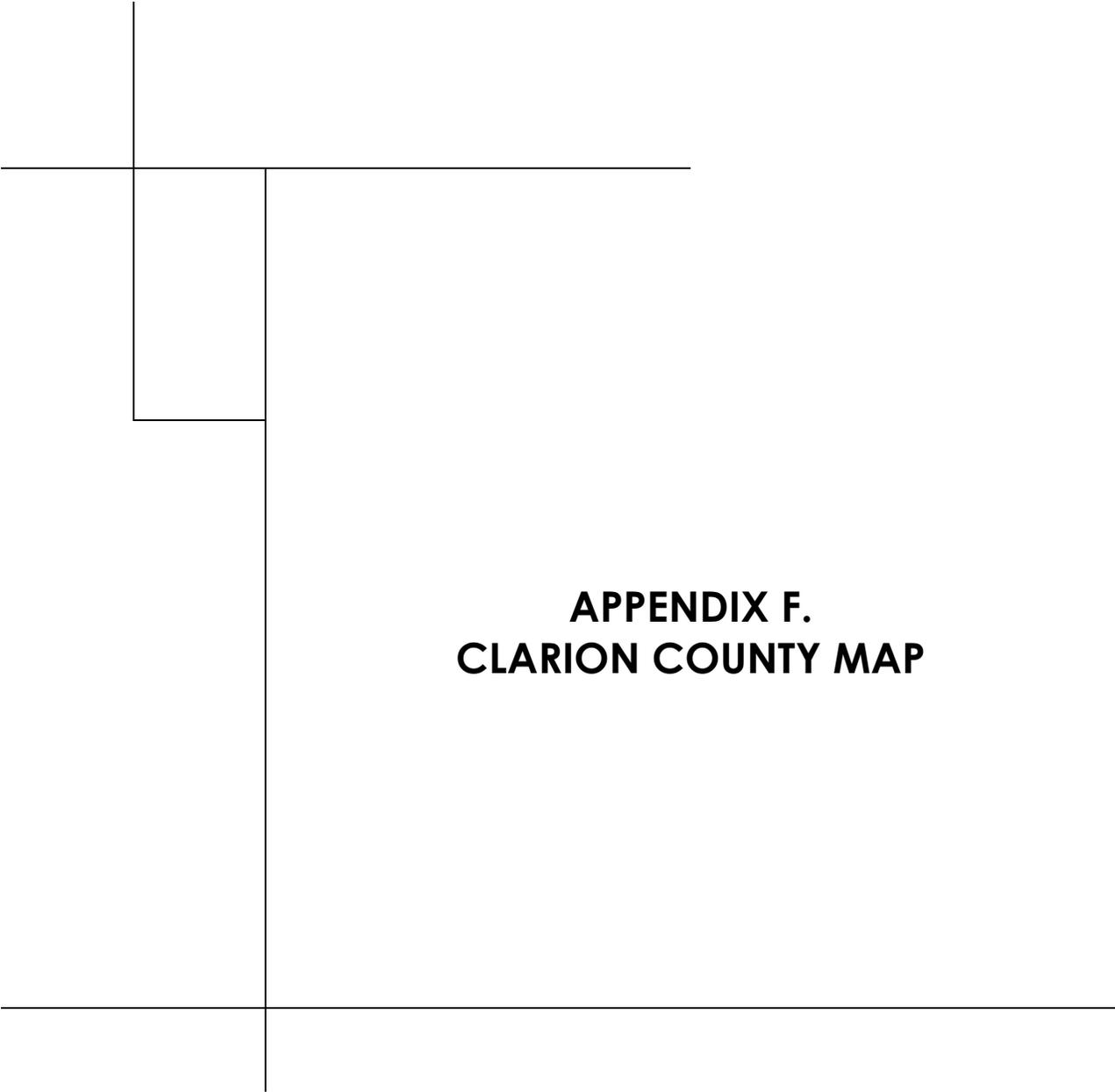
**APPENDIX E.
PHASE II PROPOSED SCHEDULE**

Phase II Proposed Schedule

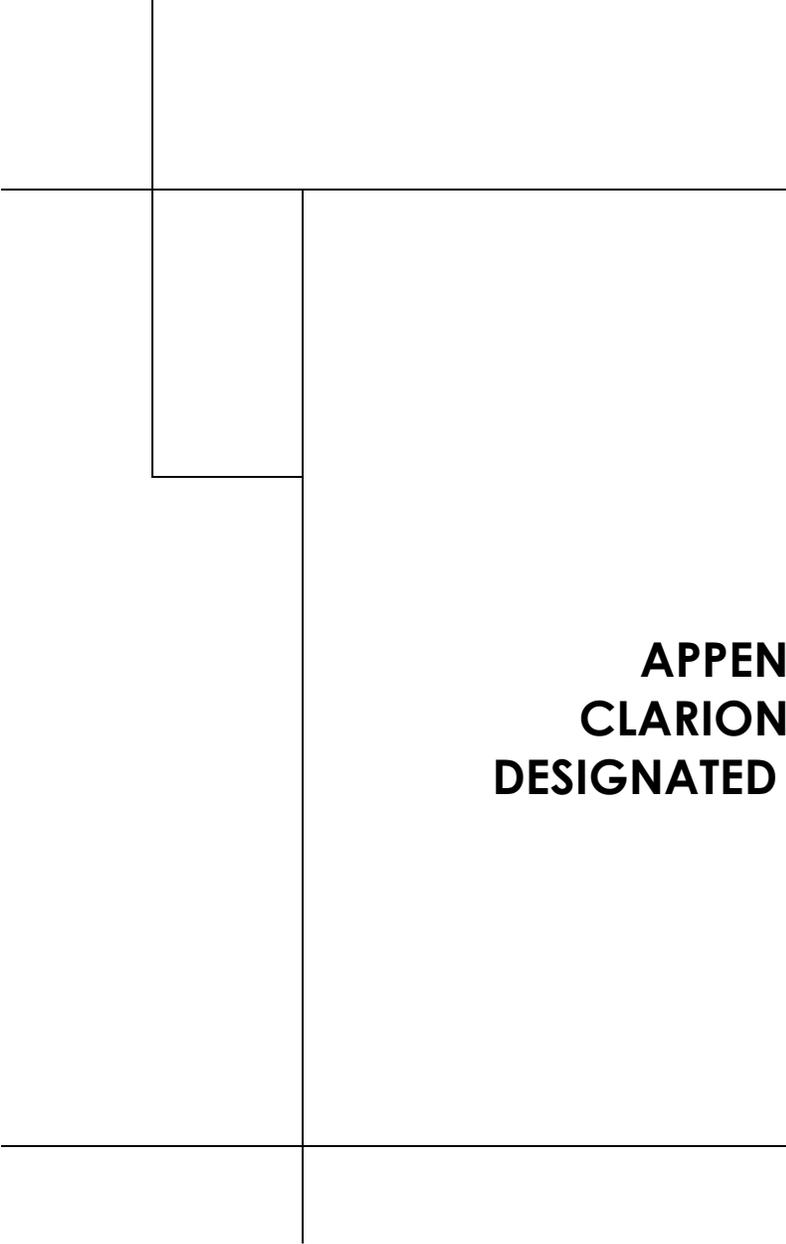
The proposed Phase II Schedule is as follows:

ANTICIPATED DATE	MILESTONE
December 2008	PADEP and Clarion County Phase II Contract Executed
February 2009	WPAC Meeting #3
February-April 2009	Field View of Problem Areas
May 2009	Conceptual Solutions to Problem Areas
June – July 2009	WPAC Meeting #4 and WPAC-E
May-September 2009	Detailed Study (Modeling)
January 2010	Draft Phase II Report
February 2010	Draft Model Ordinance
March 2010	WPAC Meeting #5 and WPAC-E
May 2010	Finalize Phase II Report, Model Ordinance, and Plates
June - July 2010	WPAC Meeting #6, WPAC-L, and BMP Workshop
September 2010	Public Hearing
October 2010	Commissioners Approval of Phase II Plan
October 2010	Phase II Report Submission to PADEP
December 2010 – June 2011	Implementation Workshops
June 2011	PADEP and Clarion County Phase II Contract Expires

This schedule will be re-evaluated at the beginning of Phase II and adjusted as needed.



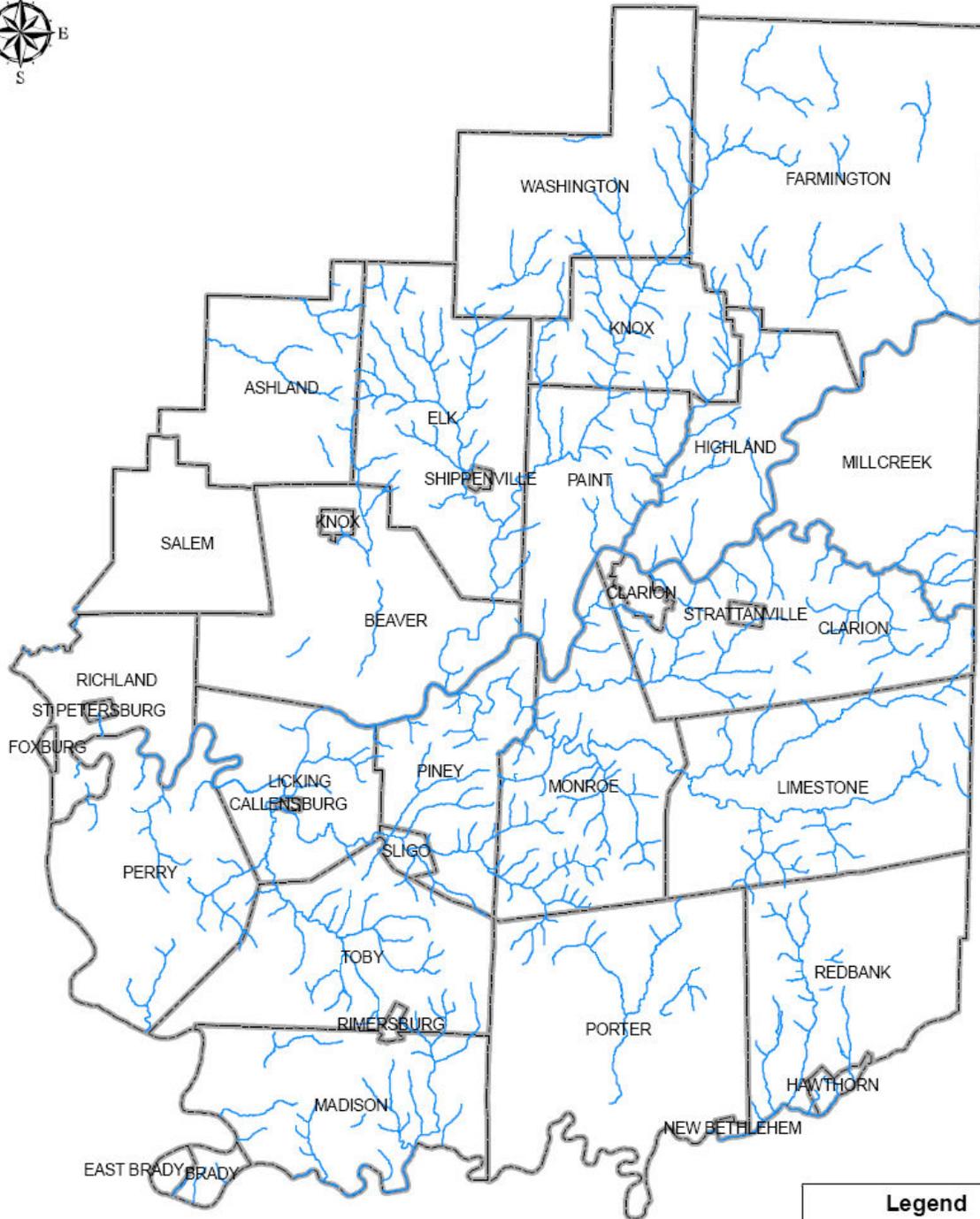
**APPENDIX F.
CLARION COUNTY MAP**



**APPENDIX G.
CLARION COUNTY
DESIGNATED WATERSHEDS**

CHAPTER 93 DESIGNATIONS

Stream	Zone	Water Uses Protected
§ 93.9q. Drainage List Q.		
Ohio River Basin in Pennsylvania - Allegheny River		
1—Ohio River		
2—Allegheny River (NY)		
2—Allegheny River	Main Stem, PA-NY State Border to Clarion River	WWF
3—UNT to Allegheny River	Basins, RM 106.70 to Clarion River	WWF
3—Richey Run	Basin	CWF
§ 93.9r. Drainage List R.		
Ohio River Basin in Pennsylvania - Clarion River		
4—UNT to Clarion River	Basins, Confluence of East and West Branches to Mouth	CWF
4—Cather Run	Basin	HQ-CWF
4—Maxwell Run	Basin	HQ-CWF
4—Blyson Run	Basin	EV
4—Mill Creek	Main Stem, Source to Little Mill Creek	HQ-CWF
5—UNT to Mill Creek	Basins, Source to Little Mill Creek	HQ-CWF
5—McCanna Run (Pendleton Run)	Basin	EV
5—Little Mill Creek	Basin	CWF
4—Mill Creek	Main Stem, Little Mill Creek to Mouth	CWF
5—UNT to Mill Creek	Basins, Little Mill Creek to Mouth	HQ-CWF
5—Douglass Run	Basin	CWF
5—Woods Run	Basin	HQ-CWF
5—Stroup Run	Basin	HQ-CWF
5—Trap Run	Basin	HQ-CWF
5—Whites Run	Basin	CWF
4—Reeds Run	Basin	CWF
4—Toby Creek	Basin	CWF
4—Trout Run	Basin	CWF
4—Courtleys Run	Basin	CWF
4—Piney Creek	Basin	CWF
4—Deer Creek	Basin	CWF
4—Canoe Creek	Basin	HQ-CWF
4—Beaver Creek	Basin	HQ-CWF
4—Licking Creek	Basin	CWF
4—Turkey Creek	Basin	HQ-CWF
§ 93.9s. Drainage List S.		
Ohio River Basin in Pennsylvania - Allegheny River		
3—Dunlap Creek	Basin	WWF
3—Black Fox Run	Basin	WWF
3—Catfish Run	Basin	WWF
4—UNT to Redbank Creek	Basins, Confluence of Sandy Lick Creek and North Fork to Mouth	CWF
4—Pine Creek	Basin	CWF
4—Town Run	Basin	CWF
4—Middle Run	Basin	CWF
4—Leisure Run	Basin	CWF
4—Long Run	Basin	CWF
4—Leatherwood Creek	Basin	CWF
4—Middle Run	Basin	CWF
4—Rock Run	Basin	CWF
4—Wildcat Run	Basin	CWF
3—Mast Run	Basin	CWF



Legend

- Nonattaining Streams
- ▭ Municipalities



NAME	SOURCE CAUSE	Total (miles)
Anderson Run	Abandoned Mine Drainage - Metals	1.127433
Bear Creek	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.023873
Black Fox Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.397756
Brush Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	2.36413
Canoe Creek	Petroleum Activities - Nonpriority Organics	2.002712
Catfish Run	Abandoned Mine Drainage - Metals	0.434993
Cherry Run	Abandoned Mine Drainage - pH	3.035151
Clarion River	Source Unknown - Mercury	12.24297
Clarion River	Abandoned Mine Drainage - Metals	3.779477
Cogley Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	1.174236
Cooper Run	Abandoned Mine Drainage – Metals, pH, Siltation	0.470381
Courtleys Run	Abandoned Mine Drainage - Metals	0.419968
Craggs Run	Grazing Related Agric - Nutrients ; Grazing Related Agric - Siltation ; Abandoned Mine Drainage - Metals ; Road Runoff - Water/Flow Variability ; Road Runoff - Siltation	0.69322
Crooks Run	Abandoned Mine Drainage - Metals	0.380917
Deer Creek	Abandoned Mine Drainage - Metals	4.283547
Douglass Run	Abandoned Mine Drainage - Metals	0.994008
EB Hemlock Creek	Petroleum Activities - Metals	0.358434
East Sandy Creek	Grazing Related Agric - Nutrients ,Organic Enrichment/Low D.O. ; Small Residential Runoff - Nutrients & Organic Enrichment/Low D.O.	0.749412
Engle Run	Petroleum Activities - Metals ; Abandoned Mine Drainage – Metals & pH	0.958549
Fowler Run	Abandoned Mine Drainage – Metals, Other Inorganics & pH	0.016225
Frills Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.584112
Gathers Run	Abandoned Mine Drainage – Metals	0.649926
Glade Run	Grazing Related Agric - Nutrients ; Abandoned Mine Drainage - Metals ; Road Runoff - Water/Flow Variability ; Road Runoff – Siltation	0.882042
Henry Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	1.498171
Huling Run	Abandoned Mine Drainage – pH	0.028203
Jack Run	Abandoned Mine Drainage – Metals	0.58277
Jones Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.774262
Judith Run	Abandoned Mine Drainage – Metals, pH, & Siltation	0.789467
Kyle Run	Abandoned Mine Drainage – Metals	0.368684
Lauer Run	Abandoned Mine Drainage – pH	0.456728
Leatherwood Creek	Abandoned Mine Drainage – Metals	1.348601
Leatherwood Creek	Agriculture – Siltation	0.637866
Licking Creek	Abandoned Mine Drainage – Metals, pH, & Siltation	5.375614
Licking Creek	Grazing Related Agric - Siltation ; Petroleum Activities – Metals & pH ; Abandoned Mine Drainage - Metals & pH	1.563698
Little Coon Run	Abandoned Mine Drainage – Metals & pH	0.603099
Little Deer Creek	Abandoned Mine Drainage – Metals, pH, & Siltation	1.270667
Little East Sandy Crk	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	1.728394
Little Licking Creek	Abandoned Mine Drainage – Metals	0.906589
Little Mill Creek	Abandoned Mine Drainage – Metals	1.121603
Little Paint Creek	Petroleum Activities - Metals ; Abandoned Mine Drainage - Metals & pH	1.937002

Little Piney Creek	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	3.175359
Little Toby Creek	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.890791
Mahles Run	Petroleum Activities - pH ; Abandoned Mine Drainage – pH	1.076131
McGourvey Run	Abandoned Mine Drainage – Metals, Other Inorganics & pH	0.670985
Middle Run	Abandoned Mine Drainage – Metals	1.07924
Mill Creek	Abandoned Mine Drainage - pH ; Abandoned Mine Drainage - Metals	2.868915
Mineral Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.932819
Paint Creek	Abandoned Mine Drainage – Metals, pH & Siltation	2.353454
Piney Creek	Abandoned Mine Drainage – Metals	6.825502
Poe Run	Grazing Related Agric - Nutrients ; Abandoned Mine Drainage - Metals	0.544767
Rapp Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.491012
Redbank Creek	Abandoned Mine Drainage - Metals & Siltation ; Other – Nutrients	3.093163
Reids Run	Abandoned Mine Drainage – Metals	1.316001
Richey Run	Abandoned Mine Drainage - Salinity/TDS/Chlorides	0.85019
Runaway Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.299878
Step Creek	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	1.504225
Step Run	Abandoned Mine Drainage – pH	1.023819
Tarkiln Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.755494
Toby Creek	Petroleum Activities - Metals ; Petroleum Activities - Siltation ; Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH ; Abandoned Mine Drainage - Siltation	4.277746
Town Run	Abandoned Mine Drainage – Metals	1.711716
Trout Run	Abandoned Mine Drainage - Metals ; On site Wastewater - Nutrients ; On site Wastewater - Suspended Solids ; On site Wastewater - Organic Enrichment/Low D.O.	0.76074
Turkey Run	Abandoned Mine Drainage - Metals	0.004058
Walley Run	Abandoned Mine Drainage - Metals	0.352726
W. F. Leatherwood Ck	Abandoned Mine Drainage - Metals	1.132043
Whites Run	Abandoned Mine Drainage - Metals	0.562854
Wildcat Run	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	1.553922
Wildcat Run East Fork	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.868533
UNT	Abandoned Mine Drainage - Metals	21.05119
UNT	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	28.71542
UNT	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH ; Abandoned Mine Drainage - Siltation	11.09572
UNT	Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - Siltation	4.143395
UNT	Abandoned Mine Drainage - Metals ; Grazing Related Agric - Nutrients	0.269203
UNT	Abandoned Mine Drainage - Metals ; On site Wastewater - Nutrients ; On site Wastewater - Suspended Solids ; On site Wastewater - Organic Enrichment/Low D.O.	0.444368
UNT	Abandoned Mine Drainage - pH	6.373156
UNT	Abandoned Mine Drainage - pH ; Abandoned Mine Drainage - Metals	0.553293
UNT	Crop Related Agric - Siltation ; Abandoned Mine Drainage - Metals ; Grazing Related Agric - Siltation	0.2628
UNT	Crop Related Agric - Siltation ; Grazing Related Agric - Siltation ; Abandoned Mine Drainage - Metals	0.164476
UNT	Grazing Related Agric - Nutrients ; Abandoned Mine Drainage - Metals	1.031009
UNT	Grazing Related Agric - Nutrients ; Abandoned Mine Drainage - Metals ; Road Runoff - Water/Flow Variability ; Road Runoff - Siltation	1.744044
UNT	Grazing Related Agric - Nutrients ; Grazing Related Agric - Organic Enrichment/Low D.O. ;	0.873792

	Small Residential Runoff - Nutrients ; Small Residential Runoff - Organic Enrichment/Low D.O.	
UNT	Grazing Related Agric - Nutrients ; Grazing Related Agric - Siltation ; Abandoned Mine Drainage - Metals ; Road Runoff - Water/Flow Variability ; Road Runoff - Siltation	5.131295
UNT	Grazing Related Agric - Nutrients ; Urban Runoff/Storm Sewers - Nutrients	0.240704
UNT	Grazing Related Agric - Siltation ; Abandoned Mine Drainage - Metals	0.223053
UNT	Grazing Related Agric - Siltation ; Petroleum Activities - Metals ; Petroleum Activities - pH ; Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	1.898025
UNT	Highway, Road, Bridge Const. - Metals ; Abandoned Mine Drainage - Metals	0.263093
UNT	Land Development - Water/Flow Variability ; Land Development - Siltation	0.39794
UNT	Natural Sources - pH ; Natural Sources - Siltation	0.267719
UNT	Petroleum Activities - Metals ; Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.646814
UNT	Petroleum Activities - Metals ; Petroleum Activities - pH ; Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	0.281969
UNT	Petroleum Activities - Metals ; Petroleum Activities - pH ; Petroleum Activities - Siltation ; Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH ; Abandoned Mine Drainage - Siltation	0.143722
UNT	Petroleum Activities - pH ; Abandoned Mine Drainage - pH	0.713435
UNT	Silvaculture - Siltation ; Abandoned Mine Drainage - Metals	0.258178
UNT	Source Unknown - Cause Unknown	0.019865
UNT	Urban Runoff/Storm Sewers - Nutrients ; Urban Runoff/Storm Sewers - Siltation	0.655348
	TOTAL	190.97