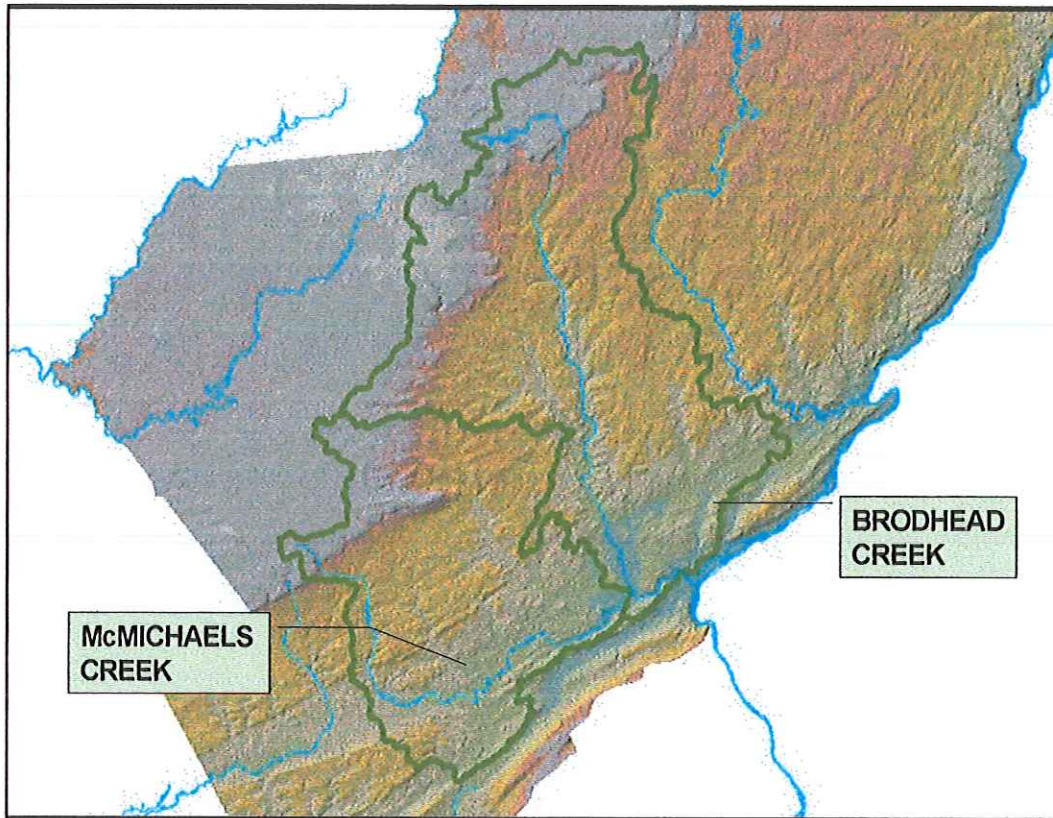


**ACT 167 STORMWATER MANAGEMENT
PLAN UPDATE
PHASE I - SCOPE OF STUDY**



**BRODHEAD CREEK AND McMICHAELS
CREEK WATERSHED
MONROE COUNTY**

SUBMITTED TO

**THE PENNSYLVANIA DEPARTMENT OF
ENVIRONMENTAL PROTECTION**

October 20, 2000

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I. INTRODUCTION

Initially, Act 167 Plans were developed for the Brodhead Creek (1991) and the McMichaels Creek (1988) separately. Since both plans are similar, since new issues are similar, and since the McMichaels Creek is a tributary to the Brodhead Creek, this Plan Update is for the combined Brodhead/McMichaels Creek Watershed.

Section 5(a) of Act 167 requires that each watershed plan be reviewed and any necessary revisions be made at least every 5 years after its initial adoption. An update may occur before the 5-year period has elapsed, should a county determine the need.

Plan updates are important to maintain effective management of stormwater runoff if significant changes in zoning have been undertaken from the zoning used in the plan to project future land cover conditions. A plan's standards may have to be reevaluated to manage the runoff from the additional impervious surfaces if, for instance, large tracts of land are rezoned from agricultural to industrial. Other reasons for updating a plan could include proposed changes in zoning, new flooding problems, and new obstructions in a stream or tributary impacting area drainage. Implementation issues at the local level and the desire by the county and municipalities to evaluate new watershed issues and management techniques such as groundwater recharge and water quality could also warrant a plan update.

II. BRODHEAD CREEK AND McMICHAELS CREEK WATERSHED CHARACTERISTICS

The Brodhead Creek and McMichaels Creek Watershed as illustrated in Figure 1 is located in south central, central, and northeast Monroe County and southwest Pike County.

The Brodhead Creek and McMichaels Creek Watershed is contained within seventeen (18) municipalities in Monroe County and one municipality in Pike County as follows:

Barrett Township	Paradise Township
Chestnuthill Township	Pocono Township
Coolbaugh Township	Price Township
East Stroudsburg Borough	Ross Township
Greene Township (Pike County)	Smithfield Township
Hamilton Township	Stroud Township
Jackson Township	Stroudsburg Borough
Middle Smithfield Township	Tobyhanna Township
Mt. Pocono Borough	Tunkhannock Township

Brodhead Creek drains a watershed area of approximately one hundred seventy-two (172) square miles in northern and east central Monroe County and a small section of southwestern Pike County. McMichaels Creek drains a watershed area of approximately one hundred

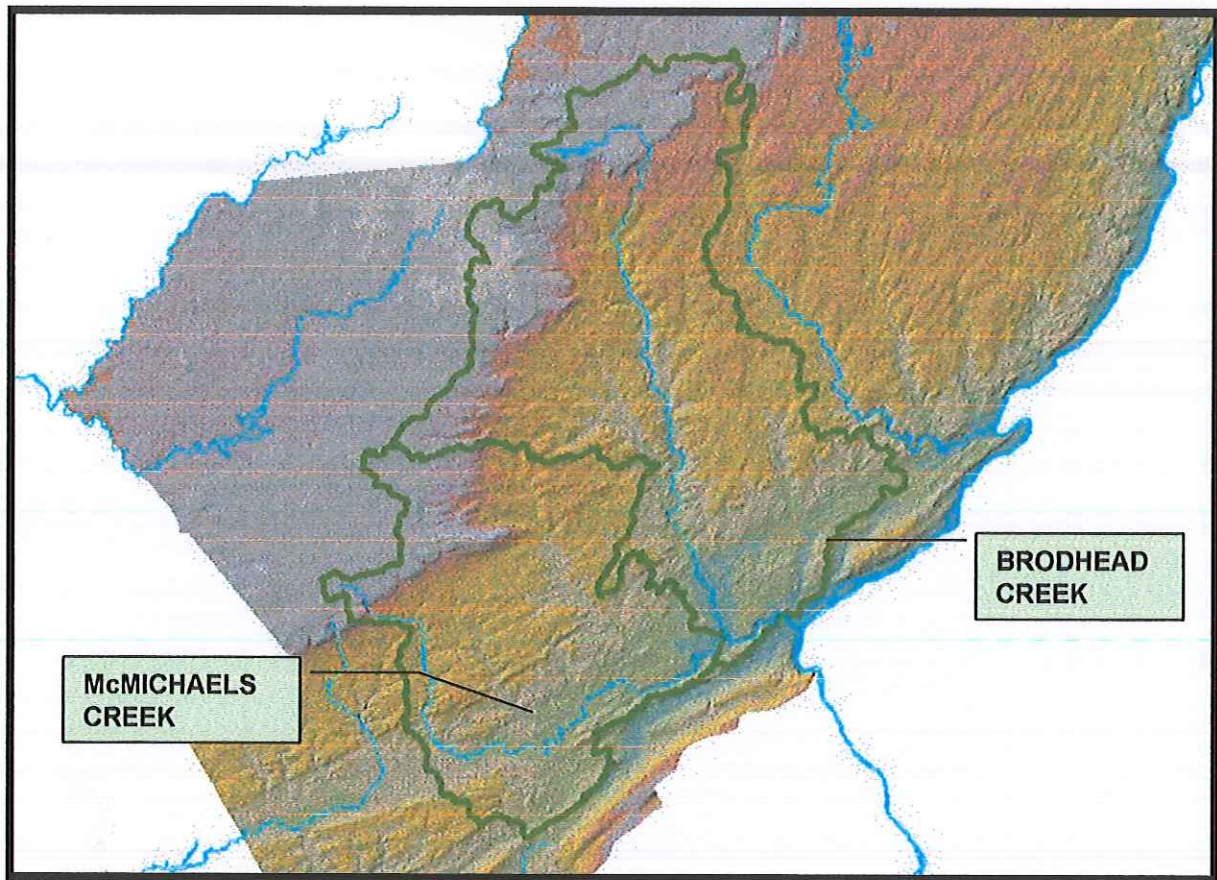


Figure 1. - DEM

thirteen (113) square miles in south central Monroe County. Major tributaries to Brodhead Creek include Buck Hill Creek, Griscom Creek, Leavitt Branch, Marshalls Creek and its tributaries, Michael Creek, Middle Branch, Mill Creek, Paradise Creek and its tributaries, Pine Mountain Run, Poplar Run, Rattlesnake Creek, Sambo Creek, Spruce Cabin Run, and Stony Creek. Major tributaries to McMichaels Creek include Appenzell Creek, Bowers Creek, Fall Creek, Hypsy Creek, Kettle Creek, Lake Creek, Little Pocono Creek, Pocono Creek, Sand Spring Run, and Spring Run. The Brodhead Creek and McMichaels Creek Watershed and major tributaries are shown in Figure 1. Large scale mapping of the watershed is available for review at the County Planning Commission office.

The major traffic routes in the Brodhead Creek and McMichaels Creek Watershed include Interstate route 80 as well as PA routes 611, 209, 33, 191, and 447. Interstate route 80 runs east-west throughout the center of the watershed.

Land use in the watershed is primarily residential, especially in Chestnuthill and Pocono Townships. There are large undeveloped areas found throughout the watershed and urbanized areas are mostly in the southeastern portions of the watershed in the Boroughs of Stroudsburg and East Stroudsburg and the Townships of Smithfield and Stroud. Commercial land uses have been concentrated along major arterial and collector highways such as Routes 611, 209, 191, and 447.

III. PREVIOUS PLAN EFFORTS

An Act 167 Plan was developed separately for the Brodhead Creek (1991) and McMichaels Creek (1988) watersheds by the Monroe County Planning Commission. Standards and criteria were developed and incorporated into a municipal ordinance. The following is the status of the municipalities adoption of the stormwater management ordinance:

McMICHAELS CREEK WATERSHED ACT 167

<u>Municipality</u>	<u>Status</u>
Stroudsburg Borough -	Adopted
Chestnuthill Township -	Adopted
Hamilton Township -	Adopted
Jackson Township -	Adopted
Pocono Township -	Adopted
Ross Township -	Adopted
Stroud Township -	Adopted
Tobyhanna Township -	Not Adopted
Tunkhannock Township -	Adopted

BRODHEAD CREEK WATERSHED ACT 167

<u>Municipality</u>	<u>Status</u>
East Stroudsburg Borough -	Adopted
Mt. Pocono Borough -	Adopted
Stroudsburg Borough -	Adopted
Barrett Township -	Adopted
Coolbaugh Township -	Adopted
Middle Smithfield Township -	Adopted
Paradise Township -	Adopted
Pocono Township -	Adopted
Price Township -	Adopted
Smithfield Township -	Adopted
Stroud Township -	Adopted
Tobyhanna Township -	Not Adopted

IV. THE PLAN UPDATE PROCESS

Updating a plan takes place in two phases. Phase I involves the preparation of a scope of study and cost estimate. The actual plan update takes place in Phase II.

Administrative Steps

The administrative steps followed to develop this update are as follows:

1. County enters into Phase I grant agreement with Department
2. Watershed Plan Advisory Committee (WPAC) is formed

3. Questionnaires are mailed out
4. County assesses questionnaires, meets with WPAC
5. County evaluates update needs
6. Scope of study is developed along with cost estimate
7. County enters into Phase II grant agreement with Department
8. Technical, educational and administrative work is conducted
9. Draft plan update prepared, reviewed by DEP, WPAC, others
10. Public hearing is held
11. County adopts plan update
12. DEP approves plan update
13. Municipalities amend ordinances as determined by plan update

Once a county completes the Phase I, Scope of Study Update, the Department reviews and evaluates the scope of work. Upon final negotiations between the Department and County (and its consultant), the Department will enter into a Phase II agreement with a County to do the actual plan update. As with regular stormwater plans, counties will be responsible for plan preparation, holding of a public hearing and adoption by the County Board of Commissioners. The Department will review the plan and provide approval.

The update will provide a forum for education and outreach on implementation of best management practices for water quality and groundwater recharge and update of "model ordinance" language to improve implementation.

V. ACT 167 PLANNING FOR BRODHEAD CREEK AND McMICHAELS CREEK WATERSHED

Given the above watershed characteristics, the watershed planning process for this study area must be fitted to the watershed characteristics, as well as the resources (technical, political, and economic) of this area. This section of the Phase I - Scope of Study Update 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 watershed stormwater management project.

Approach for the Development of the Brodhead Creek and McMichaels Creek Watershed Plan Update

In order to implement watershed-wide comprehensive planning for and management of stormwater runoff, it was necessary to take a very close look at all portions of the watershed for this Phase I study. Since the Act itself is very dependent on municipal coordination to provide for the total planning and management of stormwater throughout the watershed, it is necessary to get each municipality in the watershed involved in 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 by the County and consists of the required municipalities, the County Conservation District and interested groups. A WPAC meeting with municipalities was held during Phase I preparations to obtain their general commitment to the project. Discussions from this meeting, an evaluation of the questionnaires,

in conjunction with in-house knowledge of the county and DEP, determined to what level a plan should be updated. The WPAC Membership list can be found in Appendix C.

VI. MUNICIPAL QUESTIONNAIRE

A survey questionnaire strategy was incorporated into the Phase I Update work approach for the watershed to obtain municipal input on how well the current Plan is working, how it could be improved, and to determine areas that may necessitate reevaluation. The questionnaire is designed to solicit input from each municipality, relative to specific problems in the watershed, as well as for the needs they may see for stormwater management in their particular area. The questionnaire, along with a summary of the purpose of Act 167 (which includes an emphasis on Act 167 goals as they relate to this watershed), was distributed to municipalities, watershed groups and other agencies or interested individuals. These questionnaires included broad questions such as "How well is the plan working in your community?", to specific questions on new problem areas and new needs within the watershed. [An example of the questionnaire package is included as Appendix A of this document.]

Because the most important part of the Act 167 planning process is the implementation of the plan, another consideration in utilizing this questionnaire strategy is to develop interest by the responding municipalities for the need and the desire to actively implement stormwater management measures within their community. A summary of the stormwater related problems and the identification of properties affected by flooding incidences in each municipality is an important expected product of the Phase I study.

The overall evaluation of the Municipal Questionnaires which were received shows several occurrences of small stream flooding and stream bank erosion throughout the watershed during major storm events resulting in both private and public property damages.

These problems are more pronounced in the more populated areas most likely due to encroachments onto floodplain areas and undersized culverts or bridges. A large number of these stormwater related problems have been traced back to uncontrolled runoff from local and upstream areas, inadequate culverts or bridges, and obstructions in the system that are blocking the natural flow of stormwater.

An additional problem of major concern in this watershed relates to water quality. Runoff from parking lots and streets contribute nonpoint source pollution to the storm sewers and eventually the streams. Due to the residential land use in the watershed, the area experiences contamination caused by residential nutrient runoff as well as soil erosion and stream bank erosion. Bacteria, nutrients, sediments and erosion have been identified as water quality problems in the watershed. Water quality problems have been identified as being a result of agricultural non-point source pollution and sediment from stream bank erosion. In addition, habitat loss and eutrophication have also been reported.

The following list summarizes the major problems for individual municipalities obtained from the municipal questionnaires and demonstrates the types of stormwater runoff and water quality problems in the watershed as well as where they occur in the watershed:

<u>Township</u>	<u>Most Severe Problems</u>
Chestnuthill Township	Smaller storms, water quality
Coolbaugh Township	Flooding, erosion, sedimentation
Jackson Township	Flooding, groundwater, road drainage
Middle Smithfield Township	Flooding
Paradise Township	Existing commercial sites, stream bank erosion, inadequately sized culverts/bridges, road drainage
Stroud Township	Flooding, NPS pollution, inadequately sized culverts
Stroudsburg Borough	Flooding, water discharge quality, stream bank erosion, residential NPS pollution, sedimentation maintenance.
Tobyhanna Township	Stream bank erosion

Although some of these problems are not directly related to storm water runoff, this storm water management plan will coordinate with the programs that address some of these other problems.

There were no major changes in land cover or zoning and therefore it does not warrant an extensive evaluation of hydrologic modeling and resulting standards. It has been determined from WPAC input that under this update scope, the release rate percentage concept of storm water management is not creating any problems, however, a more simplistic application approach such as several management districts was desired. In addition, several municipalities expressed a need to address the smaller, more frequent storms that create water quality and stream bank erosion problems. Therefore, new modeling will be required to categorize the release rates into management districts. The new management districts will be a result of the effort. The Phase I Update determined that no new problems are related to the technical standards in the watershed.

Stormwater management planning is critical in the areas both affected and currently unaffected by stormwater problems in the Brodhead Creek and McMichaels Creek watershed. For areas, which are currently being affected, the frequency of flooding is mainly during larger storm events. The Act 167 plan can significantly address future more frequent flooding problems in these areas by managing runoff from newly developing areas. For areas currently unaffected by stormwater problems, the Act 167 plan will provide controls on future development to aid in preventing future stormwater runoff problems.

Any technical evaluations and revisions to standards will be done with input from the advisory committee, municipal engineers committee and legal advisory committee as in regular plan preparations.

VII. PLAN PREPARATION STRATEGY

The updated Plan will contain, at a minimum, items 1-15 below, required in Act 167, however, the level of effort required for the update will be significantly less than the original Plan effort. If these items were addressed in the initial Plan, the effort will not be duplicated here, simply updated where necessary.

- (1) a survey of existing runoff characteristics in small as well as large storms, including the impact of soils, slopes, vegetation and existing development;
- (2) an update of the survey of existing significant obstructions and their capacities,
- (3) an assessment of projected and alternative land development patterns in the watershed, and the potential impact of runoff quantity, velocity and quality;
- (4) an analysis of present and projected 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 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 particular watershed;
- (8) an identification of existing and proposed State, Federal and local flood control projects located in the watershed and their design capacities;
- (9) a designation of those areas to be served by stormwater collection and control facilities within a ten-year period, an estimate of the design capacity and costs of such facilities, a schedule and proposed methods of financing the development, construction and operation of such facilities, and an identification of the existing or proposed institutional arrangements to implement and operate the facilities;
- (10) an identification of flood plains within the watershed;
- (11) criteria and standards for the control of stormwater runoff from existing and new development which are necessary to minimize dangers to property and life and carry out the purposes of this act;
- (12) priorities for implementation of action within each plan;
- (13) provisions for periodically reviewing, revising and updating the plan;
- (14) provisions as are reasonably necessary to manage stormwater such that development or activities in each municipality within the watershed do not adversely affect health, safety

and property in other municipalities within the watershed and in basins to which the watershed is tributary; and

- (15) consideration for consistency with other existing municipal, county, regional and State environmental and land use plans.

The concept and approach presented in the previous discussions has been organized into stages that include the above indicated 15 elements of the plan.

Stage A - Data Collection and Analysis

A.1 - Data Collection/Review/Analysis

This task will involve the necessary efforts to gather, review and analyze the original Plan data and data reflecting changes since the completion of the Plan required to complete the technical and institutional planning steps for the Brodhead Creek and McMichaels Creek Act 167 Watershed Stormwater Management Plan Update.

GIS data to be collected for the Brodhead Creek and McMichaels Creek Update includes:

- Developing a Digital Elevation Model (DEM) for the watershed to show topographic relief.
- Developing a Digital Raster Graphic (DRG) map for the watershed delineation and problem area location.
- Locating problem areas
- Evaluating Geologic areas for recharge evaluation

A comprehensive review of related documents will be performed and a coordinated list of the goals and objectives from each of the project documents will be developed. Existing documents to be reviewed shall consist of, but not be limited to:

- Water Supply Plan and Wellhead Protection Program (1997), Monroe Co. Planning Commission
- McMichaels Creek Act 167 Plan (1988), Monroe Co. Planning Commission
- Brodhead Creek Act 167 Plan (1991), Monroe Co. Planning Commission
- Municipal Flood Insurance Studies (varies), Federal Emergency Management Agency
- Previous USACOE, SCS (NRCS) and local studies on Brodhead Creek and McMichaels Creek
- Pocono Creek and DRBC Study
- Floodplain Monitoring Program (MCCD)
- Municipal Ordinances

As indicated in the municipal survey forms and input from citizens in the Phase 1 WPAC meeting, there are stream bank erosion problems in several locations within the Brodhead and McMichaels Creek watershed. A detailed field investigation will be performed to evaluate the situation.

Finally, several solutions will be identified in schematic form and appropriate sources of funding identified.

This task effort will also coordinate closely with the start-up WPAC meeting, which will involve the distribution of data questionnaires to the municipalities. In addition, a discussion of procedures to be followed in the completion of the questionnaires will be provided at the initial WPAC meeting.

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 municipal data questionnaire process for consistency and usability in the final implementation plan.

Project Team Responsibility

- **COUNTY** - responsible for the distribution and initial training associated with the municipal data questionnaire, including the actual data gathering, organizing, and cataloging of data questionnaire responses at the County offices. Responsible for collection of data.
- **CONSULTANT** - responsible for assisting County with the preparation of municipal data questionnaires. Shall provide support for the actual data gathering and organizing efforts, as well as the preliminary review for consistency and content. Responsible for the review of gathered and organized data and the acceptability of the data, as well as for the preparation of a missing data list. Final responsibilities also include the final determination of data usability for the completion of the necessary technical and institutional planning efforts, as well as for providing input and/or alternatives for the collection of missing data.

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 watershed planning (including updates). A final data summary will be prepared that will identify and/or catalogue the collected data.

A.2 - Municipal Ordinance Reviews/Evaluations

This task will involve the detailed review of the 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 watershed municipalities. The objective and the preparation of the matrix is to easily and effectively see the

similarities and differences, as well as the consistency/ inconsistency, between the various municipal ordinances in the watershed. The matrix will be used to develop ordinance provision recommendations for the various municipalities that are based on the standards and criteria.

A detailed review of existing implementation procedures in the Subdivision and Land Development Ordinances (SALDO's) and/or Zoning Ordinance for nonstructural storm water management / land use regulations related water quality, groundwater recharge and stream bank erosion will be performed.

Project Team Responsibilities

- **COUNTY** - responsible for the preparation of the municipal ordinance provisions matrix for the entire watershed.
- **CONSULTANT** - responsible to provide insight and guidance to County staff in the formatting of the municipal ordinance provision matrix. Also responsible to review the completed municipal ordinance provisions matrix for consistency with the needs of the institutional analysis and implementation plan development efforts.

Anticipated Product

The product of this task will be a completed matrix of stormwater management ordinance provisions for the watershed municipalities which identifies the current status of ordinance provisions as they relate to stormwater management and incorporated changes to the existing Brodhead Creek and McMichaels Creek Watersheds Model Storm Water Management Ordinance and potentially in the municipal Subdivision and Land Development Ordinances (SALDO's).

A.3 - Data Preparation For Technical Analysis

This task involves the engineering work necessary to update the information collected under Task A.1 into a geographic information system (GIS) that can be used for the later technical tasks.

GIS data to be updated for the Brodhead Creek and McMichaels Creek Watersheds Update includes the following items:

- Developing a Digital Elevation Model (DEM) for the watershed to show topographic relief, obtaining lengths and slopes.
- Developing a Digital Raster Graphic (DRG) map for the watershed delineation and problem area location.
- Locating problem areas.
- Geology for recharge evaluation.
- Stormwater Management Districts.

Project Team Responsibilities

COUNTY – Responsible for collection original plan data.

CONSULTANT – Responsible for transposition of data relating to stormwater problem areas into the GIS and digital spreadsheets. Responsible for the remaining map preparation work described above and the development of watershed base maps for use in both the technical planning process as well as the final plan presentation. Responsible for review and analysis of the catalogued municipal data questionnaire information to help identify the data, as described above, that will be included on various maps. Responsible for final review of technical mapping information for use in modeling efforts.

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.

Stage B - Technical Analysis

The technical analysis will describe the analytical processes involved with developing a strategy to manage stormwater runoff from new land development. 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
- Maintain groundwater recharge
- Reduce channel erosion
- Manage overbank flood events
- Manage extreme flood events

These objectives will be accomplished under Subtasks B.1 to B.4. Further information on the theory of water quality design storms and runoff capture design storms may be found in Section 5 and Appendix F of the "Pennsylvania Handbook of Best Management Practices for Developing Areas".

B.1 Determine Water Quality Design Storm

1. Obtain long-term rainfall records/data in watershed or region.
2. Analyze records to identify a water quality design storm such that 90% of the total annual rainfall volumes occur in storms of equal or smaller magnitude.
3. Establish standards and guidance for the treatment of the total volume generated from the water quality design storm through bmp technology.

B.2 Determine Runoff Capture Design Storm (groundwater recharge and retention)

1. Estimate the runoff ratio (percent of annual rainfall that is retained and the percent of annual rainfall that becomes runoff) that would characterize the watershed. This may be accomplished by the analysis of regional water resources reports or the establishment of a water budget for the watershed.
2. Analyze rainfall data from the watershed or region to identify the runoff capture design storm. For example, given a runoff ratio (see item B.2.1 above) of 40 percent for a watershed, 60 percent of annual rainfall is retained and/or infiltrated. The runoff capture design storm would be such that 60 percent of annual rainfall volumes would occur from storms of equal or smaller magnitude.
3. Establish infiltration requirements and/or guidance that would reflect the capture design storm and local soil conditions. For example, given a capture design storm, a site developer would be required to provide infiltration of the capture design storm through bmps up to percolation abilities of the soils. Any remaining volume from the capture design storm not infiltrated would need to be retained on site. (Note that the runoff capture design storm may be considered part of the water quality design storm in that infiltrating all or a portion of the runoff capture design storm would count towards treatment of the water quality design storm.

B.3 Establish streambank erosion requirements

1. Discuss and provide a streambank erosion standard (for example, detain 1-year, 24-hr storm event and drain over 24-hr period) This work will involve an analysis of the erodibility of soils in and along streams within the watershed.

B.4 Establish overbank and extreme event requirements (release rates)

This task typically involves the hydrologic modeling, quantitative computations and evaluations necessary to analyze runoff characteristics of the watershed under existing and future conditions. It also establishes the need and extent of release rates for the 1, 2, 5, 10, 25, 50 and 100-year events. In the case of this Plan, the release rates have already been established, and according to the municipal survey, appear to be working. However, the release rates will be categorized into management district criteria by equating release rate criteria to stormwater management districts utilizing design storms.

The process will follow the general outline in Figure 2. All five steps' objectives will be undertaken, however, for overbank and extreme event flooding, the release rates will be equated to design storm management districts.

Act 167
 Technical Objectives (Desired)

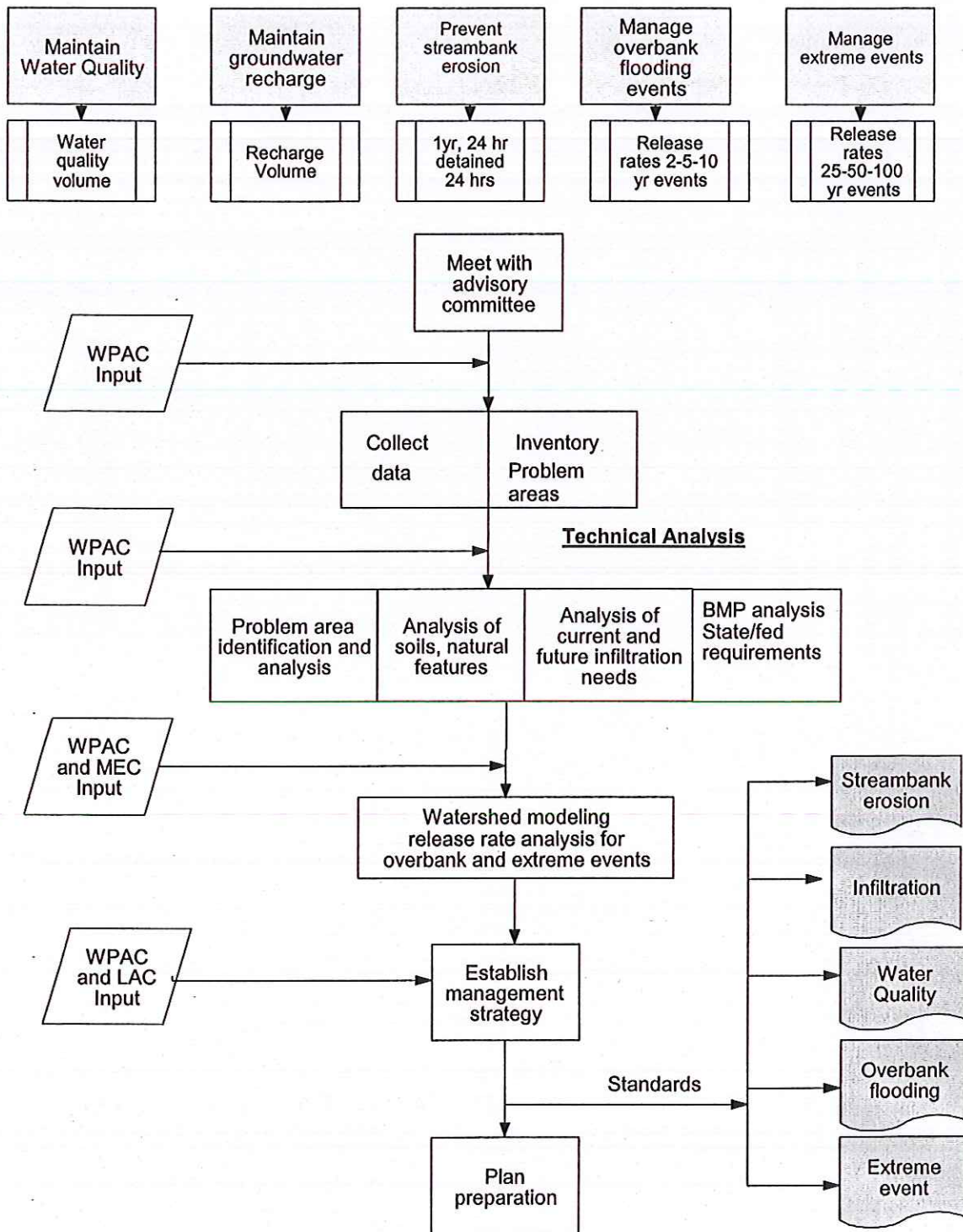


Figure 2. Flow chart for analyzing five comprehensive management objectives.

B.5 Compilation of All Technical Standards

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

The standards and criteria update will address the following in more detail than the original Plan:

- a. Identification of all areas within the watershed where different criteria apply;
- b. Recommended release rate percentages (if applicable) or other levels of control to accelerated runoff from the subareas identified in item "a" above;
- c. Recommended design flood frequencies and computational methodologies for stormwater management measures;
- d. A list of recommended alternate stormwater collection and control measures;
- e. Specifications for construction and maintenance of stormwater systems (if applicable);
- f. Safety requirements for stormwater systems during and after construction;
- g. An identification of regional versus localized problems and generalized proposed solutions;
- h. Funding sources for correction of existing problems;
- i. Coordinated efforts with concurrent studies. A summary of what tasks will be completed by what programs and what will be generated so as to avoid duplication of effort;
- j. Feasibility of a storm water utility or maintenance/management fund;
- k. Evaluation of existing floodplain ordinances and recommendations for improvement;
- l. A summary of what can and cannot be accomplished under Act 167;

The recommendations will be presented in layman's language, keeping in mind that they are directed toward the local municipalities and are to address solutions to stormwater management needs and will be read and interpreted by technical and non-technical people. The technical standards and criteria developed as a part of this task will be watershed-wide in their interpretation and/or application.

Water quality BMP information will be presented including recommendations for the voluntary implementation of water quality "Best Management Practices" or BMP's for new land development activities to minimize impacts of non-point source pollution from land development activities. This educational effort will primarily involve discussions, presentations and handouts on BMP technology to municipal officials during regularly scheduled advisory committee

meetings as described under Stage C. Information available from DEP and other sources will be distributed.

Non-structural methods of controlling stormwater runoff quantity and quality, such as innovative site planning, impervious area reduction, grading and protection of natural depression areas, temporary ponding on site and other techniques will be evaluated and recommended for inclusion in the model ordinance. To promote these measures, credits, such as shown in Table 1, will be discussed and considered.

Table 1. Stormwater Credit Program

Stormwater Credit	Description
Stormwater Credit Natural Area Conservation	Conservation of natural areas such as forest, wetlands, or other sensitive areas in a protected easement thereby retaining their pre-development hydrologic and water quality characteristics. Using this credit, a designer may subtract conservation areas from total site area when computing the required water quality volume. Additionally, the post-development curve number (CN) for these areas may be assumed to be forest in good condition.
Disconnection of Rooftop Runoff	Credit is given when rooftop runoff is disconnected and then directed over a pervious area where it may either infiltrate into the soil or filter over it. Credit is typically obtained by grading the site to promote overland flow or by providing bioretention on single-family residential lots. If a rooftop area is adequately disconnected, the impervious area may be deducted from the total impervious cover. Additionally, the post-development CNs for disconnected rooftop areas may be assumed to be forest in good condition.
Disconnection of Non-Rooftop Runoff	Credit is given for practices that disconnect surface impervious cover by directing it to pervious areas where it is either infiltrated or filtered through the soil. As with rooftop runoff, the impervious area may be deducted from the total impervious cover thereby reducing the required water quality volume.
Stream Buffer Credit	Credit is given when a stream buffer effectively treats stormwater runoff. Effective treatment constitutes capturing runoff from pervious and impervious areas adjacent to the buffer and treating the runoff through overland flow across a grass or forested area. Areas treated in this manner may be deducted from total site area in calculating and may contribute to meeting requirements for groundwater recharge.

Grass Channel (Open Section Roads)	Credit may be given when open grass channels are used to reduce the volume of runoff and pollutants during smaller storms. Use of grass channels will automatically meet the minimum groundwater recharge requirement. If designed according to appropriate criteria, these channels may meet water quality criteria for certain types of residential development.
Environmentally Sensitive Rural Development	Credit is given when a group of environmental site design techniques are applied to low density or rural residential development. This credit eliminates the need for structural practices to treat both the required recharge volume Re_v and water quality volume. The designer must still address the channel protection volume, the overbank protection and overbank/extreme flood event requirements for all roadway and connected impervious surfaces.

B.6 - Implementation of Technical Standards and Criteria

This task will involve the identification of the necessary ordinance provisions for each watershed municipality that will be required to be instituted in order to effectively comply with the technical standards and criteria. Included will be the modification of the model ordinance and/or recommendations for updating existing municipal subdivision and land development ordinances to effectively implement the technical standards and criteria for stormwater management in this watershed. A design example will be provided to show how to incorporate the various aspects of the five phase approach, innovative stormwater management and conservation planning into the site design process.

Project Team Responsibilities (B.1-B.6)

- **COUNTY** - responsible for support in technical work and preparation of the technical standards and criteria and the submission to the consultant of questions and concerns for resolution prior to the completion of the final plan. Also responsible for the development of the legal and financial alternatives for stormwater management. Additional responsibilities include the evaluation and identification of inter-municipal arrangements for watershed level (i.e., regional) stormwater management in the watershed and final responsibility for the identification of ordinance provisions for each municipality to be included in the final implementation plan for the watershed.
- **CONSULTANT** - responsible for the technical evaluation/analysis to be completed for the development and verification of technical standards and criteria as a part of this task. Responsible for assisting the County in developing the ordinance provisions.

Anticipated Product

The product will be an update to the existing Plan including the charts, tables and graphs to present the technical standards and criteria for use in the preparation of the Update. The product

will also include the identification of necessary recommended municipal ordinance provisions to implement the technical standards.

Stage C - Public/ Municipal Participation

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 and Department.

Three committees will be established 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. These committees are: 1) Watershed Plan Advisory Committee (WPAC); 2) Municipal Engineers Committee (MEC); and 3) Legal Advisory Committee (LAC).

The WPAC consists of representatives from each municipality in the watershed as well as the Conservation District, Monroe County Planning Commission and interest groups (watershed associations, for example). The WPAC meetings will be held to provide education on the planning process to elected municipal officials and interest groups, in addition to receiving advice from the municipal officials to assure the plan fits the needs of the municipalities and to solicit valuable information through the distribution of the questionnaire for technical and institutional data. The advisory role of the WPAC during the development of the plan is vital to the ultimate adoption and implementation processes.

The Municipal Engineers Committee (MEC) will consist of the municipal engineer from each municipality within the watershed (and any invited engineering, technical or scientific individuals). The MEC 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.

The Legal Advisory Committee (LAC) will include the solicitors representing every municipality in the watershed. A meeting with the LAC will be convened one time 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 municipal official's handbook will be developed tailored to the watershed and will provide guidance to municipalities to implement innovative storm water management and Best Management Practices. Included in this handbook will be a methodology to implement nonstructural stormwater management measures including conservation planning. Since facility maintenance is always a concern to municipal officials, maintenance provisions for these practices will be included in this handbook.

The County will develop and conduct a Stormwater Quality/BMP (Best Management Practices) Workshop for the Municipalities and Municipal Engineers within the watershed. The presentation of the workshop will be based on this tailored handbook and will be Coordinated with The Pennsylvania Handbook of Best Management Practices for Developing Watersheds. The workshop will contain one or more examples showing the design and construction of BMPs, including design calculations.

Table 2 describes proposed WPAC, MEC and LAC meetings and public hearing schedules including the purpose of each meeting.

Table 2. – WPAC, MEC and LAC Meetings, Purpose and Schedule

Meeting	Purpose of Meeting	Meeting Schedule
WPAC 1	Phase II Start-up Meeting - introduce the municipalities to the Phase II Planning process and establish the degree of critical municipal involvement needed throughout the study. Present the data collection questionnaire and request assistance in gathering the required information.	Beginning of the Project
MEC And LAC	Educate the municipal solicitors and engineers on the technical standards on water quantity and quality, ordinance adoption and implementation requirements of the plan and to receive comments and direction in the development of the model ordinance. Determine final technical standards on water quantity and quality.	End of Stage B
WPAC 2	Present draft plan, present technical standards and criteria for the watershed, and discuss water quality issues and preliminary ordinance provisions for the municipalities (general and overall). Review municipal comments. (Initial draft sent to municipalities prior to meeting).	Subsequent to draft preparation and WPAC 3
Stormwater Quality/BMP Workshop	Educate municipal officials, developers and engineers on BMP construction techniques and implementation.	Prior to last WPAC
Final WPAC	Review comments from WPAC, LAC and MEC, present final draft. Review implementation.	Upon completion of Final Plan
Public Hearing	Conduct the hearing as required by Act 167 to present the final <u>Plan</u> to the public.	

In addition to the topics covered in Table 2, the consultant will present one or more of the following implementation techniques at each WPAC meeting:

Nonstructural Stormwater Management Techniques

- Performance Zoning
- Disconnected Impervious Buffers
- Conservation Easements
- Riparian Buffer Zones
- Floodplain Overlay Districts

- Cluster Development
- Tree Planting

Groundwater Recharge/Infiltration

- Porous Pavement
- Recharge/Infiltration Facilities

Streambank Erosion Protection

- Streambank Restabilization and Revegetation
- Rechannelization

Water Quality Management

- Stormwater Treatment Wetlands
- Bioremediation Filters

Innovative Stormwater Management

Grant/Funding Programs for Specific Problem Areas

Sample Design Process Under the Proposed Ordinance

The subject matter may change through issues identified in the WPAC meetings. This task will also involve the production and distribution of progress reports updating the WPAC, MEC and LAC members, municipal officials, interest groups and the public on the program and issues of the plan.

Project Team Responsibilities

- **COUNTY** - responsible for the development of the coordination strategy for the overall project team (including documentation/reporting responsibilities for the WPAC, MEC, LAC and Department). Also will be responsible for identifying and finalizing the WPAC, MEC and LAC members, as well as for the necessary arrangements to hold the WPAC meetings, reproducing necessary material and preparing/distributing newsletter.
- **CONSULTANT** - responsible for supporting the County in developing project coordination procedures and for providing guidance and input in the formation of the committees. Responsible for the preparation of committee meeting agendas, technical presentations (including graphics) and addressing any legal/institutional issues.

Anticipated Product

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

Stage D - Plan Preparation and Implementation

D.1 - Plan Report Preparation

A supplement to the Plan will be prepared that will include the various components of the Plan that were researched and updated. The Update shall include the following:

- Standards and criteria for stormwater management utilizing the five phase approach including groundwater recharge, water quality, streambank erosion, overbank flooding and extreme event flooding;
- Suggested revisions /modifications to SALDOs, Zoning and model stormwater ordinance;
- A Handbook for municipal officials on implementation of stormwater management ordinances;
- A detailed description of existing drainage problems and recommendations for solutions to these existing drainage problems (since the Act 167 is not intended to solve existing problems, but to prevent their aggravation and also prevent other future problems, these recommendations for solutions to existing problems that are found to be relevant to the Plan will only be conceptual in nature indicating the type of approach needed and inter-municipal cooperation issues);
- Runoff control techniques and their efficiencies in the watershed. Recommendations for new drainage facilities to prevent future problems due to new development, and a discussion regarding inter-municipal arrangements for funding the projects will also be discussed.
- 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 necessary updates of 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.
- Model delegation agreement
- Any other items mentioned in this Scope of Work.

The preliminary outline for the PLAN SUPPLEMENT is as follows:

Section I	-	Introduction
Section II	-	Background / Five Phase Approach

- Section III - Drainage Problems and Proposed Solutions
- Section IV - Municipal Handbook and Model Delegation Agreement
- Section V - Runoff Control Techniques and Their Efficiencies
- Section VI - Suggested Zoning, SALDO and Stormwater Ordinance Provisions
- Section VII - Plan Review Adoption and Updating Procedures

PLATES/FIGURES:

- a base map showing the watershed delineation and political subdivisions, roadway network and the location as referenced to the county.
- stream flooding and drainage problem areas and proposed solutions.
- DRG with subwatersheds
- DEM
- New Management Districts
- additional information as determined by the county.

TABLES:

- subareas and corresponding management strategy information.

APPENDICES (Technical Appendix):

- any special information concerning stormwater control facilities, BMPs and other issues.

Project Team Responsibilities

COUNTY – To provide a support role for the preparation of text material associated with those sections, or aspects of the work program. Also responsible for the overall review and approval of the Plan documents.

CONSULTANT – Responsible for the coordination and preparation of the overall report for the Phase II Update. Also responsible for the preparation of the technical results tables and charts for presentation in the final Update Plan document. Revisions/modifications to be reviewed and addressed by the Consultant.

Anticipated Product

The product will be the final Brodhead Creek and McMichaels Creek Watershed Plan Update. The final Plan Update will be prepared in one Volume - a document containing the full text and descriptions of the various Plan contents as described above.

D.2 - Plan Adoption

The County will print 54 copies of the draft Plan Update and transmit the completed Plan Update to the official planning 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 Plan Update. Their review will include an evaluation of the Plan Update's consistency with other plans and programs affecting the watershed. The reviews and comments will be submitted to the County by official correspondence. The review comments will be received, tabulated, and responded appropriately and the Plan Update will be revised accordingly.

Prior to Plan Update adoption, 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 the municipality's existing ordinance framework. In addition, the meeting(s) can also serve to provide clarification of any remaining questions or concerns that municipality may have concerning the implementation of the Plan Update for any municipality.

The County will hold a public hearing concerning the Plan Update. A notice for the public hearing will be published at least two weeks before the hearing date. The public hearing notice will contain a brief summary of the principal provisions of the Plan Update and a reference to the places within each affected municipality where copies of the Plan Update may be examined or purchased at cost. The comments received at the public hearing will be reviewed by the County and appropriate modifications in the Plan Update will be made if applicable.

The Plan Update will be voted on as a resolution by the Monroe County Board of Commissioners and governing bodies for the purpose of adoption. The resolution will have to be carried by an affirmative vote of at least a majority of the members of the governing body, and should refer expressly to the maps, charts, textual matter and other materials intended to comprise the Plan Update. This action will then be recorded on the adopted Plan Update.

The County will then submit to the Department a letter of transmittal, and three copies each of the adopted Plan Update, the review by the official planning agency and governing body of each municipality, County Planning Commissions, 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 Update by the Counties (Section 8(b) of Act 167). The letter of transmittal will state that the Counties have complied with all procedures outlined in Act 167 and will request the Department to approve the adopted Plan Update. Subsequent to Department approval of Plan Update, 58 final copies of the Plan Update will be printed and distributed.

All backup material including hydrologic and hydraulic analyses of the watershed will be retained at the County offices for future use during the future plan update or any other reference.

Project Team Responsibilities

- **COUNTY** - primary responsibility for the adoption activities described above, and will also assist the consultant concerning establishment of priorities for implementation of actions identified in the Plan Update and update schedule.
- **CONSULTANT** - responsible for providing support and guidance to the County during the Plan Update adoption process and will establish priorities for implementation of actions identified in the Plan Update and set the update schedule with the help of County.

Anticipated Product

The product of this task will include the official documentation regarding Plan Update adoption and the implementation process, including the necessary documentation from the County certifying the adoption of the Plan Update, an adopted Plan Update and priorities schedule as well as an update schedule.

VIII. LEVEL OF EFFORT, COST ESTIMATE & PROJECT ADMINISTRATION

This task covers the administrative work required to initiate the Agreement between the Department of Environmental Protection (Department) and Monroe County (with Monroe County taking the lead as in the Phase I Scope of Study), and 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 Update, 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 of the Phase II start-up meeting between the Department, the Monroe County Planning Commission, Monroe County Conservation District and the selected consultant.

The previous stages were analyzed to determine the required level of effort, both by the county and the consultant to complete each stage. The estimated staff time for each project team member is presented in this section. The cost estimates presented in Appendix C reflect the specific work step descriptions presented in Section IV, including the use of the particular procedures, methodologies and estimates of direct costs that will be incurred.

Project Team Responsibilities

- **COUNTY** - responsible for overall administration of this task, including the finalizing of the Phase II Agreement with the Department and negotiating a contract with a consultant, the establishment of the project coordination roles and procedures, project scheduling and budget finalization, and the development of progress reporting procedures and formats.

- CONSULTANT - will perform a support role to County and will attend all necessary project initiation and planning meetings. Consultant shall also finalize a detailed budget and schedule for technical and institutional planning.

Anticipated Product

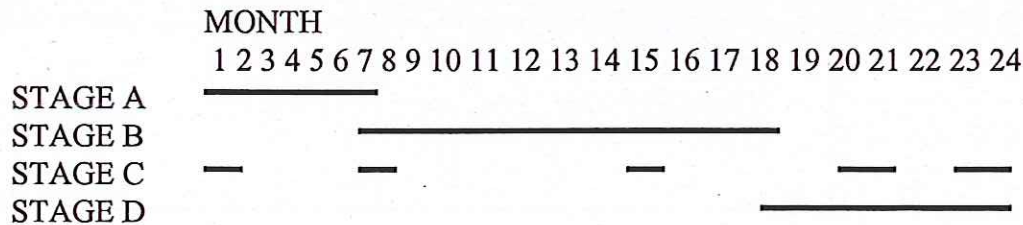
The anticipated product will be a written summary of the notes and/or minutes of project initiation meetings. In addition, the finalized project work program, along with the associated budget and schedule, will be documented for review by the Department and for use as a project management guide. A project correspondence file will also be developed and organized and will be maintained throughout the total project duration.

IX. PROPOSED PLAN DEVELOPMENT SCHEDULE

A schedule has been developed for completing the work program described herein. It is felt that the developed time frame for this project is sufficient for all the necessary contacts and follow-up correspondence, for each of the 18 municipalities, and for the applicable tasks.

The proposed work schedule follows in Figure 3.

FIGURE 3
WORK SCHEDULE



X. CONSULTANT CAPABILITIES

The consultant who assisted with the preparation of this Act 167 Phase I Plan Update was Borton-Lawson Engineering of Wilkes-Barre, Pennsylvania.

A summary of specific experience related to watershed stormwater management modeling and planning is presented below. The detailed resumes of the individuals who may work on Phase II of the Plan Update will be submitted to the Department subsequent to signing the Phase II Agreements by the County and the Department.

- Hydrologic Modeling
 - Borton-Lawson Engineering has extensive project experience in modeling study follow-up efforts, including stormwater management design projects.
 - Borton-Lawson Engineering also has developed various hydrologic and hydraulic reports to determine waterway openings required for bridges and other obstructions.

- Stormwater Management Planning

-Borton-Lawson Engineering has extensive experience in detailed planning and design for stormwater management aspects of land development projects (residential, commercial and industrial).

-Borton-Lawson has been the project consultant for the following Act 167 Scope of Studies:

Toby Creek	Luzerne County
Mill Creek	Luzerne County
Wapwallopen Creek	Luzerne County
Solomon Creek	Luzerne County
Conococheaque Creek	Franklin County
Bobs & Dunning Creek	Bedford County
Darby Creek	Delaware County
Chest Creek	Cambria County
Bull Run Update	Union County
White Deer Creek	Union County
Little Conemaugh River	Cambria County
Brodhead/McMichaels Update	Monroe County

-Borton-Lawson Engineering has been project consultant for the following Act 167 Stormwater Management Plans:

Conococheaque Creek	Franklin County
Bobs & Dunning Creek	Bedford County
Toby Creek	Luzerne County
Mill Creek	Luzerne County
Wapwallopen Creek	Luzerne County
Solomon Creek	Luzerne County
Bowman's Creek	Wyoming County
Upper Mahoning Creek	Jefferson County
Tulpehocken Creek	Berks County
E. Br. Perkiomen Creek	Bucks County
Delaware River (S.)	Bucks County
Chest Creek	Cambria County
Darby Creek	Delaware County

In addition, the project manager was responsible for a total of 20 Act 167 Plans.

For the Phase II project, the following shall apply:

- Training and Education

- Project Engineers shall be licensed by the State of Pennsylvania.

- Project Engineers shall have specific training in hydrologic and hydraulic modeling

- Computer Facilities

-The consultant shall perform all calculations using software packages approved by the Department.

- All G.I.S. information shall be compiled in an "ARC/INFO" or compatible format.

XI. References

- Monroe Co. Planning Commission, Water Supply Plan and Wellhead Protection Program (1997)
- Monroe Co. Planning Commission, Brodhead Creek Watershed Act 167 Stormwater Management Plan (1991)
- Monroe Co. Planning Commission, McMichaels Creek Watershed Act 167 Stormwater Management Plan (1988)
- USDA, Soil Conservation Service (sic Natural Resources Conservation Service), Soil Survey of Monroe, Co., PA

APPENDIX A – Sample Municipal Letter

To: All WPAC Members

From: Eric Bartolacci, Environmental Planner

Date:

Subject: Brodhead Creek and McMichaels Creek Act 167 Plan Updates

Monroe County has recently received a DEP grant to update the Brodhead Creek and McMichaels Creek Watersheds Stormwater Management Plans. The County has selected an engineer and has initiated work on this project.

The County is planning the first Watershed Planning Advisory Committee (WPAC) meeting for Monday June 12, 2000 at the Monroe County Conservation District Building at 6:30 p.m. If you have any questions, contact me at (570) 517-3100.

Dear Municipal Official:

The Monroe County Planning Commission will be embarking on the preparation of a stormwater management plan update for the Brodhead Creek and McMichaels Creek Watersheds as required by the Storm Water Management Act of 1978. This letter is to provide you with information on what the plan is all about, what is required of municipalities in the watershed and how your municipality may get involved and assist in preparing the plan.

ATTACHMENT TO LETTER:

Stormwater Management and Act 167

The need for stormwater management in Pennsylvania has been demonstrated repeatedly in the past. Since Hurricane Gloria and last year's rain storms, this issue has become critical. As the population of the area increases, land development is inevitable, and the alteration of natural ground surfaces, whether by residential, commercial, industrial development or agriculture, 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 property damages running into millions of dollars.

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:

1. 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.
2. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety and welfare and the protection of the people of the Commonwealth, their resources and the environment.

The Need for a Comprehensive Approach for Stormwater Management in the Brodhead and McMichaels Creek Watershed

Up to now, stormwater management has been oriented primarily toward addressing the increase in peak runoff rates discharging from individual development sites to protect property immediately downstream. Minimal attention has 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 the 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 concerning the types or degree of control to be practiced. Since many do not have stormwater management ordinances or controls, the impacts from stormwater runoff will only get worse.

The purpose of Act 167 is to provide a watershed-wide comprehensive program to assist in the planning and management of stormwater. With coordination of the eighteen (18) municipalities in the watershed, the resulting stormwater management ordinance will address severe and ongoing stormwater related problems in critical areas of the watersheds. Furthermore, cooperating member municipalities will be able to adopt stormwater management controls that will have a collectively beneficial impact on the waters of the Brodhead Creek and McMichaels Creek, their tributaries and those "problem" areas that presently remain unmanaged.

Act 167 and the Brodhead Creek and McMichaels Creek Watershed Stormwater Management Plan

The Brodhead Creek and McMichaels Creek Watershed encompasses an area of approximately 285 square miles. There are eighteen (18) municipalities that are within the watershed as follows:

Monroe County

Townships

Barrett Township
Chestnuthill Township
Coolbaugh Township
Greene Township (Pike Co.)
Hamilton Township
Jackson Township
Middle Smithfield Township
Paradise Township

Pocono Township
Price Township
Ross Township
Smithfield Township
Stroud Township
Tobyhanna Township
Tunkhannock Township

Boroughs

East Stroudsburg Borough
Mt. Pocono Borough
Stroudsburg Borough

The Act itself is actually divided into two phases of which, Monroe County has received Phase I funding from the Pennsylvania Department of Environmental Protection 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 for the watersheds. More specifically, the development process for the stormwater management plan is as follows:

Phase I - Detailed Scope of Study - establishing procedures used to prepare the "Plan." These procedures are determined by an overall "Survey" of:

- watershed characteristics and hydrologic conditions,
- watershed stormwater related problems,
- alternative measures for control.

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

- watershed modeling/planning,
- development of technical standards and criteria for stormwater management,
- identification of administrative procedures for implementation of the plan,
- adoption by counties, then municipalities, and municipal implementation to carry out the Act 167 plan for the watersheds.

How Each Municipality Can Become Involved

Every municipality within the Brodhead Creek and McMichaels Creek Watershed is affected by storm events in the watersheds - some much more severely than others. The attached questionnaire is intended to assist in the effective completion of the Phase I portion of the Act 167 plan for the watershed. In order to accomplish the goal of a good and comprehensive stormwater management plan for the watershed, it is important to know the characteristics of stormwater control, non-control, and problems or concerns each municipality has - now and for the future.

Your input into preparing the plan is important. The County will be establishing a Watershed Plan Advisory Committee (WPAC) to include representatives from each of the watershed municipalities along with a Municipal Engineer Committee (MEC) and a Legal Advisory Committee (LAC) to provide local input into the technical and legal aspects of the plan. You will be notified of the date and time for the kick-off meeting.

Please find attached questionnaire that is oriented toward identifying the stormwater related problems in each municipality of the Brodhead Creek and McMichaels Creek Watershed. The general questions apply to your municipality as a whole. With the specific questions, please identify three problem areas on the watershed map by number, and mark those area numbers by the answers that apply to each area. If there are more than three specific areas, try to generalize - e.g., along the northern half mile of the Brodhead Creek and McMichaels Creek headwaters.

Would you please complete the attached questionnaire and return it to the Monroe County Planning Commission in the enclosed envelope at your earliest convenience. We would like to have time to review them in order to be aware of the specific questions or concerns of each municipality, which can then be considered in the preparation of the Phase I Scope of Study.

Your community's involvement in the preparation of the Stormwater Management Plan for the Brodhead Creek and McMichaels Creek Watershed is important to its success. Should you have any questions, please do not hesitate to contact the Monroe County Planning Commission at 570-517-3100.

Brodhead and McMichaels Watershed Act 167 - Phase I Municipalities Questionnaire

Please fill out the following questionnaire. If you have any questions or comments please contact the Monroe County Planning Commission at 570-517-3100.

(Name of Municipality) _____

GENERAL INFORMATION

➤ **Municipal contact person:**

Name _____ Phone _____

Address _____

➤ **Person completing survey:**

Name _____ Phone _____

Address _____

➤ **Watershed Advisory Committee Designee:**

Name _____ Phone _____

Address _____

➤ **Alternate Designee:**

Name _____ Phone _____

Address _____

WATERSHED		FORM COMPLETED BY									
Name:		Name:									
Municipality:		Telephone:									
County:		Date:									
		Sample									
MAP NO.		A-99	A-	A-	A-	A-	A-	A-	A-	A-	A-
Types of Storm Water Problems											
Flooding		x									
Accelerated Erosion		x									
Sedimentation											
Landslide											
Groundwater											
Water Pollution		x									
Other (Explain)											
Explanation Line No.(s)											
Cause(s)											
Storm Water Volume		x									
Storm Water Velocity		x									
Storm Water Direction		x									
Water Obstruction		x									
Other (Explain)											
Explanation Line No.(s)											
Frequency											
Year Most Recent Occurred											
Year First Known to Occur											
Regularity											
More Than 1/Year		x									
Less Than 1/Year											
Only During Agnes											
Duration (If Applicable)											
Less Than One Day		x									
One Day + (Enter Days)											
Property Damages											
Loss of Life / Vital Services											
Private											
More Than One Owner											
Types of Properties											
Undeveloped											
Agricultural											
Residential											
Commercial		x									
Industrial											
Number of Properties											
1											
2-10		x									
11+											
Public (List Types)											
Explanation Line No.(s)											
Solutions -											
Suggested											
Explanation Line No.(s)		1									
Formally Proposed											
Explanation Line No.(s)											

How would you improve the ordinance, or which sections should be revised, i.e. "Maintenance provisions, etc."?

What areas related to storm water management do you see pertinent that the plan does not address properly, i.e. water quality, stream bank erosion?

Are there items that municipalities and citizens would want addressed to improve the management of runoff?

What training or educational needs do you need to help in implementation of the Plan and ordinance?

What aspects of stormwater could you use additional instruction, i.e. stormwater plan review, computations, BMP's, alternative site development ideas?

Other Comments:

APPENDIX B - Breakdown Of Direct And Administrative Expenses

#	Agency	Draft Copies Each	Total Draft Copies	Final Copies Each	Total Final Copies
18	Municipalities	2	36	2	36
2	Counties-Commissioners	2	4	3	6
2	Planning Commissions	2	4	2	4
1	DEP	3	3	5	5
2	Conservation District	2	4	2	4
1	Federal/State Agencies	1	1	1	1
2	Consultant	2	2	2	2
	TOTALS		54		58

Reproduction (Consultant Costs)

		REPRODUCTION	POSTAGE	TOTAL
54	Draft Plans	\$22 each	\$1 each	\$1,242
58	Final Plans	\$20 each	\$1 each	\$1,218
58	Final Plates (6/plan)	\$2 each		\$696
10	Presentation Plates	\$10 each		\$ 100
			TOTAL COST:	\$3,256

County Administration

(Italicized bold items are included in direct costs - hourly items (not italicized) are included in County Administration total.

Program/Financial Management
(2.0 Hour/Week - 104 wks) (Administration) 208 Hours

<i>Office Supplies (Direct Cost)</i>	\$ 500
<i>Travel (Direct Cost)</i>	
- <i>Mileage (County) @ \$.325/mile</i>	\$ 200
- <i>Advertising</i>	\$ 200
- <i>WPAC Meetings (Direct Cost)</i>	\$ 500
- <i>Legal Ads for Public Hearings (Direct Cost)</i>	\$ 150

WPAC Meetings			
-	Minutes Preparation (Stage C)	14 Hours	\$ 490
	<i>Distribution (Direct Cost)</i>		<i>\$ 500</i>

TOTAL	\$ 1910
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Municipal Reimbursement

Mileage (WPAC Members) 1 memb. @ 3 mtgs @ 16 mi RT @ 18 munic. @ \$.31/mile	\$ 300
MEC (\$100/mtg. x 18 munic. x 1 mtg.)	\$ 1800
LAC (\$100/mtg. x 18 munic. x 1 mtg.)	<u>\$ 1800</u>

TOTAL	\$ 3900
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COST BREAKDOWN

Stage A	Data Collection and Analysis	\$ 31,701
Stage B	Technical Analysis	\$ 36,020
Stage C	Public/ Municipal Participation	\$ 22,465
Stage D	Plan Preparation and Implementation	\$ 22,075

Direct Costs	\$ 7,050
(including travel, maps, charts, paper supplies, printing and reproduction, telephone charges, meeting room rentals, equipment rentals, postage and other miscellaneous expenses).	

Municipal Reimbursement	\$ 3,900
County Administration	\$ 6,680

GRAND TOTAL	\$129,891
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Maximum Department Share (75%)	\$ 97,418
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Maximum County Share (25%)	\$ 32,473
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Table B-1. - Cost Estimate

CONSULTANT												9/27/00
Task	Principal		Project Manager		Engineer		GIS/Tech.		Word Processing		Subtotal	
	Hrs	\$	Hrs	\$	Hrs	\$	Hrs	\$	Hrs	\$		
Avg. 2 yr. Billing Rate \$/hr.												
Stage A- Data Collection and Analysis												
A.1 Data Collection/Review/Analysis	1	113	8	824	16	1,088	8	496	2	70	35	2,591
Problem Area Insp/Summary/Solutions	0	-	24	2,472	24	1,632	4	248	2	70	54	4,422
Comprehensive Coord. Of studies	0	-	12	1,236	12	816	0	-	2	70	26	2,122
A.2 Municipal Ordinance Reviews / Evaluations	1	113	4	412	4	272	12	744	0	-	21	1,541
A.3 Data Preparation for Technical Analysis	1	113	24	2,472	60	4,080	80	4,960	4	140	169	11,765
Sub Total	3	339	72	7,416	116	7,888	104	6,448	10	350	305	22,441
Stage B Technical Analysis												
B.1 Evaluate Water Quality Requirements	0	-	16	1,648	48	3,264	2	124	2	70	68	5,106
B.2 Ground Water Recharge/Infiltration	0	-	24	2,472	48	3,264	8	496	2	70	82	6,302
B.3 Streambank Erosion	0	-	12	1,236	24	1,632	24	1,488	8	280	68	4,636
B.4 Overbank/extreme events (Release rates)	0	-	16	1,648	16	1,088	24	1,488	4	140	60	4,364
B.5 Compilation of Tech Standards/Criteria	1	113	48	4,944	12	816	12	744	8	280	81	6,897
B.6 Implementation of Tech Standards/Criteria	1	113	24	2,472	12	816	12	744	8	280	57	4,425
Sub Total	2	226	140	14,420	160	10,880	82	5,084	32	1,120	416	31,730
Stage C Public/Municipal Participation												
WPAC	1	113	24	2,472	24	1,632	12	744	4	140	65	5,101
MEC/LAC	0	-	24	2,472	4	272	12	744	8	280	48	3,768
Educational Topic Development	0	-	32	3,296	4	272	8	496	4	140	48	4,204
Progress Repts./Handbook	0	-	12	1,236	4	272	12	744	4	140	32	2,392
Sub Total	1	113	92	9,476	36	2,448	44	2,728	20	700	193	15,465
Stage D Plan Preparation and Implementation												
D.1 Plan Report	2	226	60	6,180	36	2,448	40	2,480	48	1,680	186	13,014
D.2 Report Revisions and followup	1	113	12	1,236	24	1,632	8	496	12	420	57	3,897
D.3 Public Hearing	0	-	8	824	0	-	0	-	0	-	8	824
Sub Total	3	339	80	8,240	60	4,080	48	2,976	60	2,100	251	17,735
Administration												
Direct Costs												
TOTALS	9	1,017	384	39,552	372	25,296	278	17,236	122	4,270	1,165	\$ 92,371

Note: Billing rates are an average based upon category - Rates will vary by individual and may change in future Fiscal Years

Table B-2. - Cost Estimate - (continued)

Brodhead/McMichaels Watershed Update

COUNTY

Task	Director		Planner		Mapping		Cons. District		Word Processing		Subtotal		Project Total	
	Hrs	\$	Hrs	\$	Hrs	\$	Hrs	\$	Hrs	\$	Hrs	\$	Hrs	\$
Avg. 2 yr. Billing Rate \$/hr.	35		35		30		35		20					
Stage A - Data Collection and Analysis														
A.1 Data Collection/Review/Analysis	16	560	24	840	8	240	8	280	4	80	60	2,000	95	4,591
Problem Area Insp/Summary/Solutions	8	280	16	560	8	240	16	560	4	80	52	1,720	106	6,142
Comprehensive Coord. Of studies	8	280	16	560	8	240	8	280	4	80	44	1,440	70	3,562
A.2 Municipal Ordinance Reviews / Evaluations	8	280	48	1,680	0	-	0	-	4	80	60	2,040	81	3,581
A.3 Data Preparation for Technical Analysis	4	140	24	840	24	720	8	280	4	80	64	2,060	233	13,825
Sub Total	44	1540	128	4480	48	1440	40	1400	20	400	280	9260	585	31,701
Stage B Technical Analysis														
B.1 Evaluate Water Quality Requirements	2	70	2	70	2	60	-	-	4	80	10	280	78	5,366
B.2 Ground Water Rech./infiltration	1	35	1	35	1	30	-	-	2	40	5	140	87	6,442
B.3 Streambank Erosion	1	35	1	35	1	30	-	-	2	40	5	140	73	4,776
B.4 Overbank/Extreme events (Release rates)	4	140	4	140	4	120	-	-	4	80	16	480	76	4,844
B.5 Compilation of Tech Standards/Criteria	4	140	16	560	4	120	2	70	4	80	30	970	111	7,867
B.6 Implementation of Tech Standards/Criteria	8	280	24	840	8	240	24	840	4	80	68	2,280	125	6,705
Sub Total	20	700	48	1680	20	600	26	910	20	400	134	4,290	550	36,020
Stage C Public/Municipal Participation														
WPAC	8	280	16	560	8	240	8	280	8	160	48	1,520	113	6,621
MEC/LAC	8	280	8	280	0	-	8	280	8	160	32	1,000	80	4,768
Educational Topic Development	4	140	24	840	8	240	40	1,400	8	160	84	2,780	132	6,984
Progress Report/Handbook	4	140	24	840	0	-	16	560	8	160	52	1,700	84	4,082
Sub Total	24	840	72	2,520	16	480	72	2,520	32	640	216	7,000	409	22,465
Stage D Plan Preparation and Implementation														
D.1 Plan Report	16	560	32	1,120	8	240	16	560	8	160	80	2,640	266	15,654
D.2 Report Revisions and followup	12	420	8	280	8	240	8	280	8	160	44	1,380	101	5,277
D.3 Public Hearing	8	280	0	-	0	-	0	-	2	40	10	320	18	1,144
Sub Total	36	1,260	40	1,400	16	480	24	840	18	360	134	4,340	385	22,075
Administration	48	1,680	120	4,200	0	-	0	-	40	800	208	6,680	208	6,680
Municipal Reimbursement (\$100/mtg. x 2 people x 19 Munic.)												3,900		3,900
Direct Costs												2,050		2,050
TOTALS	172	6020	408	14280	100	3000	162	5670	130	2600	972	\$37,520	2,137	\$129,891

Note: Billing rates are an average based upon category - Rates will vary by individual and may change in future Fiscal Years

APPENDIX C

SAMPLE MUNICIPAL ORDINANCE MATRIX (WATERSHED STORM MANAGEMENT)

Township/Borough	Zoning	Subdivision Land Dev.	Within the Subdivision and Land Development Ordinance					
			Stormwater	Flood Plain	Road	Grading	Erosion Sedimentation	Other
Bear Creek Township	Yes, 1993	Yes, 1995	Sect. 109-21	Sect. 109-27	---	Sect. 109-21	Sect. 109-26	---
Butler Township	Yes, 1994	Yes, 1995	Sect. 620	---	Sect. 610	---	Sect. 620	---
Conyngham Township	No	No	---	---	---	---	---	---
Dorrance Township	Yes	Yes, 1984	---	Sect. 5.06	---	---	Sect. 5.06	---
Fairview Township	Yes, 1981	Yes, 1973	Sect. 6115	---	Sect. 6.112	---	---	---
Hollenback Township	Yes, 1996	Yes, 1991	Sect. 608	Sect. 609	Sect. 605	---	Sect. 607	---
Nescopeck Township	Yes, 1990	Yes, 1989	Sect. 608	Sect. 609	---	Sect. 606	Sect. 607	---
Newport Township	No	No	---	---	---	---	---	---
Nuangola Township	Yes, 1996	Yes, 1993	Sect. 608	Sect. 609	---	Sect. 606	Sect. 607	---
Rice Township	Yes, 1992	Yes, 1992	Sect. 608	Sect. 609	---	Sect. 606	Sect. 607	---
Slocum Township	Yes, 1986	Yes	Sect. 6.05	---	---	---	---	---
Wright Township	Yes, 1976	Yes, 1997	Sect. 608	Sect. 609	---	Sect. 606	Sect. 607	---

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APPENDIX D – Watershed Plan Advisory Committee (WPAC members)

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