PREFACE

The Pennsylvania Sewage Facilities Act (Act 537) was enacted by the Pennsylvania Legislature on January 24, 1966. The act, officially titled Public License Law 1535, number 537, provides for the planning and regulation of community and individual wastewater systems within the Commonwealth of Pennsylvania.

To comply with the regulations provided in Act 537, local municipalities are required to prepare, adopt, and follow an official sewage facilities plan reflecting the policy set forth in Act 537 as follows:

1. To protect the public health, safety, and welfare of its citizens through the development and implementation of plans for the sanitary disposal of sewage waste.

2. To promote intermunicipal cooperation in the implementation and administration of such plans by local government.

3. To prevent and eliminate pollution of waters of the Commonwealth by coordinating planning for the sanitary disposal of sewage wastes with a comprehensive program of water quality management.

4. To provide the issuance of permits for on-lot sewage disposal systems by local government in accordance with uniform standards and to encourage intermunicipal cooperation to this end.

5 To provide for and insure a high degree of technical competency within local government in the administration of this Act.

6. To encourage the use of the best available technology for on-site sewage disposal systems.

7. To insure the right of citizens on matters of sewage disposal as they may relate to this Act and the Constitution of this Commonwealth.

The Act 537 Plan is to include all reasonable planning parameters related to the planning of wastewater systems for the local municipality as described in detail in Section 5(d) of the Act. In order to ensure that the municipality's Act 537 Plan is sensitive to changing conditions, the rules and regulations promulgated under the Act require the local municipality to review and, if necessary, revise its Act 537 Plan whenever it is determined that the Plan no longer provides for adequate facilities to meet the sewage service needs of the municipality.

During the preparation of an Act 537 Plan or Plan Update, a municipality is required to study problem areas in great depth and set forth various alternatives available to them to eliminate these problems. To avoid costly duplication of effort and facilities, the planning accomplished under this Act must be coordinated with adjoining municipalities. Furthermore, once the plans are adopted by the local agencies and approved by the Pennsylvania Department of Environmental Protection (PA DEP), the municipalities must implement the plan. Failure of the municipality to implement an Official Plan can lead to severe restrictions on the growth of that area, as well as subjecting the municipality to enforcement action.

Act 537 Plans must also address areas that have growth potential and must clearly demonstrate the municipality's approach to providing the services needed to cope with this growth. Where the projected growth is scattered or sparse, and dependent on the use of subsurface sewage systems, the plan must carefully evaluate the limitations of the soil and subsurface conditions with respect to the installation of such systems.

Through the process of revising and supplementing Official Plans during the subdivision and land development process, an up-to-date planning document can be maintained. The Plan in this form can and should be used routinely by governing officials in determining how the municipality will grow.

The regulations governing Pennsylvania's Sewage Facilities Planning have been amended many times since 1966. A major revision occurred in 1974 when Act 208 was adopted. This Act required each municipality to have a certified sewage enforcement officer (SEO) in order to issue permits for the installation of subsurface sewage disposal systems. In addition, with the passage of Chapters 71 and 73 of Rules and Regulations of PA DEP, the Act 537 planning process became part of the Commonwealth's comprehensive program of water quality management.

EXECUTIVE SUMMARY

This Act 537 Plan Update has been prepared in accordance with the regulations provided in Act 537 entitled the Pennsylvania Sewage Facilities Act, Title 25, Chapter 71 of the Pennsylvania Code and the Pennsylvania Department of Environmental Protection Act 537 Plan Content and Environmental Assessment Checklist. This Plan is intended to replace the previous Act 537 Plan prepared in 1997. The planning area for this Plan Update is Rapho Township.

The Plan is comprised of the following components addressed in the Plan of Study:

I. Previous Wastewater Planning

II. Physical Description of Planning Area and Demographic Analysis

III. Existing Sewage Facilities in the Planning Area

IV. Future Growth and Development

V. Alternatives to provide for new or improved wastewater disposal facilities

VI. Evaluation of Alternatives

VII. Institutional Evaluation

VIII. Justification for Selected Technical and Institutional Alternatives

Based upon the results of Sewerage Needs Door-to-Door Surveys, well sampling, and field investigations, no on-lot disposal system (OLDS) needs areas that require public sewerage were identified within Rapho Township. As a result, there are no sewer extensions proposed as part of this Act 537 Plan in response to identified malfunctioning on-lot disposal systems.

Since a portion of the Township's wastewater disposal is successfully accomplished through OLDS, the continued future use of these OLDS should be protected to the extent that is practical. It has been shown through analysis within this plan that successful OLDS utilization is heavily dependent upon proper maintenance of these systems. The Township will be passing an

Ordinance to ensure that proper maintenance occurs. Whereas proper maintenance has been shown to extend the useful life of the OLDS but not extend it indefinitely, a required inspection program will identify the need for repair or replacement. Additionally, the Township will undertake a public education program to inform the public of the need for and the methods of properly maintaining their OLDS.

Based upon approval of the Act 537 Plan for Rapho Township, the implementation schedule follows:

Action	Date
Act 537 Plan Submission to the Township	July 2007
Act 537 Plan Submission to LCPC	August 2007
Address LCPC Comments	September 2007
30-Day Public Comment Period	November 2007
Adoption of Act 537 Plan Resolution by the Township	November 2007
Submission of Act 537 Plan to PA DEP	December 2007
Update of OLDS Management Ordinance	December 2007
Act 537 Plan Review Letter with Comments by PA DEP	June 2008
Submission of Revised Act 537 Plan to PA DEP to Address DEP Comments	September 2008
Final Act 537 Plan Approval by PA DEP	December 2008
Enactment of the OLDS Management Ordinance (adopt Ordinance 30 days after DEP approval of Final Plan)	Estimated January 2009

The Plan has been reviewed by Rapho Township, the Lancaster County Planning Commission (LCPC), and the public. LCPC's comments have been incorporated into the Plan, and a copy of the LCPC comment letter and the Township's response letter are included in Appendix J. The public notice is shown in Appendix K. No comments were received from the public during the public comment period or at the public meeting held on December 15, 2007. Rapho Township has adopted the Act 537 Plan Update, and a copy of the resolution is included in Appendix N. Refer to Appendix M for the Plan of Study and Task Activity Report. The Plan was submitted to PA DEP in December of 2007 for review and comment. PA DEP comments were received by

the Township on June 13, 2008, and are addressed herein. Refer to Appendix N for a copy of the PA DEP response letter.

I. PREVIOUS WASTEWATER PLANNING

A. Previous Wastewater Planning for Rapho Township

1. Previous Act 537 Planning

The previous Act 537 Plan for Rapho Township, completed in 1997, addressed two primary issues related to planning. First, the vast majority of the Township was served by on-lot sewage disposal systems (OLDS), many of which were constructed before 1972 and therefore did not benefit from modern technology and regulations established by the Pennsylvania Department of Environmental Protection (PA DEP). The second major issue identified was relative to promoting and facilitating the use of public sewers in areas being planned for future growth.

The plan provided the following recommendations for specific areas of the Township, as follows:

The Triangle Area

The five-year growth area included portions of the Triangle Area, which could be served by the remaining capacity at the Mount Joy Borough Wastewater Treatment Plant that is allocated to the Township. Remaining growth areas, which would require the construction of a new Township treatment facility, would be considered within the ten-year growth area. This does not preclude such development from occurring within the first five years if developments are proposed earlier than anticipated. Existing Township residents would then be considered for connection based on their proximity to the sewer.

Red Rose Acres

This area was included in the five-year growth area. Construction of a public sewer system would not be initiated by the Township. Development of the remaining land was anticipated within the first five years and would require public sewers. When that development occurred, the existing adjacent homes would then be considered for connection.

Mount Hope

Planning for growth along the PA Route 72 corridor included an evaluation of the feasibility of connecting to the Mount Hope Estate and Winery's Wastewater Treatment Facility. If additional users were to connect, the Township would then consider transferring the ownership and operation responsibilities to a newly formed Authority, based on the existing agreement between Mount Hope Estate and Winery and the Township. The Township would continue to work closely with the owners of the Mount Hope Estate and Winery to facilitate municipal ownership if needed to address future growth or OLDS problems in the area.

Kendig Drive and Sporting Hill

The limited number of previous malfunctions and the unaffordable cost of conveyance connection to Manheim Borough did not require or permit a public sewer service alternative for this needs area. Thus, those areas were included in the ten-year growth area. Consideration of new developments should include an evaluation of the feasibility of conveyance of existing and future flows to Manheim Borough.

Mastersonville

This area utilizes OLDS constructed prior to 1972 and thus lacking modern technology. However, the soils are generally adequate for on-lot solutions and the area surrounding the village is zoned agricultural; thus

only very limited growth was anticipated. As such, the Township was to continue regulating OLDS through the Township's Sewage Enforcement Officer (SEO), requiring the repair or replacement of malfunctioning or substandard OLDS.

Further, based upon DEP review, an addendum to the Act 537 plan was prepared in 1999. Per those revisions, the costs associated with public sewers were estimated and found to be financially prohibitive. As such, it was recommended that OLDS be closely monitored by the SEO. Consideration should be given to the inclusion of de-nitrification units in any new OLDS in the area. Alternates to provide public sewerage facilities should include an environmental evaluation for the community OLDS and constructed wetlands. To manage sewage disposal in this area, the Township designated Mastersonville as a Sewage Management District under the OLDS Ordinance. This Ordinance is attached as an Appendix to the Act 537 Plan Addendum (1999).

Newtown

Due to the rolling topography and distance from existing sewer systems, any public sewer alternative were found to be cost-prohibitive. A joint effort with the owner of the mobile home park that has a treatment facility was investigated. However, even utilizing the mobile home park's treatment facility for a portion of a Township facility did not alter the economics of the situation. Thus, continued SEO actions, repairing and replacing malfunctioning or substandard OLDS, were recommended for this area.

The Newtown needs area was reevaluated as a part of the 1999 addendum to the Act 537 Plan. This involved the analysis of alternates for the Newtown area consisting of either expanding the existing treatment

facility at the Rolling Hills Mobile Park and conveying area flows to that facility, or constructing a new plant to serve the area. Based upon the evaluation, Rapho Township found the installation of public sewerage facilities to be not feasible. This conclusion was based upon the severe financial impact the cost of a public system utilizing either a treatment facility or community OLDS would place on the residents. Since none of the alternates for a public system were feasible, it was recommended the existing OLDS to be closely monitored by the SEO and that this area be designated as a Sewer Management District under the OLDS Ordinance. Consideration should be given to the inclusion of denitrification units in any new OLDS design in the area. Alternates of providing public sewerage facilities should include an environmental evaluation for community OLDS and constructed wetlands.

Future Wastewater Treatment Facilities

The plan recommended coordination between the Township and developers, and the formation of an Authority to facilitate the construction of a public wastewater treatment facility in the Triangle Area. At the time the Plan was prepared, development interests were not at a point where a specific wastewater treatment project could be identified. Therefore, the Plan did not address specific design criteria, user costs, or funding methods.

Also, many of the recommendations were implemented prior to the finalization of the Act 537 Plan and are as follows:

- Adoption of an OLDS Management Ordinance,
- Negotiation of an agreement with Manheim Borough Authority for the reservation of capacity in its wastewater treatment plant (WWTP),

- Negotiation of an agreement with Mount Joy Borough Authority (MJBA) for the reservation of capacity in its WWTP,
- Updating of the Township's Comprehensive Plan to direct growth to areas which could be served by public sewers,
- Revising the Township's Zoning Ordinance and Map to implement the Comprehensive Plan,
- Establishment of an agreement with Mount Hope Estate and Winery to facilitate transfer ownership of the treatment plant to the Township if deemed necessary to accommodate growth, and
- Creation of a Township Sewer Committee to build the foundation for an Authority for long term implementation of the Act 537 Plan, and ownership and operation of Township sewerage facilities.

2. Planning Not Completed in Accordance with an Approved Implementation Schedule

The OLDS Ordinance was adopted according to the schedule, but mandatory pump out of systems was not implemented.

3. Anticipated Additional Planning

Currently, the Mount Joy/Donegal Region is preparing a Mount Joy/Donegal Region Urban Growth Area – Smart Growth Master Plan. The municipalities involved with this Master Plan include Mount Joy Borough, Mount Joy Township, East Donegal Township, and Rapho Township, all located in Lancaster County. The specific deliverables from the plan will include an Urban Growth Area Analysis, an Urban Growth Area Master Plan, and the Development and Application of Implementation Tools.

4. Planning Completed Via Official Plan Revisions and Addenda

The Manheim Central Region Comprehensive Plan prepared in 1993 was further revised in 2000. The revised plan involved only the strategic update of the previous plan; therefore, both plans are valid. Also, based on DEP comments, additional information was added to the previous Act 537 in 1999. As mentioned earlier, an Ordinance governing the municipal management of OLDS was added to the Act 537 Plan Addendum in 1999. A Subdivision and Land Development Plan Ordinance was prepared and adopted in 2000. The Growth Management Element, or Balance, of the Lancaster County Comprehensive Plan was updated and adopted in 2006.

B. Identification of Municipal and County Planning Documents

The following sections provide an overview of existing Township and County planning documents adopted pursuant to the PA Municipalities Planning Code (Act 247), including Land Use Plans and Zoning Maps which identify residential, commercial, industrial, agricultural, recreational, and open space areas.

Consistency in the various planning documents referred by the Township is a key to its successful planning. Therefore, it is important that the Township's philosophy concerning land use management, as determined by the Comprehensive Plan, Zoning Ordinance, and other related planning documents, be reflected by this Act 537 Plan. The following section provides an overview of the Township's planning documents and summarizes the key land use management issues related to sewage facilities planning. The Township's land use management philosophy will play an important role in the evaluation of engineering and management alternatives to address the Township's sewage needs.

1. Comprehensive Plan

The Official Comprehensive Plan for the Manheim Central Region (which includes Manheim Borough, Penn Township, and Rapho Township), Lancaster County, Pennsylvania was prepared in June 1993. The land use plan for the Township is defined in this Comprehensive Plan, providing an inventory and analysis of current land uses and discussing patterns of future development. The land use plan was updated in 2000 with an elaboration on the implementation policies and actions set forth in the 1993 Comprehensive Plan. As such, this update was not intended to replace the existing comprehensive plan from 1993 but rather to be used as a stand-alone document that provides a set of strategies that can be used to further the policies adopted in 1993. All of the goals and objectives outlined in both Comprehensive Plans (1993 and 2000) must be taken into consideration during preparation of an Act 537 plan.

The Lancaster County Comprehensive Plan is comprised of three components: the Policy Element (ReVision), the Growth Management Element (Balance), and the Functional Element. The Growth Management Element, originally established in 1993 and updated in 1997, was adopted in April, 2006. It establishes a framework for future land use and development within the County and its municipalities, and aims at providing growth management within the County for the next 25 years. The 2006 Growth Management Element Update:

- Reaffirmed the Urban Growth Area;
- Proposed designation of Rural Areas;
- Provided targets to reduce growth in rural Lancaster County; and
- Provided a comprehensive action strategy.

Rapho Township has two Urban Growth Areas in the designated Donegal and Manheim Central Urban Growth Area. Adjustment of the growth boundary to include adjacent areas may be considered in the future when necessary. Mastersonville was identified in the 1997 Update but not designated as a Village Growth Area (now called Designated Rural Areas). Newton was designated as Crossroads Communities.

2. Zoning Ordinance

According to the latest Zoning Ordinance (enacted in 1993, amended and adopted in December 2005), the Township is currently divided into the following zones:

a. Agricultural Zone (A)

The purpose of this zone is to promote the continuation and preservation of agricultural activities in those areas most suitable. Areas contained within the zone have been specifically identified as possessing valuable and nonrenewable natural and cultural resources. This zone intends to protect and stabilize the Township's viable agricultural economy by eliminating uses that are incompatible with farming, while permitting limited agricultural support businesses. Consequently, residential uses are limited to one right-of-subdivision for every 50 acres and any future inhabitants in this Zone must be willing to accept the impacts associated with normal farming practices and related businesses.

b. Rural Residential Zone (R)

The purpose of this zone is to promote a continuation of the rural character of the area, characterized by farming, a mixture of

sparsely developed residential uses, and other small-scale nonresidential uses. These areas are not likely to be served by public sewer or water facilities within the foreseeable future.

c. Residential Zone (R-1)

This zone is intended to accommodate suburban detached residential growth within the Township. This zone coincides with potential sewer and water utility service areas; however, the actual availability of these services is likely to occur at different times, in different areas. As a result, permitted densities have been adjusted according to the availability of these public utilities.

d. Mixed Residential Zone (R-2)

This zone provides for a mixture of dwelling unit types at a consistent density. Permitted uses will have a maximum density of five (5) dwelling units per acre; however, the Village Overlay Zone offers an optional set of flexible design standards that seeks to recreate traditional style villages, along with substantial density bonuses. This zone is located within planned utility service areas, and intensive developments are tied to the use of such utilities.

e. Mobile Home Park Residential Zone (MHP)

This zone acknowledges the numerous mobile home park sites within the Township, and protects their continued existence. Should landowners wish to eliminate mobile home parks on a particular site, various other uses would be permitted.

f. Village Overlay Zone (VO)

This zone provides a set of design standards that seeks to achieve a "village" type setting characteristic of much of Lancaster County's early environment and heritage.

g. Neighborhood Commercial Zone (NC)

The purpose of this zone is to provide basic convenience commercial goods and services to local residents of planned neighborhoods. Uses have been limited to those services residents are likely to need on a daily or regular basis. Overall, retail size has been restricted to prevent the establishment of intensive commercial uses would not reflect the local orientation of this zone.

h. Interchange Commercial Zone (IC)

This zone provides for major commercial areas near existing public utilities that generate employment, retail trade, retail services, tourism, and related dining/lodging and entertainment uses.

i. Highway Commercial Zone (HC)

This zone provides suitable locations for highway-oriented retail, service, and entertainment businesses. These uses may involve outdoor activities and/or storage areas such as automobile, boat, and trailer sales and service establishments.

j. Commercial Recreation Zone (CR)

This zone provides for a wide range of commercial recreational activities that generate employment, retail trade, retail services, tourism, and related dining/lodging and entertainment uses.

Selected locations acknowledge prime access to major highways, which will serve the commercial recreational uses without generating undue traffic congestion on the Township's rural road system.

k. Industrial Zone (I)

This zone provides for a wide range of industrial activities that contribute to the wellbeing of the Township by diversifying its economy and providing valuable employment opportunities. This zone provides for light industrial uses as permitted by right, but requires obtainment of a conditional use for heavier and potentially more-objectionable types of industrial uses. These areas have been located near existing public utility service areas and along major roads.

l. Floodplain Zone

The Floodplain zone includes those areas of Rapho Township that are subject to periodic inundation by floodwater. This inundation results in health and safety hazards, disruption of commerce and governmental services, public expenditure for flood protection and relief, and other adverse effects on the public health, safety, and general welfare. In the interest of public health, safety and welfare, the regulations of the Floodplain zone are designed and intended to protect floodplain areas subjected to floodwater.

The Township's Zoning Ordinance (2005) also established criteria for lot size requirements for each of these zones.

The Township's Zoning Ordinance is available for review at the Township office and on their website at www.raphotownship.com. The Zoning Map is attached to this Plan as Appendix A.

3. Subdivision and Land Development Ordinance

The most recently updated Subdivision and Land Development Ordinance was prepared in 2000 and further amended in 2004, and can be referred to for further details.

4. Floodplain and Stormwater Management, and Special Protection Areas

Floodplain delineations and regulations for the protection of these sensitive areas were identified in the Township's Zoning Ordinance (2005). According to this ordinance, floodplain areas shall be those areas that are subjected to the one hundred (100) year flood, as identified in the Flood Insurance Study (FIS) for the Township of Rapho, Lancaster County, Pennsylvania, as prepared by the Federal Emergency Management Agency (FEMA), dated April 2005. As such, efforts should be made to avoid any new construction in the floodplain areas. The Zoning Ordinance can be referred to for further details.

II. PHYSICAL AND DEMOGRAPHIC ANALYSIS

The physical (i.e., geology, soil types, etc.) and demographic (i.e., population growth and distribution) characteristics of the Township are important considerations in wastewater facilities planning. Physical features determine the suitability of areas in the Township for on-lot sewage disposal. Demographic characteristics such as the location of older communities, which are not served by public sewer, and their relative location to physical features, which limit the suitability of on-lot wastewater disposal, are important considerations in determining existing needs. The rate and distribution of population growth including the location of proposed developments are important factors in determining where dense population centers are likely to occur in the future. These growth areas represent potential sewer service needs especially if these developments will occur in areas that are unsuitable for on-lot sewage disposal.

Physical and demographic characteristics of Rapho Township are evaluated in the following sections. Issues presented in these sections form the basis for determining the sewage facilities necessary to adequately address both the Township's existing and future sewage service needs.

A. Identification of the Planning Area

The planning area comprises the entire Township of Rapho, with a total area of 47 square miles. Rapho Township is located in northern Lancaster County between the western banks of Chiques Creek and the eastern banks of Little Chiques Creek, between the Boroughs of Mount Joy and Manheim. The exhibit in Appendix B shows the corporate boundary of Rapho Township. Rapho Township is bounded by West Cornwall Township in Lebanon County to the north, West Hempfield Township to the south, East Hempfield Township, Penn Township, and Manheim Borough to the east, and Mount Joy Township, Mount Joy Borough, and East Donegal Township to the west

B. Physical Characteristics

Rapho Township is an agricultural community in Lancaster County situated between Manheim Borough and Mount Joy Borough. Little Chiques Creek, Chiques Creek, and the Lancaster-Lebanon County Line form the Township's borders.

The planning area is characterized by dendritic and karstic drainage patterns and is divided into two major drainage basins: the eastern portion drains into Chiques Creek while the western portion drains to Little Chiques Creek.

Topography within the planning area features broad, moderately dissected valleys having a gently undulating surface with karstic terrain in the southern portion of the Township. Local topographic relief is low to moderate (300 to 640 feet).

C. Soils

The soil types in the planning area have been mapped by the U.S. Department of Agriculture (USDA) Soil Conservation Service in cooperation with the Pennsylvania State University College of Agriculture, the Pennsylvania Department of Environmental Resources, State Conservation Commission[1]. The soil associations found within the planning area are summarized below and illustrated in the exhibit found in Appendix C.

Rapho Township is located on three soil associations: the Ungers-Bucks-Lansdale, the Duffield-Hagerstown, and the Bedington. The majority of the soils in Rapho Township are grouped in the Bedington Group. These soils formed in material weathered from acidic shales and are found on dissected ridgetops in the central portion of the municipality. Ungers-Bucks-Lansdale soils are found in the northern portion of the planning area and formed in the residuum from mica

[1] B.H. Custer, 1985. Soil Survey of Lancaster County Pennsylvania. Soil Conservation Service. National Cooperative Soil Survey.

schist, granitized schist, quartzite, and gneiss. Ungers-Bucks-Lansdale soils are found on ridges, side slopes, and foot slopes. Duffield-Hagerstown soils are located on the southern portion of the municipality in the valleys. Duffield-Hagerstown soils formed in the residuum from carbonate rocks, such as limestone and dolomite. Each soil type group mapped in the planning area is described in the following sections.

Ungers-Bucks-Lansdale – The Ungers soils have a red, medium to moderately fine textured subsoil with more than five percent rock fragments in the surface layer and upper part of the subsoil. Ungers soils are deep, well drained and are on ridgetops and side slopes on uplands. Slope, depth to bedrock, and surface stones are the major limitations of this soil for use as septic tank absorption fields.

The Bucks soils have a red, medium to moderately fine textured subsoil with less than five percent rock fragments in the surface layer and upper part of the subsoil. Bucks soils are deep, well drained, and are found on broad ridgetops and side slopes. Slope, permeability, and depth to bedrock are the major limitations for septic tank absorption fields.

The Lansdale soils have a brown moderately coarse to fine textured subsoil. Lansdale soils are deep, well drained, and on uplands. Slope, permeability, and depth to bedrock are the major limitations for septic tank absorption fields.

Bedington – The Bedington Group consists of deep, well-drained soils that are nearly level and have a medium textured and moderately fine textured subsoil. Gently sloping and sloping soils predominate, but some areas are nearly level. Bedington soils are mainly limited by slope, depth to bedrock, and permeability for septic tank absorption fields.

Duffield-Hagerstown – Duffield soils are well-drained soils and have a brownish, moderately fine textured subsoil. They are nearly level and gently sloping. Duffield soils are limited by depth to bedrock for septic tank absorption fields.

Hagerstown soils have a reddish, moderately fine and fine textured subsoil. They are primarily nearly level to sloping; however, steep areas exist. These soils are deep, well-drained, and found on low hills and in valleys. Hagerstown soils are limited by slope, depth to bedrock, permeability, and shrink-swell potential for septic tank absorption fields.

1. Limiting Factors

The soil series mapped in Pennsylvania by the USDA have been placed into groups by the PA DEP based upon limitations for subsurface disposal of effluent from on-lot disposal systems. The soils are grouped by depth to rock, slow percolation rates, slope, wetness, and flooding. As the majority of Rapho Township is unsewered, all of the soil types in the municipality must be considered. The soils have been classified according to their degree of restrictiveness pertaining to on-lot disposal. Only that part of the soil profile between the depths of 24 and 72 inches was evaluated in the ratings provided in Table 12 – "Sanitary Facilities" of the Soil Survey of Lancaster Co., PA. The USDA Natural Resources Conservation Service – Web Soil Survey should be utilized for any further consideration of soils for Community Systems with soil adsorption.

Soils are considered to be *moderately restrictive* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations. Soils are considered to be *severely restrictive* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and increased maintenance are

required. Table II-1 lists each soil unit and its associated limiting soil features. The Soil Limitations Map (Appendix C) shows the extent of the moderately and severely restricting soil types in the municipality. The majority of Rapho Township has moderately restricting soils while the occurrence of severely restricting soils increases toward the northern end of the Township.

Table II-1 Rapho Township Soil Types

General Unit	Soil Unit	Symbol	Slope	Type	Restrictive-ness*	Depth to Rock	Slow Perc	Slope	Wetness	Flooding
Ungers-Bucks-Lansdale	Ungers	UaB	3-8%	loam	moderate	X	X			
		UaC	8-15%	loam	moderate	X	X	X		
		UbB	3-8%	extremely stony loam	moderate	X	X			
		UbD	8-25%	extremely stony loam	severe			X		
	Bucks	BuB	3-8%	silt loam	severe		X			
		BuC	8-15%	silt loam	severe		X			
	Lansdale	LaB	3-8%	loam	moderate	X	X			
		LaC	8-15%	loam	moderate	X	X	X		
		LaD	15-25%	loam	severe			X		
	Abbottstown	AbB	3-8%	silt loam	severe		X		X	
	Readington	RaB	3-10%	silt loam	severe		X		X	
		RbB	3-8%	extremely stony silt loam	severe		X		X	
	Mount Lucas	MdB	3-8%	silt loam	severe		X		X	
	Brecknock	BrB	3-8%	gravelly silt loam	moderate	X	X			
		BsB	3-8%	extremely stony silt loam	moderate	X	X			
		BsC	8-15%	extremely stony silt loam	severe			X	X	
Duffield-Hagerstown	Duffield	DbA	0-3%	silt loam	moderate	X				
		DbB	3-8%	silt loam	moderate	X				
	Hagerstown	HaA	0-3%	silt loam	moderate	X	X			
		HaB	3-8%	silt loam	moderate	X	X			
		HbC	8-15%	silty clay loam	moderate	X	X			
		HbD	15-30%	silty clay loam	severe			X		
	Blairton	Bm	3-10%	silt loam	severe	X	X		X	
	Elk	EcB	3-8%	silt loam	moderate		X			
	Clarksburg	CkA	0-3%	silt loam	severe		X		X	
Bedington	Bedington	BdA	0-3%	silt loam	moderate	X	X			
		BdB	3-8%	silt loam	moderate	X	X			
		BdC	8-15%	silt loam	moderate	X	X			
		BdD	15-25%	channery silt loam	severe			X		
Minor Soil Units	Glenelg	GbC	8-15%	silt loam	moderate	X	X	X		
	Manor	MaC		silt loam	moderate			X	X	
	Rowland	Rd	N/A	silt loam	severe		X		X	X
	Bowmansville	Bo	N/A	silt loam	severe		X		X	X
	Holly	Hg	N/A	silt loam	severe		X		X	X
	Nolin	Ne	N/A	silt loam	severe					X
	Lindside	Ln	N/A	silt loam	severe				X	X
	Newark	Nc	N/A	silt loam	severe				X	X
	Fluvaquents & Udifluvents	Ff	0-3%	loamy	NA					

D. Geologic Features

The Township of Rapho is located in the Gettysburg-Newark Lowland and Piedmont Lowland Sections of the Piedmont Physiographic Province[2]. The principal rock types that underlie the Piedmont Lowlands are shale, siltstone, and sandstone to the north and limestone and dolomite to the south. In Rapho Township, the southern half of the planning area is predominantly underlain by limestone and dolomite, while the northern half is underlain by sandstone and shale[3]. The limestones and dolomites were formed during the Ordovician and Pre-Cambrian Periods of geologic time. The limestones and dolomites present in the planning area include the Ledger Formation (CCl), Zooks Corner Formation (CCzc), the undivided Snitz Creek and Buffalo Springs Formations (CCsb), Millbach Formation (CCm), Stonehenge Formation (Os), and the Epler Formation (Oe)[4]. Hazardous karstic features including pinnacles, sinkholes, caves, and solution openings are characteristic in each of the aforementioned formations (Table II-2). The sandstones and shales are mapped as the Cocalico Formation (Oco), New Oxford Formation (TRn), and the Hammercreek Formation (TRh). The aforementioned sandstones and shales are typically not associated with geologic hazards. Minor portions of the planning area are underlain by different formations of limestone and dolomite (Annville Formation (Oan), the undivided Hershey and Myerstown Formations (Ohm), and Ontelaunee Formation (Oo)), conglomerate (New Oxford Conglomerate (TRnc) and Hammer Creek Conglomerate (TRhc), and diabase (TRd).

[2] W.D. Sevon, 2000. Physiographic Provinces of Pennsylvania. Map 13. Department of Conservation and Resources.
[3] A.R. Geyer, 1981. Atlas of Preliminary Geologic Quadrangle Maps of Pennsylvania. Map 61 – Elizabethtown, Manheim, Columbia West, and Columbia East Quadrangles. Pennsylvania Geologic Survey
[4] A.R. Geyer and J.P. Wilshusen, 1982. Engineering Characteristics of the Rocks of Pennsylvania. Environmental Geology Report 1. Pennsylvania Geologic Survey.

Table II-2

Rapho Township

Rock Types

ROCK TYPE OCCURRENCE	Rock Formation	Type	Water-Bearing Capability (Median Well Yield)	Hazards
MAJOR	Hammercreek Formation (TRh)	sandstone & shale	excellent (66 gpm)	N/A
	New Oxford Formation (TRn)	sandstone & shale	excellent (66 gpm)	N/A
	Cocalico Formation (Oco)	sandstone	moderate (10-15 gpm)	N/A
		shale	good (10-50 gpm)	N/A
	Epler Formation (Oe)	limestone & dolomite	good (25 gpm)	pinnacles, sinkholes, caves
	Stonehenge Formation (Os)	limestone	excellent (100 gpm)	sinkholes, pinnacles, solution openings
	Millback Formation (CCm)	limestone	poor	sinkholes numerous
	Snitz Creek & Buffalo Springs Formations, undivided (CCsb)	dolomite & limestone	moderate (10-25 gpm)	pinnacles, solution channels, sinkholes
	Zooks Corner Formation (CCzc)	dolomite	poor (6 gpm)	solution cavities
	Ledger Formation (CCl)	dolomite	good (30 gpm)	pinnacles, solution openings
MINOR	Diabase (TRd)	90-95% labradorite & augite	poor (5 gpm)	N/A
	Hammer Creek Conglomerate (TRhc)	conglomerate	N/A	landslides where cut slopes are steep and rock dips toward cut
	New Oxford Conglomerate (TRnc)	conglomerate	moderate (14 gpm)	N/A
	Ontelaunee Formation (Oo)	dolomite	excellent (200-500 gpm)	pinnacles, solution cavities
	Hershey & Myerstown Formations, undivided (Ohm)	limestone	good (25 gpm)	moderate karst
	Annville Formation (Oan)	limestone	good due to solution openings	sinkholes common

Underlying rock formations play an important role in the availability of groundwater. In fractured rock aquifers, groundwater occurs almost entirely in the interconnected openings present in the rock mass. The openings that commonly contain and transmit water are bedding planes, joints, cleavage, faults and solution openings (in limestone). The number, size, and interconnection of these secondary openings at any given location determines the capacity of the rock to store and transmit water to wells and springs.

The most extensive geologic formation in the planning area is the Cocalico Formation (Oco). The sandstone and shale units in the Cocalico are moderately productive with median well productivity of 10-50 gallons per minute.

The Stonehenge Formation (Os) is the most productive of the major aquifers present in Rapho Township. As water moves through the openings in a limestone bedrock aquifer, solution channels may form as the slightly acidic water dissolves the calcium carbonate minerals in the limestone. This results in an enlargement of the openings present and may lead to the formation of caves, sinkholes and other karstic features, as well as the potential risk associated with contamination by sewage or from other potential commercial and industrial pollutants. Overall, potential sources for groundwater contamination include excessive or improper application of fertilizers (natural and man-made), pesticides, herbicides, failing on-lot sewage disposal systems, chemical spills, illegal disposal of hazardous wastes, landfills, and illegal dumping.

E. Topography

Topographical variation throughout the planning area is generally moderate, with surface elevations ranging from approximately 300 feet at the confluence of Chiques Creek and Little Chiques Creek to approximately 640 feet in the northern portion of the Township. Topographic relief in the area underlain by limestone is

generally less than 40 feet. Area topography is illustrated on the Township Location/Facility Location Plan found in Appendix D.

F. Potable Water Supply

The vast majority of the planning area obtains water from private on-lot wells. Two areas within the planning area are served by public sanitary sewer and water. Residences and businesses within the development triangle bordered by Routes 230 and 772 receive sewer and water service from Mount Joy Borough Authority. Businesses on Shellyland Road receive water service from the Mount Joy Borough Authority but utilize private OLDS for sanitary sewage disposal. Sewer and water services are provided by Manheim Borough Authority to residences along Hamaker Road, Julia Lane, a small portion of Route 72, Orchard Road, and Kendig Drive in the eastern portion of Rapho Township that borders Manheim Borough.

G. Wetlands

Pursuant to PA DEP rules and regulations, development requiring wastewater facilities is not permitted in fresh water wetlands. As such, as delineated by the National Wetlands Inventory (NWI) maps, numerous isolated wetlands are identified within Rapho Township. Wetlands are shown in Maps 1, 2, and 3 found in Appendix E. Wetland preservation will be considered as a part of the Township's planning decisions and, ultimately, conveyance system design.

III. EXISTING SEWER FACILITIES IN PLANNING AREA

A. Municipal and Non-Municipal, Individual, and Community Sewerage Systems in the Planning Area

1. Location, size, and ownership of treatment facilities, main intercepting lines, pumping stations, and force mains including their size, capacity, point of discharge, name of the receiving stream, drainage basin, and facility's current effluent discharge requirements.

Existing Private Treatment Facilities

As described in the previous Act 537 plan (1997), all wastewater collection and treatment facilities within Rapho Township are either privately owned or discharge to a public treatment facility. There are currently six private collection and treatment systems in the Township. Five of those facilities are operated under the Federal National Pollution Discharge Elimination System (NPDES) program and have discharge permits. The sixth facility utilizes spray irrigation for effluent disposal rather than a stream discharge and, as such, has a PA DEP permit rather than an NPDES permit. A list of these facilities is as follows:

a) Hemlock Acres Mobile Home Park

NPDES No.	:	0043028
Permitted Flow	:	0.00525 MGD
Receiving Stream	:	Chiques Creek

b) *Ridgewood Manor Mobile Home Park*

Water Quality Management Part II Permit 3670415 Spray Irrigation Discharge

c) *Hill Top Acres Mobile Home Park*

NPDES No.	:	0082228
Permitted Flow	:	0.005 MGD
Receiving Stream	:	Chiques Creek

d) *Rolling Hills Estates Mobile Home Park (has community water service)*

NPDES No.	:	0081299
Permitted Flow	:	0.02 MGD
Receiving Stream	:	Chiques Creek

e) *Mount Hope Estate and Winery (PA Renaissance Faire)*

NPDES No.	:	Not Available
Permitted Flow	:	0.0250 MGD
Receiving Stream	:	Chiques Creek west of PA Route 72

f) *Pinch Pond Campground*

No Information Available

Mount Hope Estate and Winery treatment facility has a reserve capacity of 5,000 gpd for the Township. A single community disposal system exists at the Hilltop Acres Mobile Home Park to serve that portion of the Park not connected to the treatment facility. Also, Autumn Leaf Estates is served by a community OLDS. Each property has holding tanks, which they are responsible for pumping, that discharge to a community sand

mound. All other Township residents are served by individual OLDS or public sewer.

Each OLDS installed after 1972 was permitted in accordance with PA DEP regulations by the Township SEO. Systems installed prior to that date become permitted only as a result of system failure and subsequent repair or replacement, which is approved by the SEO.

Existing Public Sewerage System

Properties in Rapho Township located east of Mount Joy Borough are served by the MJBA WWTP. This facility treats the area's wastewater and discharges it to the Little Chiques Creek under its NPDES permit. The MJBA WWTP has a design capacity of 1.53 MGD, with 0.462 MGD of that capacity allocated to Rapho Township per the November 21, 1995 Sanitary Sewer Service Agreement allocating 1,321 EDUs at 350 gpd/EDU. The facility currently receives approximately 196,300 GPD from properties in Rapho Township.

In addition, residential and commercial properties on Julia Lane, a portion of Hamaker Road and Route 72 (Lebanon Road), Kendig Drive, and a portion of Orchard Drive are served by the Manheim Borough Authority's WWTP. According to the sewer agreement between Manheim Borough Authority and Rapho Township, approximately 75 properties are allocated to discharge to the treatment plant, which accounts for about 19,700 GPD or less than one-percent of the treatment plant's permitted capacity of 2.3 MGD.

2. *Narrative of facility's basic treatment processes including facility's NPDES permitted capacity, remaining reserve capacity, and policy concerning allocation of reserve capacity, where applicable.*

The MJBA WWTP operations include aeration, clarification in two final clarifiers, sludge digestion in primary and secondary digesters, and dewatering through a belt filter press. The facility's NPDES-permitted capacity is 1.53 MGD. Five-year projected flows result in a remaining reserve capacity of 0.40 MGD in 2010.

The Manheim Borough WWTP operates with a trickling filter and sludge drying beds. The facility's NPDES-permitted capacity is 2.3 MGD. Five-year projected flows result in a remaining reserve capacity of 1.2 MGD in 2010.

3. *Description of problems with existing facilities, including existing or projected overloads under Title 25, Chapter 94 (relating to municipal wasteload management) or violations of (NPDES) permit, Clean Streams Law Permit, or other permit, rule, or regulation of PA DEP, as well as capacity analysis of critical interceptors, based on existing flow meter data provided by Mount Joy Borough Authority and Manheim Borough Authority.*

According to Chapter 94 reports submitted to the PA DEP for 2005 by ARRO Consulting, Inc. for the MJBA WWTP and by RETTEW Associates, Inc. for the Manheim Borough Authority WWTP, there are no hydraulic or nutrient overloads, capacity issues, or permit violations related to the treatment plants.

4. *Details of scheduled or in-progress upgrading or expansion of treatment facilities and anticipated completion date of improvements and discussion*

about compatibility of rate of growth to existing and proposed wastewater treatment facilities.

According to Chapter 94 reports submitted to the PA DEP for 2005 by ARRO Consulting, Inc. for the MJBA WWTP and by RETTEW Associates, Inc. for the Manheim Borough Authority WWTP, there are no scheduled or in-process upgrades or expansions of the two above-referenced treatment facilities. Flow projections related to projected EDU allocations do not reflect potential issues that would necessitate system upgrades or expansions. However, according to requirements of the PA DEP Chesapeake Bay Tributary Strategy, each WWTP will be required to meet goals for reducing nutrients in the effluent. Therefore, the Authorities are preparing a plan to be submitted to PA DEP for reducing nutrients loadings in the effluent, which may require upgrades to the WWTPs.

5. *Detailed description of operation and maintenance requirements and status of past and present compliance with these requirements and other requirements relating to sewage management programs (including township agreements with existing private systems, package plants, denitrification systems, etc.).*

Each Authority operates and is responsible for all public sanitary sewer conveyance and treatment as per legal agreements between Rapho Township and Mount Joy Borough Authority and Manheim Borough Authority. The Township's participation is limited to administrative responsibilities.

6. *Disposal areas, if other than stream discharge, and applicable groundwater limitations.*

The Township does not own or operate any land disposal areas related to wastewater treatment.

B. Use PA DEP's Manual entitled "Sewage Disposal Needs Identification Guidance" to identify and describe areas that utilize individual and community on-lot disposal systems

1. *Complete "Needs Identification" and analysis for an estimated 407 on-lot sewage disposal systems (OLDS), representing 15 percent of the estimated 2716 on-lot disposal systems in the Township not already delineated in a needs area.*

Refer to Table III-1 for a summary of surveys and well samplings conducted within the Township.

Table III-1

Summary of Door-to-Door Survey & Well Sampling

Area	Number of Houses	Percentage to be Surveyed/ Sampled	Required Surveys/Samples	Completed Surveys	Completed Samples
Mastersonville	63	35%	22	22	22
Sporting Hill	106	25%	27	29	33
Newtown	225	25%	59	64	59
Remaining Township Area	2,716	15%	407	416	417
TOTALS	3,110		515	531	531

In total, 531 surveys were conducted and 531 water samples were taken in order to satisfy the "Needs Identification" requirements.

2. *Discuss OLDS survey results and well sampling units, provided by the Township, in text of document and through mapping*

Water samples taken for this Act 537 Plan Revision Update were tested for three parameters: total coliform, E. coli, and nitrate. Water samples were collected from indoor or outdoor faucets after allowing the water to run for two to three minutes, on average. Only untreated water samples were collected (i.e. without being softened, disinfected, etc.) No parts of the bottleware edges or lid were contaminated during the sample collection process. All samples were preserved on ice to ensure that they would reach the laboratory at the appropriate temperature.

Well sampling results represent a "snapshot" of the characteristics of the groundwater. Groundwater characteristics do vary over time depending on many factors. The intent here is to meet PA DEP requirements for sewage needs identification and not develop a comprehensive groundwater quality model.

The presence of total coliform bacteria in a well water sample indicates a potential problem such as improper on-lot wastewater disposal or that surface water is entering the aquifer without undergoing adequate natural treatment. Within the total coliform group, there are members whose normal habitat are the intestines of humans and warm- and cold-blooded animals as well as members that are naturally found in the soil and vegetation. Therefore, the presence of total coliform is the indication of a potential OLDS problem and may possibly mean that a water sample has been contaminated by fecal matter. Water from wells with samples showing coliform contamination should not be consumed.

The fecal coliform subgroup of total coliform is a much more specific indicator of fecal contamination. Among the coliform in human and warm-blooded animals, approximately 95% are fecal coliforms. *Escherichia coli* (E. coli) is the predominant member of the fecal coliform group. Fecal contamination raises health concerns because pathogenic bacteria and viruses that cause enteric diseases in humans originate from feces of diseased individuals. Again, potable water should not have any fecal coliform present. If water samples from wells show the presence of fecal coliform, the water should not be consumed.

Nitrate is the common soluble form of inorganic nitrogen in water. Nitrogen is a component of organic wastes which, when applied to the ground surface, is utilized by plants. However, when excess nitrogen is applied to the ground (i.e., heavy fertilizer applications, wastewater disposal, etc.), it is converted to nitrate through biochemical reaction as it migrates down into the groundwater. As a result, groundwater in areas relying on OLDS or in farmed areas is likely to have measurable concentrations of nitrate.

In this study, 531 wells were tested, representing approximately 17.1% of the total wells in the Township. Wells were randomly selected in the non-sewered areas of the Township. All wells tested as part of this study were untreated by any type of chlorination or ultra violet light system. A summary of test results are shown in Table III-2 and their locations are shown on the Inventory of OLDS and Private Wells map in Appendix E. Individual test results are also shown in Appendix F.

Table III-2

Rapho Township Well Results

	Rapho Township (531 Total)	
	Number	**% of Total**
Greater Than 5 mg/L, but Less Than 10 mg/L Nitrates	124	23.4 %
Greater Than or Equal to 10 mg/L Nitrates	153	28.8 %
Total Coliform Present	333	62.7 %
E. coli Present	108	20.3 %

Technically, PA DEP considers any increase in concentration of the three parameters in groundwater to be pollution, although it is acknowledged that relying on OLDS increases nitrate-nitrogen concentrations in groundwater and increases the potential for bacterial groundwater pollution. It is also important to note that PA DEP's concern when looking at groundwater quality is not only drinking water quality, but also water quality in general. Therefore, knowing that OLDS do impact groundwater quality, the test results of the above listed parameters help identify sewage needs and affect the way that future development relying on OLDS is planned. The US EPA established the following safe drinking water standards:

Total Coliform	No Detect in 100 mL sample
E. coli	No Detect in 100 mL sample
Nitrate-Nitrogen	<10 mg/L

PA DEP has also established 10 mg/L of nitrate-nitrogen as the upper limit for background concentration in groundwater for an area to rely on OLDS as a sewage disposal method. It is important to note that this limit is specific to sewage disposal system planning and that it is not necessarily predicated on the safe drinking water standard.

A review of the well testing provides an indication of potential impacts that OLDS have on the quality of the Township's groundwater in the non-sewered areas. Bacteriological contamination in well water samples is the most commonly used indicator of improperly treated septic tank effluent. Further, normally functioning septic systems produce nitrates. The density of development relying on OLDS can greatly affect the concentration of nitrate-nitrogen in the groundwater. The following paragraphs describe in more detail the impacts of OLDS on groundwater.

a. Bacteriological Contamination

Of the 531 wells tested in Rapho Township, 333 (62.7 %) were contaminated with bacteria. As discussed previously, the presence of coliform bacteria in a well water sample can be an indicator that OLDS systems are functioning improperly, or that surface water is entering the aquifer without undergoing adequate natural treatment. Additionally, 108 of the 531 wells tested (20.3 %) within the Township tested positive for E. coli, a more specific indicator of fecal contamination in the well water.

The Inventory of OLDS and Private Wells map in Appendix E shows the locations of the well tests and which wells tested positive for bacteriological contamination. Based on these results, it is evident that bacterial contamination of well water is not limited to localized 'hot spots' but rather is spread throughout the non-sewered areas of the Township.

b. Nitrates

Of the 531 wells tested, 153 (28.8 %) had nitrate concentrations above the 10 mg/L limit for safe drinking water, while 124 (23.4%)

had concentrations between 5 and 10 mg/L. Nitrate levels in the Township represent a concern for future development in areas that rely on wells for drinking water sources. Subsurface disposal systems depend upon the soil for proper treatment of sewage and upon groundwater for dispersion and dilution of contaminants that have not been completely treated. Therefore, each proposal for a new subsurface disposal system must be considered uniquely to determine if proper treatment, dispersion, and dilution can take place at the site in question.

Nitrates generated in subsurface disposal systems enter the groundwater at concentrations of approximately 45 mg/L directly under the sewage disposal system. The groundwater system reduces this concentration through dilution and dispersion in a zone of attenuation (mixing zone). If the background nitrate level of groundwater is high, this increases the distance required for dilution and dispersion of the nitrogen concentration in the septic tank effluent. This ultimately requires larger lot areas. The primary concern with nitrate-nitrogen loading of groundwater is with large volume discharges or high-density discharges from subsurface disposal systems. Because of the large volume of effluent being discharged in relation to area for disposal, nitrate-nitrogen loading is increased in relation to the dilution/dispersion capabilities of the groundwater system. Therefore, it is necessary to determine the capability of the groundwater system to dilute and disperse these increased nitrate loads prior to the approval of these discharges.

In order to obtain planning approval from PA DEP for an OLDS to be located within 0.25 mile of an area with background nitrate

levels greater than 5 mg/L, an applicant is required by PA DEP to perform a hydrogeologic study. A hydrogeologic study determines the necessary lot size, based on the background nitrate level, to properly dilute and disperse nitrate loads from septic tank effluent. This is done by evaluating the existing and proposed nitrate loading of the groundwater, the velocity and direction of groundwater movement, the area of potential contamination above 10 mg/L that can be anticipated in an aquifer, and the impact on water uses in the contaminated area. Since 1999, all new subdivisions using OLDS have been required to perform hydrogeologic studies to determine the necessary lot size as well as choose alternative sites. This has provided the Township with the necessary data to become better at siting OLDS.

Hydrogeological studies are site-specific and should delineate the following:

- *Dispersion Plume* – volume of contaminated groundwater flowing away from a treatment disposal site toward receiving surface waters.

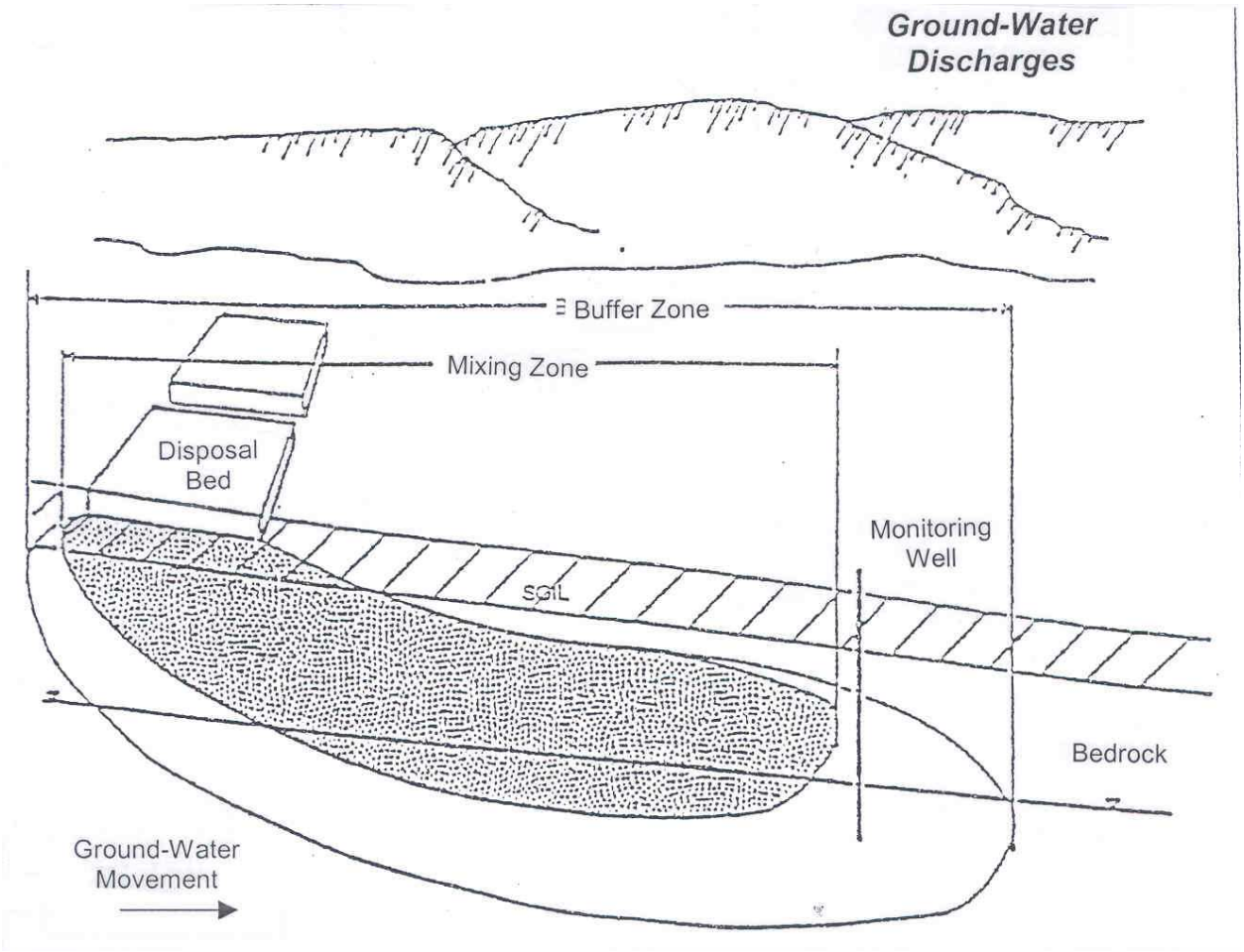
- *Mixing Zone* – portion of the dispersion plume in which groundwater quality does not meet Federal Drinking Water Standards, or discharge to surface waters does not meet surface water quality.

- *Buffer Zone* – the groundwater surrounding the mixing zone that provides for containment and restoration activities should groundwater that exceeds Federal Drinking Water Standards leave the mixing zone.

Figure III-1 illustrates the mixing zone and buffer zone.

Figure III-1

Dilution and Dispersion of Septic Tank Effluent



c. Analysis of Well Contamination

In order to identify any correlations between occurrences of well water contamination and the characteristics of the OLDS that are on the same site, well test results were compared to the age and frequency of pump out of the systems. In order to determine if older OLDS tend to influence well contamination more than newer OLDS

and whether infrequently pumped OLDS tend to influence well contamination more than frequently pumped OLDS, the results of the well tests were organized by these two criteria. Table III-3 shows well results as they are grouped by the age of the OLDS (either 10 years old or younger, 11 to 20 years old, or over 20 years old) that is on the same property of the well that was tested.

Table III-3

Well Test Results Grouped by Corresponding OLDS Age

Rapho Township					
	Total Coliform Present		E. coli Present		
Age of System*	#	%	#	%	Total Samples
10 years old or younger	57	67.1 %	12	14.1 %	85
11 to 20 years old	75	66.4 %	23	20.4 %	113
21 years old or older	123	57.7 %	40	18.8 %	213
Age not specified	78	65.0 %	33	27.5 %	120
Totals	333	62.7 %	108	20.3 %	531

1. * Of the 531 OLDS owners that had their wells tested, 477 (89.8%) were able to provide information on the age of their OLDS.

As Table III-3 indicates, throughout Rapho Township there does not seem to be an appreciable trend between the age of an OLDS and the well sample that was taken at the same site. The percentages of OLDS within each age group that have coliform contamination are similar regardless of whether the OLDS was installed recently or over 20 years ago.

Table III-4 shows well results grouped by the frequency of pumping (either every two years or more frequently, every three to four years, or every five years or more frequently) of the OLDS located on the

same property of the well that was tested. The table shows these data for the 531 wells that were tested in Rapho Township.

Table III-4

Well Test Results Grouped by Corresponding OLDS Pumping Frequency

Rapho Township					
	Total Coliform Present		E. coli Present		
Pumping Frequency	#	%	#	%	Total Samples
Every 2 years or more often	78	59.5 %	26	19.8 %	131
Every 3 to 4 years	74	50.3 %	21	14.3 %	147
Every 5 years or less often	44	53.7 %	13	15.9 %	82
Frequency not specified	137	80.1 %	48	28.1 %	171
Totals	333	62.7 %	108	20.3 %	531

* Of the 531 OLDS owners that had their wells tested, only 336 (63.3 %) were able to provide the frequency with which they pumped their septic tanks.

Similarly, examining Rapho Township's well test results by themselves do not indicate a direct link between OLDS pumping frequency and well water contamination within the Township. In conclusion, it is generally understood that OLDS malfunctions, leading to groundwater contamination, are more likely to occur in systems that are older than in those installed more recently. Similarly, it is generally accepted that septic tank pumping, at regular intervals of about three years, is an effective way to minimize malfunctions that lead to groundwater contamination. Noting that a correlation cannot be observed between occurrences of groundwater contamination and either OLDS age or pumping frequency in the results of this study does not refute these rules of thumb. Rather, they indicate that OLDS age and pumping frequency may not be the primary factors responsible for observances of groundwater contamination within the Township planning area.

d. Water Quality Concerns and Problems

The results of the well tests provide a good indication of the quality of the groundwater that underlies the non-sewered areas. Groundwater quality is an important consideration when evaluating the ability of existing wastewater facilities to address the needs of the community because many residents in these areas rely on OLDS for their sewage disposal needs. In addition, there is a public health issue since private wells are used for their water supply.

Evidence of bacteriological contamination suggests that there is some groundwater quality degradation in the non-sewered area. The number of OLDS that have either documented problems (i.e., surface discharge of effluent, etc.), which have been located on small lots, or that were constructed prior to the institution of PA DEP standards and permitting for OLDS may contribute to this problem. These issues are likely amplified by the carbonate geology that predominates this region.

It should be noted that the amount of acreage currently farmed, along with the agricultural practices of those farms, have an effect on the quality of groundwater in the area.

Implementation of an OLDS management program will help prevent OLDS that are currently functioning well from deteriorating and becoming a malfunctioning system in the future. This is especially important in areas of OLDS identified as potential malfunctions due to soils and/or geology. It is also important to note that these results are reported from one static

moment in time, and that these levels have been known to fluctuate. In this region, very little specific historical well test data can be drawn upon to create a trend of groundwater quality over time. However, a comparison of sampling data from the 1997 Act 537 Plan and this most recent 2006 sampling data was conducted. In the Township-wide area, although the percent total coliform is slightly higher, the fecal coliform remains the same and the percent nitrate is slightly lower for the 2006 data. The Mastersonville Area appears to have improved for both percent nitrates and fecal coliform since 1997, whereas, the Sporting Hill Area data shows a slight increase in percent nitrates, total and fecal coliform. The Newtown Area data shows an increase in percent total and fecal coliform and a decrease in percent nitrate levels higher than 10 mg/l since 1997. Reviewing the data from the two sampling events allowed us to see that the Township-wide groundwater quality has not grown comparatively worse over time, and some areas actually show improvement in groundwater quality.

Nitrates, as mentioned earlier, are not an indication of a malfunctioning OLDS but rather are a byproduct of a normally functioning OLDS. Further, the nitrate test results are used by PA DEP for sewage planning purposes, to determine where PA DEP will require hydrogeologic studies. The intent of these studies is to ensure the addition of OLDS serving new development in areas with elevated nitrate levels does not result in elevated groundwater nitrate levels in excess of 10 mg/L beyond the limits of the project or in the area of a proposed or existing drinking water well.

During the process of scheduling, taking, and returning the results of the well samples to the public, it is evident that some people do not know what factors contribute to groundwater quality. They are not informed about what they can do to improve groundwater quality or improve the water that they are pumping from their well. In general, people are uninformed about coliform bacteria and nitrates, where these chemical constituents come from, what factors influence the presence of these contaminants, and how they can be removed from their water before consumption. Many people are consuming water with very high levels of nitrates and/or bacteria. Clearly, this demonstrates a need for a public education program.

3. SEO Records

The needs evaluation began with the review of Sewage Enforcement Officer (SEO) records.

The SEO is the local agency (municipal) employee responsible for processing on-lot system permit applications, enforcing the state's regulations, and restraining violations. In addition to appointing an SEO, a municipality must also appoint an alternate SEO. When needing the services of the SEO, the public may choose to engage the SEO or the alternate. They are the only local agency employees who may issue or deny a permit. The actions of the SEO are official actions of the local agency.

The local agency, in turn, is charged with creating an administrative structure to support the SEO's activities. The local agency defines, in writing, the SEO's geographic areas of authority and establishes

administrative procedures for the handling of money and paper flow. The local agency also should have support personnel such as clerical staff and technical experts as needed.

SEO Responsibilities

- An SEO shall not install, design, or sell materials for individual or community sewage systems in any area under his or her jurisdiction.

- An SEO shall not accept any fee for services or work performed in the administration of the act other than the salary, wages, or other compensation set and paid by the local agency. The SEO may collect processing fees only if specifically instructed to do so, in writing, by the local agency, and by following established procedures.

- An SEO shall not conduct a test or issue any permit for an individual or community sewage system for any lot in which he or she has a financial interest or in which a relative, by blood or marriage, has a financial interest or in which an employer or business associates (except the local agency) have a financial interest.

- Before issuing a permit, an SEO shall observe, conduct personally, or otherwise confirm, in a manner approved by the department, all tests used to determine the suitability of a site for an on-lot sewage system.

- An SEO must give timely written notice to all applicants or permittees of any approval, denial, or revocation of a permit in accordance with Chapter 72 of the PA Code. The SEO has seven

days to approve or disapprove a complete application. If the application is not complete, the SEO returns it to the applicant and explains the deficiencies in writing. Upon resubmission, the SEO has 15 days to act upon the revised application.

- All permits are issued using the "Application for an Individual Sewage Disposal System Permit" (ER-BWQ-290). An SEO is required to submit to the department the completed pink copy of this form within seven days of issuing or denying the permit. The SEO must date and sign the completed green copy of the form after final inspection of each system and submit it to the department at the end of the year with the application for reimbursement.

- An SEO may issue permits only within the jurisdiction of the employing local agency.

- An SEO is required to restrain violations of the act and inform the local agency upon discovering a violation.

- An SEO shall advise the local agency of a violation which occurs within the local agency's jurisdiction.

Township Responsibilities

The local agency's administrative responsibilities include a number of important tasks outlined in Section 72.42 of the PA Code including:

- Employing an SEO and an alternate SEO.

- Processing applications for sewage system permits and establishing and collecting fees.

- Maintaining adequate files and records, maintaining offices, and purchasing equipment.

- Accounting for expenses and revenues.
- Applying to the department for reimbursement of eligible expenses.

SEO records were reviewed and categorized according to repairs permitted in accordance with "Best Technical Guidance (BTG)" or if holding tanks were permitted for the site. There were 15 permits granted according to BTG from 1999 through 2006 (see Table III-5). However, permits were issued for 27 repairs with no indication of BTG. Records did not indicate any permits issued for holding tanks in the Township from 1999 through 2006. Recent BTGs are mainly located in the northern and central portions of the Township. One BTG is located in each of the Mastersonville and Sporting Hill Needs Areas.

Table III-5

SEO Record Review Conducted 1/8/07

Parcel ID	Permit Year	Repair	BTG
609 Rife Run Rd.	2004	Sand Mound & Effluent Pump	Isolation from EMS to Well
1014 Lebanon Rd.	2004	New Septic Tank	None Stated
2886 Pinch Rd.	2004	New Sand Mound	It says SEO wants to do a BTG, but higher authority said BTG must be avoided if possible and it was stated to be possible, but BTG remediation was not stated.
2783 Camp Rd.	2004	Replace Pump/Dosing Tank	None Stated
2724 Shumaker Rd.	2004	Relocate/Replace Septic Tank	None Stated
987 Mastersonville Rd.	2004	Sand Mound	None Stated
1270 Milton Grove Rd.	2004	Tank Replaced	None Stated
80 Daffodil Drive	2004	Tank Replaced	None Stated
159 East Hernley Rd.	2004	Sand Mound	None Stated
1546 Newport Rd.	2002	Sand Mound	None Stated
1664 West Elizabethtown Rd.	2002	Sand Mound	None Stated
1667 Cider Press Rd.	2002	Drainage	Total Absorption Area = 600 ft. BTG (well)
1440 North Colebrook Rd.	2002	Tank Replaced	None Stated

Parcel ID	Permit Year	Repair	BTG
1233 Mastersonville Rd.	2002	Tank Replaced	None Stated
1428 Mastersonville Rd.	2002	Trench	Isolation Distance BTG
2861 Dogwood Circle	2002	Sand Mound	Well is At-Grade with Drainage
1211 Bridge Valley Road	2002	Tank Replaced	None Stated
86 East Hernley Rd.	2002	Sand Mound	None Stated
1287 West Elizabethtown Rd.	2002	Drip Irrigation Installed	None Stated
706 Milton Grove Rd.	2001	Dosing Box & Seepage Bed	None Stated
580 North Colebrook Rd.	2001	Tank Replaced	None Stated
1138 East Main St.	2001	Tank Replaced	None Stated
2224 Mount Joy Rd.	2001	Drainage Installed	None Stated
12 South Ronks Rd.	2001	Trench	None Stated
1940 Mountain Rd.	2001	Trench	None Stated
434 Lefever Rd.	2001	Seepage Bed	None Stated
41 North Colebrook Rd.		Seepage Bed	None Stated
2349 Sunnyside Rd.	2000	Drainage Bed	None Stated
502 West Newport Rd.	2000	Drainage Bed	None Stated
1375 Hossler Rd.	1999	Dosing Box & Drainage	None Stated
2946 Back Run Rd.	1999	New Septic Tank	None Stated
491 Hossler Rd.	1999	Drainage Bed	75 ft. Well to Drainage BTG (should be 100 ft)
17 Mount Pleasant Rd.	1999	New Septic Tank	None Stated
2703 North Colebrook Rd.	1999	New Septic Tank	Possibly, but None Stated
1722 Wisegarver Rd.	2004	Replacement System	Permit Waiver: 90 ft. from Well, 7 ft. from driveway; better than old system but still no in compliance. BTG
506 Milton Grove Rd.	2005	New Septic System	Waiver of 100 ft. isolation distance from well; Drainage is 54 ft. from Well. BTG
88 South Colebrook Rd.	2006	New Septic System	Waiver: Under 100 ft. distance from Drainage to Well. BTG
79 Hossler Rd.	2006	Replace malfunctioning system	Waiver of isolation distance. BTG.

Best Technical Guidance

The SEO must ensure that all of the regulations that apply to the location and installation of an on-lot sewage disposal system are met whenever possible.

Best Technical Guidance (BTG) may be used when a malfunction needs a new disposal area and the minimum criteria specified in the Pennsylvania Code Title 25, Environmental Protection Chapter 73 regulations eliminate any possible site on the property.

Section 73.3

This section provides some latitude to the local agency or the DEP in repair situations where site limitations on **existing properties** prohibit compliance with all Chapter 73 Regulations.

1) *The SEO must first consider all individual and community sewage systems in Chapter 73.*

2) *If the use of these systems is not physically possible, BTG may be used to correct the malfunction.*

BTG allows the SEO to systematically reduce or waive standards that cannot be met on a particular site. This systematic elimination or reduction of a standard is based upon the impact such an action may have on the environment or the protection of the public health. Some standards, such as isolation distances to property lines, may have very little potential to affect the environment or public health. These less important standards should be eliminated or modified first. Other critical standards, such as depth to limiting zone, may have a significant environmental impact if they are eliminated. Other alternatives should be pursued if **critical standards** cannot be met on a site.

Critical Standards

Other alternatives to BTG should be pursued if any of the following standards cannot be reasonably met on a site:

1) Isolation distances from the system to a water supply.

2) System sizing versus percolation rate.

3) 48-inch vertical separation between bottom of the absorption area aggregate and the top of the limiting zone.

Note: Meeting these standards is DEP policy and will not be found in the Pennsylvania Code Title 25, Environmental Protection Chapters 72 or 73 regulations.

When BTG Can Be Used

The SEO must verify the following to use BTG:

1) The system to be installed will not create a nuisance or public health hazard.

2) The system employs the best available technology.

3) The system has a reasonable probability of functioning long term.

When BTG is used to repair a malfunction, written notification must be given to the applicant explaining the possibility of a system failure.

Written Notification

If BTG is used, written notification to the homeowner should include the following information:

A) The permit is being issued under the Pennsylvania Code Title 25, Environmental Protection Chapter 73.

B) *The site does not meet the Pennsylvania Code Title 25, Environmental Protection Chapter 73 regulations. Include a list of all the deviations from the regulatory standards.*

C) *To help prolong the life of the system, water consumption should be reduced and water conservation devices should be installed.*

D) *There is a possibility the repair system could fail.*

E) *The repair permit does not relieve the applicant of the responsibility to correct any malfunctions that may occur in the future.*

The results of the SEO records review is shown in the Inventory of On-Lot Disposal Systems and Private Wells Table in Appendix F, along with the sanitary survey results.

4. Sewage Needs Survey

The sewage needs evaluation continued with sewage needs door-to-door surveys, which were conducted from May to August 2006. Surveys were mailed to 543 residences and businesses in the Township that are served by OLDS in order for them to prepare for the door-to-door survey that was conducted. A copy of the survey form used is provided in Appendix G.

The PA DEP requires that door-to-door surveys be conducted for the needs areas and 15% of the remaining township area in order to field-verify the answers given by the residents. ARRO representatives equipped with blank surveys, interviewed the property owner(s), performed field verifications, and collected water samples at the OLDS locations.

Based upon the survey results and SEO permit records, OLDS within the Township were evaluated to determine whether they exhibited characteristics warranting distinction as confirmed, suspected or potential malfunctions. The criteria used to classify OLDS malfunctions are listed below. These criteria are based upon the PA DEP's Gold Book guidance and discussions with PA DEP Harrisburg Region staff.

Confirmed Malfunction:

- SEO permit records indicate the OLDS consists of a holding tank or that the OLDS had been repaired according to "Best Technical Guidance" (BTG), meaning that it could not be repaired in accordance with current standards.

- Sewage needs survey results indicate sewage or laundry/sink water are discharged to a storm sewer, a ditch, a stream, or the ground surface.

- Sewage needs survey results indicate the owner has observed wetness or spongy areas near their OLDS, has experienced wastewater backing into their home, and has experienced a OLDS overflow.

Suspected Malfunction:

- Sewage needs survey results indicate sewage or laundry/sink water are discharged to a cesspool, old well, privy, seepage pit, or bore hole.

- Sewage needs survey results indicate the owner has observed green lush grass, water ponding or surfacing, or odors near their OLDS, or has experienced sluggish drains.

- SEO permit records indicate an experimental OLDS system was installed and permitted.

Potential Malfunction:

- SEO permit records indicate the soil absorption system had been repaired.
- Sewage needs survey results reveal the OLDS was installed prior to PA DEP permitting (longer than 30 years ago).
- Soils mapping indicates the OLDS is located within an area having soils with severe limitations for OLDS.

If an OLDS was determined to exhibit none of the characteristics described above, it was classified as having no reported malfunction. The results of the OLDS evaluation are shown on the Inventory of OLDS and Private Wells Table in Appendix E alongside the SEO permit results. The total number of results in this table may be different than the total number of sewage needs surveys analyzed because it includes the SEO permit results; not all SEO permittees were surveyed.

OLDS Pump Out Frequency and Inspection

The sewage needs survey form included a question asking the resident to indicate the frequency of the pumping out of their system. It is commonly accepted that routine pumping of septic tanks helps ensure the proper functioning of the system. Without pumping, solids will be carried to the absorption area by the distribution piping. This will clog the absorption area and cause a system to malfunction. The tables previously discussed show that approximately 63% of the respondents provided a frequency of pump out. The average rate of pump out was reported as four years. Further, 73.5% of those who provided frequency of pump out information reported pumping their system every three years or more often.

The correct frequency of pumping out of a septic system is dependant upon the number of people living in the house relying on the system and the size of the septic tank. For Rapho Township, the average number of people per house according to the 2000 U.S. Census results is 2.76. Therefore, according to the On-lot System Operation and Maintenance, as published by PA DEP (November 2005), systems should be pumped every three to five years. Most residents in Rapho Township are pumping out their systems every four years, or at the recommended interval.

Along with pumping of a system, inspecting systems is a critical task that can help prevent a system, especially those that are classified as a potential malfunction, from becoming a confirmed malfunction. The frequency of inspection of a septic system as recommended in PSATS Municipal Officials Guide to Managing On-Lot Sewage Disposal Systems, dated 1998, is once every three years.

It is possible that the septage hauler that pumps the systems does inspect each tank, however records do not reflect that inspections actually occur. Nor is there a system in place to confirm when systems were pumped out. In addition, there is no indication that the septage hauler doing the pump out has looked at all relevant parts of the disposal system, including, but not limited to, the absorption area and the distribution box.

A database with this historical information would allow tracking of pump out frequency and inspections. In the future, these data could then be used to extrapolate sewage needs and would give an accurate assessment on how well people are adhering to the recommended pumping frequency.

As for the people who did not respond to the frequency of pump out question (36.7%), it is reasonable to conclude that most respondents either do not know that they should be pumping their tank out and/or that they do not pump it at any regular interval. If people will continue to act as they responded in the survey, this percentage could be construed to approximate the ultimate potential for improvement of OLDS performance in the Township.

5. OLDS Problem Areas and Management Needs

This section identifies two distinct types of sewage needs related to the use of OLDS within the Township. The first is OLDS problem areas and describes areas that typically have existing problems with OLDS of a nature that cannot be solved through implementation of on-lot management techniques. While it is the Township's priority to try to continue the use of OLDS, especially in agricultural and rural settings, these problem areas generally require a structural improvement to achieve a solution. The second type is a management need. This type of need is rooted in operation, maintenance, public education and administration deficiencies related to the use of OLDS. Areas experiencing this type of need can usually continue to rely on OLDS for their means of sewage disposal.

a. OLDS Problem Areas

OLDS problem areas can be broken down into two types. The first is evidenced by a cluster of malfunctions and/or polluted well samples. These areas also typically have small lot sizes, with a high number and frequency of problems for a particular area. Because of these issues, some sort of structural improvement is required to address these needs. The full analysis of how to solve

these needs is reserved for discussion in the second phase of this report. The second type of need demonstrates some of the same characteristics as the clustered areas previously described, but are much more sporadic and isolated. These areas may be surrounded with good well sample results, properly functioning septic systems, and may be in agricultural or rural areas making sewer extensions undesirable.

In general, several factors were weighed to determine if an area is likely to need a structural improvement (i.e. sewers, community absorption areas, etc.), as follows:

1) *Lot size is a dominant factor in judging whether or not OLDS are a viable long-term method of sewage disposal. An area containing lot sizes that are not likely to provide enough room to site a second absorption area according to DEP requirements may not be suitable for long-term reliance on OLDS. Further, small lot sizes provide less recharge area for dilution of nitrate concentrations. Generally speaking, for an area with OLDS and relying on wells, existing lot sizes of 1-acre or more will typically provide enough room to deal with a malfunctioning absorption area. (For new lots, this size should be increased to 2 acres to ensure OLDS are a viable long-term solution.)*

2) *Soil types are a critical element in determining if an area should be relying on OLDS for sewage disposal. Areas that have poor soils have little possibility for fixing an absorption area when it malfunctions. This criterion alone is site specific, which makes the area of the lot, as described above, even more critical. In areas with soils*

that have severe limitations for OLDS, a larger lot yields a greater possibility of finding a suitable site.

3) *A documented on-lot system malfunction rate of 25 percent or more in the area would justify classification of an area as a needs area.*

4) *Documenting through well water sampling that there is a water supply contamination attributable to OLDS.*

5) *The existence of a public health problem because sewage is being improperly treated or disposed would justify classification of an area as a needs area.*

In Rapho Township, three areas were identified for further evaluation based upon the previous Act 537 Plan results. These areas are listed in order of priority and described in the following paragraphs.

Newtown Area

This area is located in the southernmost portion of the Township and includes Johnson Mill Lane, Drager Road, Loop Road, Habecker Road, the southern portion of Kinderhook Road, and western portion of Iron Bridge Road, as shown on the Newtown Area Map (Figure III-2). This area matches the Newtown Area identified as a needs area in the 1999 Act 537 Plan Addendum, as described in Section I of this report. Approximately 25 percent of the approximately 225 houses that exist in this area were investigated for sewage needs for a required amount of 59 results. The area is the most remote of the needs areas in terms of proximity to an existing sewer service region. These results are summarized in Table III-6.

Figure III-2

Newtown Area Map

Table III-6

Newtown Area

Summary of Results

Confirmed Malfunctions:	5 of 64 (7.8 %)
Suspected Malfunctions:	17 of 64 (26.6 %)
Potential Malfunctions:	49 of 64 (71.9 %)
Wells with Coliform Bacteria:	44 of 59 (74.6 %)

Sporting Hill Area

This is located at the intersection of Mount Joy Road with North Colebrook Road and South Colebrook Road in the eastern limit of the Township, as shown on the Sporting Hill Area Map (Figure III-3). This area represents the Sporting Hill Area identified as a needs area in the 1999 Act 537 Plan Addendum, as described in Section I of this report. Approximately 25 percent of the approximately 106 houses that exist in this area were investigated for sewage needs for a required amount of 27 results. These results are summarized in Table III-7.

Table III-7

Sporting Hill Area

Summary of Results

Confirmed Malfunctions:	3 of 29 (10.3 %)
Suspected Malfunctions:	5 of 29 (17.2 %)
Potential Malfunctions:	13 of 29 (44.8 %)
Wells with Coliform Bacteria:	25 of 33 (75.8 %)

Figure III-3

Sporting Hill Area Map

Mastersonville Area

This area is the smallest in terms of population. The area is located at the intersection of Meadow View Road and Mastersonville Road with North Colebrook Road, as shown on the Mastersonville Area Map (Figure III-4). Approximately 35 percent of the approximately 63 houses that exist in this area were investigated for sewage needs for a required amount of 22 results. These are summarized in Table III-8.

Table III-8

Mastersonville Area

Summary of Results

Confirmed Malfunctions:	3 of 22 (13.6 %)
Suspected Malfunctions:	5 of 22 (22.7 %)
Potential Malfunctions:	17 of 22 (77.3 %)
Wells with Coliform Bacteria:	12 of 22 (54.5%)

Figure III-4

Mastersonville Area Map

b. OLDS Management Needs

OLDS, if constructed and maintained properly, can provide a reliable and efficient means of wastewater treatment and disposal. Unfortunately, proper installation and maintenance of OLDS has not always been adequate in the past, contributing to the perspective that these systems are second rate, temporary, and prone to failure. The bacteria contamination shown by the well tests suggest that some OLDS in the Township are not operating effectively.

An OLDS Ordinance was adopted in 1990 but has not been successfully enforced. A revision to the Ordinance was prepared in conjunction with the Act 537 Plan in April 1999, but has not been officially adopted by the Township due to the requirements only being applicable to certain sections of the Township. The revised Ordinance was deemed unenforceable. The Township also does not have a system in place for tracking the occurrence of OLDS operation and maintenance tasks such as frequency of OLDS pump outs and inspections.

As with any wastewater treatment technology, OLDS have limitations. Figure III-5 provides an overview of materials which commonly enter the household plumbing system and which are discharged to the septic tank and absorption field. Figure III-6 shows the components of the OLDS and what can be treated. The limitations of the system, including the resulting contaminants that can enter the groundwater and impose adverse effects on groundwater quality, are apparent.

As previously noted, the majority of the wells tested with high nitrate levels or fecal coliform contamination are located away from densely developed areas and in the more rural areas of the Township surrounded by farmland. This implies that water quality problems may be associated with agricultural practices and not necessarily improperly functioning OLDS.

Figure III-5

Materials that Enter the Household Plumbing System

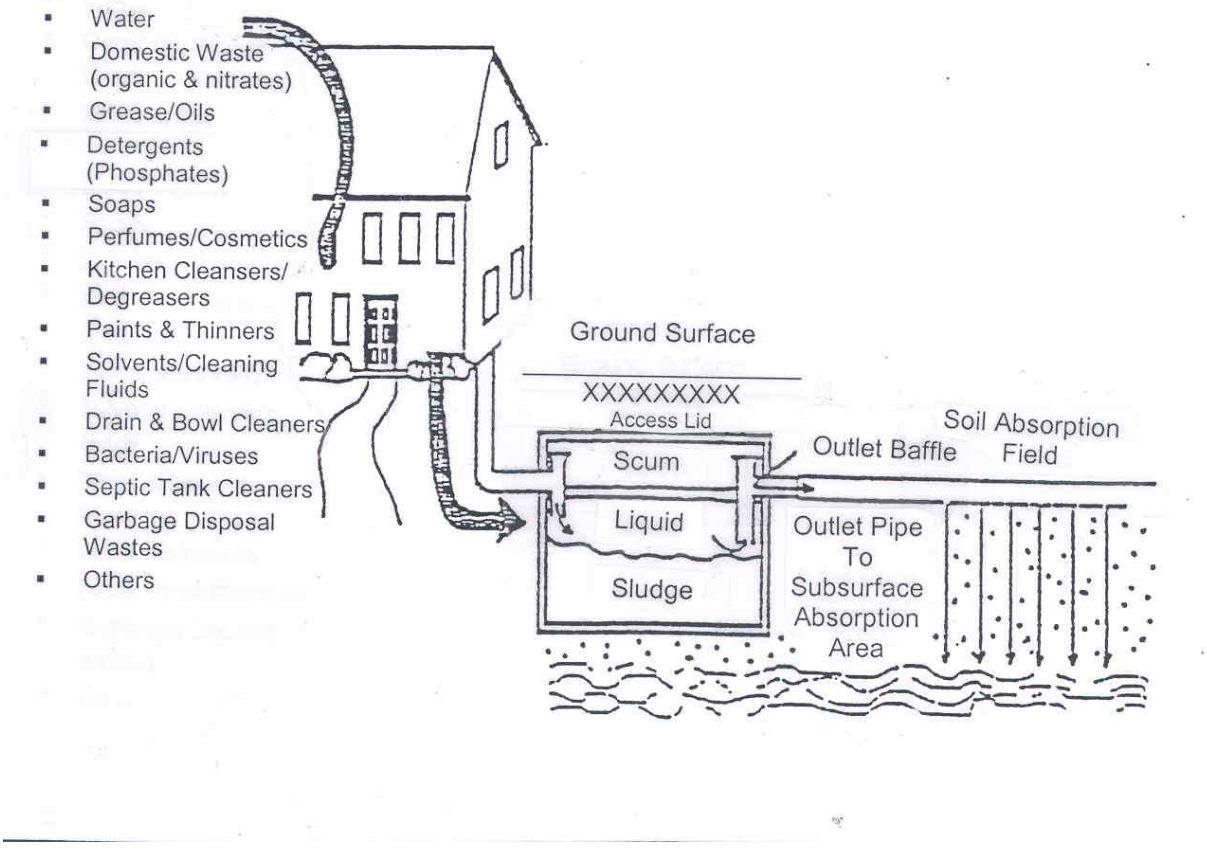
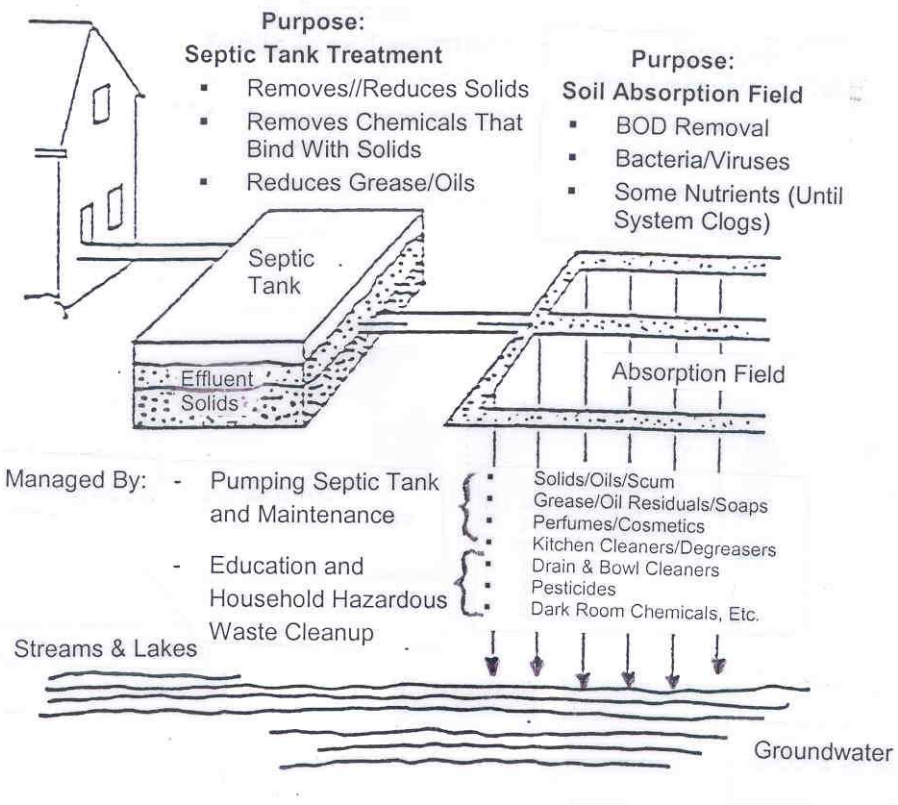


Figure III-6

Limitations of Olds



Many of the problems that cause OLDS failures are not due to technical deficiencies but are related more to homeowner use, maintenance, and other problems caused by inadequate management and operation of systems. According to EPA in its Managing Small Alternative Wastewater Systems (July 1982), OLDS commonly fail for the following reasons:

- Hydraulic overloading by improper homeowner use habits.

- Clogging from large amounts of non-biodegradable solids entering into the system, including cigarettes, grease, diapers, and other materials.

- Failure to periodically pump out solids from the septic tank resulting in solid overflows into the absorption field. Figure III-7 shows what can happen when OLDS are not properly operated and maintained. When a septic tank becomes contaminated, solids will block the septic tank outlet and/or soil absorption field, causing surface discharge of untreated effluent and back up into the home

- Improper site activities, including poor drainage near the absorption field, large vehicles being driven over the absorption field, and planting heavily-rooted trees, such as weeping willows, near the absorption field.

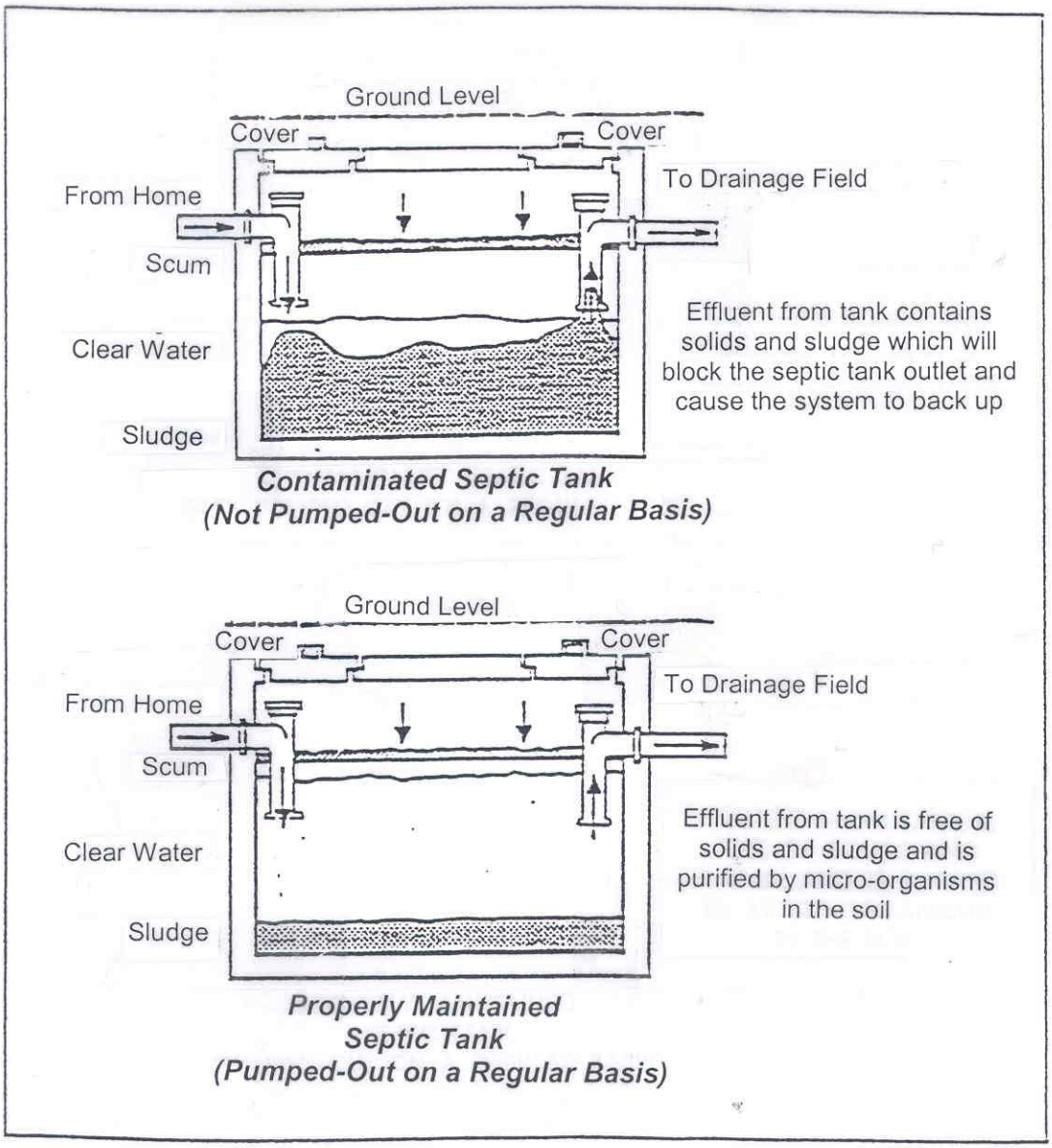
- Lack of homeowner understanding of on-site systems limitations resulting in household hazardous waste being introduced into the systems which cannot be treated in the system and is subsequently discharged to the groundwater recharge area.

It is necessary to ensure that systems are sited, designed, and installed properly in order to achieve optimal performance, but these initial actions are not enough to ensure successful operation of an OLDS. Two additional responsibilities that must be recognized are: (1) proper operation and maintenance of OLDS, and (2) homeowner education regarding use and limitations of OLDS. These elements are essential for effective OLDS utilization.

Figure III-7

Why Proper Operation and Maintenance is Essential

for Optimal Olds Performance



6. Summary of Needs

The following is a summary of the sewage needs for Rapho Township based on the evaluation of water well testing, review of SEO records, and completion of sewage needs surveys:

Water Quality Management Needs

- Develop a database of historic well quality test data to enable future trending of groundwater quality over time.
- Develop a program to educate the public about factors that contribute to groundwater quality, and how they can improve both groundwater quality and private well drinking water quality.
- Develop an OLDS Management Program and Ordinance; implement the Program and adopt the Ordinance.

OLDS Potential Problem Areas (in order of priority)

- Newtown Area
- Sporting Hill Area
- Mastersonville Area

OLDS Management Needs

- Develop SEO records management system for improved accuracy, monitoring, and retention.
- Develop a program for tracking regular pump out and inspection of OLDS.
- Develop a program for tracking malfunctions/failures.

- Develop a program, integrated with a water quality education program, to educate the public about the use, limitations and maintenance of OLDS.

OLDS Planning

a. *Widespread elevated nitrate levels above 10 mg/l require preliminary hydrogeologic studies be performed during the planning stage for proposed OLDS. Since 1999, the Township has required all new developments utilizing OLDS to perform hydrogeological studies to determine lot size and to discover alternative OLDS sites for existing properties involved in the subdivision.*

b. *Compare types of on-lot sewage systems installed in area with types of systems appropriate for area according to soil, geologic conditions, topographic limitations, sewage flows, and Title 25 Chapter 73 (relating to standard for sewage disposal facilities)*

Residential and small commercial/industrial facilities that are not served by centralized treatment facilities rely on some type of OLDS for wastewater treatment and disposal.

Most OLDS are designed with a pre-treatment unit (i.e., septic tank) that removes nearly all settleable solids and floatable grease and scum, followed by some type of secondary treatment or disposal unit. In most instances, septic tank effluent is discharged into a soil absorption field where it is absorbed and treated by the soil as it percolates to the groundwater. In areas where soils are not suitable for absorption fields and where regulations permit,

septic tank effluent can be discharged to sand mounds, evapo-transpiration (ET) beds, or lagoons for further treatment. In areas with significant environmental limitations and land area restrictions, holding tanks must sometimes be used.

Within the Township, there currently is one (1) PA DEP permitted land application system for spray irrigation, but none for drip irrigation or groundwater discharge systems. Conventional septic tank absorption field systems provide service for the majority of homes and small commercial/industrial facilities that are not connected to the Township's sewer system. **Typically, these systems will provide adequate service and may have a lifetime of thirty years or more if properly operated and maintained**.

1) *Physical Limitations for On-Lot Wastewater Disposal*

The Technical Manual for Sewage Enforcement Officers, prepared by the PA DEP, lists many environmental considerations that must be evaluated to determine whether a site is suitable for on-lot disposal of wastewater. In general, any condition that interferes with the renovation of septic tank effluent before entering the groundwater is called a "limiting zone." Limiting zones can consist of the presence of a water table condition sufficiently close to the surface such that effluent can be introduced into the groundwater before being renovated by passage through suitable soils. The presence of rock or other strata that are so tight and impermeable that they restrict the downward passage of effluent is another type of limiting zone. Other types of limiting factors are conditions such as rock with open joints, fractures or solution channels, or soils with

masses of loose rock fragments that allow effluent to pass freely through a portion of the soil horizon without proper renovation. Following is a discussion of the physical limitations to on-lot wastewater disposal that are encountered within areas of the Township.

a) Soils

Soils are an important factor in the function of OLDS as well as in the selection of an appropriate on-lot disposal system design. The vast majority of the Township has moderately restrictive soils, which require more diligent maintenance to over come or minimize the soil's restrictiveness. The areas of the Township that are adjacent to drainage patterns or streams typically have more severely restrictive soil characteristics. OLDS facilities constructed in severely limited soils must be properly designed to overcome the soil limitations and also be maintained in order to preserve the soil's nature.

b) Geology

The depth of competent or weathered bedrock can impose limitations on the design and performance of OLDS. When bedrock is not sufficiently buffered by soil, the rock will either provide an elevation where water cannot further percolate or, if fractured, provide direct conduits to the regional groundwater aquifer. If the sewage has not been properly treated in the septic tank or has not

sufficiently percolated through soils, groundwater contamination can result.

c) Floodplains and Wetlands

OLDS cannot be properly designed if they are located in floodplains or wetlands due to the inherently saturated nature of these areas. Flooding may completely destroy or compromise an OLDS. If OLDS are located in proximity to wetlands, an OLDS failure may initiate the degradation of the wetland and may cause groundwater contamination. Wetlands are interconnected with surface and groundwater hydrology; therefore, any contaminant that is encountered by a wetland, if not properly treated by the wetland, may be discharged to a surface or groundwater source.

c. Provide a description of operation and maintenance requirements of municipality for individual and small volume community on-lot systems.

There are two single-community on-lot systems in the Township. Each property has holding tanks, which the owner is responsible for pumping, that discharge to a community sand mound.

C. Identify wastewater sludge generation, transport, and disposal methods as they relate to sewage facilities alternative analysis including:

1. Location of sources of wastewater sludge or septage (septic tanks, holding tanks, wastewater treatment facilities)

There are no public facilities and no records of sludge or septage available from private facilities.

2. Quantities and types of sludges or septage generated

N/A

3. Present disposal methods locations, capacities, and transportation methods

As mentioned in previous Act 537 (1997), there are six sludge disposal sites for agricultural utilization permitted by PA DEP in Rapho Township. A tabulation of these sites is provided in Table III-9. The Lancaster Municipal Authority (LMA) (formerly the City of Lancaster Sewer Authority) permits four of the sites for use. As a result of expansion and upgrade of wastewater treatment facilities, all LMA sludge is currently composted and disposed by other means. Therefore, future use of these sites by LMA is unlikely and the permits may become available for transfer to other sewage sludge generators.

Table III-9

Permitted Sludge Disposal Sites

(per previous Act 537, 1997)

Permittee	Permit No.
Lancaster Municipal Authority	602861
Lancaster Municipal Authority	602862
Lancaster Municipal Authority	602925
Lancaster Municipal Authority	602926
Manheim Borough	602946
Marietta-Donegal Joint Authority	602958

IV. FUTURE GROWTH AND DEVELOPMENT

A. Identify and briefly summarize municipal and county planning documents adopted pursuant to PA Municipalities Planning Code (Act 247) including:

1. Land use plans and zoning maps that identify residential, commercial, industrial, agricultural, recreational, and open space areas

The Rapho Township Zoning Ordinance of 2005 delineates each land-use zone and the legal descriptions of each zone. The Ordinance is enforced by the Township zoning officer. Rapho Township is part of the Manheim Urban Growth Area. In addition, Rapho Township is in the urban growth area established as the Donegal Region Urban Growth Area, which was established in 1994 and since then has been delineated as a part of the Mount Joy/Donegal Region Urban Growth Area Master Plan (November 2006). The designated Urban Growth Areas within Rapho Township are shown in Appendix D.

2. Zoning or subdivision regulations that establish lot sizes predicated on sewage disposal methods

The following land use designations establish lot sizes and other land use requirements according to sewage disposal methods. Refer to the zoning map in Appendix A for further detail.

- *A - Agriculture* – The primary purpose of this designation is to promote the preservation of agricultural activities and limiting development to single family detached dwellings, which are not likely to be served by public sewer or water within the foreseeable future. Minimum lot size is one acre with hydro study required.

- *R- Rural Residential* – These areas are not likely to be served by public sewer or water facilities for the foreseeable future; therefore, large lot sizes are indicated. Minimum lot size is one acre with hydro study required.

- *R-1 Residential* – When no public sewers are provided, minimum lot area requirements have been sized to provide for an initial and an alternate on-site sewage disposal system.

- *R-2 Mixed Residential* – All dwellings proposed without the use of public sewers will be required to be situated to one side of a wider lot, so that future infill development potentials can be protected for when public sewers become available.

- *Mobile Home Park Residential* – All mobile home parks shall be served by community or public sewers, and community or public water.

- *Village Overlay* – Both public sewer and public water shall be used throughout the development.

- *Neighborhood Commercial* – Lot area, width, and coverage dictate the required public utilities.

Public Utilities Utilized	Minimum Lot Area	Minimum Lot Width	Maximum Lot Coverage
None	43,560 sq. ft.*	200 ft.	35%
Public Water	32,670 sq. ft.*	150 ft.	40%
Public Sewer	20,000 sq. ft.	125 ft.	45%
Both Public Sewer and Public Water	15,000 sq. ft.	100 ft.	65%

***The minimum required lot size may be increased to ensure an acceptable level of nitrate-nitrogen in the adjoining groundwater; such determinations will be made by the PA DEP, through its sewer module review process (see Section 328).**

- *Interchange Commercial* – All uses within this Zone must utilize public sewer and public water.

- *Highway Commercial* – Lot area, width, and coverage dictate the required public utilities.

Required Public Utilities[1]	Minimum Lot Area	Minimum Lot Width	Maximum Lot Coverage
None	43,560 sq. ft.[2]	200 feet	55%
Public Water	32,670 sq. ft.[2]	150 feet	60%
Public Sewer	20,000 sq. ft.	125 feet	65%
Both Public Sewer and Public Water	15,000 sq. ft.	100 feet	70%

FOOTNOTES

[1] All uses located within the Urban Growth Boundaries (UGBs), as adopted in the *Manheim Central Region Comprehensive Plan* (June, 1993), shall require the use of both public sewer and public water.

[2] All uses relying upon on-lot sewers shall comply with Section 328 of this Ordinance.

- *Industrial* – All new uses within this Zone shall utilize public sewer and public water.

3. Limitations and plans related to floodplain and stormwater management and special protection areas

- *Floodplain* – A floodplain zoning designation has been developed in order to ensure public safety, health, and welfare as related to flood-prone areas. On-site sewage disposal systems are prohibited in the floodplain. In addition, all new or replacement water and sanitary sewer facilities and systems shall be located, designed and constructed to minimize or eliminate flood damages and the infiltration of flood waters.

B. Subdivision Activity and Developing Areas

Since the vast majority of land in Rapho Township is developed for agricultural purposes, the Township primarily depends on OLDS for sewage treatment and disposal. Residential subdivisions have been approved for areas in the vicinity or within the Donegal Region Urban Growth Area or near Manheim Borough. These newer subdivisions and industrial/commercial complexes have connected to the wastewater treatment plants owned and operated by either Mount Joy Borough Authority or Manheim Borough Authority.

Table IV-1 summarizes the subdivisions or property owners that discharge to public sewer and the associated equivalent dwelling units (EDUs). According to Rapho Township, Elm Tree Properties and Elm Tree – Four Seasons and the Crest have a total of 1,005 dwelling units. Four Seasons is allotted 247 EDUs, with the remaining going to Elm Tree Properties. According to the sewer agreements adopted by each Authority with Rapho Township, one EDU discharges 350 gallons per day. However, in May 2005, MJBA recalculated and adopted an EDU value of 237 gpd/EDU. Rapho Township residential, commercial, and industrial properties currently have 904 permitted EDUs with Mount Joy Borough and 70 EDUs with Manheim Borough.

Table IV-1

Summary of Sewered Areas in Rapho Township and Associated EDUs

Properties Contributing Sewage to the Mount Joy Borough Authority Treatment Plant					
Subdivision Name/ Property Owner	**Location**	**Description**	**Allocated EDUs**	**EDUs remaining**	**Time Schedule for Remaining EDUs**
Willow Creek	Willow Creek Drive	Residential	135	0	N/A
Green Park	Green Park Drive	Residential	312	129	10 Years
Bank of Lancaster County	Mount Joy Square Shopping Ctr.	Residential	1	0	N/A
Elm Tree Properties	Elmcrest Boulevard	Residential	476	257	10 Years
Elm Tree – The Crest	Elmcrest Boulevard	Residential	282	0	N/A
Elm Tree – Four Seasons	Hawthorne Lane	Residential	247	212	5 Years
John Auker Estate		Residential	1	0	N/A
Rapho Triangle-East, LLC	East Main Street	Industrial/ Commercial	677	629	10 Years
Mount Joy Shopping Center	East Main Street	Commercial	12	0	N/A
		TOTAL	**2,143**	**1,227**	
Rapho Triangle-East Properties (portion of 677 allocated EDUs)					
Subdivision Name/ Property Owner	**Location**	**Description**	**Allocated EDUs**	**EDUs remaining**	**Time Schedule for Remaining EDUs**
NDC, Inc.	15 Eby Chiques Road	Commercial	9	0	N/A
Sheetz, Inc	1555 East Main Street	Commercial	4	0	N/A
Maibach	East Main Street	Industrial	1	0	N/A
Elm Tree Elementary	1360 Strickler Road	Institutional	1	0	N/A
Great Dane Trailers	1155 Four Star Drive	Commercial	2	0	N/A
School Specialties	Four Star Drive	Commercial	30	0	N/A
Five Star International	1294 Strickler Road	Commercial	1	0	N/A
		TOTAL	**48**	**0**	
Subdivisions Contributing Sewage to the Manheim Borough Authority Treatment Plant (286 allocated EDUs)					
Subdivision Name/ Property Owner	**Location**	**Description**	**Connected EDUs**	**EDUs remaining**	**Time Schedule for Remaining EDUs**
Red Rose Acres	Julia Lane	Residential	19	0	N/A
Kendig Drive	Kendig Drive	Residential	19	0	N/A
Orchard Road	Orchard Road	Residential	14	0	N/A
Hamaker Road	Hamaker Road	Residential	9	0	N/A
Boundary Streets	Old Line Rd/Meadow Ln/Lebanon Rd	Residential	5	0	N/A
David Rogers	430 Orchard Lane	Residential	1	0	N/A
Dr. Kenneth Lovell	426 Orchard Lane	Residential	1	0	N/A
Jay Angstadt	307 Lebanon Road	Residential	1	0	N/A
Niles Lane	309 Lebanon Road	Residential	1	0	N/A
		TOTAL	**70**	**0**	

C. Land use designations established under PA Municipalities Planning Code (35 P.S. 10101-11202), including residential, commercial, and industrial areas

All zoning land use designations described in Sections I and IV were established under PA Municipalities Planning Code (35 P.S. 10101-11202).

D. Future Growth and Land Development (Future growth and population and EDU projections for these areas)

Future land development in Rapho Township will be mainly limited to the Donegal Region Urban Growth Area associated with Mount Joy Borough due to zoning restrictions and Comprehensive Plan guidelines. The urban growth area is zoned to accommodate residential, traditional neighborhood, commercial, industrial and agricultural/open space.

One residential subdivision near the PA turnpike interchange named Quail Creek, located off Pinch Road, is proposed to have 26 new homes and three existing homes, and will discharge sewage to a proposed new package treatment plant. The total number of approved EDU's to be built in the area of the Township that contribute sanitary sewer flows to the Mount Joy Borough Authority Wastewater Treatment Plant is 2,143. According to the Mount Joy/Donegal Region Urban Growth Area Master Plan (November 2006), Rapho Township's current and projected growth rate is 511 EDU's over the next 25 years, or approximately 20 EDU's per year. This analysis includes the partially constructed Elm Tree and Green Park subdivisions and is based upon undeveloped, agricultural, and infill land within the Mount Joy Borough Urban Growth Area. It is anticipated that the remaining approved EDU's would take approximately ten years to fully develop.

Manheim Borough Authority has allocated 286 EDUs (350 gpd per EDU) for Rapho Township residents and businesses. With 70 EDUs being used, there is currently 216 EDU capacity available for connection. Currently, Rapho Township

has no land development plan or connection plan proposed for within the Manheim Urban Growth Area that will use the remaining capacity. Therefore, future development in this area or adjacent areas may be considered as potential future development sites for public sewer service from the Manheim Borough Authority.

It should be noted that in the 2000 Manheim Central Region Comprehensive Plan Update, the interchange of the PA Turnpike and PA Route 72 was identified as an attractor of limited commercial development. Although Rapho Township recognizes that some limited commercial growth will continue, the growth in this area needs to be carefully managed so that it will not attract uses other than non-residential growth. The existing established residential communities/settlements shall be protected from the adverse impacts of future commercial development. This plan concurs with the 2000 Comprehensive Plan Update in that designation of a Turnpike Interchange Growth Area may need to be considered in the future, when appropriate.

Currently, a Comprehensive Plan is being developed and will state that any new developments in the Interchange area will need to be sewered. There is no planned development in this area other than existing businesses. The Hampton Inn is on the public sewer system. If the area is sewered in the future, any existing development will be required to connect to the sewer system. Any future sewer system potentially could be owned, operated, and maintained by the Township, and will be determined during sewer system project design.

1. Population Information

According to the 2000 Census, the population in Rapho Township was 8,578. Table IV-2 shows past population trends in the Township according to U.S. Census data and presents the population project for the

Township through the year 2025. These projections were determined through consultation with the Township and LCPC.

Table IV-2

Population Trends

Year	Population	Percent Change
1900	3,342	
		2.3%
1910	3,421	
		-10.0%
1920	3,110	
		6.2%
1930	3,317	
		5.9%
1940	3,525	
		8.8%
1950	3,865	
		13.8%
1960	4,484	
		12.4%
1970	5,121	
		28.4%
1980	7,157	
		12.8%
1990	8,211	
		4.5%
2000	8,578	

Figure IV-1

Past & Projected Population in Rapho Township

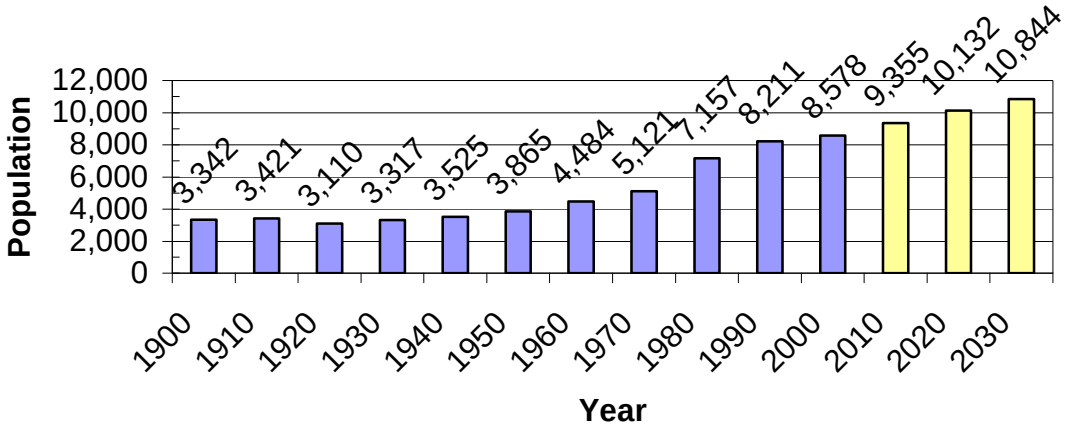


Figure IV-1. Past and Projected Population in Rapho Township

The Lancaster County Planning Commission provides preliminary population projections calculated in May 2002 for 2010, 2020, and 2030. The model used for the municipal projections involves the use of four different simple projection methods. For each method, the municipality's population is projected and then adjusted to fit the county total for the three projection years 2010, 2020, and 2030. Then, the four methods are averaged for each projection year to create a final projection.

2. Zoning, subdivision regulations, local, county, or regional comprehensive plans, and existing plans of Commonwealth agency relating to development, use, and protection of land and water resources.

Due to the great uncertainty that characterizes the various factors affecting population growth, population projections must always be treated as "best approximations" based upon the information available.

The Township's Comprehensive Plan and Subdivision and Land Development Ordinance were adopted to:

- To protect sensitive and important natural features (e.g. floodplains, wetlands, prime farmlands, unique geologic features, steep slopes, woodlands, game lands, wildlife habitats, etc.) from indiscriminate development.
- To provide for drainage, water supply, sewage disposal, and other appropriate utility services.
- To require sites for building purposes and human habitation to be suitably improved for their intended use and to minimize the peril from flood and erosion.
- To encourage preservation of adequate open spaces for recreation, light, air, and maintenance of the natural amenities characteristic of the Township.
- To ensure that developments are environmentally sound by requiring preservation of the natural features of the areas to be developed to the greatest extent practicable.
- To prevent unnecessary or undesirable blight, runoff, and pollution.
- To secure the protection of water resources and drainage ways.

The Subdivision and Land Development Ordinance requires that wetlands be delineated on all plans. Effective agricultural zoning allows for one (1) lot subdivision for every 50 acres.

3. Areas where community sewage systems are planned to be available

Five Year Projection

It is anticipated that the 212 remaining EDUs allocated to the Elm Tree – Four Seasons Subdivision will be used within the next five years.

Ten Year Projection

It is anticipated that 386 remaining residential EDUs allocated to the Green Park Subdivision and Elm Tree Properties will be used within the next 10 years. There is potential that the 629 remaining EDUs associated with Rapho Triangle-East, LLC will be allocated to businesses within the next ten years, however, the development of business within the Donegal Region Growth Area is less predictable than residential development. As such, the current amount of EDUs allocated to Rapho from Mount Joy Borough Authority will sufficiently supply sewer service to the proposed developments through mid-2009. If the commercial land associated with Rapho Triangle-East, LLC and residential areas are developed according to Table IV-3, the Township will need to acquire more EDUs from the Authority during the year 2009 to accommodate for all of the proposed development.

Future flows to the Mount Joy Borough Authority Wastewater Treatment Plant are based upon anticipated subdivision build-out schedules and uniform commercial development within the Urban Growth Area. It is discussed in the Mount Joy/Donegal Region Urban Growth Area Master Plan (November 2006) that the Mount Joy Borough Authority has already scheduled upgrades that will expand its sewage treatment capacity. Based on these scheduled upgrades, the Authority is equipped to handle projected residential and commercial development that would occur under the build-out scenario. However, because sewage treatment requirements pertaining to industrial uses vary widely, it is possible that future upgrades related to specific industrial development in the Township might be required.

Table IV-3

Anticipated Schedule of Future Flows

to the Mount Joy Borough Authority Treatment Plant

(1,321 Allocated EDUs)

Subdivision Name/Property Owner	EDUs planned	EDUs remaining	Time Schedule for Remaining EDUs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Willow Creek	135	0	N/A											
Green Park	312	129	10 Years	13	13	13	13	13	13	13	13	13	12	
Bank of Lancaster County	1	0	N/A											
Elm Tree Properties	476	257	10 Years	26	26	26	26	26	26	26	26	26	23	
Elm Tree – The Crest	282	0	N/A											
Elm Tree – Four Seasons	247	212	5 Years	42	42	42	42	44						
John Auker Estate	1	0	N/A											
Rapho Triangle-East, LLC	677	629	10 Years	63	63	63	63	63	63	63	63	63	62	
Mount Joy Shopping Center, East Main St.	12	0	N/A											
	2,143	1,227		144	144	144	144	146	102	102	102	102	97	**Additional EDU Yearly Total**
				1,060	1,204	1,348	1,492	1,638	1,740	1,842	1,944	2,046	2,143	**Cumulative Total EDUs**

Based on 350 gpd/EDU (per the Sanitary Sewer Service Agreement between Mount Joy Borough Authority and Rapho Township), this represents a total anticipated increase in flow to the Mount Joy Borough Authority WWTP of 429,450 gallons per day in 10 years. Adding this to the existing average daily flow from Rapho Township yields a flow of 745,850 gallons per day.

Table IV-4 provides a comparison of these updated flow projections for the Mount Joy Borough Authority and Manheim Borough Authority service areas with the flow projections that were determined in the 1997 Act 537 Plan. The 1997 Act 537 Plan used 300 gallons per day per EDU in Manheim Borough. This Plan Update uses 350 gallons per day per EDU for both Authorities when calculating existing and future flows. As shown in the Table, the 2016 flow projection provided by the 1997 Act 537 Plan is approximately 455,000 gallons per day higher than the flow projection arrived at by this Act 537 Plan Update for Mount Joy Borough Authority and 75,500 gallons per day higher for flows going to Manheim Borough Authority. The difference in flow projections is due to revisions to proposed development and urban growth area assessments.

Table IV-4

1997 Act 537 Plan

vs. Current Act 537 Plan Update

		From 1997 Act 537 Plan (GPD)	From Current Act 537 Plan Update (GPD)	1997 Act 537 Plan Projection Minus 2006 Act 537 Plan Projection (GPD)
Township Flows to Mount Joy Borough Authority	1997 Flow	0	0	0
	2006 Flow	1,200,845 *	316,400	884,445
	2007-2016 New Flows	0 *	429,450 *	-429,450
	2016 Projected Flow:	1,200,845 *	745,850 *	454,995
Township Flows to Manheim Borough Authority	1997 Flow	0	0	0
	2006 Flow	55,200 *	24,500	30,700
	2007-2016 New Flows	44,800 *	0 *	44,800
	2016 Projected Flow:	100,000 *	24,500 *	75,500

* Indicates Projection

V. ALTERNATIVES TO PROVIDE NEW OR IMPROVED WASTEWATER DISPOSAL FACILITIES

Based on the needs analysis presented in Section III and the Township's anticipated future growth presented in Section IV, it is recognized that there are some issues that should be addressed in order to meet the Township's existing and future sewerage needs. Three areas were identified as potential sewer needs areas: Newtown Area, Sporting Hill Area, and Mastersonville Area; however, they are not immediate needs areas that would require addressing within the next five years. It is expected that these areas will not undergo any significant growth in the near future since they are all located outside of the Township's designated Urban Growth Area Boundaries. Therefore, the identified existing EDUs in Section III for each of these areas are used in the flow calculations. The following sections present alternatives evaluated by the Township, which include improvements and expansions to the public sewerage facilities and consideration for community on-lot systems, as well as measures to help ensure that OLDS are a viable sewage disposal plan for those agricultural and rural areas where it is not appropriate to extend the public sewer system.

A. Conventional Collection, Conveyance, Treatment, and Discharge Alternatives

1. Regional Wastewater Treatment

As discussed in Section III, treatment of wastewater generated within the Township is provided by two public facilities, MJBA and Manheim Borough Authority WWTPs. All other Township residents are served by individual/community OLDS systems or private package sewerage treatment plants. MJBA's WWTP currently has a capacity allocation of 0.462 MGD for the Township, and Manheim Borough Authority's WWTP has a reserved capacity of 100,000 gpd allocated to the Township. The Lancaster Area Sewer Authority's (LASA) collection and conveyance

system is close to the Newtown Area on the east side of the Township. Based on past conversations between the Township and LASA regarding the possible sewer extension from the Township to LASA, LASA is willing to accept wastewater from the Township.

Regional wastewater treatment has numerous positive aspects relative to small, local treatment facilities since the facilities often allow for more efficient management and monitoring, and minimize the amount of pollution source points.

2. Extension of Existing Municipal or Non-Municipal Sewage Facilities

The Township recognizes that potential OLDS problem areas represent the forefront of needs for public sewer. The means utilized to identify potential Needs Areas was provided in previous sections. Possible methods for sewage collection and conveyance for these areas are addressed in the following sections.

a. *Newtown Area*

This area consists of 225 homes located along Johnson Mill Lane, Drager Road, Loop Road, Habecker Road, the southern portion of Kinderhook Road, and the western portion of Iron Bridge Road. There are also 93 EDUs in the existing Rolling Hill Estates Mobile Home Park.

The area lies in two drainage areas: 1) the east portion along Kinderhook Road and southern part of Habecker Road draining to a low point south of Kinderhook Road, and 2) the west portion along Drager Road, Johnson Mill Lane, and northern part of Habecker Road draining to a low point at Johnson Mill Lane.

Two sewer extension alternatives were evaluated for providing public sewer to this area. The first alternative is construction of a sewer extension to the existing Rolling Hill Mobile Home Park WWTP, which would require significant expansion and upgrade. The proposed collection and conveyance system consists of 18,000 linear feet of gravity main, 10,000 linear feet of force main, and two (2) pump stations, as shown in Figure V-1. The existing WWTP would need to be upgraded from 0.02 MGD to 0.12 MGD. The opinion of probable construction cost is approximately $6,323,000, as shown in Table V-1. It is expected that the Township would assume ownership and operate the expanded WWTP after construction. One advantage of this alternative is that the upgraded WWTP may be able to operate under its existing NPDES permit. However, there are some concerns relative to acquiring the existing WWTP. From the 1997 Act 537 Plan, it was noted that this park is generally a retirement community whose residents are on fixed incomes of retirement or social security benefits. The sewer costs are included in the lot rent and would not be used to contribute to the project cost. The owner of the MHP may not be willing to participate in the WWTP expansion. The Township will have to negotiate with the owner about acquiring the WWTP if this alternative is determined to be appropriate. The EDUs to be served within this area include the 225 from the area plus 93 from the Mobile Home Park, totaling 318 EDUs.

Figure V-1

Newtown Area

Sewer Extension to the Existing Rolling Hill Mobile Home Park WWTP Alternative

If the existing WWTP is not available for expansion and connection, the second alternative is to convey all sewage flow from the Newtown area to LASA's Farmdale Pump Station, which would pump the sewage to LASA's 15.0 MGD SWPCF for treatment. The sewer collection and conveyance system would be the same as discussed in the first alternative, except that a third pump station and an extra 16,000 linear feet of force main would be required to pump the flow across Chiques Creek to the Farmdale Pump Station, as shown in Figure V-2. The opinion of probable construction cost is $7,159,000, as shown in Table V-1. The higher cost of this alternative is due to the additional pump station and the long force main to the Farmdale Pump Station. The cost of purchasing capacity from LASA should also be considered, but that cost is uncertain and therefore not included in this cost estimate. It should be noted that the Township does not intend to own and operate a wastewater treatment facility within the Township. Therefore, the second alternative would still be an attractive option for the Township. Total EDUs considered in this alternative equal 225 since it does not include the 93 EDUs from the Mobile Home Park. It should be noted that LASA's 2006 Act 537 Plan states the Farmdale Pump Station may require an upgrade within 20 years. If the Township needs to meet with LASA to discuss allocation of sewer capacity, this issue may need to be addressed.

Figure V-2

Sewer Extension to LASA's Farmdale Pump Station

The option of connecting to MJBA's sewer system via the Township's Triangle Area also was considered. However, this option would require the construction of approximately three miles of force main through the Township's agricultural area, which is not consistent with the Township's agricultural land conservation policy. As such, this option was not deemed viable, and no further discussion is provided in this report.

Cost estimates for the above alternatives are tabulated in Table V-1.

Table V-1

Opinion of Probable Construction Cost

Newtown Area Sewer Extension Alternatives

Item No.	Description	Unit	Unit Prices	Sewer Extension to Existing Mobile Home Park WWTP		Sewer Extension to LASA Sewer System	
				Qty.	Total Cost	Qty.	Total Cost
1	Gravity Sewer Line	LF	$100.00	18,000	$1,800,000.00	18,000	$1,350,000.00
2	Force Main	LF	$80.00	10,000	$800,000.00	26,000	$2,080,000.00
3	Manhole/Cleanout	EA	$4,500.00	46	$207,000.00	62	$279,000.00
4	Pumping Station	EA	$150,000.00	2	$300,000.00	3	$450,000.00
5	Expansion of WWTP to 0.12 MGD	LS	$910,800.00	1	$910,800.00	0	$0.00
6	Stream Crossing	EA	$15,000.00	0	$0.00	1	$15,000.00
7	Laterals	EA	$2,500.00	225	$562,500.00	225	$562,500.00
	Subtotal				$4,581,000.00		$5,187,000.00
	Construction Contingency (20%)				$917,000.00		$1,038,000.00
	Subtotal				$5,498,000.00		$6,225,000.00
	Engineering / Legal / Administrative Fees (15%)				$825,000.00		$934,000.00
	TOTAL				**$6,323,000.00**		**$7,159,000.00**

Note: 1. Lateral Connections do not include Mobile Home Park residents corresponding to 93 EDUs.
2. The ENR Cost Index Ratio for January 2007 to April 1999 is 1.32. The 1999 Act 537 Plan estimated the unit cost of construction of a package WWTP at $5.75/gallon. Thus, the 2007 unit cost for WWTP construction would be $5.75 x 1.32 = $7.59/gallon. For a 120,000 GPD WWTP, the estimated cost of construction is $910,800.
3. The cost of purchasing sewer capacity from LASA is not included.

b. *Sporting Hill Area*

This area consists of 106 homes located at the intersection of Mount Joy Road with North Colebrook Road and South Colebrook Road. The existing Hill Top Acres Mobile Home Park WWTP has a capacity of 5,000 GPD, which corresponds to approximately 14 EDUs.

In the Township's 1997 Act 537 Plan, an alternative for extending sewer to Manheim Borough Authority's WWTP was proposed. Wastewater from the area would be collected and conveyed to a pump station located in the northeast portion of the area via a gravity or low pressure sewer system, and then pumped directly to Manheim Borough Authority's WWTP. Manheim Borough Authority has allocated 100,000 gpd of capacity to Rapho Township. As discussed in Section III, the Township currently utilizes only 19,700 gpd of the Borough's WWTP total capacity. Based upon a sewer flow of 350 gpd per EDU, the 106 EDUs in the Sporting Hill area would generate approximately 37,100 gpd, which is well within the Township's remaining allocated capacity.

This alternative consists of construction of 5,000 linear feet of gravity main, 5,300 linear feet of low pressure main, and one pump station, as shown in Figure V-3. The updated opinion of probable construction cost is $2,402,000, as shown in Table V-2. The total number of EDUs considered in this alternative is 106 EDUs, since connection of the existing mobile home park may not be a viable option.

Figure V-3

Sporting Hill Area

Sewer System Extension to Manheim Borough Authority's WWTP

A second sewer extension alternative is to expand the existing Hill Top Acres Mobile Home Park WWTP, and then direct all flow from this area to the expanded plant. This alternative consists of the construction of 3,000 linear feet of gravity main and 5,100 linear feet of low pressure main, as shown in Figure V-4. The existing WWTP would require upgrading from 0.005 MGD to 0.05 MGD in order to accommodate the additional flow from the 106 EDUs. The opinion of probable construction cost is $2,542,000, as shown in Table V-2. The total EDUs considered in this alternative equal 120. As with the alternatives proposed for the Newtown Area, there is some concern regarding acquisition of the WWTP and whether or not the owner would be willing to expand the plant. The Township would have to negotiate with the owner if this alternative is selected.

Table V-2

Opinion of Probable Construction Cost

Sporting Hill Sewer Extension Alternatives

Item No.	Description	Unit	Unit Prices	Sewer Extension to Existing Mobile Home Park WWTP		Sewer Extension to Manheim Borough WWTP	
				Qty.	Total Cost	Qty.	Total Cost
1	Gravity Sewer Line	LF	$100.00	3,000	$300,000.00	5,000	$500,000.00
2	Force Main	LF	$80.00	5,100	$408,000.00	5,300	$424,000.00
3	Manhole/Cleanout	EA	$4,500.00	11	$49,500.00	15	$67,500.00
4	Pumping Station	EA	$150,000.00	0	$0.00	1	$150,000.00
5	Expansion of WWTP to 0.05 MGD	LS	$500,000.00	1	$500,000.00	0	$0.00
6	Stream Crossing	EA	$15,000.00	0	$0.00	1	$15,000.00
7	Laterals	EA	$2,500.00	106	$265,000.00	106	$265,000.00
8	Grinder Pumps	EA	$6,000.00	53	$318,000.00	53	$318,000.00
	Subtotal				1,841,000.00		1,740,000.00
	Construction Contingency (20%)				$369,000.00		$348,000.00
	Subtotal				$2,210,000.00		$2,088,000.00
	Engineering / Legal / Administrative Fees (15%)				$332,000.00		$314,000.00
	TOTAL				**$2,542,000.00**		**$2,402,000.00**

Note: 1. Lateral Connections do not include existing Mobile Home Park residents corresponding to 14 EDUs.
2. The unit cost for construction of such a small WWTP is approximately $10.00/gallon.

Figure V-4

Sporting Hill Area

Sewer System Extension to Expanded Existing Hill Top Acres Mobile Home Park WWTP

c. *Mastersonville Area*

This area consists of 63 homes and 3 commercial properties located at the intersection of Meadow View Road and Mastersonville Road with North Colebrook Road. It is a significant distance from any existing municipal or non-municipal WWTP. Consequently, it would be cost-prohibitive to construct a sewer extension system from any existing WWTP to serve this area. Other options, such as a package WWTP, are considered in the following sections.

3. Continued Use of Existing Municipal or Non-Municipal Sewage Facilities

The existing municipal or non-municipal sewage facilities will continue serving the current sewered areas within the Township. As discussed above, Manheim Borough and LASA's sewer systems and WWTPs have enough capacity to accept additional flows from the Newtown Area and the Sporting Hill Area. These two areas also have the potential to be served by the expansion of the two existing Mobile Home Park package WWTPs. There are no existing facilities within a reasonable distance that could serve the Mastersonville Area.

4. Construction of New Community Sewage Systems

As discussed in Section D below, community sewer system alternatives would require careful evaluation on a case-by-case basis and are not normally considered a reliable long-term solution to serve the Township's sewer needs. Section D outlines the physical possibility of a Community Hybrid System with soil adsorption in the Mastersonville area.

5. Repair or Replacement of Collection and Conveyance System Components

Currently the collection and conveyance sewer systems serving the sewered areas within the Township appear to be in good condition and no problems have been identified. Therefore, there is no need for repair or replacement for the existing systems at the time of this Plan.

6. Use of Innovative/Alternative Methods of Collection/Conveyance

Apart from gravity sewer systems and pump stations, low pressure sewer systems or other innovative methods can be considered as alternatives for sewer collection and conveyance. Low pressure sewer systems can replace pump stations in small areas where the installation of pump stations is less favorable. In the sewer extension alternatives for the Sporting Hill Area, a small portion of the area is proposed to be served by lower pressure sewer systems and grinder pumps.

The conveyance system proposed for the "Hybrid" Community System, proposed in Section D for the Mastersonville area, will incorporate a small diameter gravity (4 or 6 inch) conveyance pipe to transfer septic tank effluent from new septic tanks located on the parcel to the community system treatment and disposal site.

B. Individual Sewage Disposal Systems

Rapho Township has a primarily agricultural character, and depends on OLDS for sewage disposal. The continued use of OLDS is recommended for areas where public sewer service is not available. Thus, the effective management of OLDS to promote optimal system performance is quite important and requires consideration of several elements, from location and design of the system to its operation and use. Proper maintenance of OLDS requires routine pump-outs and

inspections by the SEO. Homeowner education regarding the limitations of OLDS is also necessary to reduce improper disposal of household hazardous wastes and other materials that can cause an OLDS to malfunction. It should focus on encouraging homeowners to properly use and maintain their systems, including routine pump-outs and education.

Enforcement of the OLDS program is also important. The proposed Township OLDS ordinance requires regular pump outs, and the Township shall implement a tracking system for assuring compliance with the ordinance requirements. The ordinance requires a routine inspection be done at the time of pump-out to identify systems that are malfunctioning and in need of repair or replacement. Pump-outs and inspections shall be required every four years, and proof of such actions shall be provided to the Township. The Township will develop a system to track the submitted reports, as well as to provide notification of violations. A copy of the proposed Ordinance and the Septic System Report are included in Appendix O.

Hydrogeologic studies are required for all new on-lot subdivision proposals without public sewer. All OLDS produce nitrates; a hydrogeologic study for these new OLDS will provide the necessary analysis and safeguards needed to ensure that nitrates from the proposed systems do not raise the nitrate concentration in the adjoining area above 10 mg/l. In order to ensure that OLDS remain a long-term sanitary disposal method, an alternate absorption area will be required for all new lots served by an OLDS. It is important to note that both the OLDS primary and alternate absorption areas must be sited to meet DEP criteria.

Recently, an increasing number of municipalities in Pennsylvania have developed programs aimed at improving the reliability of OLDS. The objective of these programs is to prolong the life (avoid repairs and replacement) of OLDS and protect the quality of groundwater resources and drinking water supplies. OLDS management is a long-term wastewater program.

C. Small Sewage Treatment Facilities

Small sewage treatment facilities are used in areas that require a sewage collection and treatment system but are located a prohibitive distance from existing sewered areas, or in applications where sewer extensions would negatively impact agricultural preservation. Each of the potential Needs Areas meets the above requirements, and construction of a package WWTP on-site could be a viable alternative. Locations of proposed package WWTPs are tentative, and may be changed in the future when more information is available during design. The proposed package WWTPs will use an SBR process with aerobic digestion, post aeration, and UV disinfection. Tertiary filters will be used to further reduce TSS or TP if necessary.

Discharge limits to be met by the proposed package WWTPs are assumed to be the same as for the Manheim Borough Authority's WWTP, namely:

Biochemical Oxygen Demand (BOD):	25 mg/L
Total Suspended Solids (TSS):	30 mg/L
Ammonia Nitrogen (NH3-N):	4.5 mg/L (May 1 to Oct. 31)
	13.5 mg/L (Nov. 1 to Apr. 30)
Dissolved Oxygen (DO):	5 mg/L minimum
Fecal Coliform	200 MPN/100mL
Total Nitrogen (TN):	0 mg/L
Total Phosphorus (TP):	0 mg/L

It should be noted that "zero" discharge limits for TN and TP were established by DEP for any new wastewater treatment facility discharging nutrients into tributaries of the Chesapeake Bay in an effort to comply with the Chesapeake Bay Strategy by 2010. Nutrient credits will need to be purchased to offset the discharged nutrients. The SBR process can satisfactorily reduce nutrient discharge limits down to 6 mg/L total nitrogen (TN) and 1 mg/L total phosphorus

(TP). Currently Red Barn Trading Company is working with DEP to generate nutrient credits, which are sold at $9.00/lb/year for both nitrogen and phosphorus. The Township will need to secure nutrient credits once it is determined that a new package WWTP is to be constructed within the Township.

1. Newtown Area

This alternative is similar to the previously proposed sewer extension alternative to the existing Rolling Hill MHP WWTP, except that a new WWTP would be constructed in a different location. A 0.12 MGD package WWTP is proposed to be located at the northwest end of the area. The existing Rolling Hill MHP would be abandoned and demolished, and its flow directed to the new WWTP. The collection and conveyance system would consist of 18,000 linear feet of gravity main, 10,500 linear feet of force main, and two (2) pump stations, as shown in Figure V-5. The opinion of probable construction cost is $6,447,000, as shown in Table V-3. The total EDUs served by this alternative equal 318.

2. Sporting Hill Area

A new 0.05 MGD package WWTP is proposed to be constructed at the northeast end of the area, close to the existing Hill Top Acres MHP WWTP. The existing WWTP would be abandoned.

In some portions of the system, low pressure sewers are proposed rather than constructing pumping stations. The collection and conveyance system would consist of 3,000 linear feet of gravity main, 5,100 linear feet of force main, and 53 grinder pumps, as shown in Figure V-6. The opinion of probable construction cost is approximately $2,583,000, as shown in Table V-3.

3. Mastersonville Area

A new 0.025 MGD package WWTP is proposed to be constructed at the northeast end of the area. The collection and conveyance system would consist of 5,550 linear feet of gravity main, 1,550 linear feet of force main, and 21 grinder pumps, as shown in Figure V-7. The opinion of probable construction cost is approximately $1,786,000, as shown in Table V-3.

Figure V-5

Newtown Area

Construct New WWTP

Figure V-6

Sporting Hill Area

Construct New WWTP

Figure V-7

Mastersonville Area

Construct New WWTP

Table V-3

Opinion of Probable Construction Cost

Package WWTP Alternatives

Item No.	Description	Unit	Unit Price	Newtown Area WWTP		Sporting Hill Area WWTP		Mastersonville Area WWTP	
				Qty.	Total Cost	Qty.	Total Cost	Qty.	Total Cost
1	Gravity Sewer Line	LF	$100.00	18,000	$1,800,000.00	3,000	$300,000.00	5,550	$555,000.00
2	Force Main	LF	$80.00	10,500	$840,000.00	5,100	$408,000.00	1,550	$124,000.00
3	Manhole/Cleanout	EA	$4,500.00	46	$207,000.00	11	$49,500.00	12	$54,000.00
4	Pumping Station	EA	$150,000.00	2	$300,000.00	0	$0.00	0	$0.00
5	New WWTP	LS	Various	1	$910,800.00	1	$500,000.00	1	$250,000.00
6	Laterals	EA	$2,500.00	225	$562,500.00	106	$265,000.00	66	$165,000.00
7	Grinder Pumps	EA	$6,000.00	0	$0.00	53	$318,000.00	21	$126,000.00
8	Demolish Existing WWTP	LS	Various	1	$50,000.00	1	$30,000.00	1	$20,000.00
	Subtotal				$4,671,000.00		$1,871,000.00		$1,294,000.00
	Construction Contingency (20%)				$935,000.00		$375,000.00		$259,000.00
	Subtotal				$5,606,000.00		$2,246,000.00		$1,553,000.00
	Engineering / Legal / Administrative Fees (15%)				$841,000.00		$337,000.00		$233,000.00
	TOTAL				**$6,447,000.00**		**$2,583,000.00**		**$1,786,000.00**

Note: 1. WWTP Capacity: Newtown (120,000 gpd); Sporting Hill (50,000 gpd); Mastersonville (25,000 gpd).

Compared with the sewer extension alternatives discussed in previous sections, a new package WWTP serving the Newtown Area and the Sporting Hill Area is less cost effective. There are also several major concerns regarding construction of a package WWTP within the Township. The Township already has reserved capacity at both the MJBA and the Manheim Borough Authority's WWTPs, and also can obtain sewer capacity from LASA if desired. If the Township were to own the proposed wastewater treatment facilities, a sewer authority would have to be created to manage the sewer facilities, placing an additional financial burden on the Township and its residents. Second, due to the compliance requirement of the Chesapeake Bay Strategy, DEP has established "zero" discharge limits for total nitrogen and total phosphorus to tributaries of

Chesapeake Bay. A WWTP can obtain nutrient credits to offset its discharged nutrients; however, this is a complicated issue and also a long-term economic burden to the Township or the Authority. Third, it is very expensive to operate and maintain a WWTP. It is unlikely that construction of a small package WWTP within the Township would be feasible in the near future.

D. Community Land Disposal Alternatives

There are two community OLDS systems within the Township: Hilltop Acres Mobile Home Park and Autumn Leaf Estates community OLDS systems. However, it is reasonable to expect that if single dwelling OLDS are failing due to soil limitations, as is the case in many of the potential OLDS needs areas, it will likely be difficult to find sufficient soil absorption areas to accommodate the wastewater produced by an entire community. As such, community land disposal alternatives may need careful evaluation on a case-by-case basis, since installing land disposal systems in an area with suspect soil suitability is not a reliable long-term solution.

PA DEP requested evaluation of a Community On-Lot Disposal System in the Mastersonville area due to the lack of any existing permitted wastewater treatment facility. The soils located within and near the Mastersonville area were further analyzed with the aid of the USDA Natural Resources Web Soil Survey. This web site allows users to access soil data for defined areas of interest and to determine the soils limitation for a particular use such as the PA "alternate" At-Grade Bed Septic System.

The At-Grade Bed Septic system rating is based on the suitability of soils between depths of 0 and 48 inches. The soil properties and site features considered are those that affect absorption of the effluent such as depth to water table, depth to

bedrock, content of rock fragments, flooding, slope, and saturated hydraulic conductivity.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. It was determined that there are soils that are favorable or "slightly limited" along the southeast edge of the Mastersonville area, in soils identified as Bucks Silt Loam 3-8%.

Based on a 25,000 gpd daily flow rate and an application rate of 2 square feet per gallon per day, it was calculated that approximately 50,000 square feet of absorption area would be needed for the community land disposal site.

The proposed "Hybrid" Community System would also incorporate a re-circulating sand filter treatment process of septic tank effluent to provide de-nitrification and reduction of nitrates that would enter the absorption bed and underlying groundwater table.

The "Hybrid" Community System would require that each dwelling or building install a new septic tank on the property, and each septic tank would be required to have a "Zabel" septic tank filter at the outlet end of the tank. The septic tank effluent would then be collected and conveyed to the community system treatment and disposal site by small diameter gravity sewer pipes.

It is anticipated that at least two effluent duplex pumping stations would be required to transfer septic tank effluent to the community system parcel. A diagram of the "Hybrid" Community System is provided in Figure V-8.

Figure V-8

Mastersonville Area Proposed

Hybrid Community System

The proposed “Hybrid” Community System could be built in a phased manner where problem OLDS could be connected immediately and aging OLDS connected at a later date. This phased development may assist in keeping the project cost of the treatment facility and absorption bed down for certain low income individuals and families, and to allow existing OLDS that are working properly to remain operational for several more years of useful life.

The cost benefits of the “Hybrid” Community System include the reduction of sewer manholes and grinder pumps because no solids would be conveyed or pumped. Smaller sized gravity sewer pipe can be used and installed at a lower cost than the traditional 8 inch or larger sewer pipes that are required for sewers.

It is anticipated that small diameter gravity sewer lines can be installed more quickly and at a lower cost, and that cleanouts would replace the need for any sewer manholes in the conveyance system.

The cost of the treatment facility and the acquisition of land for the community system treatment and absorption site would be similar to a package wastewater treatment facility. An “Opinion of Probable Construction Cost” for the “Hybrid” Community System with Soil Absorption is provided herein as Table V-4.

Table V-4

Opinion of Probable Construction Cost

"Hybrid" Community System[1] with Soil Absorption

Item No.	Description	Unit	Unit Price	Quantity	Total Cost
1	Gravity Sewer Line	LF	$80	6,800	$544,000.00
2	Force Main	LF	$80	3,200	$256,000.00
3	Cleanout – Heavy Duty	EA	$3,000	23	$69,000.00
4	Sewer Manhole	EA	$4,500	2	$9,000.00
5	Pumping Station	EA	$100,000	2	$200,000.00
6	New WWTP	LS	Various	1	$300,000.00
7	Lateral Connection	EA	$2,500	66	$165,000.00
8	Septic Tanks	EA	$3,000	66	$198,000.00
9	Abandon On-Lot	EA	$500	66	$33,000.00
10	Land Acquisition	AC	$20,000	2	$40,000.00
	Subtotal				$1,814,000.00
	Construction Contingency (20%)				$363,000.00
	Subtotal				$2,177,000.00
	Engineering / Legal / Administrative Fees (15%)				$327,000.00
	TOTAL				**$2,504,000.00**

Note: 1. WWTP Capacity: Mastersonville (25,000 gpd).

E. Holding Tank Alternatives

Holding tanks can provide a method of temporary commercial, residential, and/or industrial wastewater disposal until a suitable means of either off-site conveyance or on-site treatment is available. Wastewater must be pumped from these holding tanks, transported by truck to, and treated at, a nearby wastewater treatment plant, which would require additional capacity to treat this wastewater. Due to the high maintenance costs from frequent pumping and transportation, holding tanks were not considered as a viable permanent alternative to address sewage needs in this Plan. However, they may be considered in the future for commercial and industrial facilities.

F. Sewage Management Programs

Municipalities may develop a sewage management program to address all OLDS that are within the enforcement powers of the SEO. This program is typically developed when a significant health threat is evident as a result of improper operation and maintenance of such systems.

The Township has adopted an OLDS Management Ordinance to establish the legal framework necessary to pursue aggressive enforcement action and mandatory maintenance.

The Ordinance requires that OLDS be inspected and pumped out on a 3-year basis. It has adequately addressed the measures required to manage the OLDS within the Township. However, the success of the Sewage Management Program rests on the consistency and thoroughness with which the program is implemented. The following is a summary of the major provisions of the Township's Sewage Management Ordinance:

- Permit Requirements
- Inspections
- Operations
- Maintenance
- System Rehabilitation
- Liens
- Disposal of Septage
- Administration
- Appeals
- Penalties

The following discussions provide more detail regarding the use of Sewage Management Program to assure future operation and maintenance of existing and proposed facilities in the Township:

1. Ownership and Control:

OLDS ownership is by Property Owner, and the owner is responsible for OLDS operation, maintenance, and pump-out record keeping; the Township controls the OLDS system through the permitting and inspection process. The Township also administers a public education program on OLDS systems.

2. Mandatory Inspection Requirements:

Any OLDS system in the Township may be inspected routinely by an Authorized Agent, who shall have the right to enter the property for the purpose of inspection.

3. Mandatory Regularly Scheduled Maintenance:

Any OLDS system with a septic tank shall have the tank inspected at least once every three years, and pumped out whenever an inspection reveals that the tank is filled with solids or scum in excess of 1/3 of the liquid depth of the tank.

4. Repair, Replacement, or Upgrading of Malfunctioning OLDS:

When a malfunctioning OLDS system is found by inspection, the property owner shall make application for a permit to repair or replace the system within seven (7) days of notification by the Township. The work shall commence within thirty (30) days and finish within sixty (60) days of initial notification by the Township unless the condition requires a longer period.

5. Establishment of Municipal Sewage Management Programs:

The Township has adopted a Sewage Management Ordinance and will require full enforcement.

G. Non-Structural Comprehensive Planning Alternatives

The Township, together with Manheim Borough and Penn Township, created and adopted the 1993 Manheim Central Region Comprehensive Plan. The Comprehensive Plan was updated as Strategic Update 2000 with the intention to "provide an elaboration of the policies and actions set forth in Chapter XI, Implementation" of the 1993 plan. It adequately directs growth to areas which have the potential to be served by public sewer. Another planning document, the Mount Joy/Donegal Region Urban Growth Area Master Plan (draft), was developed in 2006 with Rapho Township as a portion of the planning. Land use designations and population density requirements are currently used to manage areas of urban growth within the Township.

H. No Action Alternative

As previously described, the potential sewer needs areas that have been identified in this Plan should be addressed due to the documented incidences of confirmed, suspected, and potential malfunctions and contaminated wells. Therefore, a No-Action Alternative would not address the above-referenced needs and would not ensure adequate wastewater disposal facilities to protect the Township's public health and meet its community service needs. Thus, a "no action" alternative is not viable for any of the potential needs areas within the Township.

VI. EVALUATION OF ALTERNATIVES

A. Consistency Determination

Title 25, Chapter 71.21(a)(5) of the Pennsylvania Code requires that each alternative for new or improved sewage facilities for each needs area be evaluated for consistency with the objectives and policies of Comprehensive Plans, state water plans, plans developed under Chapter 94, plans developed under the Federal Water Quality Act, anti-degradation requirements, Pennsylvania's prime agriculture land policy, plans adopted by the county and approved by PA DEP under the Storm Water Management Act, wetland protection, protection of rare, endangered or threatened plant and animal species as identified by the Pennsylvania Natural Diversity Inventory, and the Historical and Museum Commission. The proposed alternatives to serve the potential sewage needs areas of Rapho Township involve construction of new wastewater treatment or extension/expansion of the existing sewer system to areas where these alternatives are viable and cost effective, and enforcement of the OLDS management plan in areas where a public sewer system is not readily available or is cost-prohibitive. The consistency determination is as follows:

1. Clean Streams Law

The Comprehensive Water Quality Management Plan (COWAMP) was developed by PA DEP under the Clean Stream Law. The recommendations of COWAMP are to extend Manheim Borough and MJBA's sewer systems to serve portions of Rapho Township's needs areas. In this Act 537 Plan, the alternatives proposing extension of the collection/conveyance systems within the Township to the existing wastewater treatment facilities at the MJBA and Manheim Borough Authority' Plants are consistent with the Clean Streams Law. The provisions incorporated by the Township to provide for the long-term

viability of OLDS systems is consistent due to the objectives of preventing inadequately treated discharges to the surface water or groundwater of the United States from such systems. The alternatives proposing the construction of new, or expansion of existing, package WWTPs are also consistent since their purpose is to protect groundwater sources.

2. Municipal Wasteload Management Plans

A review of MJBA's and Manheim Borough Authority's Chapter 94 reports did not indicate any inconsistencies with projected hydraulic loadings or collection/conveyance system upgrades due to the sewer extension alternatives proposed for the Newtown area and the Sporting Hill area in this Act 537 Plan.

3. Plans Developed Under Title II of the Clean Water Act or Title II and VI of the Water Quality Act of 1987

No previous wastewater planning has been conducted for the Township under Title II of the Clean Water Act or Title II and VI of the Water Quality Act of 1987 due to the fact that the Township currently does not have its own wastewater treatment facility. Therefore, there are no inconsistencies resulting from this Act 537 Plan.

4. Comprehensive Planning

The Municipal Comprehensive Plans designate areas for residential, commercial, and industrial development as well as agricultural preservation and floodplain areas within the municipalities. The Township's Comprehensive Plan forms a basis for the alternatives developed as part of this Act 537 Plan. The alternatives presented in the Act 537 Plan are consistent with the Township's Comprehensive Plan.

5. Anti-degradation Requirements Contained in Chapters 93, 95, and 102

The proposed wastewater alternatives are consistent with Chapter 93 (water quality criteria), Chapter 95 (wastewater treatment requirements), and Chapter 102 (erosion and sedimentation control requirements).

6. State Water Plan

The State Water Plan, originally developed in 1970s, divided Pennsylvania's major river basins into 20 small subbasins for planning purposes. Most of these subbasins are further divided into watershed areas. Rapho Township is located within Watershed G (Chiques Creek) of Subbasin Number 7 (The Lower Susquehanna) within the Susquehanna River Basin. Watershed G has a total drainage area of 253 square miles with its major streams including Chiques Creek, Little Chiques Creek, and Conewago Creek (east of the Susquehanna River). The State Water Plan was developed as a comprehensive management tool to guide the conservation, development and administration of the Commonwealth's water and related land resources. The Plan includes recommended solutions to water quality and quantity problems, as well as recommendations designed to meet short-term and long-term water needs. The alternatives proposed in this Act 537 Plan, with the exception of the "No Action" alternative, are consistent with the goals and objectives of the State Water Plan.

7. Pennsylvania Prime Agricultural Land Policy

The Pennsylvania's Prime Agricultural Land Policy orders and directs the prevention of the irreversible conversion of prime agricultural land to uses that result in its loss as an environmental or essential food production resource. Since the Township's primary land use is for agriculture, with the extreme north portion serving as recreation uses, protection of its agricultural land is very important to the Township. The Township's

Comprehensive Plans and Master Plan have established its Urban Growth Boundaries (UGB) around the Triangle Area. Industrial, commercial, and large residential developments outside the UGB do not exist. The proposed alternatives consist of construction of wastewater collection and conveyance systems primarily along existing roads. Some force mains require crossing some agricultural lands; however, past practice has resulted in little to no impact on the farmland. This is because the standard specifications require the sewer pipes be installed a minimum of four feet under the surface, while most topsoils are only 18" deep. It is expected that all of the construction alternatives will have little or no impact on agricultural land.

8. County Stormwater Management Plans

Development within the Township will continually be kept in agreement with the Lancaster County's stormwater management plans.

9. Wetland Protection Under Chapter 105

Based on the National Wetlands Inventory, no wetlands would be impacted by the implementation of this Plan.

10. Protection of Rare, Endangered, or Threatened Plant and Animal Species as identified by Pennsylvania Natural Diversity Inventory (PNDI)

PNDI investigations have been made for the recommended alternatives for the Newtown and Sporting Hill areas based on a February 20, 2007 conversation between ARRO Consulting, Inc. and DEP. An online PNDI search has been conducted and the results are included in Appendix H, indicating that the alternatives will not have any impact on known endangered species around the proposed project area.

11. Pennsylvania Historical and Archaeological Resource Protection

The Pennsylvania Historical and Museum Commission (PHMC) was contacted regarding the alternatives evaluated for the Newtown and Sporting Hill areas through a February 2007 conversation between ARRO Consulting, Inc. and DEP. However, since it was determined that there are no immediate needs areas that need to be addressed within the next five years, this requirement does not apply.

B. Resolution of Inconsistencies

There are no apparent inconsistencies with applicable planning requirements.

C. Evaluation of Water Quality Standards

Effluent water quality standards were not evaluated for sewer extension alternatives as the alternatives apply only to collection and conveyance. The discharge limits to be met by the proposed package WWTP alternatives are discussed in Section V. The SBR process is a well established Biological Nutrient Reactor (BNR) process and can satisfactorily meet the discharge limits with the purchase of additional nutrient credits for TN and TP discharge. There are nutrient credits available on the market at the time of this Plan, and DEP is in the process generating more nutrient credits for use.

D. Cost Opinions

The opinions of probable construction cost for the various alternatives are presented in Section V. Generally, a tapping fee will be collected after construction of the sewer system to pay for a portion of the construction cost. A tapping fee of $2,500 per EDU is estimated based on average tapping fees in adjacent municipalities.

Estimated annual Operation and Maintenance (O&M) costs are as follows:

- Package WWTP: $1/gallon/year
- Collection/Conveyance System: $20,000/year max.
- Pumping Station (Each): $6,000/year
- Administrative Expense with WWTP: $10,000/year
- Administrative Expense without WWTP: $2,000/year

For alternatives involving a new package WWTP, the annual cost of purchasing nutrient credits should also be considered as an O&M cost in the present worth analysis. The unit prices for nitrogen and phosphorus are $9/lb/year according to Red Barn Trading Company's web posted prices. The calculated annual nutrient credit costs for the proposed new WWTP were calculated using 6 mg/l TN and 1 mg/l TP, and are as follows:

- Newtown Area WWTP Annual Nutrient Credit Cost, based on 0.12 MGD, is $23,014.
- Sporting Hill Area WWTP Annual Nutrient Credit Cost, based on 0.05 MGD, is $9,589.
- Mastersonville Area WWTP Annual Nutrient Credit Cost, based on 0.025 MGD, is $4,795.

It should be noted that O&M costs do not include costs of the existing sewer service systems within the Township since they are maintained by MJBA or Manheim Borough Authority. For low pressure sewer systems, it is assumed the homeowners will be responsible for the operation and maintenance of the grinder pumps as needed.

The financing evaluations are detailed in the following Section E, Funding and Financing. The estimated interest rates and loan term are: PENNVEST (3.0% for 20 years); Municipal Bonds (5.0% for 20 years); and Bank Loans (8.0% for 20 years). According to historical data, over the past 50 years the annual US inflation

rate has ranged from -0.95% low (deflation) to 13.58% high. The current rate is under 2%, while the 50-year average rate is 3.95%. An inflation rate of 4.0% is used in this analysis.

Present worth analyses were conducted for all of the proposed alternatives. These analyses are presented in Appendix I and indicate that, based on the cost to each EDU, the proposed alternatives are cost-prohibitive to the homeowner.

E. Funding/Financing

This section of the plan addresses financing methods that could be applicable to the proposed alternatives evaluated in Section V. Three financing alternatives, PENNVEST, municipal bond financing, and bank loans are deemed most applicable for the Township and are discussed in the order of priority.

1. PENNVEST

a. General

The Pennsylvania Infrastructure Investment (PENNVEST) Authority was formed by the Commonwealth of Pennsylvania. Its legislative intent was to recognize that the health of millions of citizens of the Commonwealth is at risk due to substandard and deteriorated water and wastewater systems. Many areas of the Commonwealth have to limit their economic and population growth due to their water supply and sewerage systems becoming obsolete and overloaded. In some areas, economic revitalization is being stifled by lack of potable water and adequate wastewater facilities. State government recognized that the financing of water and sewage projects was not always available at affordable rates, and formed the PENNVEST Authority to assist in financing

projects that protect health and promote economic development in Pennsylvania.

The PENNVEST Authority may receive money from the following sources:

- State funds appropriated to the Authority.
- Federal funds appropriated to or granted to the Authority.
- Proceeds from the sale of bonds.

PENNVEST is also required to establish a Water Pollution Control Revolving Fund. PENNVEST's Board may also establish non-revolving funds and accounts. Repayments of loan principal together with interest will be deposited with PENNVEST in revolving funds or non-revolving funds from which PENNVEST would repay its indebtedness.

A look at the advantages and disadvantages of PENNVEST funding is helpful in determining its applicability to this project.

b. Advantages of PENNVEST Funding

- If the Township qualifies, the interest rates available even in the highest bracket are less than market value for a Municipal Bond Issue. The interest rate varies from 1% to 5%. Generally the interest rate is lower at the beginning and is higher after certain years.
- Program management is greatly influenced by PA DEP, which is the same agency that approves the Municipality's Act 537 Plan.

- Issuance (financial services) costs are relatively low compared to issuance costs of a Municipal Bond Issue.

- There is no negative arbitrage associated with this program. PENNVEST interest rates are low enough that, in almost all cases, interest is earned during construction.

c. Disadvantages of PENNVEST Funding

Depending on an applicant's financial status, PENNVEST financial assistance can be a source of low-interest loans, and in certain rare circumstances, grants. However, the decision to seek PENNVEST funding must be analyzed on an individual basis and, depending on the term and interest rate of the loan and the financial stability of the applicant, PENNVEST may or may not be the best source of funding.

If the decision is made to seek PENNVEST loans, the applicant must be prepared to deal with the regulatory process – including planning meetings, filing the application, pre-closing and closing meetings. Documentation needed to file the application is extensive; however, it is not unlike the process that takes place when dealing with an underwriter to secure a bond issue.

As soon as the loan is closed, applicants can begin to submit their invoices to PENNVEST. According to PENNVEST, the monthly submissions can be processed and checks mailed within 21 days if the documentation is properly organized and in the correct format. Typically, checks take at least 6 weeks, and potentially 10 to 12 weeks. An applicant would need to obtain a line of credit in order to pay construction contractors' and others' invoices. The PENNVEST check is then used to reimburse the applicant's line of

credit. Expected drawdowns need to be estimated so that the line of credit is secured for the largest monthly total expected. According to PENNVEST, the cost of borrowing is an eligible cost. It is extremely important that the applicant maintains good records and adheres to the funding schedule that was submitted to PENNVEST. This schedule is used to project cash flow for the project, so it should be revised as needed.

Whether to pursue PENNVEST funding is a decision that should be made based on the financial specifics of the situation and consideration of all the available means to fund a project. Questions that should be asked and items to consider in the financial decision-making process include the following:

- Compare the interest rate and terms of the loan or bond issue. Is it to your advantage to seek a loan? Bearing in mind that the program was conceived to assist communities with high unemployment rates and low average family incomes, will you quality for financial assistance?

- How long can you wait to start construction? Would you qualify for emergency funding? Would you qualify for a letter of no prejudice if construction is started?

- How will you handle the delays in obtaining the PENNVEST check? Can a line of credit be arranged? If so, at what cost?

- Can you tolerate and afford the governmental requirements, such as meeting certain additional planning requirements, documentation, record keeping, filing, etc.?

- The application process may be lengthy due to there being only two Board meetings each year and an increasing backlog of applications to be processed.
- There is much competition for the low interest funding.
- There are virtually no grants available and grants would only be made to severely disadvantaged communities.
- Municipal guaranty is required.
- Future borrowing by the Township may be limited by required loan documents.
- PA DEP may not approve design fees for financing and, after great delay, the financing process would have to be restarted through a second alternative method of financing.

Based on the above items, an option the Township might want to consider is applying for a PENNVEST loan to construct the proposed sewer extension project.

2. Municipal Bonds

a. General

There are several types of bonds; some are taxable and some are tax-exempt. However, the general classification of municipal bonds usually refers to tax-exempt bonds. There are three types of municipal bonds generally used in financing public works.

- General Obligation Bonds are tax-free bonds that are secured by the pledge of the full faith, credit, and taxing power of the issuing agency. This means that this type of bond is backed by all of the taxes on real estate and

personal property within the jurisdiction of the issuing agency. It involves minimum risk to the investor and therefore requires a lower rate of interest than other types of bonds.

- Dedicated Tax Bonds are payable only from the proceeds of a special tax and are not guaranteed by the full faith, credit and taxing power of the issuing agency. Examples of special dedicated taxes are the special assessments against property that is adjacent to and the principal beneficiary of the improvement, and gasoline taxes used to finance highway construction.

- Revenue Bonds are payable from revenues derived from the use of the improvement such as tolls, sewer bills, or rents paid by the users of the improvement and do not otherwise represent an obligation of the issuing agency. Revenue bonds are not ordinarily subject to statutory or constitutional debt limitations. They are often issued by commissions, authorities, and other public agencies created for the specific purpose of financing, constructing, and operating essential public projects.

Typically, municipal bonds are sold to an investment-banking firm, which then resells the bonds to individual investors. The advantage of municipal bonds to the investor is their tax-free status. A bond discount (a percentage of the total bond issue) serves as the investment banker's commission. Before bonds are sold, they must be rated on the basis of risk to the investor by a rating agency such as Standard and Poor's or Moody's. The higher

the rating, the lower the risk to the investor and, consequently, the lower the interest rate paid on the bond.

The legal instrument that sets forth the rules that must be observed by the issuing agency is the Trust Indenture. The Trust Indenture is prepared by the Bond Counsel and must be printed along with the bonds. Due to specific requirements as to the denominations of the bonds and methods and materials for printing, printing costs can be substantial. A Trustee is required to administer the bond issue and insure the terms of the Trust Indenture are observed. This results in an Annual Trustee fee.

The longer the term, the lower the annual debt service (repayment) and the higher the total amount of interest that must be paid. Investment bankers indicate that it does not pay to extend the term beyond 25 years because the interest rate increases dramatically.

b. Advantages of Municipal Bond Issue Funding

- This program affords long-term fixed rate financing.
- Tax-exempt municipal bonds are in high demand.
- There is local investment opportunity.
- Third party review is by PA DEP, but its approval is not influenced by the dual role PA DEP has with regard to PENNVEST of issuing a permit to construct and of approving the program for financing.
- Municipal credit is established.
- It retains flexibility for future borrowing.

- Financing approval period is shorter than with PENNVEST.

c. Disadvantages of Municipal Bond Issue Funding

- Market interest rates are usually higher than maximum PENNVEST interest rates.
- A Debt Service Reserve Fund is generally required.
- There are trustee fees and costs of preparing a Trust Indenture.
- Issuance costs are higher than with PENNVEST program.

Municipal bond interest rate is generally around 5%. Since PENNVEST loans are very difficult to obtain or sometimes not enough to cover the entire projects, a second financial alternative needs to be secured to ensure the completion of the projects.

3. Bank Loans

There are four basic categories of bank loans. These are:

- Real Estate Loans (Mortgage)
- Participations and Interbank Loans
- Installment Loans (Personal)
- Commercial and Industrial Loans

Of the four types, a commercial and industrial loan would be the most applicable for the Township.

Commercial and industrial loans may be made on a demand or time basis. A demand basis loan allows the bank to call for repayment at any time, or

the borrower can repay when convenient. A time basis loan provides for a specific loan maturity date.

Most commercial and industrial loans are unsecured. The credit is extended on the basis of an analysis of all available information pertaining to the customer and the bank's confidence in that customer's ability and willingness to repay. An interest rate offering would be established, and an amortization schedule set. Interest rates may range from 5% to 10%, with current interest rates in the low end of the range.

Advantages of the Bank Loan Financing

- Ability to shop around for a loan structure that best fits the customer's needs.
- Flexibility in establishing repayment schedules.
- Working with and through a local financial institution.
- Municipal credit is established.
- Ability to obtain fixed rate financing.

Disadvantages of Bank Loan Financing

- Interest rates are charged for loan repayment.
- Processing fees may be required.
- Processing and issuance fees may be expensive.

Loans from local banks is also a good financing alternative to fund the proposed projects. The best way to decide whether or not a bank loan is right for the Township is to check how soon the loan needs to be repaid.

Generally speaking, if the bank loan can be paid back in less than five years, it can be an attractive financing alternative. Under certain circumstances, the bank loan can get the project started and the loan can be paid back by other better loan. The Township may consider this option when the previous discusses funding alternatives can not provide enough funds.

In the Township's 1997 Act 537 Plans, the funding of sewer systems by new developments is proposed as the major funding source. However, with the Newtown and Mastersonville areas being zoned for agriculture, it is not likely new development will occur.

F. Implementation of Alternatives

The potential needs areas identified are not immediate needs areas that need to be addressed within the next five years.

G. Administrative and Legal Authority

The Township has the administrative structure in place and the necessary legal authority to implement the Plan. The Township has the authority to enforce its OLDS management ordinance that will require pump outs and inspections with guidance from the Township Engineer. The Township may produce a newsletter to be utilized for public education. The Township has the authority to implement minimum lot sizes and hydrogeologic studies.

VII. INSTITUTIONAL EVALUATION

A. Existing Wastewater Treatment Authority

The Township does not currently have a sewer Authority. For the existing public sewer service within the Township, the sewer systems are operated by the Mount Joy Borough Authority at the "Triangle Area" and Manheim Borough Authority at the Red Rose Acres and Kendig Drive area. The Township's responsibilities are administrative only. The permitting of OLDS installations and repairs is handled by SEOs hired by the Township.

B. Institutional Alternatives

An Authority is not required for municipal ownership of sewage facilities; however, the alternatives that include construction of a new WWTP, construction of a "Hybrid" Community On-Lot Disposal System, or expansion of an existing WWTP could warrant the creation a Sewer Authority within the Township. The functions of the proposed Sewer Authority would be:

- Operate and manage the public sewer systems within the Township and take over the Township's responsibility of administration.
- Prepare project planning for future sewer needs.
- Coordinate with SEOs to enforce sewer management programs.
- Involve in planning, ordinance update, and other municipal sewage facility plan update.

However, if only sewer extension alternatives are selected, the Township can continue to allow the other Municipalities/Sewer Authorities to handle the

operation and maintenance of its sewer system, while maintaining only administrative responsibilities.

C. Administrative and Legal Activities

The Authority would need to complete the following activities:

- Adopt the Act 537 Plan.
- Negotiate agreements with surrounding municipalities/authorities to reserve capacity for the Township's sewer needs.
- Arrange for the construction of facilities, including rights-of-way and site acquisitions.
- Manage project construction.
- Educate the public concerning OLDS by giving new homeowners who will rely on OLDS educational material on the proper care and use of their system. Further, information about the care and use of OLDS will be distributed to existing OLDS owners through the Township's newsletter.

The selected alternatives in Section VIII do not require the formation of an Authority.

D. Identify Selected Institutional Alternatives

See next Section.

VIII. JUSTIFICATION FOR SELECTED TECHNICAL & INSTITUTIONAL ALTERNATIVES

A. Justification of Selected Alternatives

Consistent with the Township's responsibility to protect the health, safety, and welfare of its residents, the alternatives presented in the previous Section have been thoroughly evaluated. Following are presentations and explanations of the selected alternatives in the identified sewer needs areas. These selected alternatives will be subject to comments from PA DEP, LCPC, and the general public.

Newtown Area

It has been determined that this area is not an immediate needs area that will require addressing within the next five years. The opinion of probable construction cost and present worth analysis indicate it is cost-prohibitive to implement the sewer extension alternatives outlined in Section V. This area will continue to utilize OLDS for existing and future development. The Township will strictly enforce the sewer management program to protect groundwater sources. Any failure of an existing septic system will result in replacement with a modern septic system.

A 10-year plan may consider extension of the Township's sewage collection and conveyance system to the Farmdale Pump Station of LASA's system. The collection and conveyance system would consist of 18,000 linear feet of gravity main, 26,000 linear feet of force main, and three pump stations. Since this areas is zoned Agricultural, it is not expected to have significant growth in the future.

Sporting Hill Area

It has been determined that this area is not an immediate needs area that will require addressing within the next five years. The opinion of probable construction cost and present worth analysis indicate it is cost-prohibitive to build a new wastewater treatment facility or expand the existing Mobile Home Park WWTP.

Although the sewer extension alternative to the existing Manheim Borough sewer system appears to be the most cost-effective alternative, the present worth analysis indicates it is cost-prohibitive as well. A 10-year plan may consider extension of the Township's sewage collection and conveyance system to the Manheim Borough's WWTP. This alternative consists of 5,000 linear feet of gravity main, 5,300 linear feet of low pressure main, and one (1) pump station.

This area will continue to utilize OLDS for existing and future development. The Township will strictly enforce the sewer management program to protect groundwater sources. Any failure of an existing septic system will result in replacement with a modern septic system.

Mastersonville Area

It has been determined that this area is not an immediate needs area that will require addressing within the next five years, and it would be cost-prohibitive to provide public sewer service to this area. This area will continue to utilize OLDS for existing and future development. The Township will strictly enforce the sewer management program to protect groundwater sources. Any failure of an existing septic system will result in replacement with a modern septic system.

Justification for the selected alternatives based on each of the following considerations is as follows:

1. Existing Wastewater Disposal Needs

A large portion of the Township's wastewater disposal is accomplished through OLDS, particularly in the more rural areas of the Township. The future viability of the continued use of these OLDS has been shown through analysis within this plan to be dependent upon proper maintenance of these systems. The Township has adopted a Sewage Management Ordinance to ensure that proper maintenance occurs. Whereas proper maintenance has been shown to extend the useful life of the OLDS, it will not extend it indefinitely. A required inspection program will identify the need for repair or replacement.

Additionally, the Township will undertake a public education program to inform the public of the need for and the methods of properly maintaining their OLDS.

2. Future Wastewater Disposal Needs

In order to minimize the potential for future wastewater disposal needs, development will be directed to areas within and adjacent to the designated Urban Growth Areas. This will serve to minimize the amount of nitrates being discharged to the groundwater resources by OLDS.

As currently in effect, proposed OLDS that do not yet have planning approval are required by the Township to have a hydrogeologic study performed. This is justified due to the high level of nitrates and bacteriological contamination in well samples, showing the need to improve the location of future wells and OLDS.

3. Operation and Maintenance Considerations

The chosen alternatives for 10-year planning consideration are the best alternatives for operation and maintenance considerations. The operation

and maintenance costs of the sewer extension system are cheaper than the cost of a WWTP. The Township will be able to let LASA or Manheim Borough Authority handle operation and maintenance issues. As for the continued use of OLDS, it requires that regular maintenance occur, and that public education be provided to allow the homeowner's proper operation of the system.

4. Cost Effectiveness

The chosen alternatives for 10-year planning consideration are the most cost effective alternatives. The construction, operation, and maintenance costs of the sewer extension lines will be less than the costs of a WWTP. The chosen alternative for continued use of OLDS is the most cost effective means of addressing OLDS needs because it proposes to continue to utilize those systems, and to maximize their function and their useful life.

Future high density residential, commercial, and industrial development will be directed to occur within and adjacent to existing Urban Growth Areas with public sewer service to provide the lowest cost of extending public sewer, and to therefore provide the highest likelihood that such developments will be connected to public sewer.

5. Available Management and Administrative Systems.

The Township has the ability to strictly enforce the adopted OLDS ordinance and implement an effective OLDS Management Plan chosen as part of this Plan, and to provide the required protection of the existing OLDS that form a portion of the existing wastewater disposal facilities of the Township. Additionally, it has the ability to plan and zone for development adjacent to existing public sewer service areas and to zone

for proper accommodation of new OLDS, and provide the best solution to future sewage disposal needs of the Township.

6. Available Financing Methods.

See Section VI.

7. Environmental Soundness and Compliance with Natural Resources Planning and Preservation Programs.

Section VI of this Plan shows that this Plan is consistent with relevant environmental soundness considerations and natural resource planning and preservation programs.

B. Selected Financing Plan

All of the financing methods discussed in Section VI should be considered to fund the sewer extension projects, giving priority first to PENNVEST, then municipal bonds, and then bank loans. PENNVEST should be considered first due to its low interest and long pay back time. However, if it is not readily available, municipal bonds and bank loans may be considered as backup financing sources. Where there is new development, the Township will work to have developers finance the necessary sewer infrastructure.

C. Implementation Schedules

1. Schedule of Necessary Action for Plan Implementation

Action	Date
Act 537 Plan Submission to the Township	July 2007
Act 537 Plan Submission to LCPC	August 2007
Address LCPC Comments	September 2007
30-Day Public Comment Period	November 2007
Adoption of Act 537 Plan Resolution by the Township	November 2007
Submission of Act 537 Plan to PA DEP	December 2007
Update of OLDS Management Ordinance	December 2007
Act 537 Plan Review Letter with Comments by PA DEP	June 2008
Submission of Revised Act 537 Plan to PA DEP to Address DEP Comments	September 2008
Final Act 537 Plan Approval by PA DEP	December 2008
Enactment of the OLDS Management Ordinance (adopt Ordinance 30 days after DEP approval of Final Plan)	Estimated January 2009

Act 537 Official Sewage Facilities Plan Update

Rapho Township

Lancaster county, Pennsylvania

ARRO #6338.00

September 2008

Prepared by:

ARRO Consulting, Inc.
270 Granite Run Drive
Lancaster, PA 17601

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Township / Facility Location Plan

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Inventory of OLDS & Private Wells Map

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Well Sampling Results

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Sewage Survey Form

DOOR-TO-DOOR
ON-LOT DISPOSAL SYSTEM NEEDS SURVEY

Date: _____ Conducted by: _____
Weather Conditions: _____

Rapho Township is conducting a survey to help identify the sewage needs of the Township. The survey results will be used to complete the Act 537 process. Please review the form in advance and answer these questions to the best of your ability to the representatives from ARRO Consulting, Inc. during the door-to-door survey.

NAME: _____ PHONE: _____ ADDRESS: _____

1. How many people live in your house? _____ SEASONAL/ALL YEAR? OWNER/RENTER?
   (If more than one housing unit is served by the same sewage system, please describe)

2. How large is your lot? _____

3. Do you have more than one sewage system on your lot? YES or NO
   If yes, explain: _____

4. What kind of water system do you have? WELL? SPRING? PUBLIC? OTHER? _____
   Do you treat your water? YES OR NO If yes, how? _____
   If you have a well: Is it DUG or DRILLED ? How Deep? _____ ft. Casing pipe? YES or NO

5. How far is the well or spring from the drain field? _____ft. Is your well UP/DOWN SLOPE from the drain field? _____
   Have you ever had your water tested? YES or NO When? _____
   What were the results (Total coliform, fecal coliform, nitrates)? _____

6. What kind of sewage system do you have? (CIRCLE ALL THAT APPLY)

SEPTIC TANK	INGROUND BED	COMMUNITY SEWER
CESSPOOL	INGROUND TRENCH	STORM SEWER
OLD WELL	ELEVATED SAND MOUND	PIPE TO DITCH
HOLDING TANK	SEEPAGE PIT	PIPE TO STREAM
PRIVY	BORE HOLE	PIPE TO SURFACE
PUBLIC SEWER	OTHER _____	

7. Where does your laundry and/or sink water go? (CIRCLE ALL THAT APPLY)

SEPTIC TANK	INGROUND BED	COMMUNITY SEWER
CESSPOOL	INGROUND TRENCH	STORM SEWER
OLD WELL	ELEVATED SAND MOUND	PIPE TO DITCH
HOLDING TANK	SEEPAGE PIT	PIPE TO STREAM
PRIVY	BORE HOLE	PIPE TO SURFACE
PUBLIC SEWER	OTHER _____	

8. How old is your system? _____Was it permitted? Y / N When? _____

9. Have you ever noticed any of the following near your septic system?

GREEN LUSH GRASS	WETNESS OR SPONGY AREAS	SYSTEM OVERFLOW
ODORS	WATER PONDING OR SURFACING	OTHER _____
SLUGGISH DRAINS	WASTEWATER BACKING INTO THE HOME	

10. Was your system ever pumped out? YES or NO How often? _____ Last time? _____
    If it was pumped, was it inspected for cracks or broken baffles? _____

11. Was your system ever repaired? YES or NO When? _____ By permit? YES / NO
    What part was repaired or replaced? _____
    TANK: REPAIRED /REPLACED LINE: REPAIRED/ REPLACED DRAIN FIELD: REPAIRED/REPLACED

12. Are there any sewage deficiencies you are aware of?

APPENDIX H

PNDI Correspondence

APPENDIX I

Present Worth Analysis

TABLE VI
MASTERSONVILLE AREA ALTERNATIVES PRESENT WORTH ANALYSIS
SEWER EXTENSION TO NEW WWTP ALTERNATIVE

Payback Year (n)
Analysis Interest Rate (i) Avg Annual Inflation Rate (f)
Future Cost = 2007 Cost x (1+f)^n Net Present Cost = Future Cost x (1+i)^(-n)

Maintenance Cost in 2007 dollars

Package WWTP	$100,000
Collection/Conveyance System	$20,000
Pumping Station (Each)	$6,000
Administrative Expenses with Package WWTP	$10,000
Administrative Expenses without Package WWTP	$2,000

FUNDING	**PENNVEST FUNDING**		**MUNICIPAL BOND**		**BANK LOAN**	
	i	**f**	**i**	**f**	**i**	**f**
	3.00%	4.00%	5.00%	4.00%	8.00%	4.00%
Year (n)	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**
0		$1,107,000		$1,107,000		$1,107,000
1	$135,200	$131,262	$135,200	$128,762	$135,200	$125,185
2	$140,608	$132,537	$140,608	$127,536	$140,608	$120,549
3	$146,232	$133,823	$146,232	$126,321	$146,232	$116,084
4	$152,082	$135,123	$152,082	$125,118	$152,082	$111,785
5	$158,165	$136,434	$158,165	$123,926	$158,165	$107,644
6	$164,491	$137,759	$164,491	$122,746	$164,491	$103,658
7	$171,071	$139,096	$171,071	$121,577	$171,071	$99,818
8	$177,914	$140,447	$177,914	$120,419	$177,914	$96,121
9	$185,031	$141,810	$185,031	$119,272	$185,031	$92,561
10	$192,432	$143,187	$192,432	$118,136	$192,432	$89,133
11	$200,129	$144,577	$200,129	$117,011	$200,129	$85,832
12	$208,134	$145,981	$208,134	$115,897	$208,134	$82,653
13	$216,460	$147,398	$216,460	$114,793	$216,460	$79,592
14	$225,118	$148,829	$225,118	$113,700	$225,118	$76,644
15	$234,123	$150,274	$234,123	$112,617	$234,123	$73,805
16	$243,488	$151,733	$243,488	$111,544	$243,488	$71,072
17	$253,227	$153,207	$253,227	$110,482	$253,227	$68,439
18	$263,356	$154,694	$263,356	$109,430	$263,356	$65,905
19	$273,890	$156,196	$273,890	$108,388	$273,890	$63,464
20	$284,846	$157,712	$284,846	$107,355	$284,846	$61,113
TOTAL:		**$3,989,082**		**$3,462,032**		**$2,898,057**
DEBT:		**$268,129**		**$277,802**		**$295,173**
EDUs:		**66**		**66**		**66**
ANNUAL COST PER EDU:		**$4,063**		**$4,209**		**$4,472**

TABLE VI-1

NEWTOWN AREA ALTERNATIVES PRESENT WORTH ANALYSIS
SEWER EXTENSION TO EXISTING MHP WWTP ALTERNATIVE

Payback Year (n)
Analysis Interest Rate (i) — Avg Annual Inflation Rate (f)
Future Cost = 2007 Cost x (1+f)^n — Net Present Cost = Future Cost x (1+i)^(-n)

Maintenance Cost in 2007 dollars

Package WWTP	$100,000
Collection/Conveyance System	$20,000
Pumping Station (Each)	$6,000
Administrative Expenses with Package WWTP	$10,000
Administrative Expenses without Package WWTP	$2,000

FUNDING:	**PENNVEST**		**MUNICIPAL BOND**		**BANK LOAN**	
	i	**f**	**i**	**f**	**i**	**f**
	3.00%	4.00%	5.00%	4.00%	8.00%	4.00%
Year (n)	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**
0		$3,768,000		$3,768,000		$3,768,000
1	$147,680	$143,379	$147,680	$140,648	$147,680	$136,741
2	$153,587	$144,771	$153,587	$139,308	$153,587	$131,676
3	$159,731	$146,176	$159,731	$137,981	$159,731	$126,799
4	$166,120	$147,595	$166,120	$136,667	$166,120	$122,103
5	$172,765	$149,028	$172,765	$135,366	$172,765	$117,581
6	$179,675	$150,475	$179,675	$134,076	$179,675	$113,226
7	$186,862	$151,936	$186,862	$132,800	$186,862	$109,032
8	$194,337	$153,411	$194,337	$131,535	$194,337	$104,994
9	$202,110	$154,901	$202,110	$130,282	$202,110	$101,105
10	$210,195	$156,405	$210,195	$129,041	$210,195	$97,361
11	$218,602	$157,923	$218,602	$127,812	$218,602	$93,755
12	$227,347	$159,456	$227,347	$126,595	$227,347	$90,282
13	$236,440	$161,004	$236,440	$125,389	$236,440	$86,939
14	$245,898	$162,568	$245,898	$124,195	$245,898	$83,719
15	$255,734	$164,146	$255,734	$123,012	$255,734	$80,618
16	$265,963	$165,740	$265,963	$121,841	$265,963	$77,632
17	$276,602	$167,349	$276,602	$120,680	$276,602	$74,757
18	$287,666	$168,973	$287,666	$119,531	$287,666	$71,988
19	$299,173	$170,614	$299,173	$118,393	$299,173	$69,322
20	$311,139	$172,270	$311,139	$117,265	$311,139	$66,754
TOTAL:		**$6,916,121**		**$6,340,419**		**$5,724,385**
DEBT:		**$464,872**		**$508,772**		**$583,041**
EDUs:		**318**		**318**		**318**
ANNUAL COST PER EDU:		**$1,462**		**$1,600**		**$1,833**

TABLE VI-2 NEWTOWN AREA ALTERNATIVES PRESENT WORTH ANALYSIS
SEWER EXTENSION TO LASA SYSTEM ALTERNATIVE

Payback Year (n)
Analysis Interest Rate (i) — Avg Annual Inflation Rate (f)
Future Cost = 2007 Cost x (1+f)^n — Net Present Cost = Future Cost x (1+i)^(-n)

Maintenance Cost in 2007 dollars

Package WWTP	$100,000
Collection/Conveyance System	$20,000
Pumping Station (Each)	$6,000
Administrative Expenses with Package WWTP	$10,000
Administrative Expenses without Package WWTP	$2,000

FUNDING	**PENNVEST FUNDING**		**MUNICIPAL BOND**		**BANK LOAN**	
	i	**f**	**i**	**f**	**i**	**f**
	3.00%	4.00%	5.00%	4.00%	8.00%	4.00%
Year (n)	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**
0		$4,083,000		$4,083,000		$4,083,000
1	$41,600	$40,388	$41,600	$39,619	$41,600	$38,519
2	$43,264	$40,780	$43,264	$39,242	$43,264	$37,092
3	$44,995	$41,176	$44,995	$38,868	$44,995	$35,718
4	$46,794	$41,576	$46,794	$38,498	$46,794	$34,395
5	$48,666	$41,980	$48,666	$38,131	$48,666	$33,121
6	$50,613	$42,387	$50,613	$37,768	$50,613	$31,895
7	$52,637	$42,799	$52,637	$37,408	$52,637	$30,713
8	$54,743	$43,214	$54,743	$37,052	$54,743	$29,576
9	$56,932	$43,634	$56,932	$36,699	$56,932	$28,480
10	$59,210	$44,058	$59,210	$36,350	$59,210	$27,426
11	$61,578	$44,485	$61,578	$36,003	$61,578	$26,410
12	$64,041	$44,917	$64,041	$35,661	$64,041	$25,432
13	$66,603	$45,353	$66,603	$35,321	$66,603	$24,490
14	$69,267	$45,794	$69,267	$34,985	$69,267	$23,583
15	$72,038	$46,238	$72,038	$34,651	$72,038	$22,709
16	$74,919	$46,687	$74,919	$34,321	$74,919	$21,868
17	$77,916	$47,140	$77,916	$33,995	$77,916	$21,058
18	$81,033	$47,598	$81,033	$33,671	$81,033	$20,278
19	$84,274	$48,060	$84,274	$33,350	$84,274	$19,527
20	$87,645	$48,527	$87,645	$33,032	$87,645	$18,804
TOTAL:		**$4,969,795**		**$4,807,625**		**$4,634,094**
DEBT:		**$334,048**		**$385,776**		**$471,993**
EDUs:		**225**		**225**		**225**
ANNUAL COST PER EDU:		**$1,485**		**$1,715**		**$2,098**

TABLE VI-3 NEWTOWN NEEDS AREA ALTERNATIVES PRESENT WORTH ANALYSIS
SEWER EXTENSION TO NEW WWTP ALTERNATIVE

Payback Year (n)
Analysis Interest Rate (i) Avg Annual Inflation Rate (f)
Future Cost = 2007 Cost x (1+f)^n Net Present Cost = Future Cost x (1+i)^(-n)

Maintenance Cost in 2007 dollars

Package WWTP	$100,000
Collection/Conveyance System	$20,000
Pumping Station (Each)	$6,000
Administrative Expenses with Package WWTP	$10,000
Administrative Expenses without Package WWTP	$2,000

FUNDING	**PENNVEST FUNDING**		**MUNICIPAL BOND**		**BANK LOAN**	
	i	**f**	**i**	**f**	**i**	**f**
	3.00%	4.00%	5.00%	4.00%	8.00%	4.00%
Year (n)	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**
0		$3,856,000		$3,856,000		$3,856,000
1	$147,680	$143,379	$147,680	$140,648	$147,680	$136,741
2	$153,587	$144,771	$153,587	$139,308	$153,587	$131,676
3	$159,731	$146,176	$159,731	$137,981	$159,731	$126,799
4	$166,120	$147,595	$166,120	$136,667	$166,120	$122,103
5	$172,765	$149,028	$172,765	$135,366	$172,765	$117,581
6	$179,675	$150,475	$179,675	$134,076	$179,675	$113,226
7	$186,862	$151,936	$186,862	$132,800	$186,862	$109,032
8	$194,337	$153,411	$194,337	$131,535	$194,337	$104,994
9	$202,110	$154,901	$202,110	$130,282	$202,110	$101,105
10	$210,195	$156,405	$210,195	$129,041	$210,195	$97,361
11	$218,602	$157,923	$218,602	$127,812	$218,602	$93,755
12	$227,347	$159,456	$227,347	$126,595	$227,347	$90,282
13	$236,440	$161,004	$236,440	$125,389	$236,440	$86,939
14	$245,898	$162,568	$245,898	$124,195	$245,898	$83,719
15	$255,734	$164,146	$255,734	$123,012	$255,734	$80,618
16	$265,963	$165,740	$265,963	$121,841	$265,963	$77,632
17	$276,602	$167,349	$276,602	$120,680	$276,602	$74,757
18	$287,666	$168,973	$287,666	$119,531	$287,666	$71,988
19	$299,173	$170,614	$299,173	$118,393	$299,173	$69,322
20	$311,139	$172,270	$311,139	$117,265	$311,139	$66,754
TOTAL:		**$7,004,121**		**$6,428,419**		**$5,812,385**
DEBT:		**$470,787**		**$515,833**		**$592,004**
EDUs:		**318**		**318**		**318**
ANNUAL COST PER EDU:		**$1,480**		**$1,622**		**$1,862**

TABLE VI-4 SPORTING HILL AREA ALTERNATIVES PRESENT WORTH ANALYSIS
SEWER EXTENSION TO EXISTING MHP WWTP ALTERNATIVE

Payback Year (n)
Analysis Interest Rate (i) Avg Annual Inflation Rate (f)
Future Cost = 2007 Cost x (1+f)^n Net Present Cost = Future Cost x (1+i)^(-n)

Maintenance Cost in 2007 dollars

Package WWTP	$100,000
Collection/Conveyance System	$20,000
Pumping Station (Each)	$6,000
Administrative Expenses with Package WWTP	$10,000
Administrative Expenses without Package WWTP	$2,000

FUNDING	**PENNVEST FUNDING**		**MUNICIPAL BOND**		**BANK LOAN**	
	i	**f**	**i**	**f**	**i**	**f**
	3.00%	4.00%	5.00%	4.00%	8.00%	4.00%
Year (n)	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**
0		$1,568,000		$1,568,000		$1,568,000
1	$135,200	$131,262	$135,200	$128,762	$135,200	$125,185
2	$140,608	$132,537	$140,608	$127,536	$140,608	$120,549
3	$146,232	$133,823	$146,232	$126,321	$146,232	$116,084
4	$152,082	$135,123	$152,082	$125,118	$152,082	$111,785
5	$158,165	$136,434	$158,165	$123,926	$158,165	$107,644
6	$164,491	$137,759	$164,491	$122,746	$164,491	$103,658
7	$171,071	$139,096	$171,071	$121,577	$171,071	$99,818
8	$177,914	$140,447	$177,914	$120,419	$177,914	$96,121
9	$185,031	$141,810	$185,031	$119,272	$185,031	$92,561
10	$192,432	$143,187	$192,432	$118,136	$192,432	$89,133
11	$200,129	$144,577	$200,129	$117,011	$200,129	$85,832
12	$208,134	$145,981	$208,134	$115,897	$208,134	$82,653
13	$216,460	$147,398	$216,460	$114,793	$216,460	$79,592
14	$225,118	$148,829	$225,118	$113,700	$225,118	$76,644
15	$234,123	$150,274	$234,123	$112,617	$234,123	$73,805
16	$243,488	$151,733	$243,488	$111,544	$243,488	$71,072
17	$253,227	$153,207	$253,227	$110,482	$253,227	$68,439
18	$263,356	$154,694	$263,356	$109,430	$263,356	$65,905
19	$273,890	$156,196	$273,890	$108,388	$273,890	$63,464
20	$284,846	$157,712	$284,846	$107,355	$284,846	$61,113
TOTAL:		**$4,450,082**		**$3,923,032**		**$3,359,057**
DEBT:		**$299,115**		**$314,794**		**$342,127**
EDUs:		**120**		**120**		**120**
ANNUAL COST PER EDU:		**$2,493**		**$2,623**		**$2,851**

TABLE VI-5 SPORTING HILL AREA ALTERNATIVES PRESENT WORTH ANALYSIS
SEWER EXTENSION TO MANHEIM BOROUGH WWTP ALTERNATIVE

Payback Year (n)
Analysis Interest Rate (i) Avg Annual Inflation Rate (f)
Future Cost = 2007 Cost x (1+f)^n Net Present Cost = Future Cost x (1+I)^(-n)

Maintenance Cost in 2007 dollars

Package WWTP	$100,000
Collection/Conveyance System	$20,000
Pumping Station (Each)	$6,000
Administrative Expenses with Package WWTP	$10,000
Administrative Expenses without Package WWTP	$2,000

FUNDING	**PENNVEST FUNDING**		**MUNICIPAL BOND**		**BANK LOAN**	
	I	**f**	**I**	**f**	**I**	**f**
	3.00%	4.00%	5.00%	4.00%	8.00%	4.00%
Year (n)	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**
0		$1,397,000		$1,397,000		$1,397,000
1	$29,120	$28,272	$29,120	$27,733	$29,120	$26,963
2	$30,285	$28,546	$30,285	$27,469	$30,285	$25,964
3	$31,496	$28,823	$31,496	$27,208	$31,496	$25,003
4	$32,756	$29,103	$32,756	$26,948	$32,756	$24,077
5	$34,066	$29,386	$34,066	$26,692	$34,066	$23,185
6	$35,429	$29,671	$35,429	$26,438	$35,429	$22,326
7	$36,846	$29,959	$36,846	$26,186	$36,846	$21,499
8	$38,320	$30,250	$38,320	$25,936	$38,320	$20,703
9	$39,853	$30,544	$39,853	$25,689	$39,853	$19,936
10	$41,447	$30,840	$41,447	$25,445	$41,447	$19,198
11	$43,105	$31,140	$43,105	$25,202	$43,105	$18,487
12	$44,829	$31,442	$44,829	$24,962	$44,829	$17,802
13	$46,622	$31,747	$46,622	$24,725	$46,622	$17,143
14	$48,487	$32,056	$48,487	$24,489	$48,487	$16,508
15	$50,426	$32,367	$50,426	$24,256	$50,426	$15,897
16	$52,443	$32,681	$52,443	$24,025	$52,443	$15,308
17	$54,541	$32,998	$54,541	$23,796	$54,541	$14,741
18	$56,723	$33,319	$56,723	$23,570	$56,723	$14,195
19	$58,992	$33,642	$58,992	$23,345	$58,992	$13,669
20	$61,351	$33,969	$61,351	$23,123	$61,351	$13,163
TOTAL:		**$2,017,756**		**$1,904,238**		**$1,782,766**
DEBT:		**$135,625**		**$152,801**		**$181,579**
EDUs:		**106**		**106**		**106**
ANNUAL COST PER EDU:		**$1,279**		**$1,442**		**$1,713**

TABLE VI-6 SPORTING HILL AREA ALTERNATIVES PRESENT WORTH ANALYSIS
SEWER EXTENSION TO NEW WWTP ALTERNATIVE

Payback Year (n)
Analysis Interest Rate (i) Avg Annual Inflation Rate (f)
Future Cost = 2007 Cost x (1+f)^n Net Present Cost = Future Cost x (1+i)^(-n)

Maintenance Cost in 2007 dollars

Package WWTP	$100,000
Collection/Conveyance System	$20,000
Pumping Station (Each)	$6,000
Administrative Expenses with Package WWTP	$10,000
Administrative Expenses without Package WWTP	$2,000

FUNDING	**PENNVEST FUNDING**		**MUNICIPAL BOND**		**BANK LOAN**	
	i	**f**	**i**	**f**	**i**	**f**
	3.00%	4.00%	5.00%	4.00%	8.00%	4.00%
Year (n)	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**	**Future Maintenance Cost**	**Net Present Cost**
0		$1,623,000		$1,623,000		$1,623,000
1	$135,200	$131,262	$135,200	$128,762	$135,200	$125,185
2	$140,608	$132,537	$140,608	$127,536	$140,608	$120,549
3	$146,232	$133,823	$146,232	$126,321	$146,232	$116,084
4	$152,082	$135,123	$152,082	$125,118	$152,082	$111,785
5	$158,165	$136,434	$158,165	$123,926	$158,165	$107,644
6	$164,491	$137,759	$164,491	$122,746	$164,491	$103,658
7	$171,071	$139,096	$171,071	$121,577	$171,071	$99,818
8	$177,914	$140,447	$177,914	$120,419	$177,914	$96,121
9	$185,031	$141,810	$185,031	$119,272	$185,031	$92,561
10	$192,432	$143,187	$192,432	$118,136	$192,432	$89,133
11	$200,129	$144,577	$200,129	$117,011	$200,129	$85,832
12	$208,134	$145,981	$208,134	$115,897	$208,134	$82,653
13	$216,460	$147,398	$216,460	$114,793	$216,460	$79,592
14	$225,118	$148,829	$225,118	$113,700	$225,118	$76,644
15	$234,123	$150,274	$234,123	$112,617	$234,123	$73,805
16	$243,488	$151,733	$243,488	$111,544	$243,488	$71,072
17	$253,227	$153,207	$253,227	$110,482	$253,227	$68,439
18	$263,356	$154,694	$263,356	$109,430	$263,356	$65,905
19	$273,890	$156,196	$273,890	$108,388	$273,890	$63,464
20	$284,846	$157,712	$284,846	$107,355	$284,846	$61,113
TOTAL:		**$4,505,082**		**$3,978,032**		**$3,414,057**
DEBT:		**$302,812**		**$319,208**		**$347,729**
EDUs:		**120**		**120**		**120**
ANNUAL COST PER EDU:		**$2,523**		**$2,660**		**$2,898**

APPENDIX J

Lancaster County Planning Commission Comments

APPENDIX K

Public Advertisement / Proof of Publication

NOTICE OF PUBLIC COMMENT PERIOD FOR
RAPHO TOWNSHIP 537 PLAN UPDATE

The Rapho Township (Township) is hereby giving notice of the 30-day public comment period for the Act 537 Official Sewage Facilities Plan (the Plan) for the Township.

The Township does not own or operate a public sewer system or treatment facility. Portions of the Township are served by the Manheim Borough Authority and the Mount Joy Borough Authority Wastewater Treatment Plants. The remainder of the Township is served either by the On-Lot Disposal System (OLDS) or small private systems.

Act 537 requires municipalities to prepare and maintain an up-to-date plan to assess current and future needs for wastewater collection, conveyance, and treatment facilities; and to evaluate alternatives to meet future demand. These needs, as determined by the plan, will be addressed by the Township through its Sewage Management Program and public education.

The plans are available for public examination Monday through Friday, between 8:00 am and 3:30 pm. The 30-day public comment period will begin November 5, 2007 and end December 5, 2007. The public is invited to review these documents and provide written comments to the individual listed below:

Rapho Township
971 North Colebrook Road
Manheim, Pa 17545
Comments to: Nancy Halliwell, Township Manager

The Township will present its plan during the regular Board of Supervisors meeting, at 7:30 pm, on Thursday, November 15, 2007. Members of the public are encouraged to attend the meeting.

RAPHO TOWNSHIP

APPENDIX L

Municipal Resolutions

RESOLUTIONS OF ADOPTION

RESOLUTION OF THE BOARD OF SUPERVISORS OF RAPHO TOWNSHIP, LANCASTER COUNTY, PENNSYL VANIA (hereinafter "the municipality").

WHEREAS, Section 5 of the Act of January 24, 1966, PoL. 1535, No. 537, known as the "Pennsylvania Sewage Facilities Act," as amended, and the Rules and Regulations of the Department of Environmental Protection (Department) adopted thereunder, Chapter 71 of Title 25 of the Pennsylvania Code, requires the municipality to adopt an Official Sewage Facilities Plan providing for sewage services' adequate to prevent contamination of waters and/or environmental health hazards with sewage wastes, and to revise said plan whenever it is necessary to meet the sewage disposal needs of the municipality, and

WHEREAS, ARRO Consulting, Inc has prepared an Act 537 Plan Update which identifies sewer needs areas in portions of Rapho Township, and

The alternative of choice to be implemented is enforcement of Sewage Management Program and public education of properly operate and maintain the On-Lot Disposal System (OLDS).

WHEREAS, Rapho Township finds that the Facility Plan described above conforms to applicable zoning, subdivision, other municipal ordinances and plans and to a comprehensive program of pollution control and water quality management.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of Rapho Township hereby adopt and submit to the Department of Environmental Protection for its approval as a update to the "Official Plan" of the municipality, the above referenced Facility Plan. The municipality hereby assures the Department of the complete and timely implementation of the said plan as required by law. (Section 5, Pennsylvania Sewage Facilities Act as amended).

I, _____, Chairman of Board of Supervisors, Rapho Township, hereby certify that the foregoing is a true copy of the Township's Resolution No. _____, adopted _____, 20____.

AUTHORIZED SIGNATURE TOWNSHIP SEAL

_____

APPENDIX M

Plan of Study and Task Activity Report

APPENDIX N

PA DEP Response Letter dated June 13, 2008

APPENDIX O

Proposed OLDS Ordinance
and
Septic System Report

APPENDIX P

Act 537 Plan Content
and
Environmental Assessment Checklist