II. PHYSICAL AND DEMOGRAPHIC ANALYSIS

A. Identify Planning Area, Municipal Boundaries and Township's Service Area Boundaries

Amity Township is located in southeastern Berks County, Pennsylvania. It is part of the Reading Metropolitan Statistical Area (MSA), and covers 18.5 square miles. The Amity Sewage Treatment Plant is a sub-regional facility, and currently serves the Gramacy Garden area in Union Township to its south, a portion of Douglass Township to the east, and a small number of homes in Earl township to the north of Amity's system.

Much of the southern portion of the Township is already sewered. The planning area, for the purpose of this Plan, is identified on the exhibit found in Appendix A.

B. Identification of Physical Characteristics of the Planning Area

The major geographic characteristics of Amity Township are its natural drainage patterns and soils, subsurface geology, topography, and ground water sources. Collectively, they constitute the physical framework within which future development must occur. To the extent that these physical characteristics are favorable, growth and development may proceed without undue difficulty.

Amity Township covers 18.5 square miles. It is bounded on the south by the Schuylkill River. Currently, portions of four farms are restricted by Agricultural Conservation Easements (the farms are partially in Amity township, with portions in Oley, Earl and Exeter Townships). An additional 89 parcels, covering 3,865 acres (6 sq. mi., or approximately 33% of the Township), is in the Berks County

"Clean and Green" program, further restricting development in the northern portion of the Township.

Amity Township's Zoning Ordinance establishes "Environmental Protection Overlay District Regulations." These further restrict development due to the presence of certain physical features. The Districts are:

- Floodplain Overlay District
- Hydric Soil Overlay District
- High Water Table Overlay District
- Steep Slope Overlay District

These additional restrictions are noted in the appropriate sections that follow.

C. Soils

Soils are formed primarily by weathering of bedrock and therefore have characteristics similar to those of the underlying rock formations. The Township is primarily divided into two major soil classifications. These soils classifications include a calcareous conglomerate generally located in the northern quarter of the Township and a shale and sandstone dominating the southern three-quarters, except for the land area that encompasses Monocacy Hill. These soils are further described in the following narrative excerpted from the Berks County Soil Survey. A soils plan is found in Appendix B.

1. **Athol Series**

The northern quarter of the Township primarily has soils of the Athol series which were formed from materials weathered from calcareous conglomerate. They are deep in most places, but ledges of rock crop out in many areas, and large rocks are common.

Runoff ranges from slow, in the gently sloping Athol soils, to rapid or very rapid in the moderately steep ones. Permeability is moderate to moderately rapid. The available moisture capacity is generally high but is somewhat lower in the severely eroded areas than in other places.

Practically all of this association is farmed. Except where the limestone ledges occur, the soils have few limitations if used for crops and for other uses. Wells in this area can become polluted, however, by drainage into the solution channels in the underlying bedrock. These soils are shown on the Soils Map AsB, AsC and AsD, and correlate with the carbonate bedrock formations.

2. **Penn Series**

The southern three-quarters of the Township primarily consist of soils of the Penn series, with the exception of the Monocacy Hill region. Soils that are moderately deep, well drained, and gently sloping to moderately steep make up the Penn series. These soils have formed in material that weathered from red shale and sandstone. They are in the southern one-third of the county in the area underlain by red rocks.

The Penn soils are low in natural fertility, moderate to low in available moisture capacity, and moderately rapid in permeability. The steeper slopes are susceptible to erosion.

Penn Soils are easily tilled. They are generally suited to the crops commonly grown in the county, except where they are too steep or eroded.

In general, lack of ability to supply adequate moisture to plants makes the soils of this association poorly suited to field crops. Where the soils are used for some purposes, restricted depth to bedrock and a seasonal high water table are severe limitations.

3. **Brecknock Series**

Deep, well-drained, gently sloping to steep soils make up the Brecknock series. These soils have formed in material weathered from shale and siltstone that were metamorphosed by heat and pressure when the adjacent diabase intrusions were formed. They have inherited their dark colors and low chroma from the very dark gray or purplish-grape colors of the baked shale. These soils contain a large number of dark-colored, platy, coarse fragments and are generally located in the southern part of the county. The Monocacy Hill region consists primarily of the Brecknock and Neshaminy soils.

Brecknock soils have low natural fertility. Most of the acreage is in pasture or trees, but field crops are grown in small areas. The soils under trees are generally very stony.

4. **Neshaminy Series**

The Neshaminy series consists of deep, well-drained, gently sloping to steep soils formed in material that weathered from diabase rocks. These soils are mainly in the southern part of the county.

These soils have high available moisture capacity because of their moderately fine textures subsoil. Natural fertility is high. Permeability throughout the profile is moderate.

Large areas of these soils are in trees or pasture. Smaller areas are idle or are used for crops.

Most of the Brecknock-Neshaminy association is in forests of red and black oak or tulip poplar. Some areas have been cleared, however, and are used to grow general crops. Except for stoniness, the Neshaminy soils have few limitations to use for farming, and they are suitable for many other uses. In places, bedrock near the surface is a limitation in areas of Brecknock soils.

Soils of the Bowmansville, Birdsboro, Readington, Reaville, and Rowland series are also found within the Township in the floodplains of the Schuylkill River, Manatawny Creek, Monocacy Creek, and other tributaries.

5. **Soil Suitability Relative to Development**

Soil features that are related to use of soils for community developments are depth to bedrock, degree of slopes, permeability, incidence of flooding, depth to a seasonal high water table, texture of the soils, and stoniness. The plan in Appendix C shows ratings of slight, moderate, and severe which have been used to describe the degrees of limitation for development. A rating of "slight" indicates that the degree of limitation ranges from none to slight, but few soils have no limitation to use. A rating of "moderate" indicates soils limitations that require special practices to overcome. A rating of "severe" indicates soil limitations that generally are very difficult to overcome.

The main limiting features of the soils for drainage fields for septic tanks are restricted permeability, steepness of slope, shallowness over bedrock, and the presence of a seasonal high water table. In addition, where soils

are underlain by cavernous limestone, the underground water can be contaminated by seepage through crevices in the rocks or through solution channels. Soils that have a rating of "slight" generally have few or no limitations that affect their use as disposal fields for sewage effluent. Those that have a rating of "moderate" may be borderline and should be investigated carefully at the exact site where a disposal field is to be installed. For some soils that have a rating of "moderate," a larger drain field is needed than where soils have a rating of "slight." For all the soils that have a rating of "severe," especially careful investigation is needed at the site of the proposed disposal field to see if the field can be expected to function properly. Limitations for disposal fields that are used only a short time each year for summer camps or similar uses may be less severe than indicated.

Prime agricultural soils are shown in the plan in Appendix D.

D. Geology

Amity Township is comprised of a flat to a rolling terrain. It is underlain mostly by shale, mudstone and siltstone. Some of these rocks lie in a system of major thrust slices of nappes, which juxtapose rocks of similar age but of somewhat different facies. Such stratigraphically distinct assemblages are called sequence. Two distinct sequences are recognized in the Township. Dominantly carbonate rocks of the Lebanon Valley, which lie in the Lebanon Valley nappe, make up the Lebanon Valley sequence (MacLachlan, 1967). Approximately the upper half of the sequence, extending from the lowest Martinsburg Formation (Upper Ordovician) into the Millbach Formation (Upper Cambrian), is present.

The Lehigh Valley sequence is comprised of a Lower Cambrian basal quartzite and a large thickness of shallow-water Cambrian and Lower Ordovician limestone and dolomite that grades up into Middle Ordovician shale. The sequence was

deposited on a basement of Precambrian gneisses that are now present in the Reading Prong. Only the lower part of the sequence, extending upward to the Allentown formation, is present in Amity Township. The figure in Appendix E provides an analysis of the geology within Amity Township.

1. Geologic Features

a. Diabase

The youngest formation in the Township consists of Traissic diabase which represents the core of Monocacy Hill. The Brunswick Formation has been intruded by many diabase dikes and sills in southeastern Pennsylvania. The sills, with few exceptions are much thicker than the dikes. The largest sills in the county are more than 1,000 feet thick. The diabase in the larger intrusives, except in the chilled border zone, is medium to coarse grained, greenish gray, and also consists of 90 to 95 percent labradorite and augite. Near the diabase intrusives, the shales of the Brunswick are altered to dark, tough hornfels. These hornfels closely resemble the Locatong formation because of the change of color caused by the reduction of ferric to ferrous oxide. The effect of the metamorphism on the color of the sediments if graditional, the first effect being the change from red to purplish red. With increased baking the beds change from purple to dark gray or blue black. This complies with the soils of the Brecknock series that have formed from the weathered shale.

b. Brunswick Formation

The Brunswick Formation consists typically of reddish-brown shale, mudstone, and siltstone. A few very thin beds of green shale and brown shale are present in the Brunswick, and in some places they can be used as market beds for distances up to 1 mile. The Brunswick Formation has been found to consist chiefly of feldspar, illite, chlorite, quartz, and calcite.

Some beds are finely micaceous. Joints in the formation commonly are partly filled with calcite and quartz. Occasionally barite and pyrite are present as joint filling, and very small crystals of pyrite may be disseminated throughout the rock.

Near the base of the Brunswick much of the rock is tough, thick-bedded red argillite and is interbedded with dark-gray argillite of the Lockatong Formation. This red argillite grades upward into red shale, mudstones, and siltstone. These are typically interbedded with and grade laterally into sandstone and fanglomerate. Exposures of the Brunswick Formation can be found along streams and railroad cuts.

c. **Fanglomerates**

Fanglomerates occupy most of the northern border of the Brunswick formation in the Township. These fanglomerates were deposited as alluvial fans by streams and are some of the youngest beds within the Brunswick Formation. They are mostly limestone breccias consisting of angular gray limestone pebbles in a reddish-brown buff, fine-grained, sandy to argillaceous matrix. Some pebbles of quartzite and other rock are also present.

The fanglomerates are extensively interbedded with the Brunswick shale and siltstone. The beds of limestone breccias grade into reddish-brown sandstone and then into reddish-brown shale.

d. **Martinsburg Formation**

The youngest formation in the Lebanon Valley sequence is the Martinsburg Formation, of Late Ordovician age. This formation is a thin-bedded gray to dark-gray shale that weathers buff. It contains minor thin interbeds of greywacke siltstone, metabentonite, and fine-grained

sandstone. This formation lies along a small portion of the northern boundary of the Township.

e. **Beekmantown Group**

From youngest to oldest, the Beekmantown Group has been divided into the Ontelaunee, Epler, Rickenbach, and Stonehenge Formations. The Group is also located along a section of the northern boundary of the Township and surrounds the Martinsburg Formation.

The Ontelaunee Formation, of Middle Ordovician age, is a light-to-dark-gray, thick-bedded, crystalline dolomite that weathers dark grayish brown. Mottled beds of limestone may compose about 50 percent of the medial portion of the formation. Dark gray beds of chert occur near the base. This formation typically has a minimum thickness of 500 feet.

The Epler Formation, of Early to Middle Ordovician age, is chiefly interbedded light-gray limestone and dark-gray dolomite with lenses of calcarenite. Dark nodular beds of chert occur near the base. Thickness of this formation typically ranges from 650 to 100 feet.

The Rickenbach Formation, of Early Ordovician age, is finely crystalline, cherty, dark-gray to gray dolomite with subordinate limestone interbeds. The typical thickness ranges from 650 to 100 feet for this formation.

The Stonehenge Formation, of Late Cambrian to Early Ordovician age, is a medium-gray, crystalline limestone that is cherty in the upper part with numerous nonshaly beds and laminations, and conglomeritic at the base.

f. **Conococheague Group**

Only two formations of the Conococheague Group are present within the Township. These formations include the Richland and the underlying Millbach. The Richland Formation of Late Cambrian age consists of predominantly gray dolomite that is thick-bedded, with subordinate interbeds of limestone that were deposited in shallow-water to intertidal cycles. Limestone is more abundant in the middle of the formation. The unit is dolomitic and sandy toward the base.

The Millbach Formation, of Late Cambrian age, consists of interbedded limestone and dolomite that is predominantly light-gray to occasionally pinkish-gray. Algal structures and intraformational conglomerates are widely distributed.

g. **Allentown Formation**

The Allentown Formation is the youngest geologic unit occurring in the Lehigh Valley Sequence in the Township. It consists predominantly of gray dolomite to silty dolomite. It is usually thick-bedded with subordinate interbedded limestone. Algal laminate structures are common with some colite and sharpstone conglomerate. It tends to be more calcareous and shaly toward the base, which may be older than otherwise equivalent Conococheague Group.

h. **Leithsville Formation**

The Leithsville Formation, of Middle Cambrian age, consists predominantly of gray, crystalline dolomite that is shaly in the upper part and has considerable amounts of chert in the lower part. The formation is typically covered by a thick overburden.

i. **Hardyston Formation**

The Hardyston Formation, of Early Cambrian age, consists of light-gray quartzite and feldspathic sandstone and quartzose. The unit has a conglomerate bed at the base. It is located eastward at the northern boundary of the Township where it is beginning to form a ridge.

2. **Carbonate Bedrock**

The Department of Environmental Protection has determined that sewage disposal in soils of this parent material creates a high hazard of groundwater pollution through solution channels. According to maps of karst topography [2] provided by the Pennsylvania Bureau of Topographic and Geologic Survey, there is only a small portion of carbonate bedrock in Amity Township, located in the northwestern corner of the Township. Carbonate bedrock is prevalent to the north in Oley and Earl Townships.

The area of carbonate bedrock is currently zoned "RC." Some of the land is in the Manatawny Creek watershed and floodplain. A small number of sinkholes and depressions indicating carbonate bedrock are located in the "LDR" zoning district near Yellow House. Limited residential development has already occurred near there, but the critical areas appear to be within the "high water table" Environmental Overlay District, in the Manatawny Creek floodplain.

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[2] "In some regions of exceptionally soluble rocks, sinks and caverns are so numerous that they combine to form a peculiar topography characterized by many small basins. In this kind of topography the drainage pattern is irregular; streams disappear abruptly into the ground, leaving their valleys dry and then reappear elsewhere as large springs. This has been termed karst topography because it is strikingly developed in the Karst region of [the former] Yugoslavia. It is defined as *an assemblage of topographic forms consisting primarily of closely spaced sinks."* **Physical Geology,** Longwell, Flint and Saunders. John Wiley and Sons, Inc. 1969.

E. Topography

The topography of Amity Township generally varies from a flat to a rolling terrain with a minimal amount of land which can be classified as being mountainous. The elevations within the Township range from a low point of 128 feet above sea level along the Schuylkill River to a high point of 663 feet about sea level atop Monocacy Hill. The plan in Appendix F depicts the generalized topography of Amity Township by categorizing the degree of slope. Slope is defined as the change in vertical distance per unit area of horizontal distance. Based on this generalized topographical analysis, approximately twenty (20) percent of the Township has land areas with slopes exceeding twelve (12) percent.

The topography of a particular area can prescribe that site's ability to achieve adequate on-site sewage disposal. On the basis of degree of slope, only five (5) percent of the township is not compatible for on-site sewage disposal. Standard beds may be used as an absorption area on slopes up to and including eight (8) percent. Trenches are acceptable up to twenty-five (25) percent slope. Therefore on the basis of this topographical analysis, most of the Township is suitable for bed designs and trenches.

The steep slope areas are further restricted by the "Steep Slope Overlay District" (Section 505 of the Zoning Ordinance).

Amity Township is comprised of two (2) major drainage basins. These drainage basins include the Manatawny Creek Basin which encompasses 2,936 acres or 24.9 percent of the land area of the Township, and the Schuylkill River Basin which encompasses 8,840 acres or 75.1 percent of the land area of the Township. Each of these drainage basins are comprised of a variety of minor and subminor drainage basins.

F. Potable Water

The Pennsylvania-American Water Company, a public utility, provides water to a portion of the Township, all within the area currently served by sewer. The major residential developments served include Greenbriar Estates, Westridge, Michael D. Rhodes, Amity Gardens, Cider Mill, Woods's Edge, and Amity Township is comprised of two (2) major drainage basins. These drainage basins include the Manatawny Creek Basin which encompasses 2,936 acres or 24.9 percent of the land area of the Township, and the Schuylkill River Basin which encompasses 8,840 acres or 75.1 percent of the land area of the Township. Each of these drainage basins are comprised of a variety of minor and subminor drainage basins. The water system closely follows the sewer system, with the following exceptions where there is sewer, but no water.

- West along Route 422, beyond the Monocacy Creek Road intersection.
- Northwest on Old Swede Road and Weavertown Road, in the vicinity of the Township building.
- Old Swede Road between Morlatton Road and Bieber Road.

See the map in Appendix G for a detailed map of the area served by Pennsylvania-American Water Company. This map was taken from the joint municipal comprehensive plan.

All potable water, whether on-lot or "public," is obtained from wells. There are no surface water supplies (lakes, rivers, etc.) that are used for potable water. The Schuylkill River is used downstream by the City of Pottstown for potable water.

G. Wetlands

The U.S. Army Corps of Engineers in conjunction with the U.S. Environmental Protection Agency has defined the term "wetlands" as follows:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated conditions. Wetlands generally include swamps, marshes, bogs and similar areas. The three major characteristics of wetlands include vegetation, soil and hydrology.

Wetlands and deep water habitats are essential breeding, rearing and feeding grounds for many species of fish and wildlife. Wetlands also perform important flood protection functions by decreasing the peak flood flow and spreading out the discharge over a longer period of time. In this manner they act as a natural form of stormwater detention and serve the same purpose as the detention facilities required in a new development. Wetlands also act to remove sediment and pollution from storm water by this reduction in the flow rate.

The table below provides a composite list of the "hydric soils" that are found in the Township. The location of these "hydric soils" may indicate the presence of a wetlands area. Development in these areas is further restricted by the "Hydric Soil Overlay District" (Section 503 of the Zoning Ordinance).

HYDRIC SOILS

Soils Name	Map Symbol	Hydric Component
Baile Silt	Ba	Baile (MD0023)
Baile Stony Silt	Bd	Baile (MD0028)
Bowmansville Silt	Do	Bowmansville (PA0048)
Burgin Silt	Bu	Burgin Var. (PA0042)
Croton Silt	CrA	Croton (NJ0001)
Croton Silt	CrB_2	Croton (NJ0001)

Source: Berks County Soil Conservation District

The plan in Appendix H illustrates the locations of the "hydric soils" that are present within the Township, and are not overlapped by the 100-year flood boundary. These locations may indicate the presence of a wetlands area. The final determination of whether an area is a wetland and whether the activity requires a permit must be made by the U.S. Army Corps of Engineers.

1. **Alluvial and High Water Table Soils**

Alluvial soils are defined as soils which have been deposited in the past by flooding. The presence of these soils is a reliable indication that heavy runoff conditions will probably create flooding in the future. For the purposes of this Plan, soils that have less than three (3) feet of depth to the seasonable high water table are defined as a high water table oil. The alluvial and high water table soils which are found in Amity Township are indicated in the table below.

ALLUVIAL AND HIGH WATER TABLE SOILS

Soils Series	Map Symbols	Depth to Seasonable High Water Table
Atkins	Au	0 to 0.5 feet
Baile	Ba, Bd	0 to 0.5 feet
Bowmansville Silt	Do	0 to 0.5 feet
Burgin	Bu	0 to 0.5 feet
Croton	CrA, CrB[2]	0 to 0.5 feet
Glenville	GlA[1], GlB_2	1.5 to 3.0 feet
Lehigh	LhA, LhB_2, LhC_3	1.5 to 3.0 feet
Lindside	Lt	0 to 0.5 feet
Melvin	Ml	0 to 0.5 feet
Philo	Ph, Pl	1.5 to 3.0 feet
Raritan	RaB	1.5 to 3.0 feet
Readington	ReA, ReB_2	1.5 to 3.0 feet
Reaville	RlA_2, RlB_2	1.0 to 3.0 feet
Rowland	Ro	1.5 to 3.0 feet
Wiltshire	WsA, WsB_2	1.5 to 3.0 feet

Source: U.S. Department of Agriculture

The Table above also illustrates the locations of the alluvial and high water table soils that are not overlapped by the 100-year flood boundary and/or any hydric soils. Because of their vital natural function in absorbing storm water runoff and because of potential flooding, these soils should remain undeveloped.

These areas are further restricted by the "High Water Table Overlay District" (Section 504 of the Zoning Ordinance).

Floodplain Control Analysis

Floodplains provide ecological, aesthetic and recreational benefits, while imposing constraints to development. The primary function of floodplains is to provide an area that will accommodate the floodwaters of a given storm. The National Flood Insurance Program has defined the floodplain by the 100 year or base flood which has a 1% chance of being equaled or exceeded in a given year.

The minimum requirements established under the National Flood Insurance Program prohibits new construction or substantial improvements to existing structures, fill or encroachments within the floodway. The figure in Appendix H illustrates the 100-year flood plain, as established by the Federal Emergency Management Agency on the Amity Township Flood Insurance Rate Map.

The "Floodplain Overlay District" severely restricts development in these areas. The requirements are further delineated in the Amity Township Floodplain Ordinance."