

CHAPTER III

PHYSICAL AND DEMOGRAPHIC ANALYSIS

A. BASE LINE MAPPING AND ANALYSIS OF ENVIRONMENTAL CHARACTERISTICS

1. Delineation of Study Areas

To facilitate analysis of the various wastewater alternatives, the Township has been divided into a framework of three study areas. These study areas are smaller portions of the Township that share common characteristics and present similar wastewater planning concerns. The following parameters are utilized in defining the boundaries of the study areas: existing sewer service, existing land use, natural and manmade features, and existing problem areas.

The delineated study areas are described below and are displayed on Map III-1.

a. Chester Creek Study Area

1) Location:

This area is bounded by the Pennsylvania Railroad to the west and the Township borders to the north, east and south.

2) Existing Sewer Service:

As will be seen in Chapter IV, sewer service is currently provided to the northeastern portion of the study area by the Westtown-Chester Creek treatment plant. Wastewater service is currently provided to both detached and attached dwelling communities and to commercial and professional uses along the Route 3 corridor. The Township has recently received approval to increase capacity at the treatment plant that would allow expanded service within this study area.

3) Existing Land Use:

The majority of this study area is comprised of residential land use consisting of single-family detached dwellings. There are, however pockets of higher density attached dwelling developments in the Route 3 corridor. This study area also includes the campus of the Westtown School, which owns approximately 500 acres stretching from the northern to southern border of the Township. Few remaining undeveloped tracts exist within this study area with the exception of the Jones tract, which is currently in the conditional use process for an age-restricted community comprising approximately 400 units.

Map III-1 (go back to the Act 537 Plan page on the website to view this map)

4) Problem Areas:

Although portions of this study area are served by centralized sewer service, the majority of the residential areas still utilize individual on-lot systems. Due to the extent of the problem areas, which will be discussed further in Chapter IV, and the proximity to existing collection and conveyance systems, these problem areas were included in this study area.

b. West Goshen Study Area

1) Location:

This area is bounded by Route 202 to the west, the Pennsylvania Railroad to the east and Township borders to the north and south.

2) Existing Sewer Service:

The majority of this study area is currently served by the West Goshen Township treatment plant and a Westtown Township collection and conveyance system.

3) Existing Land Use:

As with the Chester Creek Study Area, the majority of this study area is comprised of single-family detached dwellings. Some attached dwelling developments exist in the northern portion of the study area and along Route 202 with some commercial and professional uses occurring along the Route 202 corridor.

4) Problem Areas:

Those portions of the study area not currently served by centralized sewer are experiencing problems with on-lot systems as indicated by the number and concentration of septic system repair permits issued.

c. Route 202 Study Area

1) Location:

This area is bounded by Route 202 to the east and the Township borders to the north, west and south.

2) Existing Sewer Service:

Except for the Stetson Junior High and Starkweather Elementary Schools, which are served by the West Goshen Treatment Plant, no centralized or community sewer service is provided to this study

area.

3) Existing Land Use:

The northern portion of this study area is comprised of single-family detached dwellings with the southern portion being comprised of vacant agricultural lands. This southern portion of the study area, which includes the Crebilly Farm, is the largest undeveloped area of the Township. Amendments to the Township Comprehensive Plan are currently being considered that would allow for a Planned Unit Development (PUD) as a conditional use in this area.

4) Problem Areas:

As with the other study areas, this study area is also experiencing problems with individual on-lot systems as evidenced by the number and concentration of septic system repair permits issued.

2. Soils

Soils are a critical factor affecting the suitability of a site for subsurface disposal systems. Because the majority of Westtown Township residents utilize such systems, analysis of soil suitability and recognition of constraints is an important consideration. Analysis of soils for subsurface disposal is also an important factor when considering community systems in Westtown Township.

a. Pollution Attenuation

Soils lying above the water table have a natural ability to attenuate pollutants. The effectiveness of a soil in attenuating pollutants depends on its composition, thickness, and degree of saturation with water. There are five separate processes operating in soils that can help to remove contaminants. The sixth, evaporation, can increase the concentration of contaminants.

- 1) Filtration processes depend on the soil acting as a physical filter to trap suspended solids.
- 2) Sorption and adsorption processes involve soil particles physically and chemically capturing dissolved or suspended compounds.
- 3) Oxidation and reduction of contaminants can render them chemically inert or may hasten their precipitation out of solution.
- 4) Biological assimilation processes involve the uptake of contaminants by plant material.

- 5) Dilution and volatilization processes can decrease the concentration of contaminants in soils to acceptable levels.
- 6) Evaporation processes can increase the concentration of contaminants.

The processes can be very effective in attenuating pollutants under the right conditions. Proper operation of on-site sewage disposal systems depends on these processes to treat wastewater properly; if conditions are not suitable, potential pollution problems can result. It is important to note that once contaminants have reached the saturated zone (below the water table) of an aquifer, there are few mechanisms to remove or contain the contaminants.

Floodplains, wet soils, shallow soils, steep slopes, and areas with fractured rock are more susceptible to pollution, because the contaminants can reach the groundwater without sufficient opportunity or time for the above processes to operate. This in turn can contaminate surface water resources. Surface water can also be easily contaminated by system malfunctions in areas adjacent to stream corridors if untreated wastewater is not filtered and allowed to run off.

b. Subsurface Disposal

The Pennsylvania Department of Environmental Protection's, *Technical Manual for Sewage Enforcement Officers* (Technical Manual), has classified soils in Pennsylvania into fifteen categories based on suitability for subsurface disposal of wastewater and probable percolation rates. The classification system from the Technical Manual is included in Appendix A. It should be noted that the Technical Manual does not consider slope in classifying the suitability of a soil for subsurface disposal of wastewater. The impact of slope on wastewater disposal will be discussed later in this Chapter.

According to the 1997 version of the Soil Survey Geographic Database for Chester County, Pennsylvania, there are twelve major soil series in Westtown Township. For the purposes of this study, using the Technical Manual classifications and additional characteristics from the Soil Survey for Chester and Delaware Counties dated May 1963, soils in Westtown Township have been classified into three categories relative to subsurface disposal suitability which are:

Generally Suitable: Soils that, according to the Soil Survey, have no apparent limitations for use with on-lot systems.

Conditionally Suitable: Soils that, according to the Soil Survey, could have a limiting zone within five feet of the surface. Such soils would not be capable of providing four feet of suitable material between the bottom of a trench and the limiting zone as required by DEP Regulations, Title 25, Chapter 73.51.(a)(i).

Generally Unsuitable: Soils that, according to the Soil Survey, exhibit a seasonal high water table, are located in a floodplain, or are underlain by Limestone geology and are obviously unsuitable for on-lot systems.

Map III-2, Subsurface Disposal Soils Suitability, illustrates the distribution of soil suitability for subsurface disposal systems in the Township. Table III-1 displays the major soil types in the Township, their subsurface suitability, comments relative to their suitability, acreage and the percentage of the total Township associated with each major soil type. It should be noted that land classified as Urban Soil is generally developed land. For the purposes of this study, the suitability class for the Urban Soil Series is based on the former soil series prior to development. Due to wide variations in drainage, slope and development conditions, local evaluations must be made before considering land listed as “urban” for subsurface disposal. A summary of the soil suitability classification for subsurface disposal systems is as follows:

Soils Generally Suited for Subsurface Disposal Systems

Approximately 9% of soils in the Township are considered to be generally suitable for on-lot subsurface disposal. These lands are predominantly located on the Chester and Neshaminy soil series.

Soils Conditionally Suited for Subsurface Disposal Systems

Over 74% of the Township soils are conditionally suitable for subsurface disposal. These lands are predominantly the Glenelg and Manor soils.

Soils Generally Unsuitable for Subsurface Disposal Systems

Approximately 17% of the Township is comprised of soils which are generally considered unsuitable for on-lot subsurface disposal. In Westtown Township the Glenville, Chewacla and Wehadkee soils are associated with floodplains, the Worsham soils are limited by drainage class or water table and the Conowingo is associated with limestone bedrock.

3. Geologic Features

Various considerations regarding the underlying geology of an area are additional factors, which can affect the suitability of a site for subsurface system operations. The primary consideration of geology regarding wastewater disposal is the potential for contamination of the water supply contained within the various rock formations. The potential for contamination is affected by the types and amount of systems that are utilized and the attenuation characteristics of the overlying soil, in addition to geologic formation characteristics. Map III-3 - Geology, displays the three main

Map III-2 (go back to the Act 537 Plan page on the website to view this map)

TABLE III-1

MAJOR SOIL TYPES IN WESTTOWN TOWNSHIP

Soil Symbol	Soil Series Name	Suitability For Subsurface Disposal	Comments	Acres
Cd	Chester	Generally Suitable		276
Ch	Chewacla	Generally Unsuitable	Floodplain	39
Ck	Chrome	Conditionally Suitable	Depth to bedrock 1-1.5'	28
Co	Conowingo	Generally Unsuitable	Underlain by Limestone	4
Ge	Glenelg	Conditionally Suitable	Depth to bedrock 3-5'	1683
Gn	Glenville	Generally Unsuitable	Seasonal high water table	361
Mg, Mh, Mk, Mm	Manor	Conditionally Suitable	Depth to bedrock 2-7'	178
Na, Ns	Neshaminy	Generally Suitable		64
U	Urban	n/a		2385
W	Wetland	Generally Unsuitable		19
We	Wehadkee	Generally Unsuitable	Floodplain	287
Wo	Worsham	Generally Unsuitable	Seasonal high water table	162
	Other Soils			80

1. Original Soil Series used for Soils Presently Designated as Urban.
2. Suitability for Subsurface Disposal based on DEP's Technical Manual for Sewage Enforcement Officers and Soil Survey for Chester and Delaware Counties, May 1963.

Map III-3 (go back to the Act 537 Plan page on the website to view this map)

formations found in the Township. Westtown Township lies entirely within the Piedmont Province of the Appalachian Highlands, a great band of rolling country that stretches from New York to Georgia. The “fall line”, marking the transition from Piedmont to Coastal Plan, is located a few miles to the southeast.

The Felsic Gneiss underlays approximately 71% of the Township. It is as hard as mafic gneiss, but less dense, being metamorphosed from granite. A Precambrian rock, weathering occurs to a similar depth of some eight feet, and water capacity is also low. Characteristics include rolling uplands and steeper slopes by the streams. As in the schists, Glenelg, Chester, Manor and Glenville soils are associated with the gneiss's.

The Wissahickon mica schist formation underlays approximately 26% of the Township. The Wissahickon Schist is a Lower Paleozoic metamorphosed clay. It is not as hard as the other noncarbonate formations, thus it is prone to deep weathering because of its great age. The available water capacity in the weathered saprolite or “rotten rock” is high when compared to other metamorphic formations. The parent material is sometimes encountered as far as 100 feet below surface. The surface terrain is generally rolling uplands, with steeper slopes along creeks. Chester, Glenelg, Hollingsworth, Manor and Glenville soils are associated with this formation. Mafic Gneiss underlays approximately 2% of the Township. It is a metamorphic gabbro of probably Precambrian age found in smaller formations interbedded with schists, quartzite or felsic gneiss. Soils are quite shallow with a scattering of boulders. Available water capacity is low resulting from lack of porosity or weathering. Natural slopes are steep and stable.

4. Topography

The topography, or slope, of the land is another important consideration, which requires analysis to determine site suitability for wastewater disposal. The topography is also a controlling factor when evaluating wastewater collection and conveyance systems to serve a given area.

The degree of slope, measured as the change in elevation over a horizontal distance, provides an indication of site suitability for wastewater systems. Any slope encountered is an important consideration, and must be evaluated with regard to the particular wastewater disposal or conveyance application. Areas with slope in excess of 15% present serious constraints to the successful operation of soil absorption systems. DEP requires modified system design on slopes between 15-25%. In areas where the slope exceeds 25%, the use of such systems is unsuitable and is restricted under Chapter 73 of DEP's Rules and Regulations.

In level areas, the standards in Chapter 73 require that there be a minimum of 48" of suitable soil beneath the system to properly dispose of the pollutants, but in areas where slope is encountered, this standard may need to be increased. If slope is encountered, the use of a pressure dosed trench system or some other form of absorption technology may perform better than the standard trench.

The slope requirements of Chapter 73 are based upon the type of system. As mentioned above, the typical subsurface absorption system cannot be used on slopes of 25% or greater. Spray irrigation systems may be used on slopes in excess of 25%, although application rates would be seriously restricted. Application would also be affected by other site characteristics such as vegetation, soils, and geology.

Recent policy statements by DEP indicated that drip irrigation disposal systems are permitted on slopes up to 25%. On slopes greater than 25%, drip irrigation systems will be considered on a case-by-case basis.

Westtown Township is characterized by rolling hills and stream valleys associated with the creeks and tributaries that drain through the Township. Topographic elevations within the Township range from 470 feet above sea level southwest of the intersection of Matlack St and Oakbourne Rd to 215 feet above sea level at a point along Radley Run Creek where it crosses into Birmingham Township, in the southwest part of the Township.

Map III-4, Topography, displays the locations of the various slope categories in the Township. This map was created using the slope characteristics of soils as described in the Soil Survey for Chester & Delaware Counties; “A” soils have 0 to 3% slope, “B” soils have 3 to 8% slope, “C” soils have 8 to 15% slope, “D” soils have 15 to 25 % slope and “E” soils have greater than 25% slope. Soils without a slope designation were evaluated and classified as 0-3% slope. The percentage of the Township in each slope classification can be found in Table III-2.

TABLE III-2

TOWNSHIP SLOPE CHARACTERISTICS

Slope Characteristic	% of Township
0-3%	14%
3-8%	54%
8-15%	14%
15-25%	17%
>25%	1%

About 82% of the land in Westtown Township falls within the gentle and moderate slope categories (0-15% slope). Land having slope within these categories generally impose few environmental limitations on residential, commercial, and industrial development. Potential soil erosion and sedimentation problems, which might occur during periods of ground disturbance, can be minimized when conventional conservation practices are properly employed. Nevertheless, moderate slopes frequently exhibit moderate to severe loss of the topsoil mantle due to erosion, primarily due to historic farming practices not

Map III-4 (go back to the Act 537 Plan page on the website to view this map)

geared to soil conservation. Highly eroded soils, with thin depth to underlying rock, may not accept conventional on-site sewage disposal. Further, it should be noted that lands sloping greater than 12% (in the middle of the moderate slope range) would not be permitted to host a sand mound disposal system.

About 17% of the land in the Township is within the 15 to 25% steep slope category. Activities in this category require special conservation practices to limit soil erosion during construction. Such conditions may require engineering modifications to on-site sanitary sewer systems. Subdivision design must carefully consider steep slope conditions, and where possible, maintain these areas free from development. When construction occurs on steep slope areas, ground disturbances must be limited.

Approximately 1% of the land in the Township is in excess of 25% slope and is unsuitable for development using conventional practices. The steep slope factor provides a high potential for soil erosion during development, and makes it difficult to re-establish vegetation cover once ground disturbance has occurred. Except for drip irrigation systems, to be considered on a case-by-case basis, on-site sewage disposal systems are not permitted on slopes exceeding 25%. These sensitive areas should remain open to prevent environmental deterioration.

5. Wetlands and Drainage Basins

Wetlands and drainage basins of the Township are shown in Map III-5. Wetland areas are important local resource areas since they help reduce potential flood damage, act as important stormwater controls, are important vegetation and wildlife habitats, help to protect surface water quality by purifying overland flows of water, and are areas where recharge of the groundwater reservoirs occur. For these reasons, and because the loss of wetlands has become an important environmental concern, these areas are protected by federal and state regulations. Proposed development activity which will impact these areas must be reviewed and approved by the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the State Department of Environmental Protection.

In terms of wastewater planning, it is essential that treatment systems in or near wetlands do not contaminate or interfere with the natural functions of these resources. Wetlands should be buffered from potential contamination sources, such as conventional on-site treatment system components. While it is important to protect wetlands from potential wastewater system problems, wetlands have been used as components of some innovative on-site treatment systems. This technology uses the wetland as a final purification component and supplies nutrients and water to support these local resource areas. This type of technology can be quite successful if designed and maintained correctly, thereby achieving retention of local groundwater supplies.

Predominantly in the middle part of the Township approximately 71% of the Township is located within the East Branch of the Chester Creek Watershed. An estimated 19% of the Township, in the southwest part of the Township, is located within the Brandywine Creek Watershed, and 10% is located in the Ridley Creek Watershed to the northeast.

Map III-5 (go back to the Act 537 Plan page on the website to view this map)

6. Floodplains

Protection of floodplain areas is essential not only on aesthetic and ecological grounds, but also to protect the community from possible flood damage. Most communities recognize the importance of controlling development in and near floodplains and have incorporated appropriate restrictions into their zoning regulations.

The floodplain areas are mapped by the Federal Emergency Management Agency (FEMA). In addition to the areas mapped by FEMA, there are areas of alluvial or floodplain soils where restrictions are also applicable.

Floodplains are also shown in Map III-5.

7. Existing Water Supply Facilities

Nearly all of Westtown Township lies within the franchise area of the Philadelphia Suburban Water Company (PSWC). Approximately 74% of the Township currently receives water from PSWC. Due to potential contamination to individual on-site wells from failing septic systems, the Township encourages expansion of services by PSWC.

8. Population and Housing

In the Westtown Township Comprehensive Plan, population totals since 1960 are presented. As recently as 1960, the Township was home to only 1,947 people. From that point, however, its rapid development as a suburban community began. By August 1986, Westtown's estimated population had reached 8,926. The increments of growth in population during this period were as follows:

1960	1,947
1970	5,069
1980	6,774
1986	8,926

As documented in Westtown's Open Space Plan, the 1990 Census showed a continuation of accelerated growth in the Township. The recorded total of 9,937 represented a 46.7% increase from 1980. Nearly half of this growth was in the 25-44 age group; coupled with a nearly 100% increase in the under-5-years age group, the figures indicated a clear trend toward young families moving into the Township. This also was consistent with the growth in the housing stock, with most new units being single-family detached on lots large enough to be served by individual sewage systems.

As compared with the eight-municipality West Chester Region of which it is a part, and with Chester County as a whole, Westtown's rate of growth during the 1960-1990 period clearly was at the high end. Its average of 70% growth per decade compares with about 30% for the West Chester Region and 20% for Chester County.

A relative reversal of this trend, within both the Township and region, has been in evidence during the 1990's. While Chester County's growth is accelerating, the new population is locating in other parts of the county. Within Westtown and most of the West Chester Region, the pace has slowed as the supply of developable land diminishes. Through 1997, population estimates show Westtown's rate of growth still exceeding that of Chester County, but by a very slight amount – 15.9% vs. 13.5%, respectively, for the seven years of this decade. The estimates, prepared by the Chester County Planning Commission, show the annual population for the Township during this period to be:

1990	9,937
1991	10,090
1992	10,480
1993	10,630
1994	10,810
1995	10,950
1996	11,000
1997	11,520

During this same seven-year period, the rate of growth for other municipalities in the West Chester Region is as follows:

West Chester Borough	3.8%
Thornbury Township	28.2%
Pocopson Township	9.9%
West Goshen Township	11.3%
East Goshen Township	8.6%
East Bradford Township	23.0%
Birmingham Township	37.3%

Municipal population projections to the year 2020 were prepared by the Chester County Planning Commission following analysis of the 1990 Census. The projected totals for the Township were:

2000	10,610
2010	11,230
2020	11,840

For Westtown, continued growth through this decade already has eclipsed the county's projection for the year 2000 and is fast approaching the projected figure for 2010. The projected rates of growth for these two decades were 6.8% (1990-2000) and 5.8% (2000-2010). While the county thus foresaw a more precipitous decline in the growth rate than current estimates indicate, the slowing of growth during the next two decades should be more reflective of the county's view. Any meaningful increase in Township population is dependent upon whether any of the few remaining vacant tracts in the Township are converted to development.

Total dwelling units in the Township increased 61.7% during the decade of the 1980's, from 2,028 to 3,279. As reported in the 1990 Census, the housing stock maintained its traditionally high percentage of single-family detached dwellings. During the 1980's, this segment of the housing mix increased 43.5% to a total of 2,587. As a percentage of the total housing stock, however, single-family detached dwellings actually decreased from 88.9% to 78.9% between 1980 and 1990. Despite these changes, the percentage of owner-occupied units actually increased during the 1980's, from 89.4% to 90.2%.

Although modest, the shift toward a broadened mix of dwelling types in the Township is further reflected in building permit data for the years 1990-97. As compiled by the Chester County Planning Commission from information supplied by the Township, the totals for Westtown were:

Single-family	202
Apartment	434
Townhouse	19
Total	655

One other important factor in this diversification is the reduction in the Township's average household size, and thus in the average demand upon water and sewer service. For the years 1970, 1980, and 1990, the average number of persons per household in Westtown was reported as 3.78, 3.41, and 3.07, respectively. This trend, of course, is consistent with that being experienced in most jurisdictions; average household size for the county as a whole had declined to 2.73 in 1990. The building permit data reported above suggest that, in Westtown, this downward trend will be continuing.