DESIGN, DEVELOPMENT, AND IMPLEMENTATION OF A GROUND-WATER QUALITY MONITORING NETWORK FOR SOUTHERN NEW CASTLE COUNTY, DELAWARE

PHASE II - EVALUATION OF GROUND-WATER AVAILABILITY

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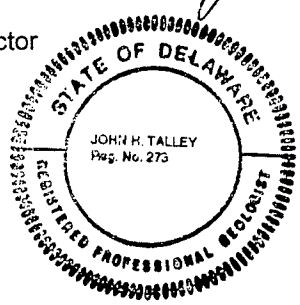

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PHASE II - EVALUATION OF GROUND-WATER AVAILABILITY

INTRODUCTION

New Castle County will continue to experience increased development of its water resources, especially ground water, for public, domestic, agricultural, and industrial use. At this time, aquifers provide more than 25 million gallons of water each day (mgd) for all uses throughout the County. Most of this water is withdrawn from aquifers in northern New Castle County, that area north of the Chesapeake and Delaware Canal.

At this time it is estimated that about 6.8 mgd is used in southern New Castle County with all potable supplies from aquifers (Metcalf and Eddy, 1991b). We do not anticipate the development and utilization of surface water in southern New Castle County for public water supply to any large degree because of the lack of adequate flows in the non-tidal portions of the water courses and the lack of favorable conditions for large impoundments.

Until about 1991, demands for water supply from large capacity wells in southern New Castle County were generally restricted to municipalities such as Middletown and Townsend, and to agriculture in the form of irrigation wells. Small communities and homes in rural areas are served by individual wells with relatively low water demands. As a result of the relatively low water demands throughout southern New Castle County up until 1992 there had been very little exploration for additional supplies.

During the past several years there has been a significant increase in ground-water exploration and development in southern New Castle County for both public water supply and irrigation. The number of investor-owned water systems and the

spatial distribution of these systems has increased significantly. At this time there are 13 public water supply systems operated by private or investor owned utilities and two municipalities. Ground-water exploration and construction of wells in the deeper aquifer systems (Potomac, Magothy, Englishtown-Mt. Laurel, and Rancocas) has resulted in the generation of detailed geologic data in the form of geologic logs, geophysical logs, and rock samples as well as some detailed hydrologic data from aquifer testing. There remains the potential to obtain much more detailed and site specific hydrologic data. Our data base has grown sufficiently to enable us to develop a detailed geologic framework including mapping the distribution of aquifer units, especially in the area between the Chesapeake and Delaware Canal and Townsend.

The need for a well-planned and clearly defined assessment of ground-water availability (quantity) in southern New Castle County has been demonstrated to support resolution of complex issues related to long-term growth, both economic and residential, and infrastructural needs for existing and future New Castle County residents and businesses.

Previous Investigations

During the past several decades investigators have evaluated the availability of ground water from the aquifers in New Castle County (Metcalf and Eddy, 1991a,b); Martin, 1984; Groot et al., 1983a; Talley, 1976; Sundstrom and Pickett, 1971; Sundstrom, 1967; and Rima et al., 1964). Because of the large water demands in northern New Castle County, ground-water exploration and development was concentrated in that portion of the County in aquifers in the Columbia and Potomac formations. As a result, the availability of ground water in northern New Castle County has been fairly well established.

The last detailed investigation of ground-water availability in southern New Castle County was conducted by Groot et al. (1983a) and was based on data available in numerous reports and maps, and files at the Delaware Geological Survey (DGS) and U.S. Geological Survey (USGS). Groot et al. (1983a) made several assumptions in determining ground-water availability such as, but not limited to: (1) maximum water withdrawals from any aquifer shall not exceed available recharge; (2) well efficiency is 100% and production from confined aquifer wells must exceed 100 gallons per minute (gpm) with drawdowns less than 300 ft; (3) individual domestic supplies were excluded from estimates of total availability; and (4) present water use was assumed to be zero.

Based on these assumptions, Groot et al. (1983a) concluded that the amount of water available from the five aquifers is as follows: (1) water-table aquifer - 36 mgd; (2) Potomac aquifer - 6.9 mgd; (3) Magothy aquifer - 3 mgd; (4) Englishtown-Mt. Laurel aquifer - 1 mgd; and (5) Rancocas aquifer - 3 mgd. Total availability was estimated to be approximately 50 mgd in southern New Castle County.

Groot et al. (1983a) made the following recommendations: (1) "Identify the chemical quality of ground water in areas of greatest water availability"; and (2) "more data be developed on aquifer characteristics through carefully controlled and supervised pumping tests." The USGS in cooperation with the DGS has recently completed an investigation titled "Quality and Geochemistry of Ground Water in Southern New Castle County, Delaware" (Bachman and Ferrari, 1995). In addition, the DGS through contract with the Water Resources Agency for New Castle County and the New Castle County Department of Public Works has completed a Phase I investigation to "Design, Develop, and Implement a Ground-Water Quality Monitoring Network for Southern New Castle County, Delaware." This current report is for Phase II, an "Evaluation of Ground-Water Availability."

Purpose and Scope

The objectives of this investigation are to: (1) refine the hydrogeologic framework; (2) map the distribution of hydrologic units or aquifers; (3) determine hydrologic characteristics of aquifers providing water supplies for public use; (4) provide a refined estimate of ground-water availability from each of the aquifers, and (5) summarize estimates of availability for each of the eleven watersheds in southern New Castle County.

The results will be integrated with the results of the recently completed ground-water quality investigation (Phase I) and with the monitoring network that is currently being designed for the Water Resources Agency for New Castle County and New Castle County Department of Public Works (Phase III). This Phase II Evaluation of Ground-Water Availability will also be included as a section of the revised Water Supply Plan for Southern New Castle County (Water 2000/2020) being prepared by the Water Resources Agency.

Location of Study Area

The area of investigation includes that portion of southern New Castle County in the Atlantic Coastal Plain Physiographic Province. The area is bounded on the north by the Chesapeake and Delaware Canal. The eastern, western, and southern portions of the study area are bounded by the Delaware River, and the Delaware-Maryland and New Castle-Kent County boundaries, respectively (Fig. 1). The study area covers more than 200 square miles and includes eleven watersheds. The Delaware River basin portion of the area includes the Chesapeake and Delaware Canal, Augustine Creek, Drawyer Creek, Appoquinimink River, Blackbird Creek, Cedar Swamp, and the Smyrna River watersheds. The Chesapeake Bay basin includes Back Creek, Sandy Branch/Great Bohemia Creek, Sassafras River, and the Cypress Branch watersheds.

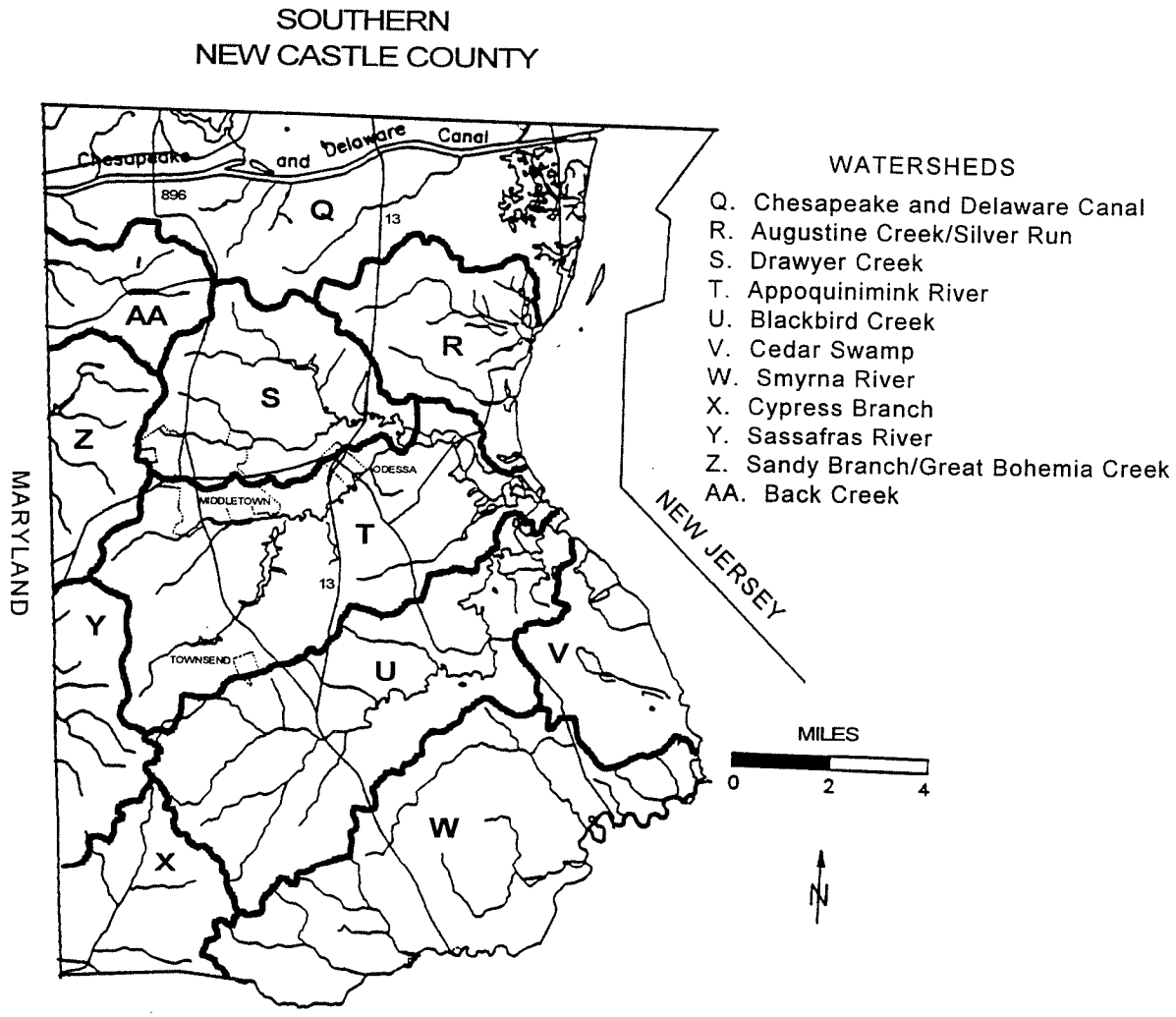

Figure 1. Location of study area.

The availability of groundwater in this report will include a watershed-based approach to collection of data and presentation of results.

Acknowledgments

This report was prepared under contract between the Delaware Geological Survey, University of Delaware, and the New Castle County Department of Public Works and the Water Resources Agency for New Castle County.

Thanks are due to staff of the Delaware Geological Survey, Water Resources Agency for New Castle County, and Delaware Department of Natural Resources and Environmental Control for the many valuable suggestions offered during the course of this investigation.

Well construction and hydrologic information provided by Artesian Water Company and Tidewater Utilities, Inc., are gratefully acknowledged. Tidewater Utilities provided access to wells in nine well fields for testing, and in most instances provided the infrastructure and cooperation that enabled the DGS to conduct aquifer testing.

METHODS OF STUDY

Existing data on hydrologic characteristics of the aquifer systems in southern New Castle County are available from numerous sources including but not limited to the DGS, USGS, Water Resources Center at the University of Delaware, municipalities, and consultants' reports. The data are associated with site-specific exploration for additional ground-water resources, development of new well fields, developing county-wide subsurface geologic and hydrologic frameworks, and quantitatively appraising the availability of water from aquifers in New Castle County.

This investigation involved reviewing existing publications to compile a list of wells from which hydrologic characteristics of aquifers are already available and to identify wells that could be tested. In addition, consultants' reports were obtained that contained new hydrologic information associated with recent ground-water exploration projects in southern New Castle County.

Criteria used to evaluate the usefulness of existing hydrologic information included: (1) the source of the data; (2) identification of the agency or individual who analyzed the data; (3) the methodology used to evaluate the data; (4) the date the analysis was made; and (5) the amount and adequacy of information on well locations, details of well construction, and proper identification of the aquifers from which data are available.

The DGS worked in cooperation with Tidewater Utilities to identify wells which were available for aquifer testing in the study area. The DGS conducted aquifer tests in nine public water-supply well fields. Tests were conducted in aquifers in the Magothy and Englishtown-Mt. Laurel formations, and the Rancocas Group. No tests were conducted in the Columbia. Hydraulic characteristics (transmissivity, coefficient of storage, and specific capacity) were determined through the use of the Theis equation and AQTESOLV, a software package used for determining hydraulic properties of aquifers from pumping tests. Wells on which aquifer tests were performed were located using a Global Positioning System (GPS, Appendix A). Aquifer test data are located in Appendix B.

Artesian Water Company provided recently completed reports of their ground-water exploration efforts in the Potomac and Mt. Laurel formations, and the Rancocas Group at seven sites. The locations of wells (public and test) used in this investigation were located using a Global Positioning System (GPS, Appendix A).

The spatial distribution and thickness of each aquifer system was determined through interpretation of geologic and hydrologic information, and detailed cross-sections.

Potential water availability from each aquifer was estimated following the assumptions presented below and use of QUICKFLOW, an analytical ground-water flow model.

The DGS maintains a data base which contains subsurface geophysical logs and descriptive geologic logs for hundreds of wells in southern New Castle County. The data base was searched for geophysical logs which could be used in developing a revised and detailed subsurface hydrogeologic framework. Selected logs were digitized for detailed interpretation. Artesian Water Company provided geophysical logs from wells that they recently drilled in support of their ground-water exploration efforts. The DGS conducted geophysical logging in 12 well fields during this investigation. Geophysical logs used in the investigation are presented in Appendix C.

A bibliography of reports, publications, unpublished reports, and files and maps containing hydrologic data was compiled.

ASSUMPTIONS MADE IN DETERMINING WATER AVAILABILITY

Estimates of ground-water availability have generally been based on the concept of "safe yield," a term with no definitive definition. Safe yield of a ground-water basin was defined by Todd (1959) "... as the amount of water that can be withdrawn from it annually without producing an undesired result." It has been recognized by others

(Domenico, 1972) that the undesired results mentioned in the definition by Todd (1959) include among other things, depletion of ground-water reserves, salt-water intrusion or water of undesirable quality, excessive streamflow depletion, land subsidence, and excessive pumping costs. Because of the complexity associated with defining safe yield, there has been general dissatisfaction with the term. A term being used more and more is "optimal yield" which is determined by selecting a ground-water management scenario from a set of alternatives or objectives including economic, social, and environmental. The selection of an optimal yield scheme for a basin is a policy decision requiring the integration of many factors (technical, economic, social, environmental). Of critical importance to the development of optimal yield is the determination of the occurrence, availability, quality, and potential quantity of water that is available from aquifer systems.

In general, empirical methodologies were used to make estimates of availability. Each subsequent evaluation utilized additional information that was generated and available from previous work. Nevertheless, until 1991 the number of relatively large capacity public water supply wells was small and there was a very limited number of wells in each of the aquifer systems.

The assumptions used to estimate water availability in southern New Castle County are very similar to those used by Groot et. al (1983a): (1) maximum withdrawals in a particular watershed shall not exceed average recharge; (2) the aquifer must be capable of yielding a minimum of 100 gpm to individual wells; (3) wells are very efficient and take advantage of the full thickness of the aquifer; (4) potential adverse effects on water levels in the Potomac Formation in northern New Castle County will be minimal; (5) the potential for salt-water intrusion along the C&D Canal, Delaware River, and in lower New Castle County will be minimal; (6) all water is of acceptable quality for public water supply use; and (7) present water use in southern New Castle County was not taken into account.

Various pumping scenarios were incorporated into the QUICKFLOW model until a configuration of wells pumping at a minimum of 100 gpm maximized groundwater withdrawal for each aquifer. Well spacing was varied to: (1) ensure withdrawals did not exceed recharge, (2) ensure drawdowns did not exceed screen tops and (3) adjust for mutual interference from cones of depression.

HYDROGEOLOGIC FRAMEWORK

The area is underlain by unconsolidated gravels, sands, silts, and clays that range in age from Lower Cretaceous through Holocene. The hydrostratigraphic nomenclature of southern New Castle County is presented in Table 1. Thickness of sedimentary rocks range from approximately 600 to 700 ft near the C&D Canal to approximately 2,300 ft in southeastern New Castle County. Within this area, the

Columbia Formation overlies the truncated edges of older geologic units that dip in a seaward direction.

Aquifers in the following formations are used for public water supply: (1) Potomac, (2) Magothy, (3) Englishtown-Mt. Laurel, and (4) Rancocas (Vincentown

Table 1
Hydrostratigraphic Nomenclature for Southern New Castle County

SYSTEM	SERIES	GROUP AND FORMATION		HYDROSTRATIGRAPHIC DIVISION
QUATERNARY	Holocene and Pleistocene	Holocene Sediments and Columbia Formation		Columbia Aquifer (usually a surficial aquifer in hydraulic connection with an underlying unit)
TERTIARY	Miocene		Calvert Formation	Confining Unit
	Paleocene	Rancocas Group	Vincentown Formation	Rancocas Aquifer
			Hornerstown Formation	
CRETACEOUS	Upper Cretaceous		Mt. Laurel Formation	Englishtown-Mt. Laurel Aquifer System
		Mattawan Group	Marshalltown Formation	
			Englishtown Formation	
			Merchantville Formation	
			Magothy Formation	Magothy Aquifer
	Lower Cretaceous		Potomac Formation	Potomac Aquifer

Formation). Some high yielding wells used for irrigation are completed in the Columbia Formation in the Middletown area whereas several high-yielding irrigation wells in the Boyds Corner area are screened in multiple aquifers, a practice no longer permitted. In some areas in southern New Castle County, the Columbia directly overlies the Englishtown-Mt. Laurel and Rancocas aquifers. Where this occurs, the formations are hydraulically connected and function as a single unconfined aquifer system.

Because of the complexity of the environments of deposition associated with the geologic formations, the aquifers within the formations are not homogeneous and isotropic. That is, hydrologic characteristics can be, and often are, highly variable over relatively short distances. Accordingly, the occurrence and availability of ground water from these aquifer systems is not equally distributed throughout southern New Castle County. Some areas will have better water-bearing and transmitting properties than other areas. As described earlier, our ability to map the distribution of sands which

function as aquifers has been restricted by the lack of detailed subsurface control in the form of well logs, samples, geophysical logs, and aquifer tests.

Seven detailed cross sections showing the vertical and lateral distribution of geologic units and associated aquifers were constructed using existing and new geologic information, and geophysical logs from deep wells. Emphasis is placed on aquifers in the Magothy, Englishtown-Mt. Laurel, and Columbia formations, and the Rancocas Group in cross sections A-A', B-B', C-C', D-D', E-E', and F-F' (Figs. 3-8). In G-G' emphasis is placed on sands in the Potomac Formation (Fig. 9). Because of the scarcity of deep subsurface control in the Potomac Formation in southern New Castle County, especially the area south of Middletown, individual sandy sections within the Potomac could not be correlated with a great degree of confidence.

The locations of the cross sections, as well as the wells used to construct the cross sections, are shown on Figure 2. Cross sections A-A' and G-G' (Figs. 3 and 9) are "dip" sections oriented perpendicular to the "strike" of the formations whereas cross sections B-B', C-C', D-D', E-E', and F-F' (Figs. 4-8) are oriented along the "strike" of the formations.

Potomac Aquifer System

The Potomac Formation is comprised of unconsolidated sediments (sands, silts, clays, and gravels). Sands and gravels in the Potomac function as aquifers. The Potomac is used extensively for public and industrial water supply in northern New Castle County. However, because of the relatively small demands for water in southern New Castle County and the availability of sufficient supplies from shallower aquifers, there has been very little ground-water development in the Potomac in southern New Castle County. The Town of Middletown currently uses two wells in the Potomac and Artesian Water Company has one well field on line. Artesian Water Company has conducted a considerable amount of ground-water exploration into the Potomac Formation in anticipation of increased demands associated with projected growth in southern New Castle County.

The Potomac Formation, which was deposited in a fluvial, or deltaic environment (Marine and Rasmussen, 1955) increases in thickness from about 500 to 600 ft in the vicinity of the C&D Canal to approximately 1,600 ft in southeastern New Castle County where the top of the formation is more than 650 ft below land surface (Fig. 9). The Potomac aquifer system is entirely confined in the study area and individual sand bodies are difficult to correlate, both horizontally and vertically.

Martin (1984) subdivided the Potomac Formation into three aquifers (lower, middle, and upper) and three intervening confining units in northern New Castle

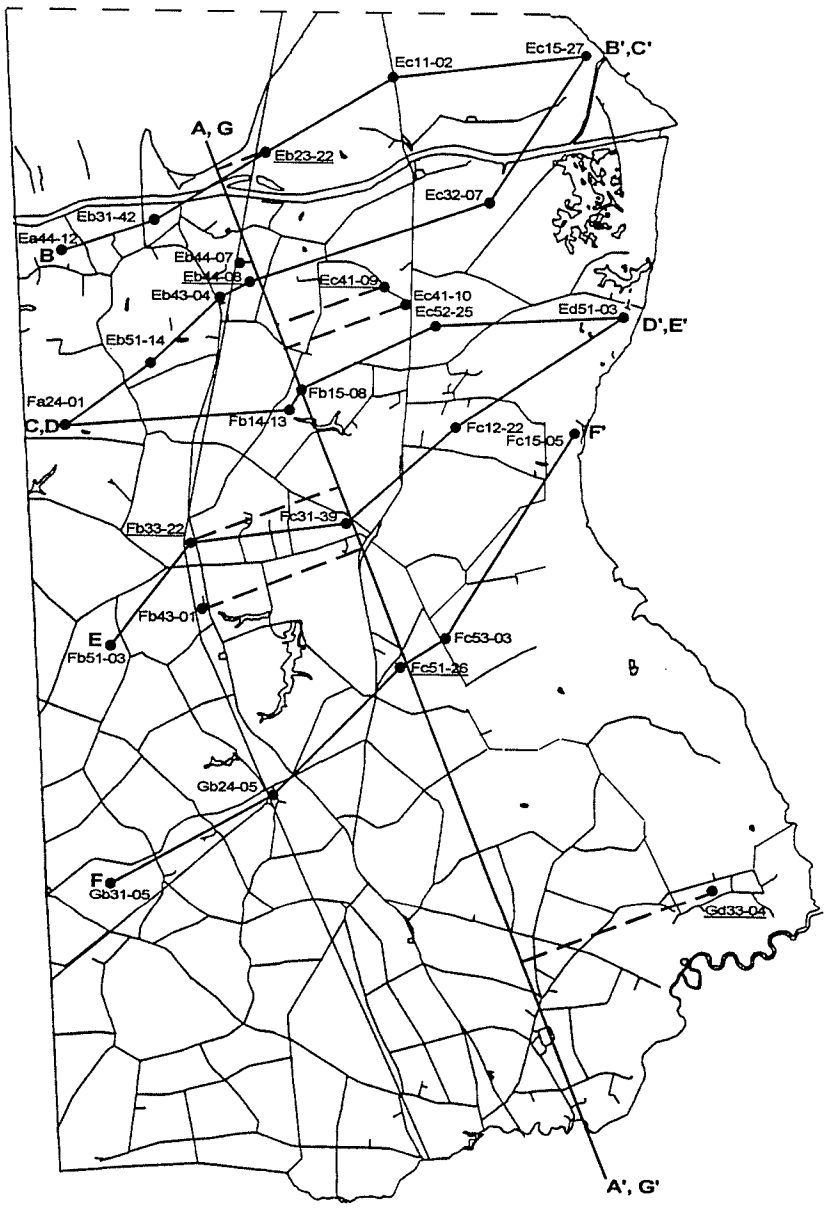

Figure 2. Locations of cross sections shown in Figures 3 through 9. Wells located on G-G' are indicated by an underlined DGSID.

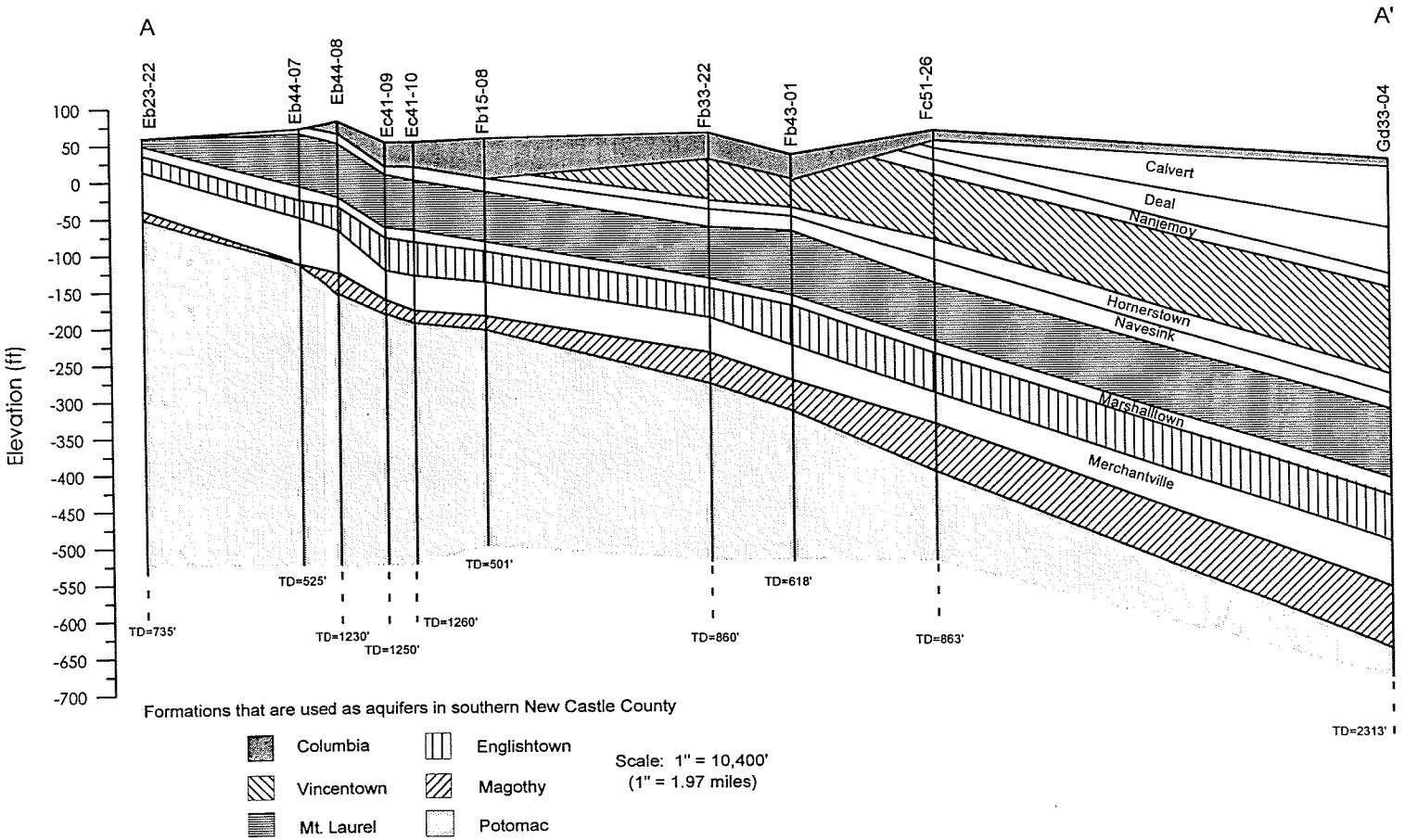

Figure 3. Geologic cross section of southern New Castle County. A-A' line is shown on Figure 2.

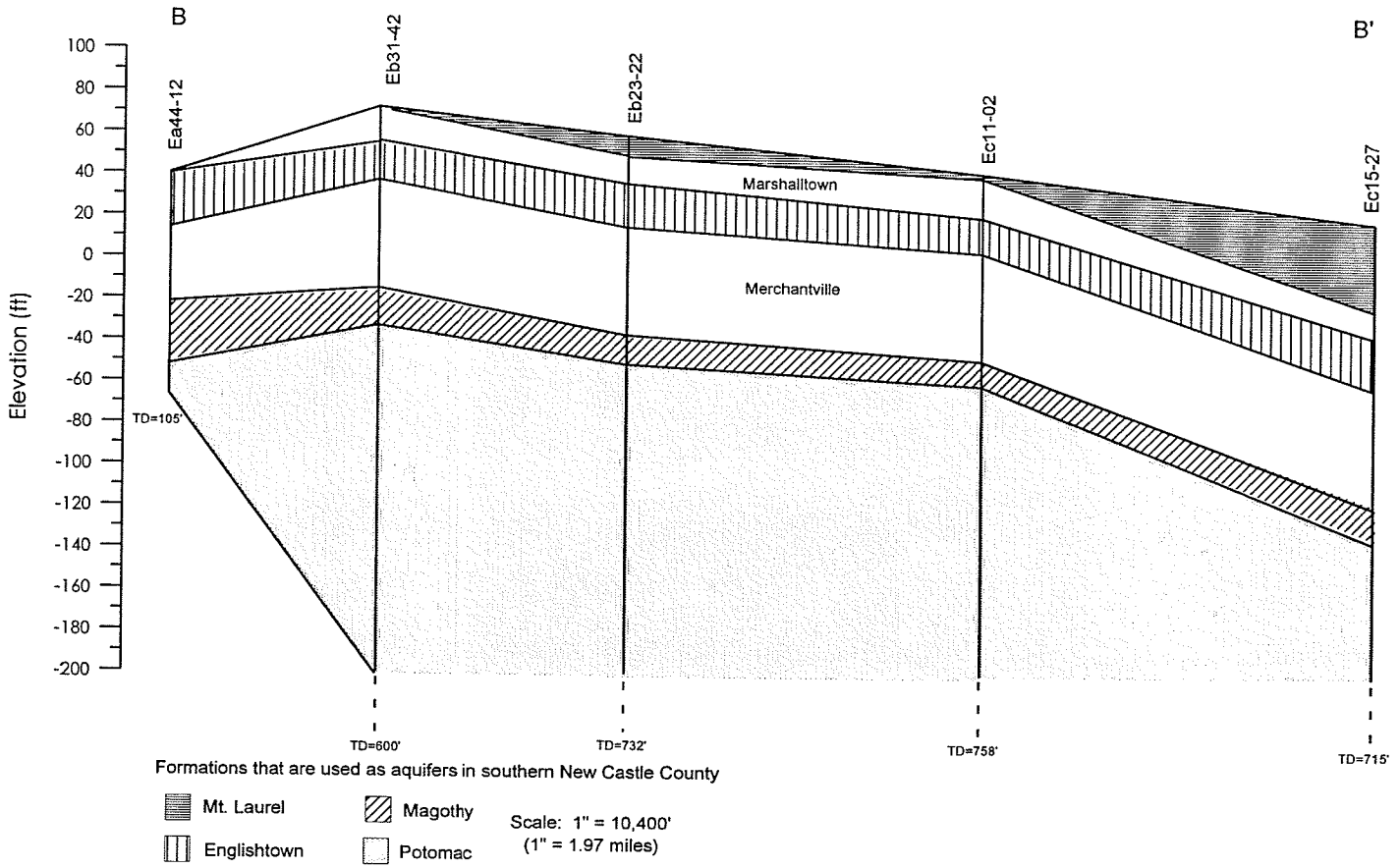

Figure 4. Geologic cross section of southern New Castle County. B-B' line is shown on Figure 2.

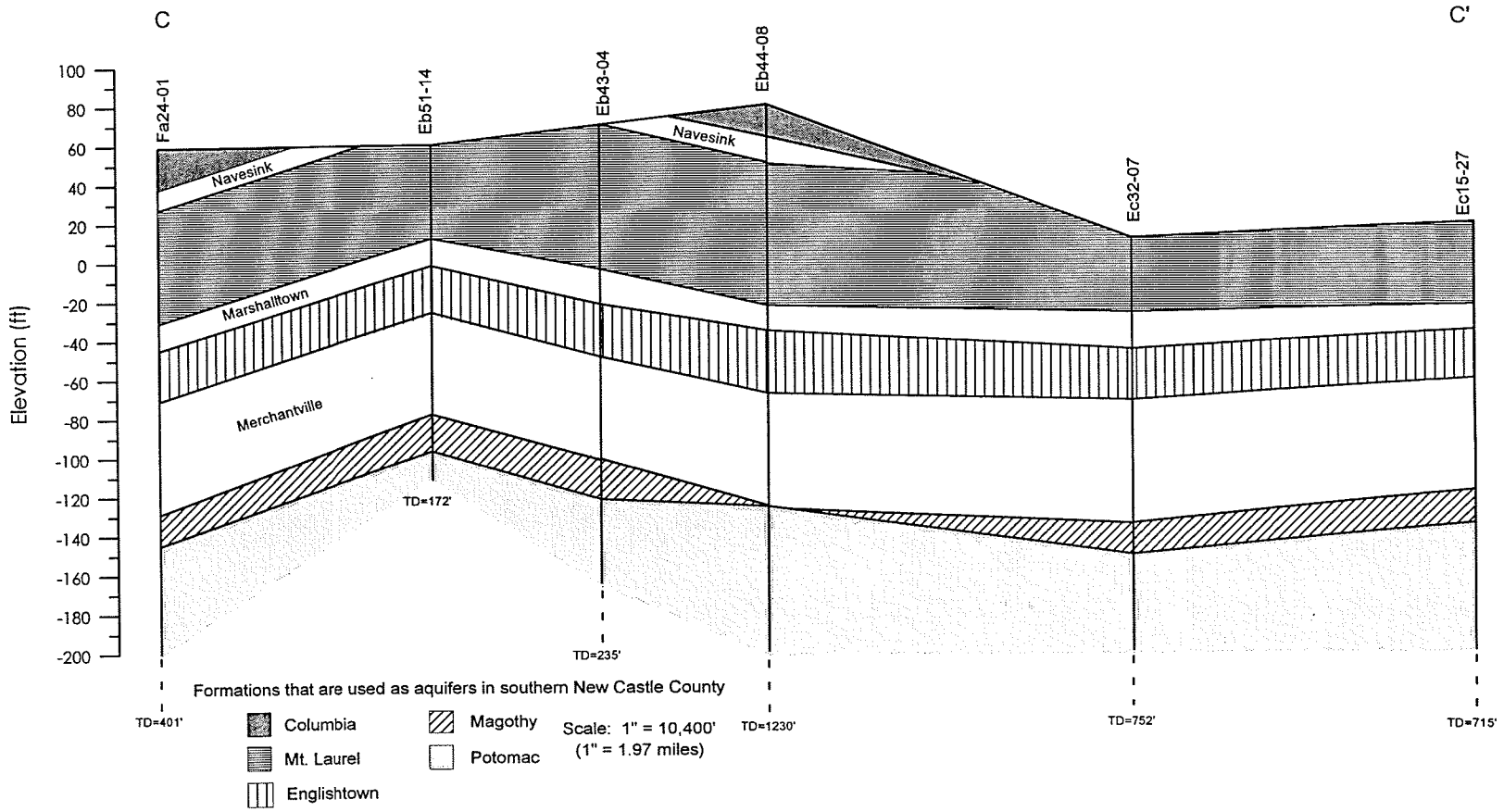

Figure 5. Geologic cross section of southern New Castle County. C-C' line is shown on Figure 2.

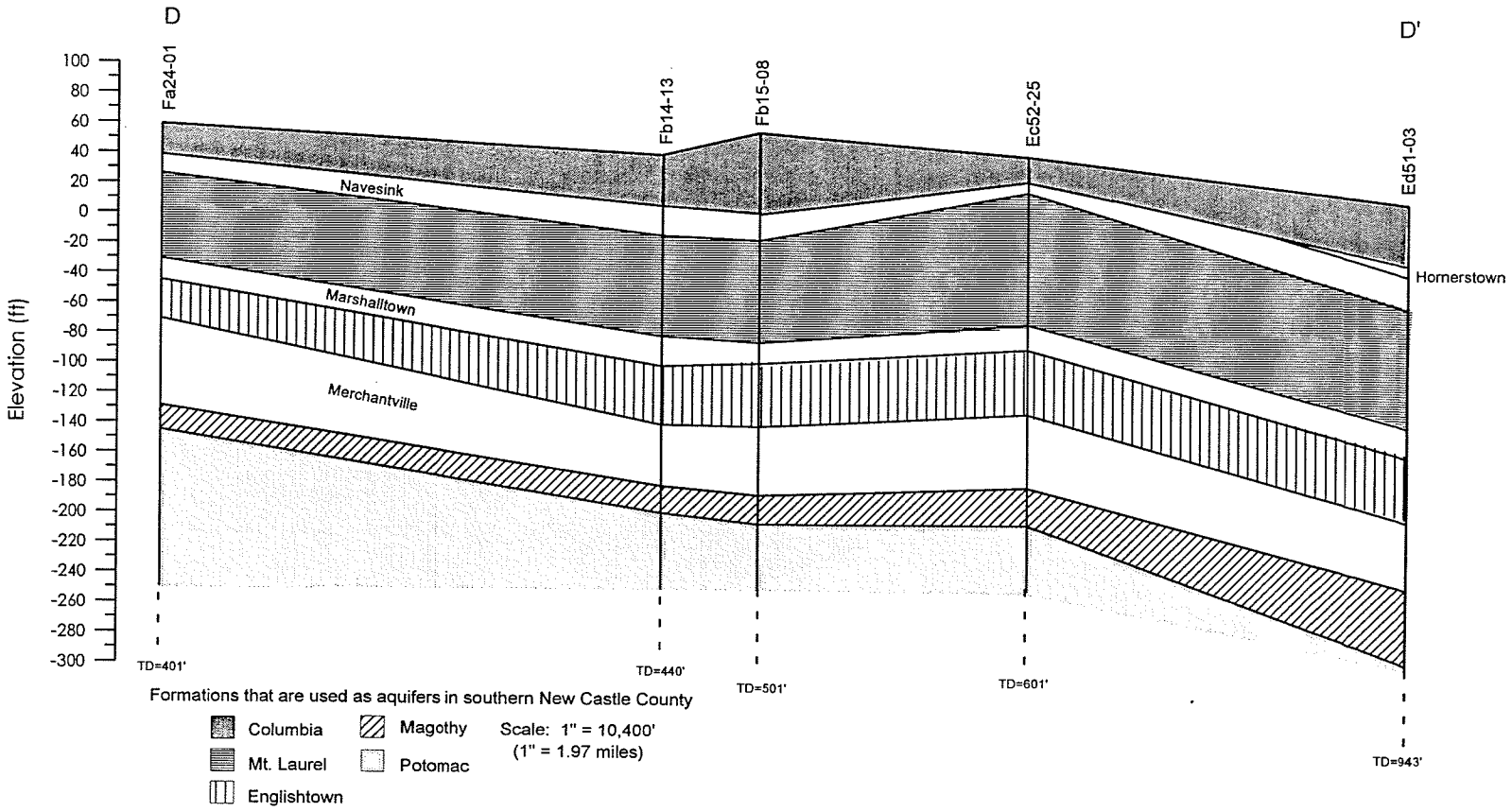

Figure 6. Geologic cross section of southern New Castle County. D-D' line is shown on Figure 2.

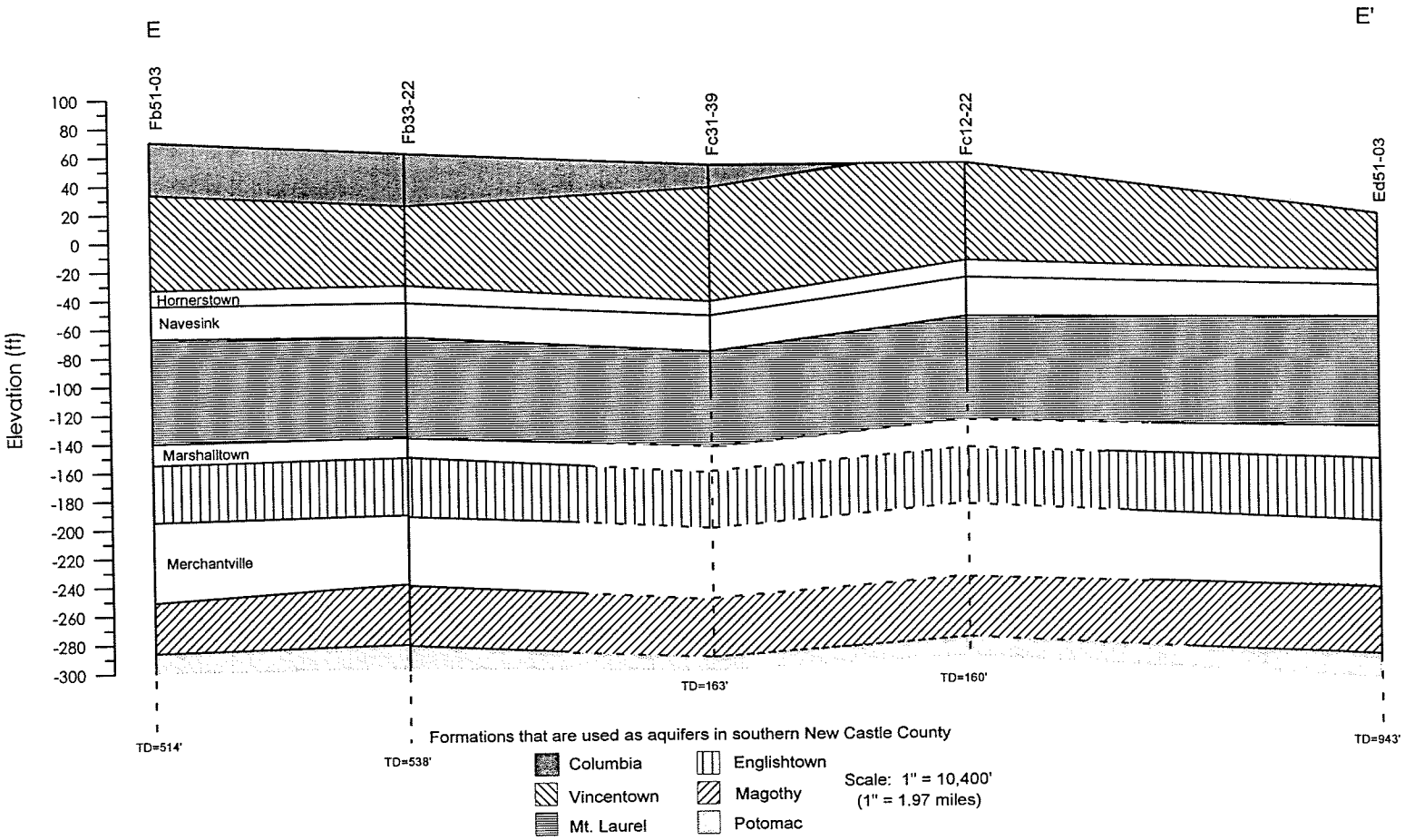

Figure 7. Geologic cross section of southern New Castle County. E-E' line is shown on Figure 2.

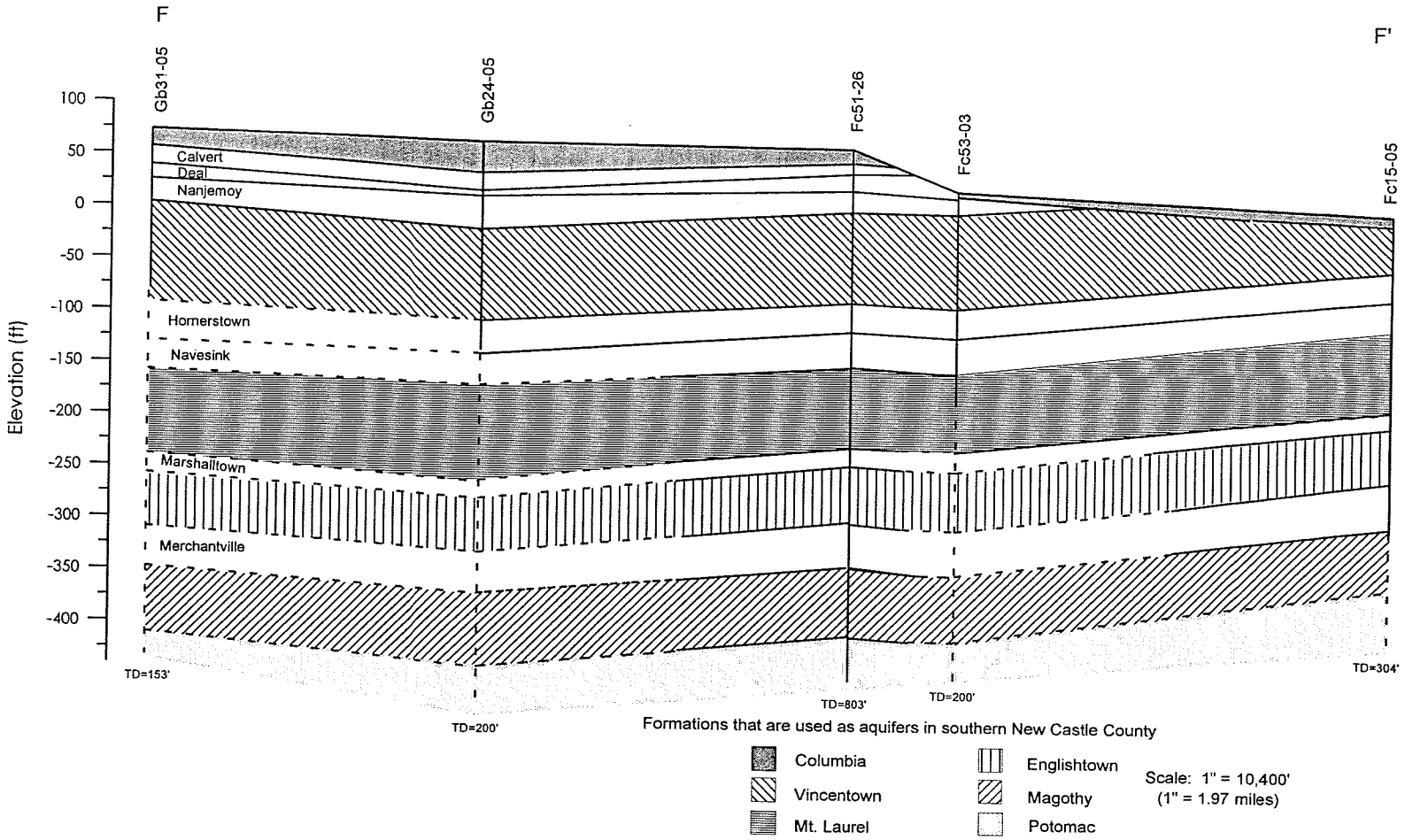

Figure 8. Geologic cross section of southern New Castle County. F-F' line is shown on Figure 2.

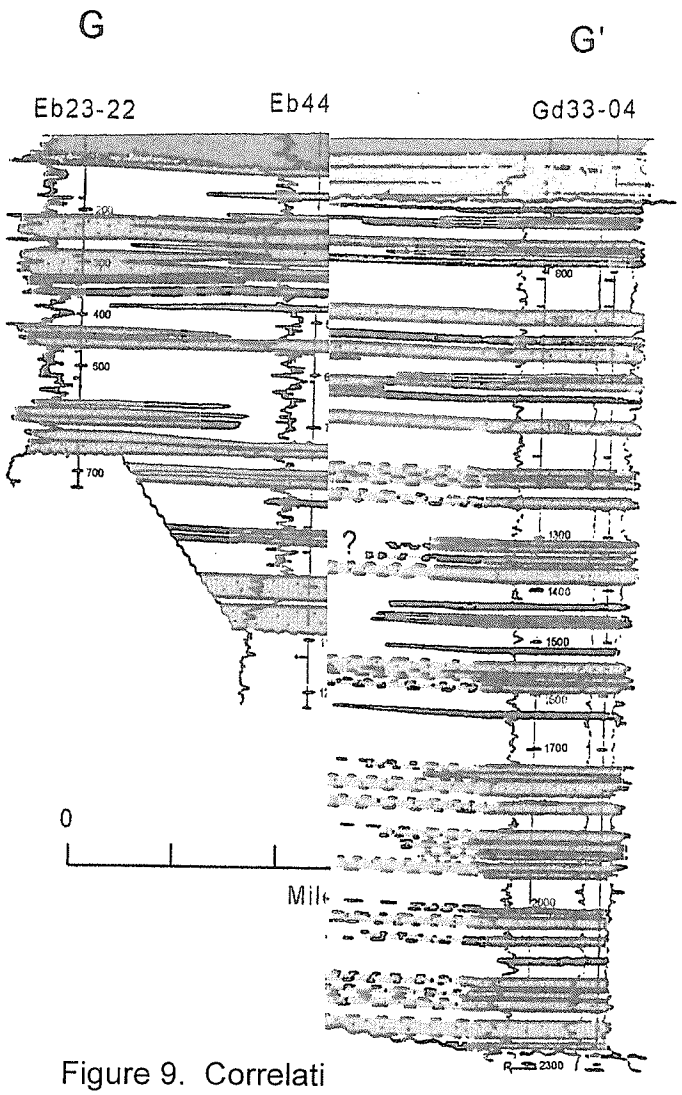

Figure 9. Correlati
Datum:

County. The aquifers are not distinct and easily mappable; rather they are comprised of sandy zones in which sands are more dominant than they are in the confining units.

Subsurface control in the Potomac Formation in southern New Castle County is limited. Holes have been drilled through the Potomac a few miles south of the C&D Canal and in extreme southeastern New Castle County at Deakyneville (well Gd33-04). R. N. Benson (DGS) has constructed a cross-section of the Potomac Formation (Fig. 9) in which sandy zones in the upper portion of the Potomac have been tentatively correlated. Very tentative correlations of sandy zones in the lower part of the Potomac have been made using available subsurface control.

Because of the scarcity of hydrologic data for aquifers in the Potomac Formation, aquifer test data from recently tested wells near Old County Road in southwestern northern New Castle County just north of the C&D Canal were also used. Figure 10 contains the locations of wells and areas where aquifer test data are available for the Potomac Formation. Results of aquifer tests are presented in Table 2.

Table 2
Aquifer Test Results - Potomac Formation

Location and Pumping Well Number	Date, Test Duration, and Pump Rate	Observation Wells and Distance from Pump Well	Analysis By	Method of Analysis	Transmissivity (ft^2/d)	Coefficient of Storage (dimensionless)	Specific Capacity (gpm/ft/dw)
Old County Rd. Ea14-32	10/25/94 72 hrs 815 gpm	Ea14-33 50' Ea14-35 17' Ea14-36 600'	Hydro Group, Inc.	Theis	1,390 1,310 1,982	2.50E-05 1.20E-04 3.40E-05	7.1
Old County Rd. Ea14-33	11/9/93 72 Hrs 600 gpm	Ea14-35 50' Ea14-36 600'	Hydro Group, Inc.	Theis	1,330 1,966	5.50E-04 7.40E-05	5.0
Old County Rd. Ea14-34	10/10/93 72 Hrs. 495 gpm	Ea14-32 1,900' Ea14-36 1,800'	Hydro Group, Inc.	Theis	2,527 2,527	2.40E-04 1.70E-04	6.6
Delmarva Power & Light Eb44-09	10/1/75 47 Hrs. 250 gpm	Eb44-10 1,400' Eb45-09 80' Eb45-10 260'	Denver & Martin	Stallman Single-Boundary Artesian	660 957 1,143	9.60E-05 7.00E-05 9.50E-05	-
Emerson Farm Eb55-10	1/17/94 72 Hrs. 251 gpm	Eb55-08 1,027' Eb55-09 599'	DGS	Aqtesolv Theis	801 862	7.57E-05 3.73E-05	1.1
Chestnut Grove Fb14-11	11/8/93 73 Hrs. 250 gpm	Fb14-12 1,520' Fb14-13 1,000'	DGS	Aqtesolv Theis	1,008 960	7.58E-05 1.30E-04	2.5
Stonefield Fc51-27	8/8/94 72 Hrs. 425 gpm	Fc51-26 610'	Hydro Group, Inc.	Theis	757	5.00E-05	2.2
Town of Middletown Fb33-22	7/11/77 3.5 Hrs. 52 gpm	Fb33-02 41'	DGS	Cooper Jacob	779	3.23E-03	3.5
Lester Farm Ec52-23	1/10/95 72 Hrs. 466 gpm	Ec52-24 1,050' Ec52-25 700'	Ground Water Associates	Cooper Jacob	5,350 4,350	5.20E-04 8.10E-05	2.5
Union Carbide Ec32-03	10/12/66 51 Hrs. 300 gpm	Ec32-04 200' Ec32-05 600'	R. W. Sundstrom	-	869 869	-	0.9

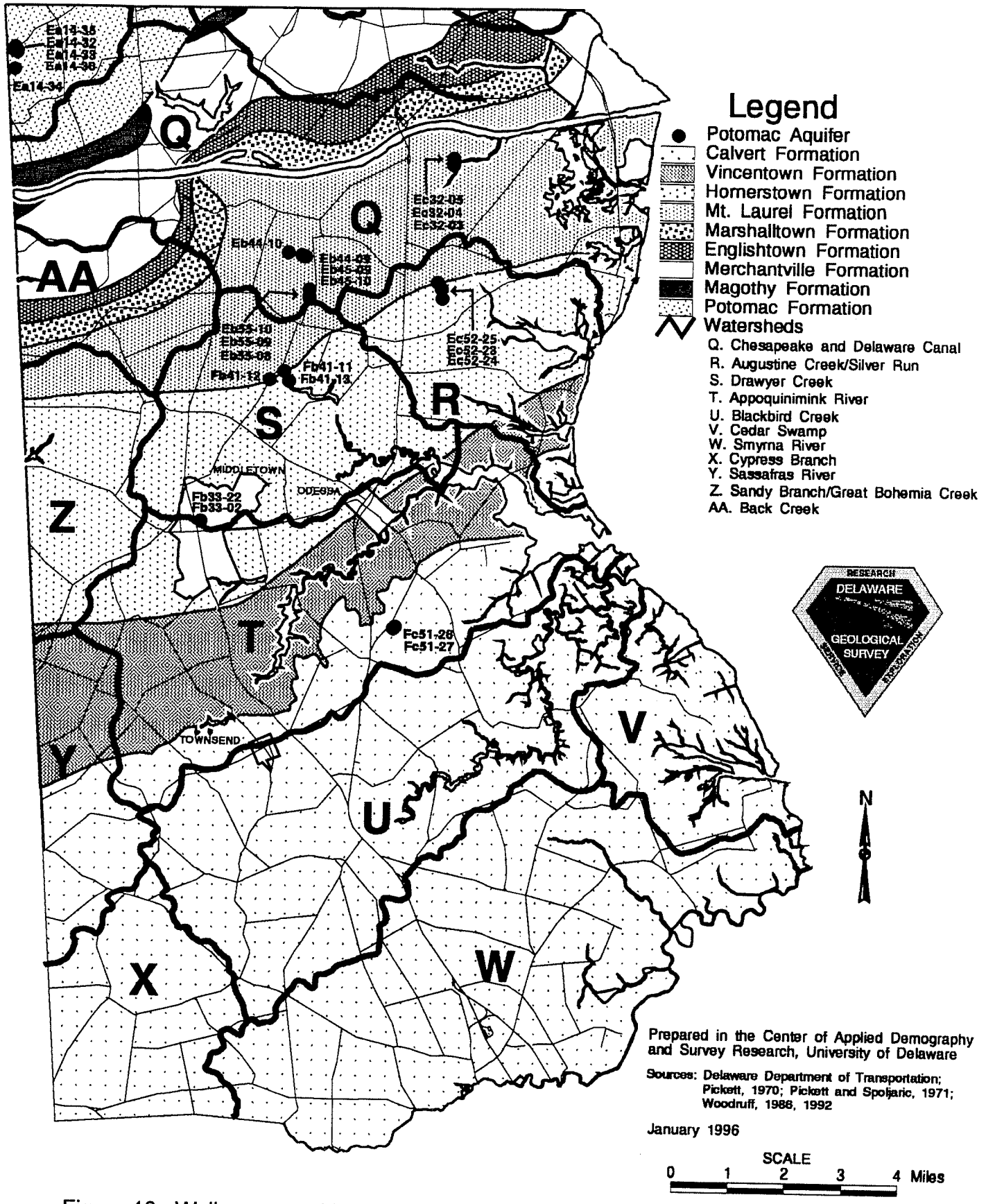

Figure 10. Wells screened in the Potomac Formation with aquifer test data available.

Transmissivity values range from 757 to 5,350 ft^2/d. The wide range of transmissivity values is consistent with the range reported by Martin (1984) and can be attributed to the complex depositional environment in which there are abrupt changes in sediment characteristics both laterally and vertically. Coefficients of storage range from 0.000096 to 0.00323. Values of specific capacity are highly variable ranging from 0.9 to 7.1 gpm/ft (gallons per minute per foot of drawdown).

The area of potential use of aquifers in the Potomac Formation in southern New Castle County may be limited by water quality, particularly, total dissolved solids and chlorides. Rima et. al (1964) placed the approximate position of the interface between fresh and salt water along a northeast-southwest trending line through Blackbird. Cushing et. al. (1973, plate 2) suggest that the downdip limit of fresh water in the Potomac probably occurs along a line that runs from near the Maryland-New Castle-Kent County line northeast through Blackbird to the Delaware Bay. Groot (1983) and Groot et al. (1983a) also conclude that the downdip limit of fresh water in the Potomac is probably located in the lowermost portion of southern New Castle County. In the absence of more detailed water-quality control in this area, we feel that a conservative approach should be utilized and that the area of potential use of aquifers in the Potomac Formation should be limited. Therefore, aquifers in the Potomac Formation may not be available for use in the Smyrna River and Cedar Swamp watersheds and that only portions of the Potomac in the Cypress Branch and Blackbird Creek watersheds are available for use (Fig. 11).

There are several primary limiting factors presented by Groot et. al (1983a) that were taken into account in evaluating the availability of ground water from the Potomac aquifer. These factors were incorporated into this investigation. Because recharge to the Potomac in northern New Castle County is about 20 mgd and ground-water withdrawals are about that amount, Groot et a.l (1983a) postulated that there is little likelihood that recharge to the Potomac reaches southern New Castle County. Recharge to the Potomac aquifers in southern New Castle County will most likely come from vertical leakage through overlying geologic units. Using available information, Groot et al. (1983a) estimated that about 8.7 mgd of recharge via leakage might be expected under specific conditions.

Additional limiting factors taken into account in evaluating the potential availability of ground water from the Potomac Formation included: (1) minimizing the lowering of heads in the Potomac in northern New Castle County; (2) minimizing the potential for salt-water intrusion near the salt-fresh water interface in lower New Castle County; and (3) ensuring that ground-water withdrawals do not exceed estimated recharge via vertical leakage.

The estimated long-term water availability by watershed from aquifers in the Potomac Formation is presented in Table 3. The total amount of water available based

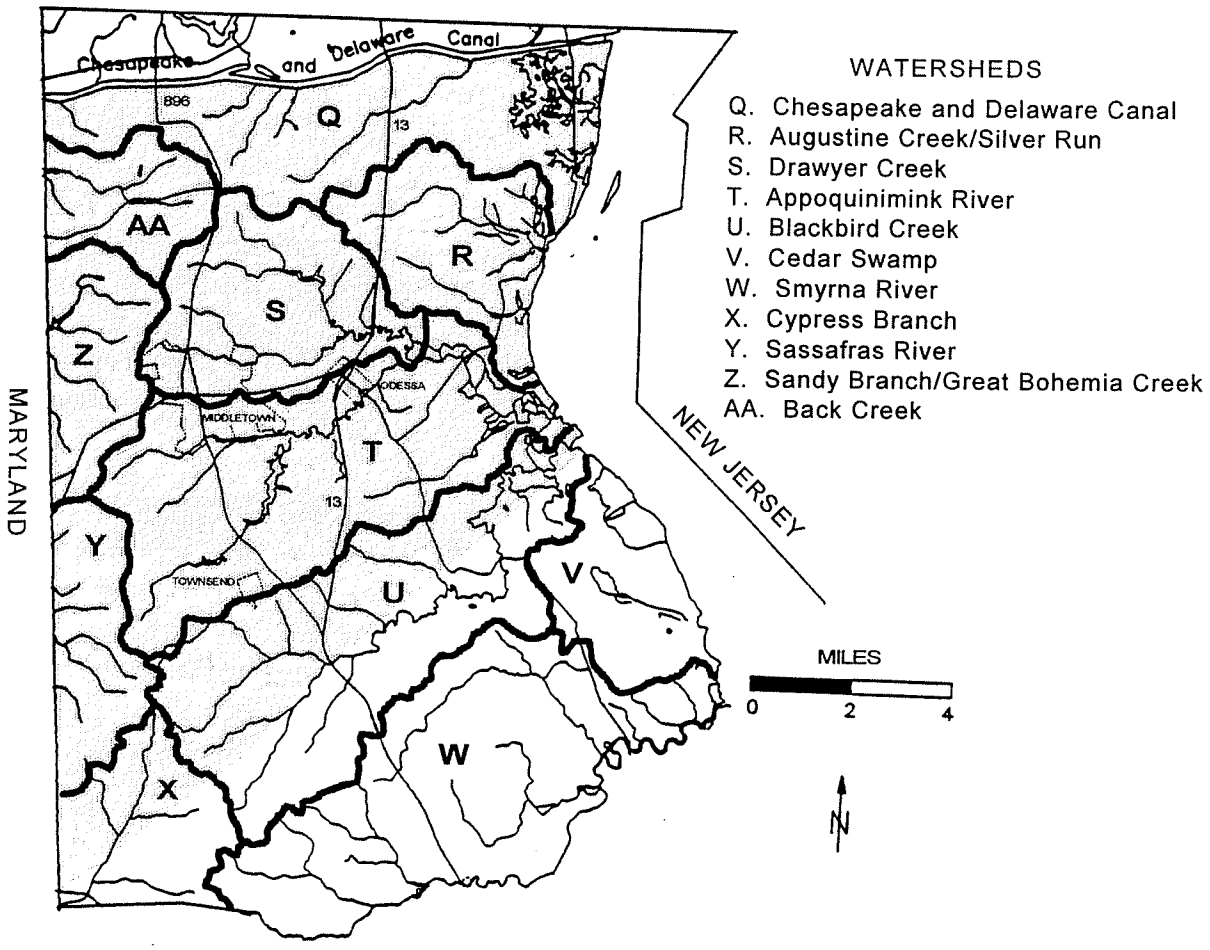

Figure 11. Area of potential use of the Potomac Formation (shaded region).

on available information is estimated to be 6.9 mgd in southern New Castle County from wells spaced approximately 3 miles apart yielding about 300 gpm per well.

Table 3
Long-Term Water Availability - Potomac Formation

Watershed Designation	Watershed Name	Water Availability (mgd)
Q	Chesapeake and Delaware Canal	1.10
AA	Back Creek	0.44
R	Augustine Creek/Silver Run	0.48
S	Drawyer Creek	1.00
T	Appoquinimink River	1.61
U	Blackbird Creek	0.91
V	Cedar Swamp	x
W	Smyrna River	x
X	Cypress Branch	0.28
Y	Sassafras River	0.48
Z	Sandy Branch/Great Bohemia Creek	0.59

Magothy Aquifer System

The Magothy Formation is comprised of "white and buff, angular to subangular quartz sand, frequently cross-bedded, and beds of gray and black clayey silt containing abundant finely disseminated organic matter and lignite" (Jordan, 1962). The sandy portions of the Magothy function as aquifers that are used for both domestic and public water supply in southern New Castle County.

At this time the Magothy is not heavily used for public water supply. However, use of the Magothy is increasing as several small public water supply systems operated by Tidewater Utilities, Inc., tap the Magothy in the vicinity of Mt. Pleasant.

The Magothy subcrop/outcrop area is located in extreme northwestern southern New Castle County along the C&D Canal (Fig. 12). South of the subcrop/outcrop area, the Magothy functions as a confined aquifer. The Magothy Formation ranges in thickness from about 0 to 40-50 ft in the vicinity of the C&D Canal to about 40 ft in the Middletown, and to approximately 80 ft in southeastern New Castle County (Fig. 3).

The area of use of the aquifer in the Magothy Formation for public water supplies is limited at this time to northwestern southern New Castle County from near the C&D Canal to several miles south where Tidewater Utilities, Inc., has several small wellfields in the Magothy. The southernmost use of the Magothy is in the Town of Middletown where the Magothy has been used since the early 1960s. The Magothy is not currently

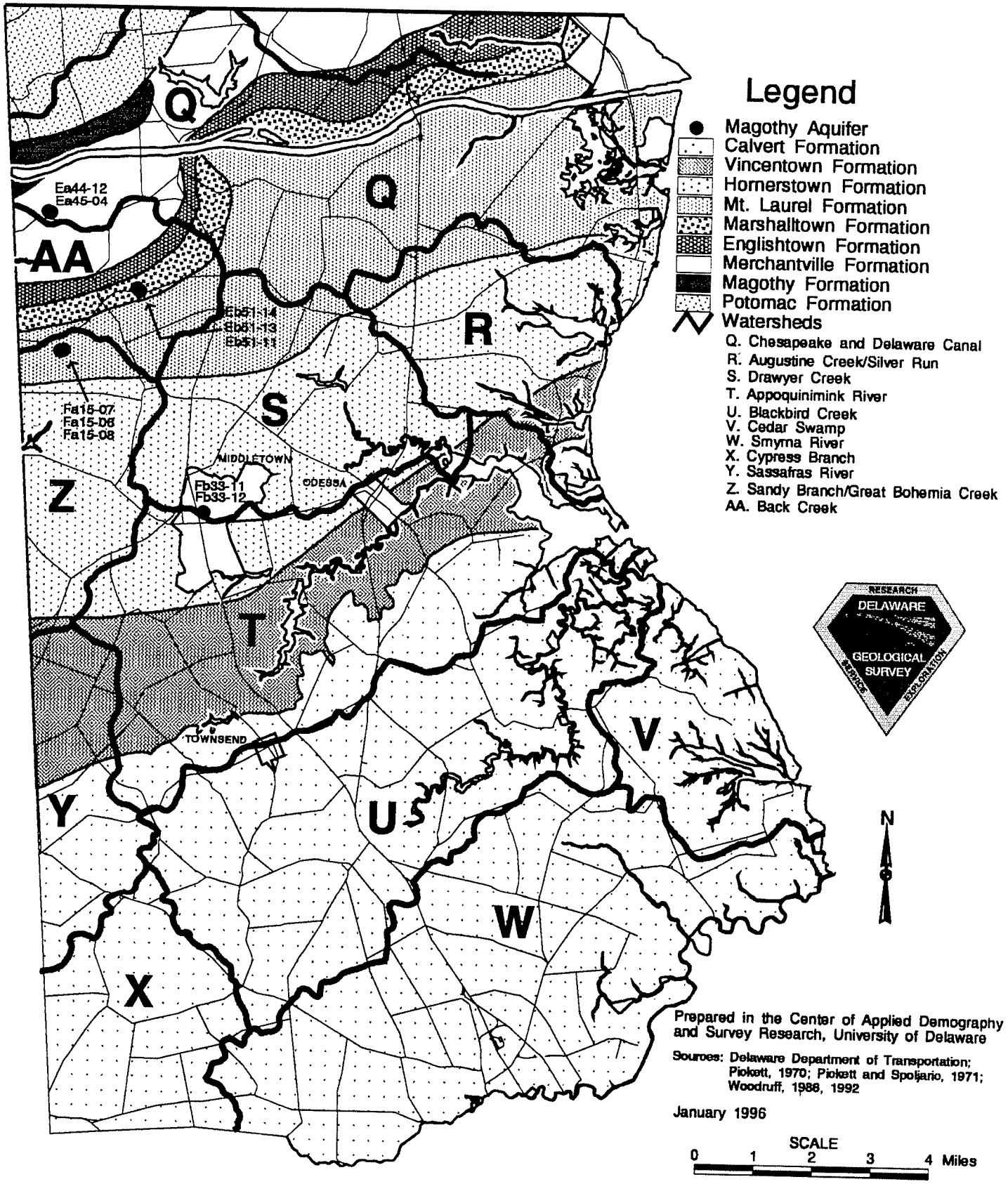

Figure 12. Wells screened in the Magothy Formation with aquifer test data available.

used south of Middletown and, therefore, little information is available about its hydrologic characteristics south of Middletown.

Hydrologic characteristics of the aquifer were determined from four aquifer tests (Table 4). Transmissivity values range from 413 to 1,655 ft^2/d with an average value of 955 ft^2/d. Storage coefficients range from 0.00035 to 0.000089. Specific capacities in four public water supply wells range from 1.3 to 5.1 gpm/ft (Table 4).

Table 4
Aquifer Test Results - Magothy Formation

Location and Pumping Well Number	Date, Test Duration, and Pump Rate	Observation Wells and Distance from Pump Well	Analysis By	Method of Analysis	Transmissivity (ft^2/d)	Coefficient of Storage (dimensionless)	Specific Capacity (gpm/ft/dw)
Nautical Cove Ea45-04	6/7/95 9.5 Hrs. 127 gpm	Ea44-12 124'	DGS	Aqtesolv Theis	899	3.50E-04	3.0
Dickerson Farms Eb51-14	5/16/95 14 Hrs. 74 gpm	Eb51-11 326' Eb51-13 163.5'	DGS	Aqtesolv Theis	689 413	8.47E-05	1.3
Wheatland Fa15-08	6/13/95 8 Hrs. 92 gpm	Fa15-06 321' Fa15-07 211.4'	DGS	Aqtesolv Theis	1,620 1,655	6.79E-05 6.92E-05	5.1
Town of Middletown Fb33-12	1/15/62 24 Hrs. 315 gpm	Fb33-11 125'	DGS	Aqtesolv Theis	452	8.93E-05	1.8

Although the Magothy Formation persists throughout much of southern New Castle County, its small thickness (40-50 ft) and fair to poor hydrologic characteristics render it unfavorable for development of high yielding localized pumping centers. It is more suitable for widespread pumping centers and is a good source of water for smaller water systems (10 - 75 gpm).

Because the Magothy is a confined aquifer and occurs at increasingly greater depths from north to south, the further downdip (south) the aquifer is tapped, the greater the available drawdown and the higher the yields will be from individual wells.

The area of potential use of the Magothy Formation is shown on Figure 13. The area is limited by its areal distribution, its inability to yield more than 100 gpm to wells on a long term basis, and its susceptibility to salt water intrusion near the C&D Canal, Delaware estuary, and New Castle County-Kent County line.

Recent ground-water exploration in the vicinity of the C&D Canal to several miles south indicates that the Magothy does not exist and is, therefore, not available for use in an area roughly bounded by the C&D Canal, Rt. 301. Rt. 896, and U.S. Rt. 13 (Figs. 3, 5 and 13).

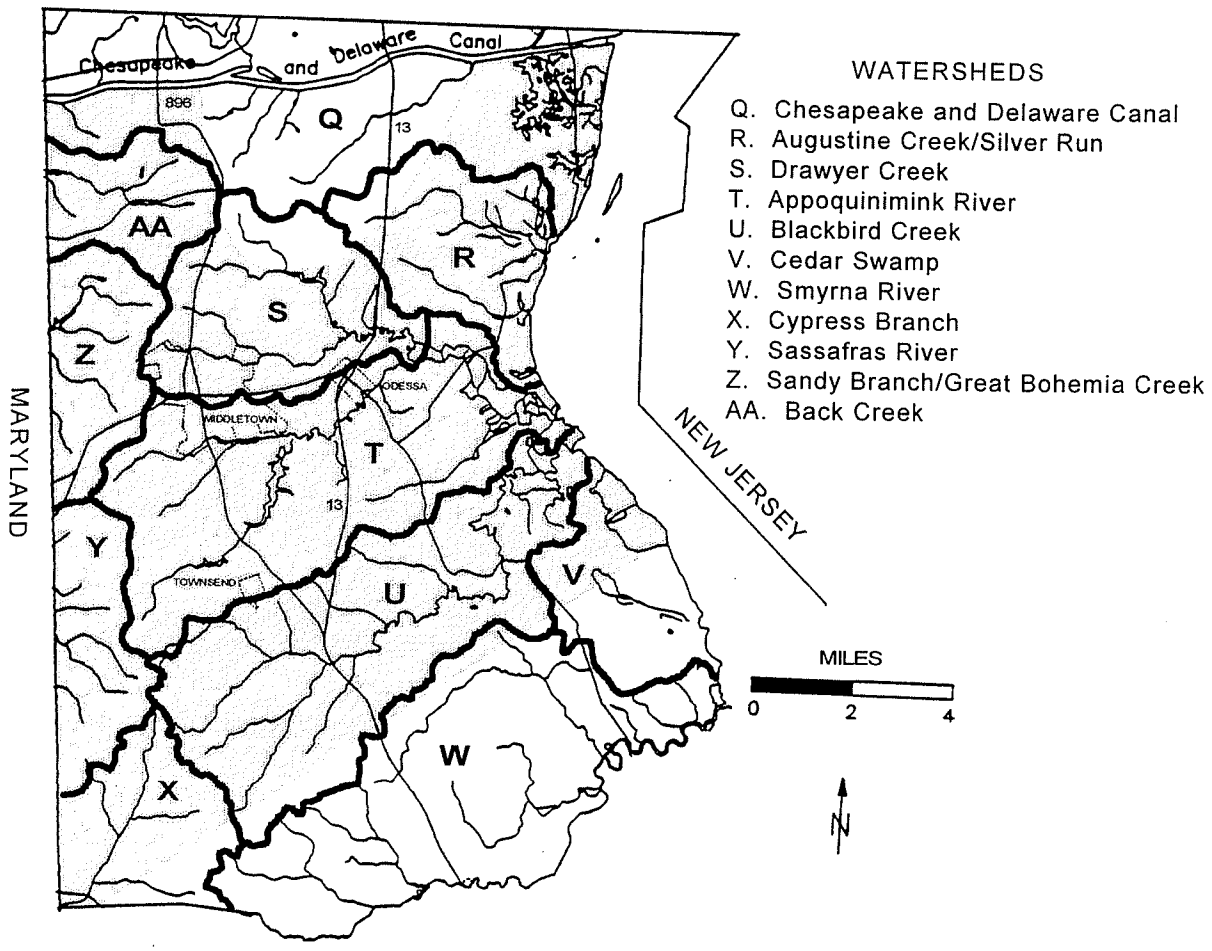

Figure 13. Area of potential use of the Magothy Formation (shaded region).

The fresh-salt water interface in the Magothy in the southern portion of southern New Castle County has been mapped by Rima et al. (1964), Sundstrom and Pickett (1971), Groot (1983), and Groot et al. (1983a). The interface which has been used to define the southernmost area of use of the Magothy has been placed along a northeast-southwest trending line which passes through Blackbird where the top of the Magothy is approximately 450 ft below mean sea level (Fig. 13).

The Magothy is not available for use in more than half of the C&D Canal watershed, most of the Cedar Swamp watershed, a small portion of the Cypress Branch watershed, and in all of the Smyrna River watershed.

The estimated long-term water availability by watershed from the Magothy is shown in Table 5. The total amount of water available based on current information is estimated to be 2.3 mgd in southern New Castle County from wells with an average spacing of approximately 5 miles yielding 100 to 250 gpm per well.

Table 5
Long-Term Water Availability - Magothy Formation

Watershed Designation	Watershed Name	Water Availability (mgd)
Q	Chesapeake and Delaware Canal	0.11
AA	Back Creek	0.11
R	Augustine Creek/Silver Run	0.08
S	Drawyer Creek	0.24
T	Appoquinimink River	0.57
U	Blackbird Creek	0.59
V	Cedar Swamp	0.02
W	Smyrna River	x
X	Cypress Branch	0.24
Y	Sassafras River	0.18
Z	Sandy Branch/Great Bohemia Creek	0.18

Englishtown-Mt. Laurel Aquifer System

Aquifers in the Englishtown and Mt. Laurel are informally called the Englishtown-Mt. Laurel aquifer. The aquifer, although separated by the Marshalltown Formation, is considered as a single hydrologic unit. Where the subcrop/outcrop is overlain by the Columbia Formation it is considered as part of the unconfined or water-table aquifer. In most instances, wells are completed in the Mt. Laurel Formation which, based on interpretation of geologic and geophysical logs, has more favorable hydrologic characteristics than the Englishtown.

The Englishtown Formation, which is comprised of micaceous fine sand, with some glauconite and thin interbedded layers of silty sand, (Pickett, 1970) subcrops in northwestern southern New Castle County south of the C&D Canal and in central and southeastern northern New Castle County immediately north of the C&D Canal. Thickness of the Englishtown ranges from approximately 25 ft in the north to 60 ft in southernmost New Castle County.

The Mt. Laurel Formation subcrops within the study area from near the C&D Canal to approximately 3 to 4 miles to the south (Fig. 14). The subcrop area is relatively large comprising approximately 40 square miles. It consists of fine to medium quartz sand with some silt, glauconite, and fossils. The aquifer becomes confined 3 to 4 miles south of the C&D Canal where it is overlain by the Rancocas Group. The thickness of the Mt. Laurel, which increases downdip from north to south, ranges from 70 ft in the subcrop area to approximately 95 ft in southernmost New Castle County (Fig. 3). The top of the Mt. Laurel ranges from about 60 ft above sea level near the C&D Canal to about 325 ft below sea level in southernmost New Castle County.

The area of use of the aquifer for public water supplies is concentrated in the Boyds Corner area where several wellfields are constructed in the Englishtown-Mt. Laurel. Yields from public water supply wells in this area are generally less that 100 gpm. Other areas where the aquifer is used for public water supply include Bayview Beach, Drawyer's Creek development, Odessa, and Middletown. It is not used for public water supply purposes in the subcrop area north of Boyds Corner where it is a water-table aquifer primarily because of its inability to yield appreciable quantities of water (>100 gpm) to wells. In addition, it would not be practical to use all of the available drawdown in the Englishtown-Mt. Laurel where it is overlain by the Columbia Formation because well yields would diminish as the aquifer became dewatered.

Very little ground-water exploration of the Englishtown-Mt. Laurel has taken place south of Middletown and Odessa and, therefore, little information is available about its hydrologic characteristics.

Aquifer test data from the Englishtown-Mt. Laurel are available from eight locations (Table 6). Transmissivity values range from 331 to 815 ft^2/d and average 506 ft^2/d. Storage coefficients range from 0.00777 to 0.000281. Values of specific capacity determined from eight aquifer tests range from about 1 to 2.5 gpm/ft.

As reported by Groot et al. (1983a), potential recharge in the Englishtown-Mt. Laurel subcrop/outcrop is considerably greater than the amount of water that can be developed from it because of the poor to fair water-bearing characteristics. Therefore, it is not favorable for developing high-yielding wells in localized pumping centers. Wells capable of yielding 100 to 200 gpm would have to be evenly spread over the entire area of potential use to maximize use of the aquifer.

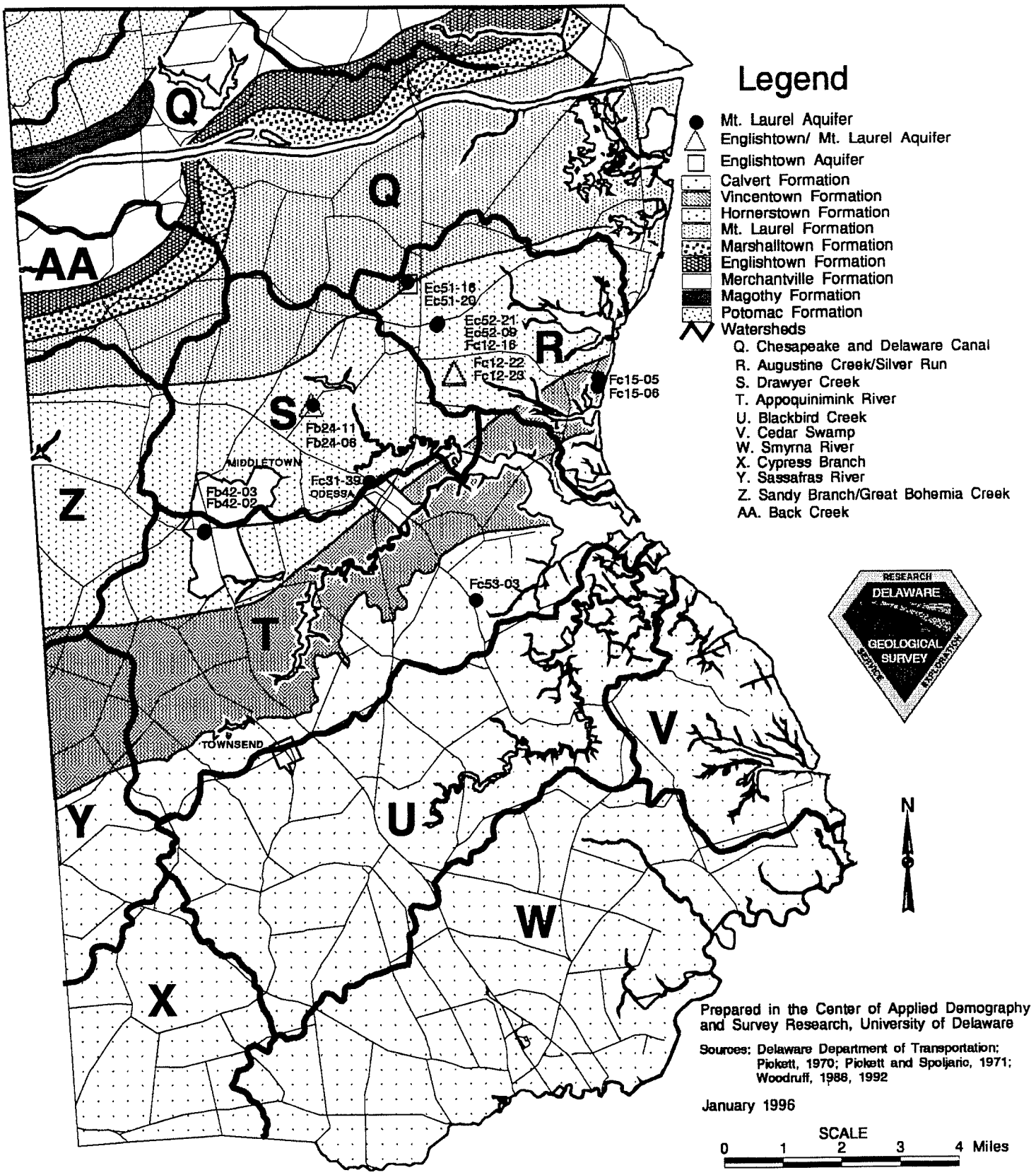

Figure 14. Wells screened in the Englishtown-Mt. Laurel formations with aquifer test data available.

Table 6
Aquifer Test Results - Englishtown-Mt. Laurel Formations

Location and Pumping Well Number	Date, Test Duration, and Pump Rate	Observation Wells and Distance from Pump Well	Analysis By	Method of Analysis	Transmissivity (ft^2/d)	Coefficient of Storage (dimensionless)	Specific Capacity (gpm/ft/dw)
Misty Vale Fc12-23	2/2/95 24 Hrs. 80 gpm	Fc12-22 99.3'	DGS	Aqtesolv Theis	357	2.80E-04	1.3
Asbury Chase Ec51-20	5/9/95 6 Hrs. 40 gpm	Ec51-16 10'	DGS	Aqtesolv Theis	445	7.70E-03	1.0
Vandegrift Ec52-09	3/22/95 24 Hrs. 107 gpm	Fc12-16 247' Ec52-21 70.7'	DGS	Aqtesolv Theis	738 708	1.42E-04 1.05E-04	2.5
Drawyer's Creek Fb24-11	4/5/95 24 Hrs. 39 gpm	Fb24-06 123'	DGS	Aqtesolv Theis	331	1.05E-04	1.1
Bayview Fc15-05	1/17/94 72 Hrs. 246 gpm	Fc15-06 764'	DGS	Aqtesolv Theis	815	1.63E-04	2.5
Betty Robins Odessa Fc31-39	4/17/95 20 Hrs. 79 gpm	Pump Well Only	DGS	Aqtesolv Theis	414	-	0.95
Cantewell Fc53-03	4/19/95 20 Hrs. 79.5 gpm	Pump Well Only	DGS	Aqtesolv Theis	390	-	1.0
Town of Middletown Fb42-03	4/19/61 49 Hrs. 80 gpm	Fb42-02 34'	DGS	Cooper Jacob	361	2.81E-04	1.4

Because of low transmissivity, low specific capacity, and small available drawdown, the use of the aquifer for public supply wells (>100 gpm) is not possible in the areas where it subcrops/outcrops. However, it is a fairly good source of water in this area for smaller supplies of water (10 - 50 gpm).

The area of potential use for yielding water to wells in excess of 100 gpm is limited to that area from several miles south of where it functions as a confined aquifer to the New Castle-Kent County line (Fig. 15). Higher yields can be expected in the southern portion of the area (Blackbird Creek, Cedar Swamp, Smyrna River, and Cypress Branch watersheds) because of larger available drawdowns. It is not available for use in the C&D Canal and Back Creek watersheds, and in the southernmost portions of the Sandy Branch/Great Bohemia Creek, Drawyer Creek, and Augustine Creek/Silver Run watersheds. Recent test drilling in the Sandy Branch/Great Bohemia Creek watershed indicates that the Mt. Laurel may not be capable of yielding more than 100 gpm to individual wells.

The estimated long-term availability by watershed for the Englishtown-Mt. Laurel is contained in Table 7. The total amount of water available based on available

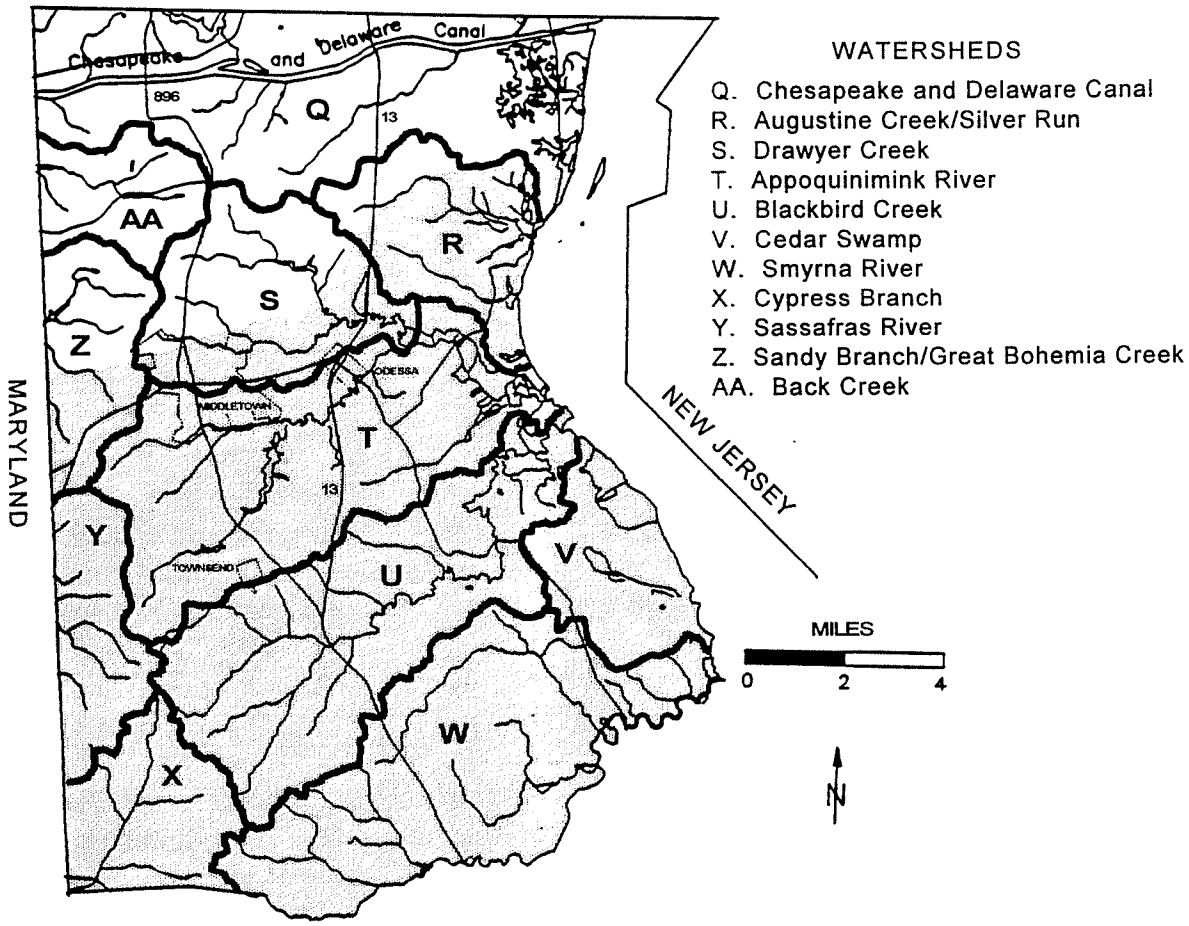

Figure 15. Area of potential use of the Englishtown-Mt. Laurel formations (shaded area).

information is estimated to be 4.2 mgd in southern New Castle County from wells spaced approximately 4 miles apart yielding 100 to 200 gpm per well.

Table 7
Long-Term Water Availabiltiy - Englishtown-Mt. Laurel Formations

Watershed Designation	Watershed Name	Water Availability (mgd)
Q	Chesapeake and Delaware Canal	x
AA	Back Creek	x
R	Augustine Creek/Silver Run	0.85
S	Drawyer Creek	0.99
T	Appoquinimink River	0.49
U	Blackbird Creek	0.62
V	Cedar Swamp	0.07
W	Smyrna River	0.72
X	Cypress Branch	0.26
Y	Sassafras River	0.16
Z	Sandy Branch/Great Bohemia Creek	0.08

Rancocas Group Aquifer System

The Rancocas Group is comprised of the Hornerstown and Vincentown formations. The formations have been described as being lithologically similar. Fine to medium textured highly glauconitic sand characterize the Hornerstown whereas the Vincentown is coarser with more quartz sand and less glauconite. Interpretation of geophysical and descriptive logs from downdip areas suggests that the Hornerstown is finer grained than the Vincentown and that its water-bearing characteristics are much less favorable than those in the Vincentown.

The subcrop/outcrop area of the Rancocas Group is shown on Figure 16. The Rancocas functions as an unconfined aquifer is this area. The Rancocas is covered by the Calvert Formation throughout the southern half of the study area where it functions as a confined aquifer. The thickness of both formations increases in a downdip direction with the Vincentown being the thickest of the two formations and having the most favorable water-bearing characteristics. The Rancocas thickens from a featheredge in the north to approximately 115 ft near the New Castle County-Kent County line (Fig. 3). The top of the unit ranges from about 10 ft above sea level in the north to approximately 160 ft below sea level to the south.

The area of use of the aquifer for public water supplies is limited to relatively few areas including the Town of Townsend, Smyrna Rest Area, the Delaware Correctional Center, and several small communities along U. S. Route 13 south of Blackbird. It is

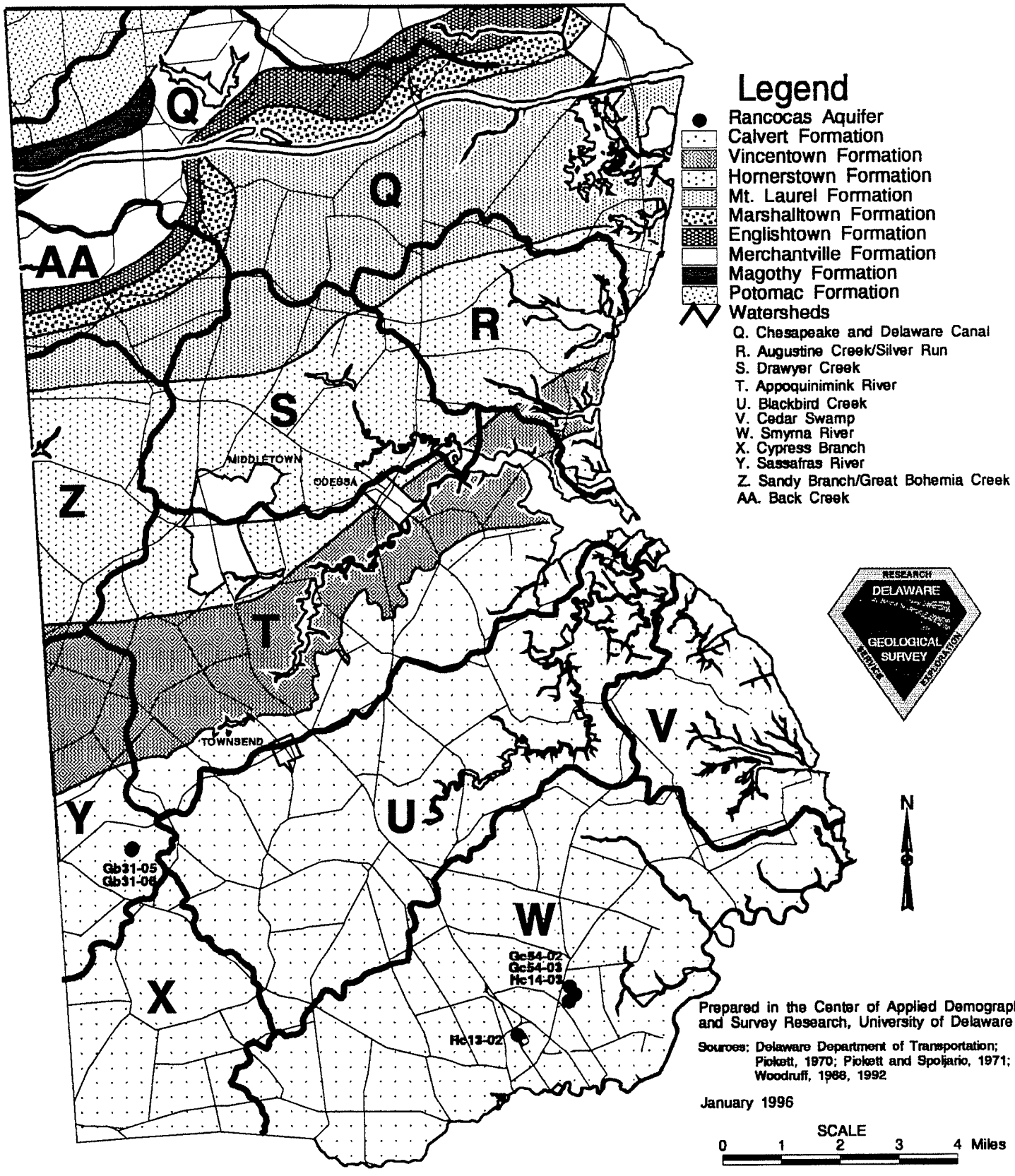

Figure 16. Wells screened in the Rancocas Group with aquifer test data available.

not generally used for public water supply in the area where it functions as an unconfined aquifer primarily because of its inability to yield appreciable quantities of water (>100 gpm) to wells. In some areas the Rancocas can form a locally productive aquifer in its subcrop area where it is overlain by the Columbia Formation. However, it would not be practical to use all of the available drawdown in the Rancocas where it is overlain by the Columbia Formation because well yields would diminish as the aquifer became dewatered.

Aquifer test data from the Rancocas are available from three locations in the confined portion of the aquifer (Table 8). Transmissivity values range from 1,523 ft^2/d to 2,647 ft^2/d. Storage coefficients range from 0.0011 to 0.00028. Values of specific capacity range from 3.0 to 3.7 gpm/ft.

Table 8
Aquifer Test Results - Rancocas Group

Location and Pumping Well Number	Date, Test Duration, and Pump Rate	Observation Wells and Distance from Pump Well	Analysis By	Method of Analysis	Transmissivity (ft^2/d)	Coefficient of Storage (dimensionless)	Specific Capacity (gpm/ft/dw)
Springhaven Gb31-06	4/1/94 72 Hrs. 175 gpm	Gb31-05 42' Barn Well	Ground Water Associates	Cooper Jacob Theis	1,523 1,787	1.10E-03 2.80E-04	3.7
Smyrna Rest Area Hc13-02	2/16/81 22.5 Hrs. 150 gpm	-	DGS	Cooper Jacob	2,647	-	3.0
De. Correctional Center Hc14-03	3/28/67 12 Hrs. 503 gpm	Gc54-02 1,060' Gc54-03 1,380'	R.W. Sundstrom	Modified Theis	2,547 2,560	2.80E-04 2.70E-04	3.5
De. Correctional Center Gc54-03	4/10/67 12 Hrs. 146 gpm	Gc54-02 512' Hc14-03 1,380'	R.W. Sundstrom	Modified Theis	1,867 2,240	2.20E-04 1.90E-04	3.4

Groot et al. (1983a) report that the recharge area of the Rancocas is approximately 41 square miles and that the potential exists for about 20 mgd of recharge to the Rancocas. However, in this area the likelihood of developing high yielding wells (>100 gpm) is low because of limited available drawdown.

The area of potential use for developing high-yielding wells (>100 gpm) is generally limited to watersheds in the Blackbird Creek, Cypress Branch, Smyrna River, and Cedar Swamp watersheds as depicted on Figure 17. There may be isolated areas in the Sassafras River and Appoquinimink River watersheds where the Rancocas may be locally productive.

The estimated long-term availability by watershed for the Rancocas is contained in Table 9. The total amount of water available based on current information is estimated to be 5.2 mgd from wells spaced approximately 3 miles apart yielding about 300 gpm per well.

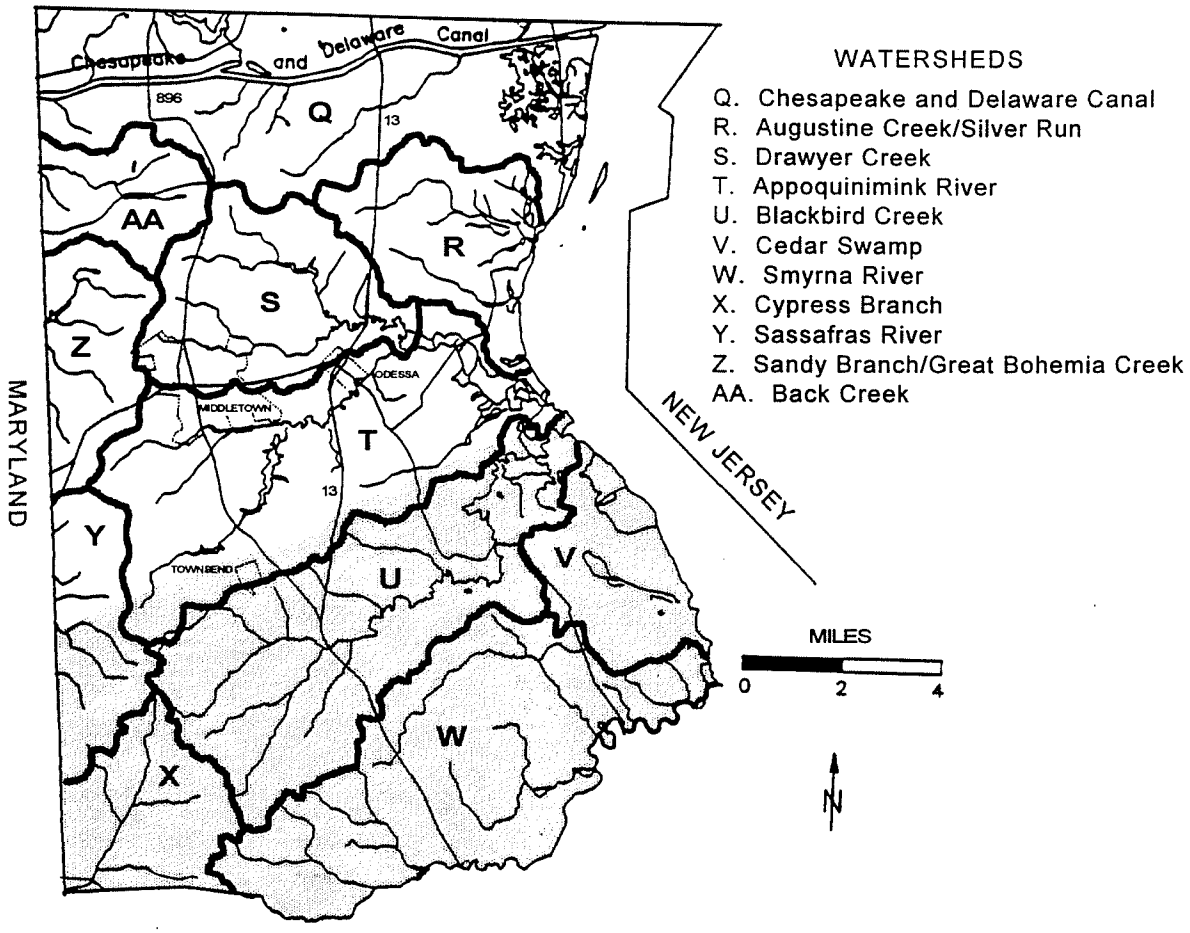

Figure 17. Area of potential use of the Rancocas Group (shaded area).

Table 9
Long-Term Water Availability - Rancocas Group

Watershed Designation	Watershed Name	Water Availability (mgd)
Q	Chesapeake and Delaware Canal	x
AA	Back Creek	x
R	Augustine Creek/Silver Run	x
S	Drawyer Creek	x
T	Appoquinimink River	x
U	Blackbird Creek	1.82
V	Cedar Swamp	0.22
W	Smyrna River	2.11
X	Cypress Branch	0.76
Y	Sassafras River	0.27
Z	Sandy Branch/Great Bohemia Creek	x

Columbia Aquifer System

The Columbia Formation is the surficial geologic unit in southern New Castle County and it unconformably overlies older formations. In northern Delaware the Columbia Formation is composed of fine to coarse sand and gravel with boulders in addition to some silt and clay. The sediments are fluvial and were deposited in channels, flood plains, cut-off meanders, and levees (Spoljaric and Woodruff, 1970).

The Columbia forms a locally productive aquifer, especially where it is in hydraulic contact with underlying aquifers. In most instances it is used for small domestic supplies and for irrigation by the agricultural community. However, because it is generally less than 40 ft. thick, it does not usually form the major part of the water-table aquifer.

This near-surface aquifer, which naturally receives its water from infiltration of precipitation, is protected by a relatively thin soil zone that functions as a filtering mechanism. The hydrologic characteristics and the position with respect to land surface render it particularly susceptible to contamination. Approximately three-quarters of the annual surface-water streamflow is provided through natural discharge of ground water (Johnston, 1976). In addition, recharge to deeper aquifers is through the Columbia Formation.

The Columbia is not generally used for public water supply purposes in the study area because in most areas it is relatively thin with insufficient saturated thickness to yield appreciable quantities of water to wells. However, there are a few areas where high-yielding wells have been constructed in the Columbia Formation. In some

instances, multiple aquifers, including the Columbia, have had to be screened to obtain high yields for agricultural purposes.

Very few aquifer tests have been conducted in wells constructed in the Columbia in southern New Castle County (Fig 18). Johnston (1973) estimated transmissivities in the Columbia aquifer in southern New Castle County (Table 10). Four of the wells (Eb55-04, Eb55-05, Ec41-07, and Fb23-06) are multiple screened in the Columbia and underlying Englishtown-Mt. Laurel aquifer system and do not, therefore, represent actual aquifer characteristics of the Columbia. However, they do provide an estimate of aquifer characteristics at these sites of the water-table aquifer. Johnston (1973) estimated transmissivities from specific capacities of the wells and from drillers' reports and well logs.

Table 10
Aquifer Test Results - Columbia Formation

Location and Pumping Well Number	Date, Test Duration, and Pump Rate	Observation Wells and Distance from Pump Well	Analysis By	Method of Analysis	Transmissivity (ft^2/d)	Coefficient of Storage (dimensionless)	Specific Capacity (gpm/ft/dw)
Baker Brothers Eb55-04	-	-	Johnston	estimated	4,000	-	19
Warren Baker Eb55-05	-	-	Johnston	estimated	4,800	-	24
Fred Haas Ec41-07	-	-	Johnston	estimated	800	-	4
Fred Wicks Fb23-06	-	-	Johnston	estimated	1,600	-	8.3
Univ of DE Fb34-16	5/7/70 24 Hrs. 60 gpm	Fb34-17 26.5 ft.	Woodruff	Theis	4,500	3.00E-03	3.5
George & Sam Brooks Fb51-04	1958 - 520 gpm	-	Johnston	estimated	4,000	-	19
George & Sam Brooks Fb51-05	1958 - 616 gpm	-	Johnston	estimated	4,000	-	20
Norman & Sam Brooks Fb51-06	12/1/66 - 298 gpm	-	Johnston	estimated	2,500	-	12
Chris Wicks Fb53-07	11/3/66 - 578 gpm	-	Johnston	estimated	1,900	-	9
Gerald Zeh Ga15-04	11/12/58 - 2100 gpm	-	Johnston	estimated	10,000	-	51

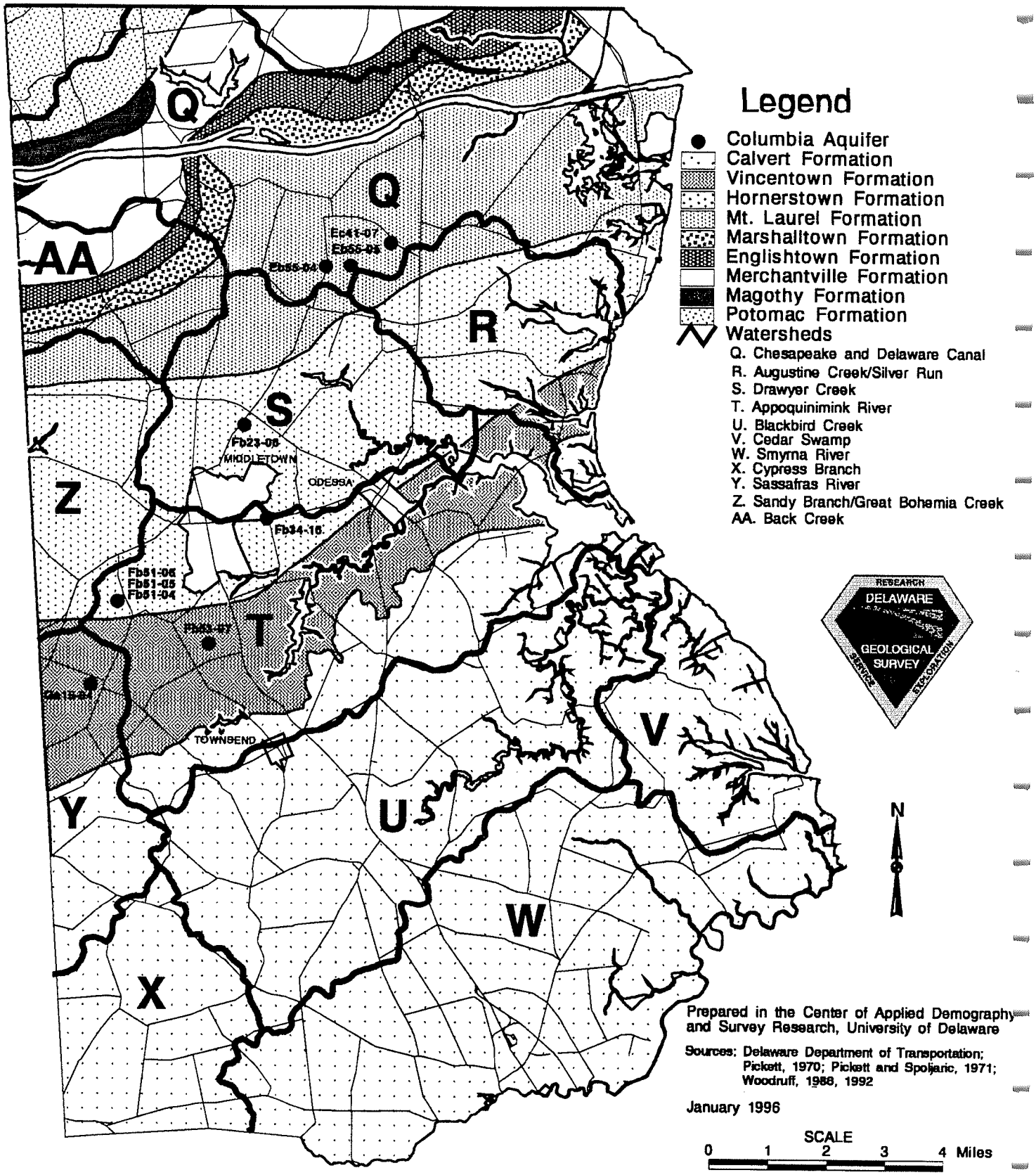

Figure 18. Wells screened in the Columbia Formation with aquifer test data available.

Estimated transmissivities from six wells in the Columbia range from 1,900 to 4,500 ft^2/d. Values of specific capacity range from 3.5 to 51 gpd/ft. The high values of specific capacity in wells Fb51-04, Fb51-05, and Ga15-04 were most likely determined from relatively short aquifer tests and may not represent realistic values.

The area of potential use for developing high-yielding wells (>100 gpm) is generally limited to portions of the Drawyer Creek, Appoquinimink River, Sassafras River, and Sandy Branch/Great Bohemia Creek watersheds (Fig. 19) where saturated thickness exceeds 40 ft. There may be other areas where the Columbia may be locally productive; however, such areas are likely to be relatively small.

The estimated long-term availability by watershed for the Columbia is contained in Table 11. The total amount of water available based on current information is estimated to be 1.4 mgd from wells spaced approximately 2 miles apart yielding about 250 gpm per well.

Table 11
Long-Term Water Availability - Columbia Formation

Watershed Designation	Watershed Name	Water Availability (mgd)
Q	Chesapeake and Delaware Canal	x
AA	Back Creek	x
R	Augustine Creek/Silver Run	x
S	Drawyer Creek	0.13
T	Appoquinimink River	0.70
U	Blackbird Creek	x
V	Cedar Swamp	x
W	Smyrna River	x
X	Cypress Branch	x
Y	Sassafras River	0.28
Z	Sandy Branch/Great Bohemia Creek	0.33

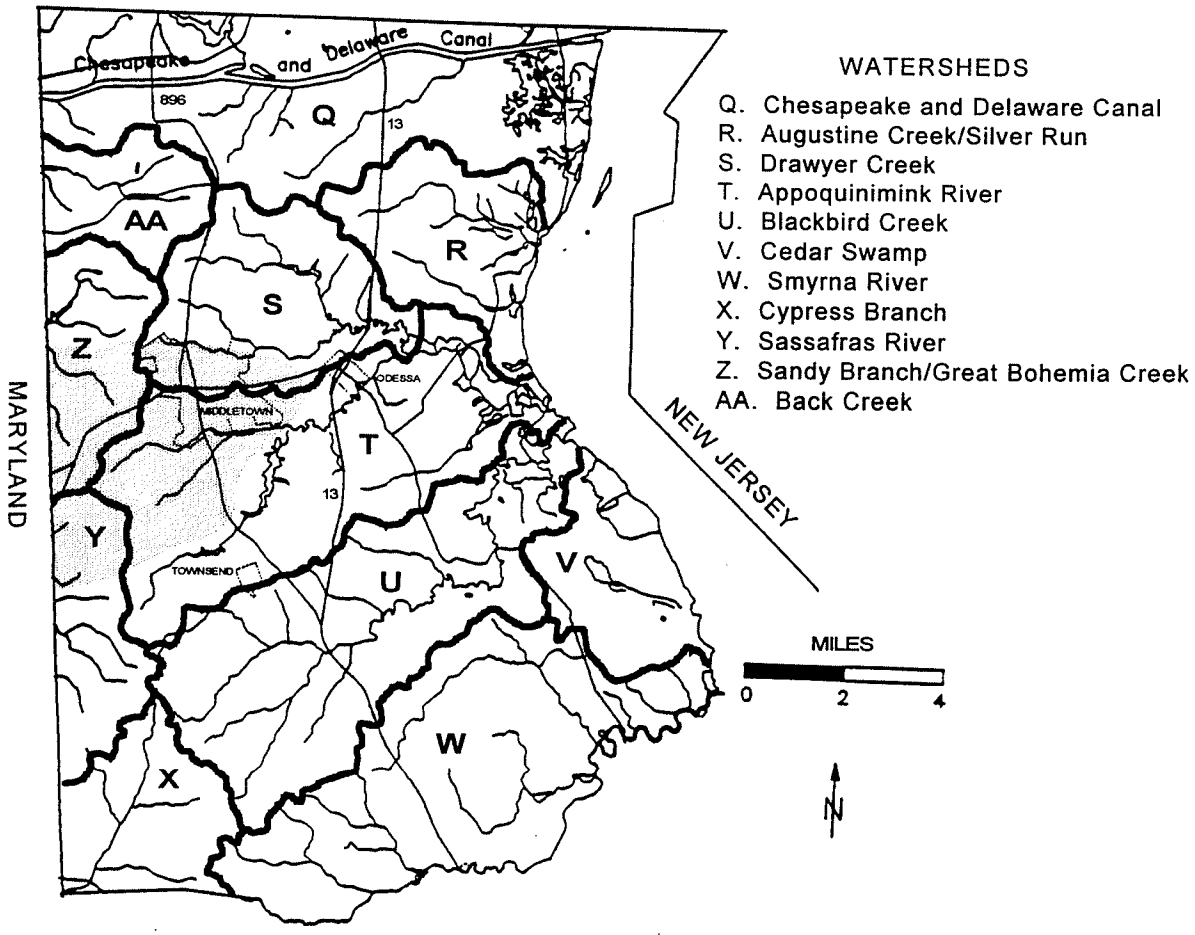

Figure 19. Area of potential use of the Columbia Formation (shaded region).

SUMMARY

The availability of ground water from aquifers in the Potomac, Magothy, Englishtown-Mt. Laurel, and Columbia formations, and the Rancocas Group in southern New Castle County is estimated to be about 20 mgd from wells yielding at least 100 gpm. The estimated amount of ground water available from each aquifer in each of the eleven watersheds is presented in Table 12.

Table 12
Summary of Estimated Water Availability

Watershed Designation	Watershed Name	Potomac (mgd)	Magothy (mgd)	Englishtown/Mt. Laurel (mgd)	Rancocas (mgd)	Columbia (mgd)	Estimated Water Availability per Watershed (mgd)
Q	Chesapeake and Delaware Canal	1.10	0.11	x	x	x	1.21
AA	Back Creek	0.44	0.11	x	x	x	0.55
R	Augustine Creek/Silver Run	0.48	0.08	0.85	x	x	1.41
S	Drawyer Creek	1.00	0.24	0.99	x	0.13	2.36
T	Appoquinimink River	1.61	0.57	0.49	x	0.70	3.37
U	Blackbird Creek	0.91	0.59	0.62	1.82	x	3.94
V	Cedar Swamp	x	0.02	0.07	0.22	x	0.31
W	Smyrna River	x	x	0.72	2.11	x	2.83
X	Cypress Branch	0.28	0.24	0.26	0.76	x	1.54
Y	Sassafras River	0.48	0.18	0.16	0.27	0.28	1.37
Z	Sandy Branch/Great Bohemia Creek	0.59	0.18	0.08	x	0.33	1.18
		6.89	2.32	4.24	5.18	1.44	20.07

The Potomac is expected to yield about 7 mgd from wells spaced approximately 3 miles apart yielding about 300 gpm per well. Constraints on development of the Potomac include the location of the salt-fresh water interface in southernmost New Castle County, additional lowering of heads in the Potomac aquifer in northern New Castle County, and recharge by vertical leakage.

The Magothy is expected to yield about 2.3 mgd from wells with an average spacing of approximately 5 miles yielding between 100 to 250 gpm per well. The highest yields can be expected from areas in the central and southern portion of the study area where available drawdowns are greatest. Because the hydrologic characteristics in the aquifer are poor to good, the location of high-yielding wells in the Magothy in the vicinity of the C&D Canal to several miles south where current growth is occurring is limited by the absence of the Magothy in portions of this area, the potential for salt-water intrusion near the C&D Canal, and limited available drawdown. There is also a potential for salt-water intrusion into the Magothy in southernmost New Castle County.

The estimated long-term water availability from the Englishtown-Mt. Laurel aquifer is about 4.2 mgd from wells spaced approximately 4 miles aprart yielding 100 to 200 gpm per well. The area of potential use of this aquifer is limited to where it functions as a confined aquifer system. As with the Magothy, the Englishtown-Mt.

Laurel is not favorable for developing high-yielding wells in localized pumping centers. Wells yielding more than 100 gpm will have to be evenly spread over the area of use to maximize use of the aquifer.

Estimated ground-water availability from the Rancocas is estimated to be about 5.2 mgd from wells spaced approximately 3 miles apart yielding about 300 gpm per well. The area of potential use of the Rancocas for high-yielding wells is generally limited to the lower portion of southern New Castle County where the Rancocas is a confined aquifer. It is not generally capable of yielding more than 100 gpm to individual wells in the area where it is unconfined because of its hydrologic characteristics and limited available drawdown. However, there may be localized areas where the saturated thickness of the Rancocas and overlying Columbia may be thick enough to support localized high-yielding wells. Maximum yields from the Rancocas can be achieved by carefully spacing wells to minimize mutual well interference.

The Columbia is expected to yield about 1.4 mgd from wells spaced approximately 2 miles apart yielding about 250 gpm per well. Water availability from high-yielding wells in the Columbia Formation is restricted by the relatively small saturated thickness of the aquifer. Therefore, it is not used for public water supplies at this time. However, there are areas where the aquifer is locally productive yielding several hundred gpm to individual wells for agricultural purposes. Current mapping indicates that the area with the most potential for developing high-yielding wells is located in west-central southern New Castle County.

A 30 mgd difference in estimated water availability for southern New Castle County is apparent when figures from this study are compared to Groot et al. (1983a) (Table 13). Differences are attributed to refined hydrologic data using recently acquired aquifer test results which were used to refine an aquifer's area of potential use. The large difference in water availability in the water table aquifer is due to the fact that Groot et al. (1983a) assumed a minimum yield of 20 gpm whereas this study assumed production of at least 100 gpm to individual wells. This assumption limited the area of potential use for developing high-yielding wells in the water table aquifer to the west-central portion of southern New Castle County (Fig. 19) where saturated thicknesses are great enough to support such wells.

Table 13
Comparison of Water Availability Reports

Aquifer	Groot et al. (1983a) (mgd)	SNCC Study (1996) (mgd)
Potomac	6.9	6.9
Magothy	3.0	2.3
Englishtown/ Mt. Laurel	1.0	4.2
Rancocas	3.0	5.2
Water Table	*36	*1.4
TOTALS	49.9	20.0

*Please note explanation in last paragraph on page 41.

Based on the results of this investigation the amount of water available for water-supply purposes appears to be adequate to meet the projected maximum daily demand of 18.6 mgd through the year 2040 (Metcalf and Eddy, 1991b; Table 14). The estimated maximum daily demand figure includes the projected average daily demand for irrigation which remains steady at 4.7 mgd through the year 2040 (Metcalf and Eddy, 1991b).

Table 14
Estimated Water Availability and Daily Demand

Year	Estimated Water Supply (mgd)	Estimated Maximum Daily Demand (mgd)
1990	20.0	6.8
1995	20.0	10.7
2000	20.0	11.1
2005	20.0	11.9
2010	20.0	12.8
2020	20.0	14.5
2030	20.0	16.6
2040	20.0	18.6

The amount of ground water that can potentially be developed depends on hydrologic characteristics of the aquifer, available recharge, yield of individual wells, and on well spacing. In general, in aquifers with fair to good hydrologic characteristics, more water can be obtained from many lower-yielding wells (100-200 gpm) than from a few high-yielding wells (500-600 gpm).

The estimated amount of ground water that can be developed from each of the aquifers in each of the watersheds is based on the amount of information available at the time of this investigation and a set of assumptions. In general, more hydrologic data are available for the northern portion of the study area than the southern portion. Water availability from aquifers in the Potomac, Magothy, and Mt. Laurel in southernmost New Castle County should be refined as more data are obtained.

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APPENDIX A

Southern New Castle County
Ground-Water Monitoring Network
Wells Located Using GPS

DGS ID	DNREC ID	Latitude	Longitude	Aquifer	Watershed
Ea14-32	100813	393422.11	754647.76	ptg	Q
Ea14-33	095617	393422.35	754648.28	ptg	Q
Ea14-34	101100	393403.53	754646.94	ptg	Q
Ea24-07	096500	393314.16	754649.68	ptg	Q
Ea35-21	102148	393241.37	754545.30	ptg	Q
Ea44-11	086812	393133.99	754601.58	clg	Q
Ea44-12	086813	393133.88	754601.49	m	Q
Ea45-04	100389	393133.61	754559.87	m	Q
Ea55-16	097287	393008.93	754504.78	clg	AA
Ea55-17	097288	393021.49	754520.44	clg	AA
Ea55-18	097289	393009.56	754537.68	clg	AA
Ea55-19	097290	393029.05	754555.65	clg	AA
Eb31-43	095414	393202.98	754414.57	ptg	Q
Eb31-44	095413	393203.26	754414.69	m	Q
Eb33-40	096189	393206.28	754220.98	clg	Q
Eb33-41	096190	393212.85	754221.98	clg	Q
Eb33-42	096191	393210.28	754226.11	clg	Q
Eb33-43	096192	393211.90	754234.93	clg	Q
Eb33-46	096195	393214.31	754250.15	clg	Q
Eb33-47	096196	393210.24	754242.38	clg	Q
Eb41-15	089665	393143.08	754403.84	m	AA
Eb43-04	068945	393103.84	754249.57	m	Q
Eb43-10	068944	393103.77	754249.78	m	Q
Eb51-11	080899	393024.31	754416.20	m	AA
Eb51-13	086499	393025.76	754416.99	m	AA
Eb51-14	086498	393027.26	754417.78	m	AA
Eb55-08	098124	393036.97	754042.73	ptg	Q
Eb55-09	098123	393039.46	754050.74	ptg	Q
Eb55-10	098112	393045.40	754050.65	ptg	Q
Ec51-16	082244	393035.04	753911.89	ml	R
Ec51-19	082242	393035.36	753911.67	ml	R
Ec51-20	082243	393035.43	753911.58	et	R
Ec52-09	078973	393001.16	753838.46	ml	R
Ec52-21	084134	393000.58	753839.01	ml	R
Ec52-23	099469	393047.58	753814.19	ptg	R
Ec52-24	101153	393037.67	753813.37	ptg	R
Ec52-25	099470	393053.23	753818.40	ptg	R
Fa15-06	083638	392930.27	754545.05	m	Z
Fa15-07	083639	392930.50	754543.72	m	Z
Fa15-08	083640	392931.20	754541.18	m	Z
Fa15-09	097286	392951.09	754537.34	clg	AA
Fb14-12	097371	392920.59	754137.07	ptg	S
Fb14-13	097370	392919.56	754114.21	ptg	S
Fb24-06	084852	392847.32	754104.02	et/ml	S
Fb24-11	089852	392847.68	754102.47	ml	S
Fb43-03	010454	392618.12	754247.20	m	T
Fc12-16	078974	392959.06	753840.08	ml	R
Fc12-22	096299	392915.71	753818.53	et/ml	R
Fc12-23	096300	392914.64	753819.06	et/ml	R
Fc15-05	096840	392910.86	753535.48	ml	R
Fc15-06	097875	392902.97	753535.85	ml	R
Fc31-39	071254	392739.5	753958.26	ml	S
Fc32-08	090409	392709.16	753806.53	vt	T
Fc32-09	090410	392707.16	753843.05	vt	T
Fc32-10	090622	392707.05	753843.25	vt	T
Fc42-10	090406	392618.07	753829.81	vt	T
Fc42-13	097960	392639.76	753847.58	vt	T
Fc42-14	098133	392639.84	753847.47	vt	T
Fc42-15	090407	392635.61	753804.17	vt	T
Fc43-02	090408	392644.62	753750.97	vt	T
Fc51-27	099806	392531.48	753906.23	ptg	T
Fc51-28	099009	392531.35	753906.62	rng	T
Gb31-05	098805	392210.54	754431.43	rng	Y
Gb31-06	098741	392210.05	754431.80	rng	Y

Watershed Key:
Q. Chesapeake and Delaware Canal
R. Augustine Creek/Silver Run
S. Drawyer Creek
T. Appoquinimink River
Y. Sassafras River
Z. Sandy Branch/Great Bohemia Creek
AA. Back Creek

Aquifer Key:
clg = Columbia
rng = Rancocas
vt = Vincentown
ml = Mt. Laurel
et/ml = Englishtown/Mt. Laurel
et = Englishtown
m = Magothy
ptg = Potomac

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Asbury Chase Aquifer Test
DGS ID Ec51-20; DNREC ID 082243; Pump Well
Date: May 9, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0800	0	30.41	0.00	
0801	1	82.90	52.49	
0802	2	97.75	67.34	
0802.5	2.5	101.50	71.09	
0803	3	103.22	72.81	41 gpm
0804	4	105.18	74.77	
0804.5	4.5	105.79	75.38	
0805	5	106.23	75.82	
0806	6	106.66	76.25	
0807	7	106.88	76.47	
0808	8	107.03	76.62	
0809	9	107.23	76.82	41 gpm
0810	10	107.42	77.01	
0812	12	107.52	77.11	
0814	14	107.65	77.24	
0816	16	107.78	77.37	
0818	18	107.84	77.43	
0820	20	107.83	77.42	
0823	23	108.04	77.63	
0824	24	108.06	77.65	
0826	26	108.09	77.68	
0828	28	108.03	77.62	
0830	30	108.05	77.64	
0835	35	108.15	77.74	
0840	40	108.21	77.80	
0845	45	108.23	77.82	
0850	50	108.36	77.95	
0855	55	108.35	77.94	40 gpm
0900	60	108.33	77.92	
0905	65	108.35	77.94	
0910	70	108.43	78.02	
0920	80	108.49	78.08	tech. change
0930	90	108.68	78.27	
0940	100	109.02	78.61	
0950	110	109.11	78.70	
1000	120	109.01	78.60	
1010	130	108.76	78.35	
1020	140	108.87	78.46	41 gpm
1030	150	108.91	78.50	
1040	160	109.04	78.63	
1050	170	108.91	78.50	
1100	180	109.09	78.68	
1110	190	108.91	78.50	
1120	200	108.89	78.48	
1130	210	108.92	78.51	
1145	225	108.85	78.44	
1200	240	108.95	78.54	40 gpm
1215	255	108.87	78.46	
1230	270	109.02	78.61	
1245	285	109.00	78.59	
1300	300	108.96	78.55	40 gpm
1315	315	108.96	78.55	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1330	330	108.94	78.53	40 gpm
1345	345	108.88	78.47	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Asbury Chase Aquifer Test
DGS ID Ec51-20; DNREC ID 082243; Pump Well
Date: May 9, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
1345	345	108.88	0	0.00	
1346	346	57.66	1	51.22	
1347	347	45.71	2	63.17	
1348	348	40.08	3	68.8	
1349	349	37.97	4	70.91	
1350	350	36.93	5	71.95	
1351	351	36.32	6	72.56	
1352	352	35.95	7	72.93	
1353	352	35.70	8	73.18	
1354	354	35.36	9	73.52	
1355	355	35.12	10	73.76	
1357	357	34.87	12	74.01	
1359	359	34.34	14	74.54	
1401	361	34.22	16	74.66	
1403	363	33.90	18	74.98	
1405	365	33.76	20	75.12	
1407	367	33.65	22	75.23	
1409	369	33.40	24	75.48	
1411	371	33.27	26	75.61	
1413	373	33.32	28	75.56	
1415	375	33.10	30	75.78	
1416	376				hose moved
1420	380	32.85	35	76.03	
1425	385	32.73	40	76.15	
1430	390	32.36	45	76.52	
1436	396	32.25	50	76.63	
1440	400	32.12	55	76.76	tech. change
1445	405	32.06	60	76.82	
1450	410	31.91	65	76.97	
1455	415	31.78	70	77.1	
1505	425	31.55	80	77.33	
1515	435	31.45	90	77.43	
1525	445	31.28	100	77.6	pump on
1535	455	31.60	110	77.28	
1545	465	31.67	120	77.21	
1555	475	31.62	130	77.26	
1605	485	31.64	140	77.24	
1616	495	31.59	150	77.29	
1625	505	31.55	160	77.33	
1635	515	31.56	170	77.32	
1645	525	31.52	180	77.36	
1700	540	31.56	195	77.32	
1715	555	31.41	210	77.47	pump off
1730	570	31.10	225	77.78	
1745	585	30.70	240	78.18	
1800	600	30.60	255	78.28	
1815	615	30.46	270	78.42	
1830	630	30.37	285	78.51	
1845	645	30.30	300	78.58	
1900	700	30.23	315	78.65	
1915	715	30.79	330	78.09	pump on

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
1930	730	30.93	345	77.95	
1945	745	30.92	360	77.96	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Asbury Chase Aquifer Test
DGS ID Ec51-16; DNREC ID 082244; Observation Well
Date: May 9, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0800	0	30.00	0.00	
0801	1	30.12	0.12	
0802	2	30.75	0.75	
0803	3	31.23	1.23	
0804	4	31.73	1.73	
0805	5	32.10	2.10	
0806	6	32.44	2.44	
0807	7	32.68	2.68	
0808	8	32.79	2.79	
0809	9	33.04	3.04	
0810	10	33.19	3.19	
0812	12	33.45	3.45	
0814	14	33.64	3.64	
0816	16	33.84	3.84	
0818	18	34.06	4.06	
0820	20	34.80	4.80	
0822	22	34.42	4.42	
0824	24	34.89	4.89	
0826	26	34.54	4.54	
0828	28	35.16	5.16	
0830	30	34.91	4.91	
0835	35	35.08	5.08	
0840	40	35.13	5.13	
0845	45	35.68	5.68	
0850	50	35.82	5.82	
0855	55	35.74	5.74	
0900	60	35.97	5.97	
0905	65	35.94	5.94	
0910	70	35.94	5.94	
0921	81	36.27	6.27	
0931	91	36.38	6.38	
0941	101	36.35	6.35	
0951	111	36.47	6.47	
1001	121	36.71	6.71	
1011	131	36.73	6.73	
1021	141	36.78	6.78	
1031	151	36.94	6.94	
1041	161	36.96	6.96	
1051	171	37.08	7.08	
1101	181	37.14	7.14	
1111	191	37.15	7.15	
1121	201	37.23	7.23	
1131	211	37.31	7.31	
1146	226	37.30	7.30	
1201	241	37.31	7.31	
1216	256	37.42	7.42	
1232	271	37.43	7.43	
1246	286	37.52	7.52	
1301	301	37.56	7.56	
1316	316	37.57	7.57	
1331	331	37.71	7.71	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1345	345	37.69	7.69	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Asbury Chase Aquifer Test
DGS ID Ec51-16; DNREC ID 082244; Observation Well
Date: May 9, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
1345	345	37.69	0	0.00	
1346	346	37.39	1	0.3	
1347	347	36.61	2	1.08	
1348	348	35.85	3	1.84	
1349	349	35.25	4	2.44	
1350	350	34.83	5	2.86	
1351	351	34.50	6	3.19	
1352	352	34.09	7	3.6	
1353	353	33.93	8	3.76	
1354	354	33.70	9	3.99	
1355	355	33.58	10	4.11	
1357	357	33.28	12	4.41	
1359	359	33.03	14	4.66	
1361	361	32.77	16	4.92	
1363	363	32.67	18	5.02	
1365	365	32.50	20	5.19	
1367	367	32.35	22	5.34	
1369	369	32.23	24	5.46	
1371	371	32.09	26	5.6	
1373	373	32.00	28	5.69	
1415	375	31.95	30	5.74	
1420	380	31.65	35	6.04	
1425	385	31.44	40	6.25	
1430	390	31.25	45	6.44	
1436	396	31.06	51	6.63	
1441	401	30.97	56	6.72	
1446	406	30.82	61	6.87	
1451	411	30.72	66	6.97	
1456	416	30.66	71	7.03	
1506	426	30.45	81	7.24	
1516	436	30.29	91	7.4	
1526	446	30.31	101	7.38	pump on
1536	456	30.90	111	6.79	
1546	466	30.91	121	6.78	
1556	476	30.83	131	6.86	
1606	486	30.80	141	6.89	
1617	496	30.80	151	6.89	
1626	506	30.81	161	6.88	
1636	516	30.75	171	6.94	
1646	526	30.80	181	6.89	
1701	541	30.80	196	6.89	
1716	556	30.80	211	6.89	pump off
1731	571	30.10	226	7.59	
1746	586	29.70	241	7.99	
1801	601	29.60	256	8.09	
1816	616	29.50	271	8.19	
1831	631	29.30	286	8.39	
1846	646	29.25	301	8.44	
1901	701	29.21	316	8.48	
1916	716	30.13	331	7.56	pump on

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
1931	731	30.15	346	7.54	
1946	746	30.21	361	7.48	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Betty Robbin's Aquifer Test
DGS ID Fc31-39; DNREC ID 071254; Pump Well
Date: April 17, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1100	0	42.20	0.00	
1101	1		missed	reading
1102	2	102.48	60.28	80 gpm
1103	3	107.00	64.80	
1104	4	109.26	67.06	
1105	5	110.03	67.83	
1106	6	111.15	68.95	
1107	7	111.59	69.39	82 gpm
1108	8	112.06	69.86	
1109	9	112.53	70.33	
1110	10	112.96	70.76	80 gpm
1112	12	113.66	71.46	
1114	14	114.19	71.99	
1116	16	114.59	72.39	
1118	18	114.87	72.67	
1120	20	115.11	72.91	
1122	22	115.33	73.13	80 gpm
1124	24	115.56	73.36	
1126	26	115.90	73.70	
1128	28	116.09	73.89	
1130	30	116.31	74.11	80 gpm
1135	35	116.72	74.52	80 gpm
1140	40	117.06	74.86	81 gpm
1145	45	117.39	75.19	
1150	50	117.84	75.64	
1155	55	118.00	75.80	
1200	60	118.08	75.88	80 gpm
1205	65	118.58	76.38	
1210	70	118.68	76.48	79 gpm
1220	80	118.95	76.75	
1230	90	119.40	77.20	
1240	100	119.51	77.31	
1250	110	119.50	77.30	80 gpm
1300	120	119.85	77.65	
1310	130	120.08	77.88	
1320	140	120.30	78.10	
1330	150	120.58	78.38	
1340	160	120.71	78.51	
1350	170	120.86	78.66	78 gpm
1400	180	121.07	78.87	
1415	195	121.17	78.97	
1430	210	121.33	79.13	
1445	225	121.68	79.48	
1500	240	121.57	79.37	
1515	255	121.65	79.45	
1530	270	121.86	79.66	
1545	285	121.91	79.71	80 gpm
1600	300	122.13	79.93	
1615	315	122.27	80.07	
1630	330	122.39	80.19	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1700	360	122.64	80.44	tech. change
1730	390	122.85	80.65	
1800	420	123.08	80.88	
1830	450	123.29	81.09	
1900	480	123.37	81.17	generator
1930	510	123.75	81.55	@ 1/2 tank
2000	540	124.37	82.17	
2100	600	124.63	82.43	tech. change
2200	660	124.75	82.55	78 gpm
2300	720	124.94	82.74	79 gpm
2400	780	124.96	82.76	kink in hose
0100	840	125.22	83.02	
0200	900	125.35	83.15	
0300	960	125.44	83.24	80 gpm
0400	1020	125.56	83.36	79 gpm
0500	1080	125.62	83.42	79 gpm
0600	1140	125.68	83.48	78 gpm
0700	1200	125.66	83.46	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Betty Robbin's Aquifer Test
DGS ID Fc31-39; DNREC ID 071254; Pump Well
Date: April 18, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
0700	1200	125.66	0	0.00	
0701	1201	81.50	1	44.16	
0702	1202	71.52	2	54.14	
0703	1203	65.77	3	59.89	
0704	1204	62.98	4	62.68	
0705	1205	61.35	5	64.31	
0706	1206	60.21	6	65.45	
0707	1207	59.54	7	66.12	
0708	1208	58.82	8	66.84	
0709	1209	58.33	9	67.33	
0710	1210	57.97	10	67.69	
0712	1212	57.17	12	68.49	
0714	1214	56.60	14	69.06	
0716	1216	56.11	16	69.55	
0718	1218	55.65	18	70.01	
0720	1220	55.29	20	70.37	
0722	1222	55.00	22	70.66	
0724	1224	54.76	24	70.9	
0726	1226	54.35	26	71.31	
0728	1228	54.20	28	71.46	
0730	1230	53.93	30	71.73	
0735	1235	53.32	35	72.34	
0740	1240	52.91	40	72.75	
0745	1245	52.48	45	73.18	
0750	1250	52.11	50	73.55	
0755	1255	51.85	55	73.81	
0800	1260	51.54	60	74.12	
0805	1265	51.23	65	74.43	
0810	1270	51.02	70	74.64	
0820	1280	50.55	80	75.11	
0830	1290	50.23	90	75.43	
0840	1300	49.87	100	75.79	
0850	1310	49.63	110	76.03	
0900	1320	49.30	120	76.36	
0910	1330	49.12	130	76.54	
0920	1340	48.89	140	76.77	
0930	1350	48.66	150	77	
0940	1360	48.47	160	77.19	
0950	1370	48.43	170	77.23	
1000	1380	48.11	180	77.55	
1015	1395	47.90	195	77.76	
1030	1410	47.71	210	77.95	
1045	1425	47.50	225	78.16	
1100	1440	47.41	240	78.25	
1115	1455	47.21	255	78.45	
1130	1470	47.04	270	78.62	
1145	1485	46.87	285	78.79	
1200	1500	46.65	300	79.01	
1215	1515	46.69	315	78.97	
1230	1530	46.46	330	79.2	

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
1245	1545	46.41	345	79.25	
1300	1560	46.29	360	79.37	
1315	1575	46.21	375	79.45	
1330	1590	46.10	390	79.56	
1400	1620	45.81	420	79.85	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Cantewell Aquifer Test
Pump Well 102217
Date: April 13, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1200	0	17.74	0.00	
1201	1	61.00	43.26	
1202	2	71.57	53.83	80 gpm
1203	3	76.74	59.00	
1204	4	79.11	61.37	
1205	5	80.19	62.45	79 gpm
1206	6	80.79	63.05	79 gpm
1207	7	81.67	63.93	opened valve
1208	8	82.55	64.81	80 gpm
1209	9	83.11	65.37	
1210	10	83.57	65.83	80 gpm
1212	12	84.03	66.29	80 gpm
1214	14	84.37	66.63	80 gpm
1216	16	84.57	66.83	80 gpm
1218	18	84.97	67.23	
1220	20	85.17	67.43	80 gpm
1222	22	84.35	66.61	adjusted hose
1224	24	85.51	67.77	readjusted hose
1226	26	86.03	68.29	80 gpm
1228	28	86.09	68.35	
1230	30	86.34	68.60	80 gpm
1235	35	86.61	68.87	
1240	40	86.77	69.03	80 gpm
1245	45	87.23	69.49	
1250	50	87.26	69.52	
1255	55	87.28	69.54	79 gpm
1300	60	87.97	70.23	80 gpm
1305	65	88.04	70.30	
1310	70	88.37	70.63	80 gpm
1320	80	88.41	70.67	80 gpm
1330	90	88.79	71.05	
1340	100	88.94	71.20	
1350	110	88.92	71.18	
1400	120	89.10	71.36	
1410	130	89.69	71.95	79 gpm
1420	140	89.49	71.75	
1430	150	89.76	72.02	
1440	160	89.75	72.01	80 gpm
1450	170	89.92	72.18	
1500	180	89.97	72.23	
1515	195	90.06	72.32	80 gpm
1530	210	90.16	72.42	
1545	225	90.46	72.72	
1600	240	90.57	72.83	78 gpm
1615	255	91.87	74.13	
1630	270	92.13	74.39	tech. change
1645	285	92.14	74.40	
1700	300	92.43	74.69	
1715	315	92.40	74.66	
1730	330	92.50	74.76	
1745	345	92.60	74.86	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1800	360	92.71	74.97	
1815	375	92.83	75.09	
1830	390	92.94	75.20	
1900	420	93.06	75.32	
1930	450	93.14	75.40	
2000	480	93.20	75.46	
2030	510	93.30	75.56	
2100	540	93.56	75.82	
2200	600	93.76	76.02	
2300	660	93.86	76.12	tech. change
0000	720	93.93	76.19	80 gpm
0100	780	94.08	76.34	
0200	840	94.16	76.42	80 gpm
0300	900	94.28	76.54	
0400	960	94.44	76.70	80 gpm
0500	1020	94.62	76.88	
0600	1080	94.86	77.12	
0700	1140	95.08	77.34	
0800	1200	94.92	77.18	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Cantewell Aquifer Test
Pump Well # 102217
Date: April 14, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
0800	1200	94.92	0	0.00	
0801	1201	54.63	1	40.29	
0802	1202	41.15	2	53.77	
0803	1203	35.62	3	59.3	
0804	1204	32.93	4	61.99	
0805	1205	31.68	5	63.24	
0806	1206	30.75	6	64.17	
0807	1207	30.13	7	64.79	
0808	1208	29.72	8	65.2	
0809	1209	29.27	9	65.65	
0810	1210	28.94	10	65.98	
0812	1212	28.44	12	66.48	
0814	1214	28.02	14	66.9	
0816	1216	27.66	16	67.26	
0818	1218	27.36	18	67.56	
0820	1220	27.17	20	67.75	
0822	1222	26.91	22	68.01	
0824	1224	26.85	24	68.07	
0826	1226	26.43	26	68.49	
0828	1228	26.34	28	68.58	
0830	1230	26.19	30	68.73	
0835	1235	25.78	35	69.14	
0840	1240	25.51	40	69.41	
0845	1245	25.28	45	69.64	
0850	1250	25.09	50	69.83	
0855	1255	24.87	55	70.05	
0900	1260	24.65	60	70.27	
0905	1265	24.45	65	70.47	
0910	1270	24.23	70	70.69	
0920	1280	23.96	80	70.96	
0930	1290	23.71	90	71.21	
0940	1300	23.50	100	71.42	
0950	1310	23.30	110	71.62	
1000	1320	23.06	120	71.86	
1010	1330	23.00	130	71.92	
1020	1340	22.82	140	72.1	
1030	1350	22.65	150	72.27	
1040	1360	22.36	160	72.56	
1050	1370	22.33	170	72.59	
1100	1380	22.18	180	72.74	
1116	1395	22.00	195	72.92	
1130	1410	21.98	210	72.94	
1145	1425	21.77	225	73.15	
1200	1440	21.54	240	73.38	
1215	1455	21.52	255	73.4	
1230	1470	21.36	270	73.56	
1245	1485	21.25	285	73.67	
1300	1500	21.11	300	73.81	
1315	1515	21.05	315	73.87	
1330	1530	21.00	330	73.92	
1345	1545	20.86	345	74.06	
1400	1560	20.79	360	74.13	
1415	1575	20.80	375	74.12	
1430	1590	20.72	390	74.2	
1500	1620	20.56	420	74.36	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Dickerson Farms Aquifer Test
DGS ID Eb51-14; DNREC ID 086498; Pump Well
Date: May 16, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0800	0	55.76	0.00	
0800.5	0.5	77.13	21.37	
0801	1	85.92	30.16	
0801.5	1.5	90.14	34.38	
0802	2	92.30	36.54	
0802.5	2.5	93.58	37.82	
0803	3	94.60	38.84	
0803.5	3.5	95.52	39.76	
0804	4	95.91	40.15	
0805	5	97.58	41.82	
0806	6	99.34	43.58	
0807	7	100.08	44.32	90 gpm
0808	8	100.42	44.66	
0809	9	100.73	44.97	
0810	10	100.95	45.19	
0812	12	102.27	46.51	tech. change
0814	14	103.19	47.43	
0816	16	103.51	47.75	
8818	18	103.42	47.66	
0820	20	103.91	48.15	
0822	22	103.86	48.10	
0824	24	104.11	48.35	
0826	26	104.34	48.58	
0828	28	104.39	48.63	
0830	30	104.53	48.77	
0835	35	104.91	49.15	
0840	40	105.04	49.28	
0845	45	105.26	49.50	mtr=273770
0850	50	105.58	49.82	
0855	55	105.79	50.03	
0900	60	105.69	49.93	
0905	65	106.01	50.25	79 gpm
0910	70	107.12	51.36	
0920	80	107.41	51.65	
0930	90	107.73	51.97	
0940	100	107.89	52.13	78 gpm(10psi)
0950	110	108.06	52.30	
1000	120	108.33	52.57	mtr=279060
1010	130	108.53	52.77	
1020	140	109.01	53.25	
1030	150	109.00	53.24	
1040	160	109.16	53.40	
1050	170	109.28	53.52	
1100	180	109.45	53.69	
1115	195	109.73	53.97	
1130	210	109.87	54.11	
1145	225	109.97	54.21	
1200	240	110.07	54.31	
1215	255	110.16	54.40	
1230	270	110.18	54.42	getting windy
1245	285	110.42	54.66	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1300	300	110.61	54.85	
1315	315	110.62	54.86	
1330	330	110.79	55.03	
1345	345	111.08	55.32	
1400	360	111.04	55.28	
1415	375	111.10	55.34	tech. change
1430	390	111.25	55.49	
1500	420	111.47	55.71	
1530	450	111.70	55.94	
1600	480	111.87	56.11	mtr=300700
1630	510	111.94	56.18	
1700	540	112.20	56.44	mtr=311700
1800	600	112.51	56.75	mtr=316600
1900	660	112.82	57.06	mtr=320900
2000	720	113.00	57.24	mtr=325600
2100	780	113.32	57.56	mtr=330400
	840			elec. failure
2235	915	64.00	49.32	begin recvry
2252	932	63.57	49.75	
2305	985	63.61	49.71	
2327	1007	62.81	50.51	
2345	1025	62.70	50.62	
2400	1040	62.64	50.68	
0815		60.30	53.02	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Dickerson Farms Aquifer Test
DGS ID Eb51-11; DNREC ID 080899; Observation Well
Date: May 16, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0800	0	51.07	0.00	
0801	1	64.91	13.84	
0802	2	69.81	18.74	
0803	3	72.58	21.51	
0804	4	76.45	25.38	
0805	5	75.81	24.74	probe sticking
0806	6	75.35	24.28	probe sticking
0807	7	72.96	21.89	probe sticking
0808	8			missed reading
0809	9	71.81	20.74	
0810	10	71.40	20.33	
0812	12			tech. chg./miss read
0814	14	70.65	19.58	
0816	16	70.73	19.66	
0818	18	70.70	19.63	
0820	20	70.70	19.63	
0822	22	70.70	19.63	
0824	24	70.69	19.62	
0826	26	70.60	19.53	
0828	28			missed reading
0830	30	70.60	19.53	
0835	35	70.52	19.45	meter=5529999
0840	40	70.55	19.48	@ 24 gpm discharge
0845	45	70.81	19.74	affected by pressure
0850	50	71.22	20.15	release discharge
0855	55			when open-less head
0900	60	72.30	21.23	pressure-increase
0905	65			pumping rate
0910	70	72.88	21.81	
0923	83	73.35	22.28	
0932	92	73.80	22.73	
0940	100	74.13	23.06	meter=5531311
0952	112	74.71	23.64	tech. change
1000	122	74.93	23.86	meter=5531896
1012	132	75.15	24.08	
1022	142	76.21	25.14	
1032	152	76.15	25.08	
1042	162	76.59	25.52	
1052	172	76.32	25.25	
1102	182	76.83	25.76	78 gpm
1117	197	76.68	25.61	
1132	212	77.33	26.26	80 gpm
1147	227	77.51	26.44	
1202	242	77.38	26.31	
1217	257	77.49	26.42	
1232	272	77.65	26.58	79 gpm
1247	287	77.70	26.63	
1302	302	77.75	26.68	
1317	317	77.65	26.58	80 gpm
1332	332	77.87	26.80	
1347	347	77.67	26.60	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1402	362	77.74	26.67	
1417	375	77.80	26.73	tech. change
1432	390	77.75	26.68	
1502	420	77.85	26.78	
1532	450	78.04	26.97	
1602	480	78.27	27.20	
1632	510	78.57	27.50	
1702	540	79.11	28.04	
1802	600	79.94	28.87	
1902	660	80.00	28.93	
2002	720	80.68	29.61	
2100	780	78.28	27.21	
	840			elec. failure
2312	1052	76.30	25.23	begin recvry
2404	1144	75.47	24.40	
0832		73.72	22.65	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Dickerson Farms Aquifer Test
DGS ID Eb51-13; DNREC ID 086499; Observation Well
Date: May 16, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0800	0	53.71	0.00	
0801	1	53.79	0.08	
0802	2	54.11	0.40	
0803	3	54.37	0.66	
0804	4	55.12	1.41	
0805	5	55.62	1.91	
0806	6	56.05	2.34	
0807	7	56.46	2.75	
0808	8	56.81	3.10	
0809	9	57.10	3.39	
0810	10	57.35	3.64	
0812	12	57.85	4.14	
0814	14	58.17	4.46	
0816	16	58.48	4.77	
0818	18	58.77	5.06	
0820	20	58.99	5.28	
0822	22	59.19	5.48	
0824	24	59.40	5.69	
0826	26	59.57	5.86	
0828	28	59.73	6.02	
0830	30	59.87	6.16	
0835	35	60.17	6.46	
0840	40	60.46	6.75	
0845	45	60.71	7.00	
0850	50	60.94	7.23	
0855	55	61.16	7.45	
0900	60	61.37	7.66	
0905	65	61.58	7.87	
0910	70	61.76	8.05	
0920	80	62.19	8.48	
0930	90	62.45	8.74	
0940	100	62.72	9.01	
0950	110	62.97	9.26	
1000	120	63.23	9.52	
1011	131	63.54	9.83	tech. change
1021	141	63.76	10.05	
1031	151	63.94	10.23	
1041	161	64.16	10.45	
1051	171	64.32	10.61	
1101	181	64.56	10.85	
1116	196	64.74	11.03	
1131	211	64.84	11.13	
1146	226	65.15	11.44	
1201	241	65.29	11.58	
1216	256	65.32	11.61	
1231	271	65.58	11.87	
1246	286	65.70	11.99	
1301	301	65.91	12.20	
1316	316	66.46	12.75	
1331	331	66.18	12.47	
1346	346	66.30	12.59	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1401	361	66.36	12.65	
1416	376	66.48	12.77	tech. change
1431	391	66.67	12.96	
1501	421	66.90	13.19	
1531	451	67.15	13.44	
1601	481	67.31	13.60	
1631	511	67.51	13.80	
1701	541	67.60	13.89	
1801	601	68.05	14.34	
1901	661	68.32	14.61	
2001	721	68.74	15.03	
2101	781	68.75	15.04	
	840			elec. failure
2238	977	62.71	6.04	begin rcvry
2255	994	62.45	6.30	
2308	1047	61.97	6.78	
2330	1069	61.84	6.91	
2348	1087	61.55	7.20	
2408	1147	61.47	7.28	
0830		59.10	9.65	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Drawyer's Creek Aquifer Test
DGS ID Fb24-11; DNREC ID 089852; Pump Well
Date: April 5, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0830	0	45.54	0.00	
0831	1	62.65	17.11	
0831.5	1.5	65.94		
0832	2	68.10	22.56	pump rate limited by
0832.5	2.5	69.41		pump size
0833	3	70.24	24.70	Goulds 35LD20412
0834	4	71.24	25.70	
0835	5	71.93	26.39	
0836	6	72.48	26.94	
0837	7	72.81	27.27	
0838	8	73.15	27.61	41 gpm
0839	9	73.39	27.85	
0840	10	73.69	28.15	
0842	12	73.95	28.41	
0844	14	74.22	28.68	
0846	16	74.51	28.97	
0848	18	74.75	29.21	
0850	20	74.95	29.41	40 gpm
0852	22	75.15	29.61	
0854	24	75.27	29.73	
0856	26	75.47	29.93	
0858	28	75.58	30.04	
0900	30	75.73	30.19	40 gpm
0905	35	76.04	30.50	
0910	40	76.34	30.80	
0915	45	76.50	30.96	
0920	50	76.77	31.23	
0925	55	76.69	31.15	hose added
0930	60	77.08	31.54	
0935	65	77.34	31.80	
0940	70	77.39	31.85	
0950	80	77.62	32.08	windy
1000	90	77.82	32.28	
1010	100	78.20	32.66	
1020	110	78.28	32.74	40 gpm
1030	120	78.42	32.88	
1040	130	78.51	32.97	
1050	140	78.70	33.16	
1100	150	78.80	33.26	
1110	160	78.93	33.39	
1120	170	79.10	33.56	
1130	180	79.27	33.73	
1145	195	79.38	33.84	tech. change
1200	210	79.48	33.94	
1215	225	79.81	34.27	40 gpm
1230	240	79.76	34.22	
1245	255	79.83	34.28	
1300	270	79.96	34.42	
1315	285	80.09	34.55	39 gpm
1330	300	80.11	34.57	
1345	315	80.16	34.62	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1400	330	80.19	34.65	
1415	345	80.26	34.72	
1430	360	80.36	34.82	
1445	375	80.45	34.91	
1500	390	80.46	34.92	
1530	420	80.76	35.22	
1600	450	80.70	35.16	42 gpm
1630	480	80.77	35.23	tech. change
1700	510	80.77	35.23	
1730	540	79.51	33.97	hose moved
1830	600	79.39	33.85	
1930	660	79.21	33.67	
2030	720	80.46	34.92	hose moved
2130	780	81.22	35.68	to orig. pos.
2230	840	81.35	35.81	
2330	900	81.45	35.91	tech. change
2430	960	81.60	36.06	
0130	1020	81.57	36.03	40 gpm
0230	1080	81.65	36.11	
0330	1140	81.72	36.18	40 gpm
0430	1200	81.80	36.26	
0530	1260	81.80	36.26	40 gpm
0630	1320	81.75	36.21	clear, cold
0730	1380	81.83	36.28	@ 34
0830	1440	81.83	36.28	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Drawyer's Creek Aquifer Test
DGS ID Fb24-11; DNREC ID 089852; Pump Well
Date: April 6, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
0830	1440	81.83	0	0.00	
0830.5		71.72	0.5	10.11	
0831	1441	65.85	1	15.98	
0831.5		62.74	1.5	19.09	
0832	1442	60.51	2	21.32	
0832.5		59.17	2.5	22.66	
0833	1443	58.27	3	23.56	
0833.5		57.52	3.5	24.31	
0834	1444	57.05	4	24.78	
0834.5		56.59	4.5	25.24	
0835	1445	56.26	5	25.57	
0836	1446	55.70	6	26.13	
0837	1447	55.41	7	26.42	
0838	1448	55.08	8	26.75	
0839	1449	54.80	9	27.03	
0840	1450	54.48	10	27.35	
0842	1452	54.10	12	27.73	
0844	1454	53.76	14	28.07	
0846	1456	53.45	16	28.38	
0848	1458	53.21	18	28.62	
0850	1460	52.97	20	28.86	
0852	1462	52.85	22	28.98	
0854	1464	52.58	24	29.25	
0856	1466	52.42	26	29.41	
0858	1468	52.23	28	29.60	
0900	1470	52.07	30	29.76	
0905	1475	51.74	35	30.09	
0910	1480	51.52	40	30.31	
0915	1485	51.26	45	30.57	
0920	1490	50.99	50	30.84	
0925	1495	50.88	55	30.95	
0930	1500	50.60	60	31.23	
0935	1505	50.44	65	31.39	
0940	1510	50.28	70	31.55	
0950	1520	50.01	80	31.82	
1000	1530	49.77	90	32.06	
1010	1540	49.55	100	32.28	
1020	1550	49.52	110	32.31	
1030	1560	49.30	120	32.53	tech. change
1040	1570	49.05	130	32.78	
1050	1580	48.90	140	32.93	
1100	1590	48.88	150	32.95	
1110	1600	48.71	160	33.12	
1120	1610	48.65	170	33.18	
1130	1620	48.50	180	33.33	
1145	1635	48.38	195	33.45	
1200	1650	48.22	210	33.61	
1215	1665	48.10	225	33.73	
1230	1680	47.97	240	33.86	
1300	1710	47.70	270	34.13	
1330	1740	47.45	300	34.38	
1400	1770	47.38	330	34.45	
1430	1800	47.15	360	34.68	
1500	1830	47.10	390		end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Drawyer's Creek Aquifer Test
DGS ID Fb24-06; DNREC ID 084852; Observation Well
Date: April 5, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0830	0	43.92	0.00	
0831	1	44.06	0.14	
0832	2	44.25	0.33	
0833	3	44.51	0.59	
0834	4	44.87	0.95	
0835	5	45.00	1.08	
0836	6	45.32	1.40	
0837	7	46.56	1.64	
0838	8	45.85	1.93	
0839	9	45.90	1.98	
0840	10	46.05	2.13	
0842	12	46.27	2.35	
0844	14	46.59	2.67	
0846	16	47.04	3.12	
0848	18	47.10	3.18	
0850	20	47.25	3.33	
0852	22	47.42	3.50	
0854	24	47.60	3.68	
0856	26	47.81	3.89	
0858	28	47.96	4.04	
0900	30	48.03	4.11	
0905	35	48.33	4.41	
0910	40	48.61	4.69	
0915	45	48.79	4.87	
0920	50	49.13	5.21	
0925	55	49.26	5.34	
0930	60	49.76	5.84	
0935	65	49.59	5.67	
0940	70	49.79	5.87	
0950	80	50.00	6.08	
1000	90	50.25	6.33	
1010	100	50.44	6.52	
1020	110	50.60	6.68	
1030	120	50.87	6.95	
1040	130	51.00	7.08	
1050	140	51.14	7.22	
1100	150	51.39	7.47	
1110	160	51.55	7.63	
1120	170	51.58	7.66	
1131	181	51.61	7.69	
1146	196	51.77	7.85	
1201	211	51.91	7.99	
1216	226	52.04	8.12	
1231	241	52.16	8.24	
1246	256	52.20	8.28	
1301	271	52.38	8.46	
1316	286	52.46	8.54	
1331	301	52.53	8.60	
1346	316	52.64	8.72	
1401	331	52.63	8.71	
1416	346	52.75	8.83	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1431	361	52.80	8.88	
1446	376	52.91	8.99	
1501	391	52.96	9.04	
1531	421	53.02	9.10	
1601	451	53.15	9.23	
1631	481	53.21	9.29	tech. change
1701	511	53.28	9.36	
1731	541	53.50	9.58	
1831	601	53.25	9.33	
1931	661	53.32	9.40	
2031	721	53.60	9.68	
2131	781	53.80	9.88	
2231	841	53.90	9.98	
2331	901	53.83	9.91	tech. change
2431	961	54.00	10.08	
0131	1021	53.95	10.03	
0231	1081	54.12	10.20	
0331	1141	54.25	10.33	
0431	1201	54.36	10.44	
0531	1261	54.40	10.48	
0631	1321	54.41	10.49	
0730	1380	54.40	10.48	
0830	1440	54.48	10.56	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II-Ground-Water Availability

Drawyer's Creek Aquifer Test
DGS ID Fb24-06; DNREC ID 084852; Observation Well
Date:April 6, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
0830	1440	54.48	0	0.00	
0831	1441	54.47	1	0.01	
0832	1442	54.44	2	0.04	
0833	1443	54.27	3	0.21	
0834	1444	54.25	4	0.23	
0835	1445	53.70	5	0.78	
0836	1446	53.36	6	1.12	
0837	1447	53.13	7	1.35	
0838	1448	52.93	8	1.55	
0839	1449	52.70	9	1.78	
0840	1450	52.85	10	1.63	
0842	1452	52.27	12	2.21	
0844	1454	52.16	14	2.32	
0846	1456	51.80	16	2.68	
0848	1458	51.63	18	2.85	
0850	1460	51.31	20	3.17	
0852	1462	51.33	22	3.15	
0854	1464	51.05	24	3.43	
0856	1466	51.07	26	3.41	
0858	1468	50.80	28	3.68	
0900	1470	50.61	30	3.87	
0905	1475	50.28	35	4.20	
0910	1480	50.26	40	4.22	
0915	1485	50.00	45	4.48	
0920	1490	49.61	50	4.87	
0925	1495	49.42	55	5.06	
0930	1500	49.31	60	5.17	
0935	1505	49.24	65	5.24	
0940	1510	48.92	70	5.56	
0950	1520	48.88	80	5.60	
1000	1530	48.46	90	6.02	
1010	1540	48.25	100	6.23	
1020	1550	48.01	110	6.47	
1030	1560	47.84	120	6.64	
1041	1571	47.73	131	6.75	tech. change
1051	1581	47.60	141	6.88	
1101	1591	47.45	151	7.03	
1111	1601	47.33	161	7.15	
1121	1611	47.20	171	7.28	
1131	1621	47.09	181	7.39	
1146	1636	46.95	196	7.53	
1201	1651	46.82	211	7.66	
1216	1666	46.69	226	7.79	
1231	1681	46.59	241	7.89	
1301	1711	46.34	271	8.14	
1331	1741	46.20	301	8.28	
1401	1771	45.98	331	8.50	
1431	1801	45.82	361	8.66	
1500	1831	45.73	391	8.75	end of test

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Misty Vale Aquifer Test
DGS ID Fc12-23; DNREC ID 096300; Pump Well
Date: February 2, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0835	0	42.92	0.00	
0836	1	69.08	26.16	
0837	2	78.10	35.18	
0838	3	82.76	39.84	
0839	4	85.21	42.29	
0840	5	86.67	43.75	
0841	6	87.54	44.62	
0842	7	88.28	45.36	
0843	8	88.81	45.89	
0844	9	89.21	46.29	
0845	10	89.56	46.64	
0847	12	90.17	47.25	
0849	14	90.68	47.76	
0851	16	91.26	48.34	
0853	18	91.56	48.64	
0855	20	91.95	49.03	
0857	22	92.32	49.40	
0859	24	92.48	49.56	
0901	26	92.72	49.80	
0903	28	93.00	50.08	80 gpm
0905	30	93.17	50.25	
0910	35	93.65	50.73	
0915	40	94.07	51.15	
0920	45	94.42	51.50	
0925	50	94.72	51.80	
0930	55	95.00	52.08	
0935	60	95.30	52.38	80 gpm
0945	70	95.70	52.78	
0955	80	96.11	53.19	
1005	90	96.40	53.48	
1015	100	96.73	53.81	
1025	110	97.07	54.15	80 gpm
1035	120	97.20	54.28	
1045	130	97.36	54.44	
1055	140	97.67	54.75	
1105	150	97.86	54.94	80 gpm
1115	160	98.00	55.08	
1125	170	98.14	55.22	
1135	180	98.28	55.36	
1150	195	98.50	55.58	
1205	210	98.70	55.78	80 gpm
1220	225	98.90	55.98	
1235	240	99.10	56.18	
1250	255	99.21	56.29	
1305	270	99.41	56.49	
1320	285	99.58	56.66	
1335	300	99.76	56.84	
1350	315	99.98	57.06	
1405	330	100.00	57.08	80 gpm
1420	345	100.10	57.18	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1435	360	100.25	57.33	
1450	375	100.35	57.43	80 gpm
1505	390	100.44	57.52	
1535	420	100.66	57.74	
1605	450	100.86	57.94	80 gpm
1635	480	100.99	58.07	
1705	510	101.12	58.20	
1735	540	101.35	58.43	80 gpm
1835	600	101.48	58.56	80 gpm
1935	660	101.89	58.97	
2035	720	102.05	59.13	tech. change
2135	780	102.32	59.40	
2235	840	102.58	59.66	
2335	900	102.71	59.79	
0035	960	102.85	59.93	80 gpm
0135	1020	103.09	60.17	
0235	1080	103.12	60.20	
0335	1140	103.23	60.31	
0445	1200	103.32	60.40	80 gpm
0535	1260	103.43	60.51	
0635	1320	103.57	60.65	
0735	1380	103.69	60.77	
0835	1440	103.88	60.96	

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Misty Vale Aquifer Test
DGS ID Fc12-23; DNREC ID 096300; Pump Well
Date: February 3, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
0835	1440	103.88	0	0	
0836	1441	79.98	1	23.90	
0837	1442	71.39	2	32.49	
0838	1443	66.75	3	37.13	
0839	1444	64.27	4	39.61	
0840	1445	62.63	5	41.25	
0841	1446	61.50	6	42.38	
0842	1447	60.67	7	43.21	
0843	1448	60.06	8	43.82	
0844	1449	59.44	9	44.44	
0845	1450	59.27	10	44.61	
0847	1452	58.47	12	45.41	
0849	1454	57.88	14	46.00	
0851	1456	57.38	16	46.50	
0853	1458	56.97	18	46.91	
0855	1460	56.59	20	47.29	
0857	1462	56.32	22	47.56	
0859	1464	55.99	24	47.89	
0901	1466	55.67	26	48.21	
0903	1468	55.38	28	48.50	
0905	1470	55.19	30	48.69	
0910	1475	54.60	35	49.28	
0915	1480	54.17	40	49.71	
0920	1485	53.09	45	50.79	
0925	1490	53.54	50	50.34	
0930	1495	53.11	55	50.77	
0935	1500	52.91	60	50.97	
0940	1505	52.65	65	51.23	
0945	1510	52.43	70	51.45	
0955	1520	52.04	80	51.84	
1005	1530	51.73	90	52.15	
1015	1540	51.46	100	52.42	
1025	1550	51.06	110	52.82	
1035	1560	50.78	120	53.10	
1045	1570	50.57	130	53.31	
1055	1580	50.31	140	53.57	
1105	1590	50.13	150	53.75	
1115	1600	49.95	160	53.93	
1125	1610	49.76	170	54.12	
1135	1620	49.68	180	54.20	
1150	1635	49.57	195	54.31	
1205	1650	49.18	210	54.70	questionable
1220	1665	48.95	225	54.93	
1235	1680	48.90	240	54.98	
1250	1695	48.68	255	55.20	
1305	1710	48.49	270	55.39	
1320	1725	48.37	285	55.51	
1335	1740	48.17	300	55.71	
1350	1755	48.16	315	55.72	
1405	1770	47.92	330	55.96	

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
1420	1785	47.80	345	56.08	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Misty Vale Aquifer Test
DGS ID Fc12-22; DNREC ID 096299; Observation Well
Date: February 2, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0835	0	38.72	0.00	
0836	1	38.80	0.08	
0837	2	38.92	0.20	
0838	3	39.19	0.47	
0839	4	39.40	0.68	
0840	5	39.80	1.08	
0841	6	40.30	1.58	
0842	7	40.72	2.00	
0843	8	41.10	2.38	
0844	9	41.43	2.71	
0845	10	41.89	3.17	
0847	12	42.55	3.83	
0849	14	43.20	4.48	
0851	16	43.81	5.09	
0853	18	44.34	5.62	
0855	20	44.86	6.14	
0857	22	45.26	6.54	
0859	24	45.64	6.92	
0901	26	45.99	7.27	
0903	28	46.28	7.56	
0905	30	46.58	7.86	
0910	35	47.23	8.51	
0915	40	47.67	8.95	
0920	45	48.08	9.36	
0925	50	48.50	9.78	
0930	55	48.82	10.10	
0935	60	49.06	10.34	
0945	70	49.61	10.89	
0956	81	50.50	11.78	tech. change
1006	91	50.63	11.91	
1016	101	50.90	12.18	
1026	111	51.15	12.43	
1036	121	51.52	12.80	
1046	131	51.70	12.98	
1056	141	51.93	13.21	
1106	151	52.00	13.28	
1116	161	52.17	13.45	
1126	171	52.33	13.61	
1136	181	52.51	13.79	
1151	196	52.69	13.97	
1206	211	52.87	14.15	
1221	226	53.08	14.36	
1236	241	53.30	14.58	
1251	256	53.48	14.76	
1306	271	53.69	14.97	
1321	286	53.79	15.07	
1336	301	54.00	15.28	
1351	316	54.08	15.36	
1406	331	54.21	15.49	
1421	346	54.36	15.64	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1436	361	54.57	15.85	
1451	376	54.68	15.96	
1506	391	54.79	16.07	
1536	421	55.00	16.28	
1606	451	55.07	16.35	
1636	481	55.34	16.62	
1706	511	55.51	16.79	
1736	541	55.72	17.00	
1836	601	56.51	17.79	
1936	661	56.56	17.84	
2035	720	56.57	17.85	tech. change
2135	780	56.78	18.06	
2235	840	57.10	18.38	
2335	900	57.25	18.53	
0035	960	57.37	18.65	
0135	1020	57.58	18.86	
0235	1080	57.72	19.00	
0335	1140	57.80	19.08	
0445	1200	58.00	19.28	
0535	1260	58.10	19.38	
0635	1320	58.27	19.55	
0735	1380	58.30	19.58	
0835	1440	58.47	19.75	

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II Ground-Water Availability

Misty Vale Aquifer Test
DGS ID Fc12-22; DNREC ID 096299; Observation Well
Date: February 3, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
0835	1440	58.47	0	0.00	
0836	1441	58.45	1	0.02	
0837	1442	58.35	2	0.12	
0838	1443	58.10	3	0.37	
0839	1444	57.80	4	0.67	
0840	1445	57.44	5	1.03	
0841	1446	57.04	6	1.43	
0842	1447	56.64	7	1.83	
0843	1448	56.25	8	2.22	
0844	1449	55.80	9	2.67	
0845	1450	55.45	10	3.02	
0847	1452	54.68	12	3.79	
0849	1454	54.15	14	4.32	
0851	1456	53.60	16	4.87	
0853	1458	53.15	18	5.32	
0855	1460	52.68	20	5.79	
0857	1462	52.33	22	6.14	
0859	1464	52.00	24	6.47	
0901	1466	51.71	26	6.76	
0903	1468	51.45	28	7.02	
0905	1470	51.18	30	7.29	
0910	1475	50.60	35	7.87	
0915	1480	50.10	40	8.37	
0921	1486	49.66	46	8.81	tech. change
0926	1491	49.24	51	9.23	
0931	1496	48.96	56	9.51	
0936	1501	48.68	61	9.79	
0941	1506	48.40	66	10.07	
0946	1511	48.11	71	10.36	
0956	1521	47.78	81	10.69	
1006	1531	47.40	91	11.07	
1016	1541	47.09	101	11.38	
1026	1551	46.76	111	11.71	
1036	1561	46.62	121	11.85	
1046	1571	46.25	131	12.22	
1056	1581	46.05	141	12.42	
1106	1591	45.87	151	12.6	
1116	1601	45.67	161	12.8	
1126	1611	45.49	171	12.98	
1136	1621	45.30	181	13.17	
1151	1636	45.08	196	13.39	
1206	1651	44.91	211	13.56	
1221	1666	44.65	226	13.82	
1236	1681	44.53	241	13.94	
1251	1696	44.31	256	14.16	
1306	1711	44.10	271	14.37	
1321	1726	44.04	286	14.43	
1336	1741	43.95	301	14.52	
1351	1756	43.71	316	14.76	
1406	1771	43.65	331	14.82	
1421	1786	43.56	346	14.91	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Nautical Cove Aquifer Test
DGS ID Ea45-04; DNREC ID 100389; Pump Well
Date: June 7, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0845	0	41.90	0.00	
0846	1	70.00	28.10	
0847	2	71.50	29.60	
0848	3	71.79	29.89	
0849	4	72.10	30.20	
0850	5	72.29	30.39	
0851	6	72.69	30.79	
0852	7	72.65	30.75	
0853	8	72.75	30.85	
0854	9	72.93	31.03	
0855	10	73.02	31.12	122 gpm
0857	12	73.29	31.39	
0859	14	73.41	31.51	
0901	16	73.66	31.76	
0903	18	73.87	31.97	
0905	20	74.01	32.11	
0907	22	74.13	32.23	
0909	24	74.22	32.32	
0911	26	74.21	32.31	
0913	28	74.43	32.53	
0915	30	74.43	32.53	
0920	35	74.72	32.82	
0925	40	74.89	32.99	
0930	45	75.16	33.26	
0935	50	75.24	33.34	
0940	55	75.49	33.59	
0945	60	75.56	33.66	125 gpm
0950	65	75.67	33.77	
0955	70	75.94	34.04	
1005	80	76.17	34.27	
1015	90	76.45	34.55	
1025	100	76.58	34.68	
1035	110	76.81	34.91	
1045	120	76.97	35.07	125 gpm
1055	130	77.11	35.21	
1105	140	77.38	35.48	
1115	150	77.51	35.61	
1125	160	-		missed read
1135	170	77.73	35.83	
1145	180	77.87	35.97	
1200	195	78.09	36.19	125 gpm
1215	210	78.31	36.41	
1230	225	78.62	36.72	
1245	240	78.55	36.65	
1300	255	78.71	36.81	
1315	270	78.86	36.96	
1330	285	79.14	37.24	
1345	300	79.28	37.38	
1400	315	79.28	37.38	
1415	330	79.45	37.55	125 gpm
1430	345	79.43	37.53	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1445	360	79.51	37.61	
1500	375	79.68	37.78	
1515	390	79.81	37.91	
1545	420	79.93	38.03	
1615	450	80.00	38.10	
1645	480	80.13	38.23	125 gpm
1715	510	80.34	38.44	
1745	540	80.49	38.59	
1805	560	80.55	38.65	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Nautical Cove Aquifer Test
DGS ID Ea44-12; DNREC ID 086813; Observation Well
Date: June 7. 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0845	static	41.40	0.00	
0845	0	41.40	0.00	
0846	1	42.21	0.81	
0847	2	42.72	1.32	
0848	3	43.16	1.76	
0849	4	43.25	1.85	
0850	5	43.51	2.11	
0851	6	43.64	2.24	
0852	7	43.82	2.42	
0853	8	43.94	2.54	
0854	9	44.06	2.66	
0855	10	44.15	2.75	
0857	12	44.35	2.95	
0859	14	44.53	3.13	
0901	16	44.74	3.34	
0903	18	44.91	3.51	
0905	20	45.07	3.67	
0907	22	45.21	3.81	
0909	24	45.31	3.91	
0911	26	45.42	4.02	
0913	28	45.54	4.14	
0915	30	45.65	4.25	
0920	35	45.94	4.54	
0925	40	46.12	4.72	
0930	45	46.41	5.01	
0935	50	46.59	5.19	
0940	55	46.86	5.46	
0945	60	46.98	5.58	
0950	65	47.10	5.70	
0956	71	47.27	5.87	tech. change
1006	81	47.68	6.28	
1016	91	47.91	6.51	
1026	101	48.10	6.70	
1036	111	48.34	6.94	
1046	121	48.71	7.31	
1056	131	48.76	7.36	
1106	141	49.36	7.96	
1116	151	49.15	7.75	
1126	161			missed readg
1136	171	49.47	8.07	
1146	181	49.68	8.28	
1201	196	49.93	8.53	
1216	211	50.12	8.72	
1231	226	50.33	8.93	
1246	241	50.41	9.01	
1301	256	50.43	9.03	
1316	271	50.58	9.18	
1331	286	50.91	9.51	
1346	301	51.00	9.60	
1401	316	51.03	9.63	
1416	331	51.21	9.81	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1431	346	51.40	10.00	
1446	361	51.51	10.11	
1501	376	51.53	10.13	
1516	391	51.61	10.21	
1546	421	51.82	10.42	
1616	451	51.92	10.52	
1646	481	52.13	10.73	
1716	511	52.32	10.92	
1746	541	52.57	11.17	
1806	561	52.54	11.14	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Vandegrift Manor Aquifer Test
DGS ID Ec52-09; DNREC ID 078973; Pumping Well
Date: March 22, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0845	0	56.41	0.00	
0846	1	82.46	26.05	128 gpm
0847	2	89.77	33.36	
0848	3	92.52	36.11	
0849	4	94.01	37.60	120 gpm
0850	5	95.00	38.59	
0851	6	95.68	39.27	118 gpm
0852	7	96.07	39.66	
0853	8	96.68	40.27	120 gpm
0854	9	96.97	40.56	
0855	10	97.28	40.87	
0857	12	97.86	41.45	118 @ 26 psi
0859	14	98.20	41.79	
0901	16	98.57	42.16	
0903	18	98.85	42.44	
0905	20	99.13	42.72	123.4 (cal)
0907	22	99.50	43.09	
0909	24	99.59	43.18	
0911	26	99.77	43.36	
0913	28	99.62	43.21	
0915	30	98.74	42.33	
0920	35	100.76	44.35	
0925	40	98.70	42.29	
0930	45	99.15	42.74	
0935	50	101.84	45.43	pump on inc.
0940	55	99.67	43.26	discharge
0945	60	102.26	45.85	
0950	65	100.02	43.61	
0955	70	100.03	43.62	
1005	80	100.38	43.97	
1015	90	101.03	44.62	
1025	100	101.08	44.67	tech. change
1035	110	103.24	46.83	120 gpm
1045	120	101.21	44.80	
1055	130	102.08	45.67	
1105	140	101.48	45.07	
1115	150	101.43	45.02	120 gpm
1125	160	101.81	45.40	
1135	170	101.73	45.32	
1145	180	103.55	47.14	
1200	195	102.03	45.62	
1215	210	102.10	45.69	
1230	225	103.50	47.09	
1245	240	102.20	45.79	
1300	255	102.82	46.41	
1315	270	102.50	46.09	
1330	285	102.51	46.10	
1345	300	104.50	48.09	
1400	315	102.83	46.42	
1415	330	103.26	46.85	pump on
1430	345	103.11	46.70	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1445	360	103.08	46.67	
1500	375	103.31	46.90	120 gpm
1515	390	103.37	46.96	
1545	420	105.18	48.77	
1615	450	103.20	46.79	tech. change
1645	480	103.41	47.00	
1715	510	103.58	47.17	
1745	540	105.55	49.14	
1845	600	105.00	48.59	
1945	660	105.60	49.19	
2045	720	104.55	48.14	
2145	780	103.90	47.49	
2245	840	105.55	49.14	tech. change
2345	900	104.00	47.59	
0045	960	104.07	47.66	
0145	1020	106.10	49.69	
0245	1080	104.00	47.59	
0345	1140	104.10	47.69	110 gpm
0445	1200	104.36	47.95	
0545	1260	106.25	49.84	
0645	1320	106.58	50.17	
0745	1380	105.00	48.59	
0845	1440	104.35	47.94	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Vandegrift Manor Aquifer Test
DGS ID Ec52-09; DNREC ID 078973; Pump Well
Date: March 23, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
0845	1440	104.35	0	0	
0846	1441	83.99	1	20.36	
0847	1442	76.56	2	27.79	
0848	1443	73.36	3	30.99	
0849	1444	71.69	4	32.66	
0850	1445	70.56	5	33.79	
0851	1446	69.76	6	34.59	
0852	1447	69.27	7	35.08	
0853	1448	68.69	8	35.66	
0854	1449	68.31	9	36.04	
0855	1450	67.83	10	36.52	
0857	1452	67.22	12	37.13	
0859	1454	66.68	14	37.67	
0901	1456	66.20	16	38.15	
0903	1458	65.82	18	38.53	
0905	1460	65.54	20	38.81	
0907	1462	65.15	22	39.20	
0909	1464	64.96	24	39.39	
0911	1466	64.68	26	39.67	
0913	1468	64.40	28	39.95	
0915	1470	64.23	30	40.12	
0920	1475	63.75	35	40.60	
0925	1480	63.32	40	41.03	
0930	1485	62.92	45	41.43	
0935	1490	62.69	50	41.66	
0940	1495	62.32	55	42.03	
0945	1500	62.07	60	42.28	
0950	1505	61.81	65	42.54	
0955	1510	61.61	70	42.74	
1005	1520	61.20	80	43.15	tech. change
1015	1530	60.91	90	43.44	
1025	1540	60.57	100	43.78	
1035	1550	60.40	110	43.95	
1045	1560	60.18	120	44.17	
1055	1570	59.84	130	44.51	
1105	1580	59.64	140	44.71	
1135	1610	59.22	170	45.13	
1205	1640	59.06	200	45.29	
1235	1670	58.57	230	45.78	
1305	1700	57.95	260	46.40	
1335	1730	57.71	290	46.64	
1405	1760	57.39	320	46.96	
1435	1790	57.28	350	47.07	
1505	1820	57.02	380	47.33	end of test

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II Ground-Water Availability

Vandegrift Manor Aquifer Test
DGS ID Fc12-16; DNREC ID 078974; Observation Well
Date: March 22. 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0845	0	52.86	0.00	
0846	1	52.87	0.01	
0847	2	52.90	0.04	
0848	3	52.92	0.06	
0849	4	53.02	0.16	
0850	5	53.12	0.26	
0851	6	53.27	0.41	
0852	7	53.46	0.60	
0853	8	53.60	0.74	
0854	9	53.78	0.92	
0855	10	53.90	1.04	
0857	12	54.32	1.46	
0859	14	54.52	1.66	
0901	16	54.82	1.96	
0903	18	55.08	2.22	
0905	20	55.24	2.38	
0907	22	55.47	2.61	
0909	24	55.61	2.75	
0911	26	55.79	2.93	
0913	28	56.00	3.14	
0915	30	56.11	3.25	
0920	35	56.54	3.68	
0925	40	56.79	3.93	
0930	45	57.10	4.24	
0935	50	57.29	4.43	
0940	55	57.49	4.63	
0945	60	57.65	4.79	
0950	65	57.88	5.02	
0955	70	58.10	5.24	
1007	82	58.85	5.99	tech. change
1017	92	58.89	6.03	
1027	102	59.05	6.19	
1037	112	59.18	6.32	
1047	122	59.53	6.67	
1057	132	59.62	6.76	
1107	142	59.83	6.97	
1117	152	59.90	7.04	
1127	162	60.17	7.31	
1137	172	60.18	7.32	
1147	182	60.47	7.61	
1202	197	60.35	7.49	
1217	212	60.55	7.69	
1232	227	60.68	7.82	
1247	242	61.03	8.17	
1302	257	60.98	8.12	
1317	272	61.21	8.35	
1332	287	61.26	8.40	
1347	302	61.48	8.62	
1402	317	61.43	8.57	
1417	332	61.48	8.62	
1432	347	61.51	8.65	
1447	362	61.86	9.00	
1502	377	61.82	8.96	
1517	392	61.84	8.98	
1547	422	62.00	9.14	
1617	452	62.13	9.27	tech. change
1647	582	62.23	9.37	
1717	512	62.42	9.56	
1747	542	62.55	9.69	
1847	602	62.68	9.82	
1947	662	63.00	10.14	
2047	722	63.10	10.24	
2147	782	63.20	10.34	
2247	842	63.30	10.44	tech. change
2347	902	63.32	10.46	
0047	962	63.38	10.52	
0147	1022	63.40	10.54	
0247	1082	63.45	10.59	
0347	1142	63.53	10.67	
0447	1202	63.61	10.75	
0547	1262	62.90	10.04	
0647	1322	63.95	11.09	
0747	1382	64.18	11.32	
0845	1440	64.05	11.19	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II Ground-Water Availability

Vandegrift Mnr Aquifer Test
DGS ID Fc12-16; DNREC ID 78974; Observation Well
Date: March 23, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
0845	1440	64.05	0	0	
0846	1441	64.03	1	0.02	
0847	1442	64.03	2	0.02	
0848	1443	63.99	3	0.06	
0849	1444	63.92	4	0.13	
0850	1445	63.80	5	0.25	
0851	1446	63.68	6	0.37	
0852	1447	63.53	7	0.52	
0853	1448	63.36	8	0.69	
0854	1449	63.22	9	0.83	
0855	1450	63.07	10	0.98	
0857	1452	62.79	12	1.26	
0859	1454	62.48	14	1.57	
0901	1456	62.23	16	1.82	
0903	1458	61.99	18	2.06	
0905	1460	61.77	20	2.28	
0907	1462	61.56	22	2.49	
0909	1464	61.36	24	2.69	
0911	1466	61.18	26	2.87	
0913	1468	61.01	28	3.04	
0915	1470	60.85	30	3.20	
0920	1475	60.49	35	3.56	
0925	1480	60.16	40	3.89	
0930	1485	59.89	45	4.16	
0935	1490	59.63	50	4.42	
0940	1495	59.38	55	4.67	
0945	1500	59.17	60	4.88	
0950	1505	58.95	65	5.10	
0955	1510	58.77	70	5.28	
1007	1522	58.58	82	5.47	tech. change
1017	1532	58.14	92	5.91	
1027	1542	57.80	102	6.25	
1037	1552	57.68	112	6.37	
1047	1562	57.42	122	6.63	
1057	1572	57.15	132	6.90	
1107	1582	56.78	142	7.27	
1137	1612	56.56	172	7.49	
1207	1642	56.02	202	8.03	
1237	1672	55.92	232	8.13	
1307	1702	55.64	262	8.41	
1337	1732	54.97	292	9.08	
1407	1762	54.84	322	9.21	
1437	1792	54.55	352	9.50	
1507	1822	54.40	382	9.65	

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II Ground-Water Availability

Vandegrift Manor Aquifer Test
DGS ID Ec52-21; DNREC ID 084134; Observation Well
Date: March 22, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0845	0	55.75	0.00	
0846	1	55.64	-0.11	questionable
0847	2	57.12	1.37	
0848	3	58.48	2.73	
0849	4			probe stuck
0850	5			probe stuck
0851	6			probe stuck
0852	7	61.38	5.63	
0853	8	61.82	6.07	
0854	9	62.15	6.40	
0855	10	62.55	6.80	
0857	12	63.18	7.43	
0859	14	63.49	7.74	
0901	16	64.00	8.25	
0903	18	64.21	8.46	
0905	20	64.59	8.84	
0907	22	64.91	9.16	
0909	24	65.00	9.25	
0911	26	65.41	9.66	
0913	28	65.50	9.75	
0915	30	65.58	9.83	
0920	35	66.17	10.42	
0925	40	66.34	10.59	
0930	45	66.53	10.78	
0935	50	67.08	11.33	
0940	55	67.15	11.40	
0945	60	67.35	11.60	
0950	65	67.51	11.76	
0955	70	67.76	12.01	
1006	81	67.95	12.20	
1016	91	68.38	12.63	
1026	101	68.53	12.78	
1036	111	68.95	13.20	
1046	121	68.91	13.16	
1056	131	69.22	13.47	
1106	141	69.39	13.64	
1116	151	69.42	13.67	
1126	161	69.55	13.80	
1136	171	69.75	14.00	
1146	181	70.00	14.25	
1201	196	69.83	14.08	
1216	211	70.10	14.35	
1231	226	70.32	14.57	
1246	241	70.48	14.73	
1301	256	70.68	14.93	
1316	171	70.61	14.86	
1331	186	70.66	14.91	
1346	301	71.01	15.26	
1401	316	71.04	15.29	
1416	331	71.04	15.29	
1431	346	71.25	15.50	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1446	361	71.38	15.63	
1501	376	71.47	15.72	
1516	391	71.46	15.71	
1546	421	71.50	15.75	
1616	451	71.50	15.75	tech. change
1646	481	71.70	15.95	
1716	511	71.75	16.00	
1746	541	72.00	16.25	
1846	601	73.30	17.55	
1946	661	72.54	16.79	
2046	721	72.55	16.80	
2146	781	72.56	16.81	
2246	841	72.75	17.00	tech. change
2346	901	72.88	17.13	
0046	961	72.75	17.00	
0146	1021	72.86	17.11	
0246	1081	72.75	17.00	
0346	1141	72.90	17.15	
0446	1201	72.93	17.18	
0546	1261	73.43	17.68	
0646	1321	73.50	17.75	
0746	1381	73.43	17.68	
0845	1440	73.48	17.73	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II Ground-Water Availability

Vandegrift Mnr Aquifer Test
DGSID Ec52-21; DNREC ID 084134; Observation Well
Date: March 23, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
0845	1440	73.48	0	0	
0846	1441	72.87	1	0.61	
0847	1442	71.64	2	1.84	
0848	1443	70.45	3	3.03	
0849	1444	61.51	4	11.97	
0850	1445	68.78	5	4.70	
0851	1446	68.25	6	5.23	
0852	1447	67.84	7	5.64	
0853	1448	67.27	8	6.21	
0854	1449	67.02	9	6.46	
0855	1450	66.70	10	6.78	
0857	1452	66.06	12	7.42	
0859	1454	65.58	14	7.90	
0901	1456	65.19	16	8.29	
0903	1458	64.85	18	8.63	
0905	1460	64.61	20	8.87	
0907	1462	64.32	22	9.16	
0909	1464	64.00	24	9.48	
0911	1466	63.76	26	9.72	
0913	1468	63.55	28	9.93	
0915	1470	63.36	30	10.12	
0920	1475	63.03	35	10.45	
0925	1480	62.56	40	10.92	
0930	1485	62.16	45	11.32	
0935	1490	61.86	50	11.62	
0940	1495	61.91	55	11.57	
0945	1500	61.41	60	12.07	
0950	1505	61.12	65	12.36	
0955	1510	60.86	70	12.62	
1006	1521	60.43	81	13.05	tech. change
1016	1531	60.08	91	13.40	
1026	1541	59.95	101	13.53	
1036	1551	59.70	111	13.78	
1046	1561	59.52	121	13.96	
1056	1571	59.52	131	13.96	
1106	1581	58.93	141	14.55	
1136	1611	58.46	171	15.02	
1206	1641	58.19	201	15.29	
1236	1671	57.60	231	15.88	
1306	1701	57.21	261	16.27	
1336	1731	57.20	291	16.28	
1406	1761	56.77	321	16.71	
1436	1791	56.75	351	16.73	
1506	1821	56.41	381	17.07	end of test

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Wheatland Aquifer Test
DGS ID Fa15-08; DNREC ID 083640; Pump Well
Date: June 13, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0930	0	68.95	0.00	windy, cool, overcast
0931	1	81.17	12.22	
0932	2	82.06	13.11	
0933	3	82.49	13.54	
0934	4	82.70	13.75	
0935	5	82.96	14.01	
0936	6	83.15	14.2	
0937	7	83.28	14.33	
0938	8	83.46	14.51	
0939	9	83.57	14.62	
0940	10	83.62	14.67	
0942	12	83.89	14.94	
0944	14	83.91	14.96	
0946	16	83.98	15.03	
0948	18	84.15	15.2	
0950	20	84.21	15.26	
0952	22	84.33	15.38	90 gpm?
0954	24	84.35	15.4	
0956	26	84.44	15.49	
0958	28	84.57	15.62	
1000	30	84.70	15.75	90 gpm
1005	35	84.89	15.94	
1010	40	84.85	15.9	90 gpm
1015	45	84.92	15.97	
1020	50	84.95	16	
1025	55	85.11	16.16	
1030	60	85.15	16.2	
1035	65	85.20	16.25	
1040	70	85.26	16.31	
1050	80	85.40	16.45	
1100	90	85.51	16.56	90 gpm
1110	100	85.51	16.56	
1120	110	85.69	16.74	
1130	120	85.77	16.82	
1140	130	85.76	16.81	
1150	140	85.96	17.01	
1200	150	85.92	16.97	
1210	160	85.97	17.02	
1220	170	85.97	17.02	
1230	180	86.18	17.23	
1245	195	86.20	17.25	90 gpm
1300	210	86.19	17.24	
1315	225	86.23	17.28	
1330	240	86.28	17.33	
1345	255	86.38	17.43	
1400	270	86.33	17.38	
1415	285	86.44	17.49	
1430	300	86.42	17.47	
1445	315	86.49	17.54	
1500	330	86.47	17.52	
1515	345	86.52	17.57	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1530	360	86.59	17.64	
1545	375	86.64	17.69	90 gpm
1600	390	86.64	17.69	
1630	420	86.70	17.75	
1700	450	86.73	17.78	
1730	480	86.79	17.84	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Wheatland Aquifer Test
DGS ID Fa15-08; DNREC ID 083640; Pump Well
Date: June 13, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
1730	480	86.79	0	0.00	
1731	481	74.50	1	12.29	
1732	482	73.67	2	13.12	
1733	483	73.23	3	13.56	
1734	484	72.90	4	13.89	
1735	485	72.79	5	14	
1736	486	72.60	6	14.19	
1737	487	72.42	7	14.37	
1738	488	72.26	8	14.53	
1739	489	72.14	9	14.65	
1740	490	72.06	10	14.73	
1742	492	71.85	12	14.94	
1744	494	71.75	14	15.04	
1746	496	71.65	16	15.14	
1748	498	71.56	18	15.23	
1750	500	71.46	20	15.33	
1752	502	71.41	22	15.38	
1754	504	71.30	24	15.49	
1756	506	71.23	26	15.56	
1758	508	71.25	28	15.54	
1800	510	71.18	30	15.61	
1805	515	70.97	35	15.82	
1810	520	70.93	40	15.86	
1815	525	70.77	45	16.02	
1820	530	70.76	50	16.03	
1825	535	70.62	55	16.17	
1830	540	70.52	60	16.27	
1835	555	70.48	65	16.31	
1840	560	70.45	70	16.34	
1850	570	70.23	80	16.56	
1900	580	70.05	90	16.74	
1910	590	70.00	100	16.79	tech. change
1920	600	69.95	110	16.84	
1930	610	69.87	120	16.92	
1940	620	69.82	130	16.97	
1950	630	69.82	140	16.97	
2000	640	69.70	150	17.09	
2010	650	69.70	160	17.09	
2020	660	69.54	170	17.25	
2030	670	69.68	180	17.11	
2045	685	69.62	195	17.17	
2100	700	69.85	210	16.94	end of test

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Wheatland Aquifer Test
DGS ID Fa15-06; DNREC ID 083638; Observation Well
Date: June 13, 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0930	0	65.72	0.00	
0931	1	65.72	0.00	
0932	2	65.97	0.25	
0933	3	66.14	0.42	
0934	4	66.36	0.64	
0935	5	66.47	0.75	
0936	6	66.57	0.85	
0937	7	66.70	0.98	
0938	8	66.77	1.05	
0939	9	66.85	1.13	
0940	10	66.94	1.22	
0942	12	67.07	1.35	
0944	14	67.25	1.53	
0946	16	67.32	1.60	
0948	18	67.41	1.69	
0950	20	67.49	1.77	
0952	22	67.58	1.86	
0954	24	67.63	1.91	
0956	26	67.68	1.96	
0958	28	67.76	2.04	
1000	30	67.83	2.11	
1005	35	67.98	2.26	
1010	40	68.11	2.39	
1015	45	68.15	2.43	
1020	50	68.25	2.53	
1025	55	68.32	2.60	
1030	60	68.39	2.67	
1035	65	68.44	2.72	
1040	70	68.51	2.79	
1052	82	68.76	3.04	tech. change
1102	92	68.82	3.10	
1112	102	68.86	3.14	
1122	112	69.06	3.34	
1132	122	69.10	3.38	
1142	132	69.13	3.41	
1152	142	69.10	3.38	
1202	152	69.21	3.49	
1212	162	69.25	3.53	
1222	172	69.38	3.66	
1232	182	69.45	3.73	
1247	197	69.56	3.84	
1302	212	69.65	3.93	
1317	227	69.65	3.93	
1332	242	69.62	3.90	
1347	257	69.66	3.94	
1402	272	69.60	3.88	
1417	287	69.80	4.08	
1432	302	69.79	4.07	
1447	317	69.80	4.08	
1502	332	69.83	4.11	
1517	347	69.88	4.16	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1532	362	69.90	4.18	
1547	377	69.94	4.22	
1602	392	69.96	4.24	
1632	422	70.00	4.28	
1700	450	70.00	4.28	tech. change
1730	480	70.05	4.33	end of test

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Wheatland Aquifer Test
DGS ID Fa15-06; DNREC ID 083638; Observation Well
Date: June 13, 1995
Recovery Data

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
1730	480	70.05	0	0.00	
1731	481	69.95	1	0.1	
1732	482	69.83	2	0.22	
1733	483	69.55	3	0.5	
1734	484	69.37	4	0.68	
1735	485	69.25	5	0.8	
1736	486	69.18	6	0.87	
1737	487	68.95	7	1.1	
1738	488	68.86	8	1.19	
1739	489	68.76	9	1.29	
1740	490	68.73	10	1.32	
1742	492	68.56	12	1.49	
1744	494	68.49	14	1.56	
1746	496	68.38	16	1.67	
1748	498	68.22	18	1.83	
1750	500	68.16	20	1.89	
1752	502	68.13	22	1.92	
1754	504	68.04	24	2.01	
1756	506	67.94	26	2.11	
1758	508	67.88	28	2.17	
1800	510	67.82	30	2.23	
1805	515	67.70	35	2.35	
1810	520	67.60	40	2.45	
1815	525	67.50	45	2.55	
1820	530	67.52	50	2.53	
1825	535	67.35	55	2.7	
1830	540	67.27	60	2.78	
1830	555	67.20	65	2.85	
1840	560	67.19	70	2.86	
1852	572	67.12	82	2.93	tech. change
1902	582	66.58	92	3.47	
1912	592	66.68	102	3.37	
1922	602	66.08	112	3.97	
1932	612	66.52	122	3.53	
1942	622	66.45	132	3.6	
1952	632	66.63	142	3.42	
2002	642	66.48	152	3.57	
2012	652	66.35	162	3.7	
2022	662	66.40	172	3.65	
2032	672	66.40	182	3.65	
2047	687	66.10	197	3.95	
2102	702	66.15	212	3.9	end of test

Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks

APPENDIX B

Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

Wheatland Aquifer Test
DGS ID Fa15-07; DNREC ID 083639; Observation Well
Date: June 13. 1995
Pump Test

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
0930	0	66.78	0.00	
0931	1	66.95	0.17	
0932	2	67.41	0.63	
0933	3	67.60	0.82	
0934	4	67.92	1.14	
0935	5	68.02	1.24	
0936	6	68.44	1.66	
0937	7	68.15	1.37	
0938	8	68.47	1.69	
0939	9	68.55	1.77	
0940	10	68.65	1.87	
0942	12	68.79	2.01	
0944	14	68.92	2.14	
0946	16	69.07	2.29	
0948	18	69.13	2.35	
0950	20	69.20	2.42	
0952	22	69.38	2.60	
0954	24	69.52	2.74	
0956	26	69.33	2.55	
0958	28	69.47	2.69	
1000	30	69.58	2.80	
1005	35	69.65	2.87	
1010	40	69.85	3.07	
1015	45	69.87	3.09	
1020	50	69.95	3.17	
1025	55	70.03	3.25	
1030	60	70.12	3.34	
1035	65	70.15	3.37	
1040	70	70.30	3.52	
1051	81	70.36	3.58	tech. change
1101	91	70.47	3.69	
1111	101	70.61	3.83	
1121	111	70.60	3.82	
1131	121	70.81	4.03	
1141	131	70.78	4.00	
1151	141	70.93	4.15	
1201	151	71.00	4.22	
1211	161	71.02	4.24	
1221	171	71.04	4.26	
1231	181	71.13	4.35	
1246	196	71.19	4.41	
1301	211	71.22	4.44	
1316	226	71.26	4.48	
1331	241	71.28	4.50	
1346	256]	71.37	4.59	
1401	271	71.35	4.57	
1416	286	71.41	4.63	
1431	301	71.45	4.67	
1446	316	71.48	4.70	
1501	331	71.53	4.75	
1516	346	71.55	4.77	

Time	Elapsed Time (min)	Water Level (ft)	Observed Drawdown (ft)	Remarks
1531	361	71.60	4.82	
1546	376	71.56	4.78	
1601	391	71.65	4.87	
1631	421	71.70	4.92	
1700	450	71.65	4.87	tech. change
1730	480	71.75	4.97	end of test

APPENDIX B

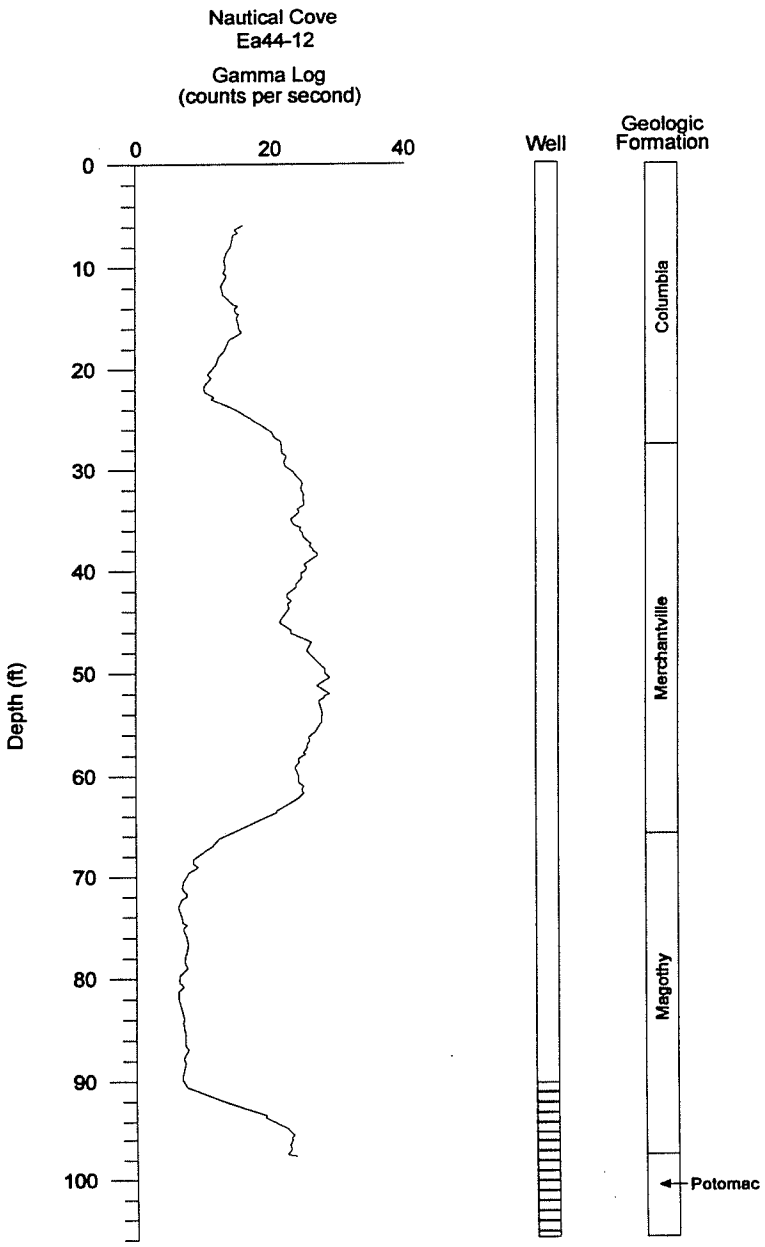
Southern New Castle County
Ground-Water Monitoring Network
Phase II - Ground-Water Availability

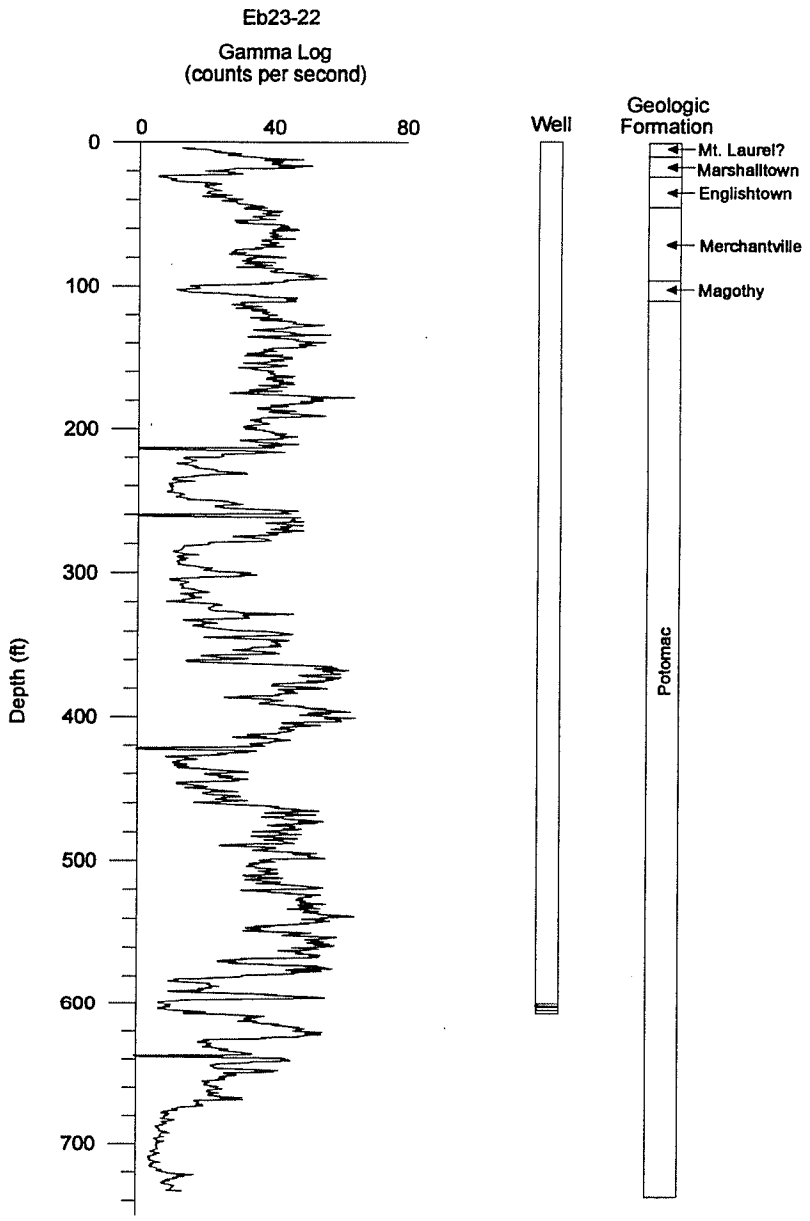
Wheatland Aquifer Test
DGS ID Fa15-07; DNREC ID 083639; Observation Well
Date: June 13, 1995
Recovery Data

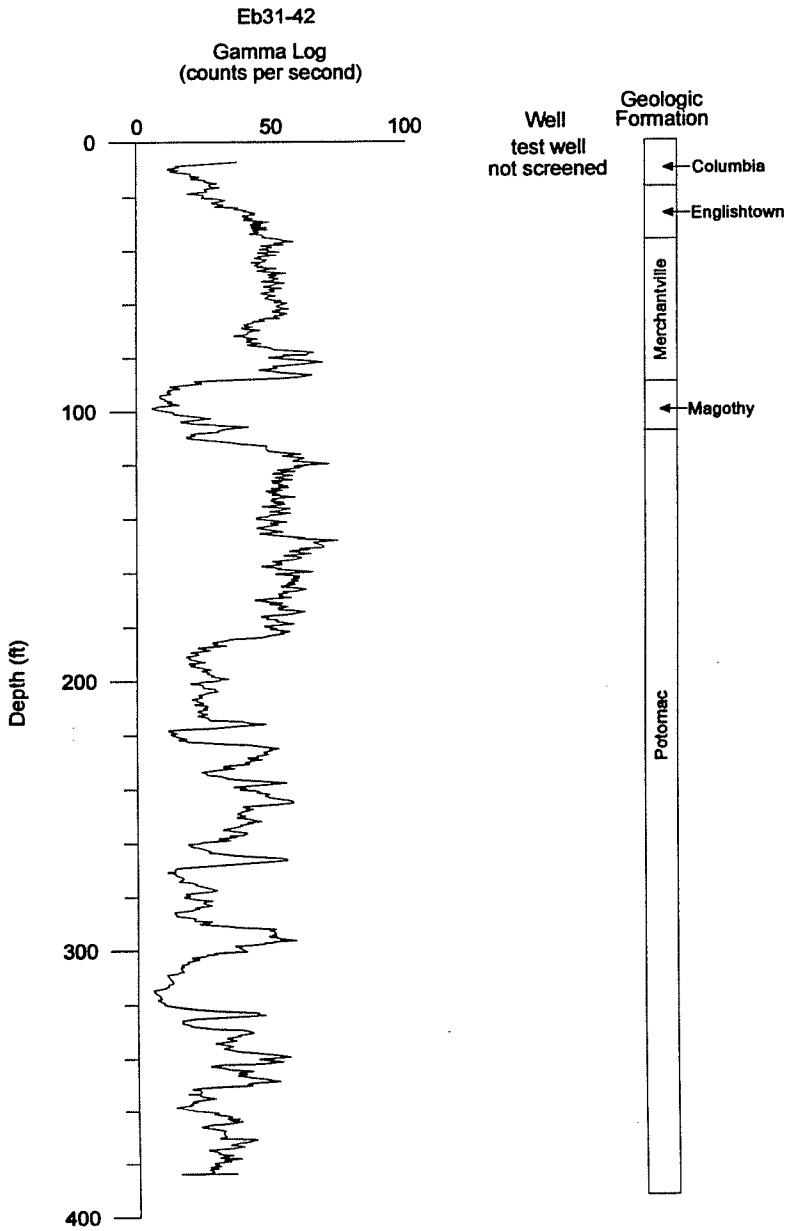
Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks
1730	480	71.75	0	0.00	
1731	481	71.38	1	0.37	
1732	482	71.02	2	0.73	
1733	483	70.73	3	1.02	
1734	484	70.42	4	1.33	
1735	485	70.30	5	1.45	
1736	486	70.24	6	1.51	
1737	487	70.22	7	1.53	
1738	488	69.93	8	1.82	
1739	489	69.90	9	1.85	
1740	490	69.76	10	1.99	
1742	492	69.66	12	2.09	
1744	494	69.45	14	2.3	
1746	496	69.30	16	2.45	
1748	498	69.15	18	2.6	
1750	500	69.15	20	2.6	
1752	502	69.05	22	2.7	
1754	504	69.05	24	2.7	
1756	506	68.83	26	2.92	
1758	508	68.77	28	2.98	
1800	510	68.71	30	3.04	
1805	515	68.59	35	3.16	
1810	520	68.62	40	3.13	
1815	525	68.51	45	3.24	
1820	530	68.38	50	3.37	
1825	535	68.27	55	3.48	
1830	540	68.22	60	3.53	
1835	555	68.14	65	3.61	
1840	560	68.15	70	3.6	
1851	571	67.88	81	3.87	tech. change
1901	581	67.70	91	4.05	
1912	591	67.68	101	4.07	
1921	601	67.75	111	4	
1931	611	67.83	121	3.92	
1941	621	67.55	131	4.2	
1951	631	67.55	141	4.2	
2001	641	67.58	151	4.17	
2011	651	67.35	161	4.4	
2021	661	67.45	171	4.3	
2031	671	67.40	181	4.35	
2046	686	67.32	196	4.43	
2101	701	67.72	211	4.03	end of test

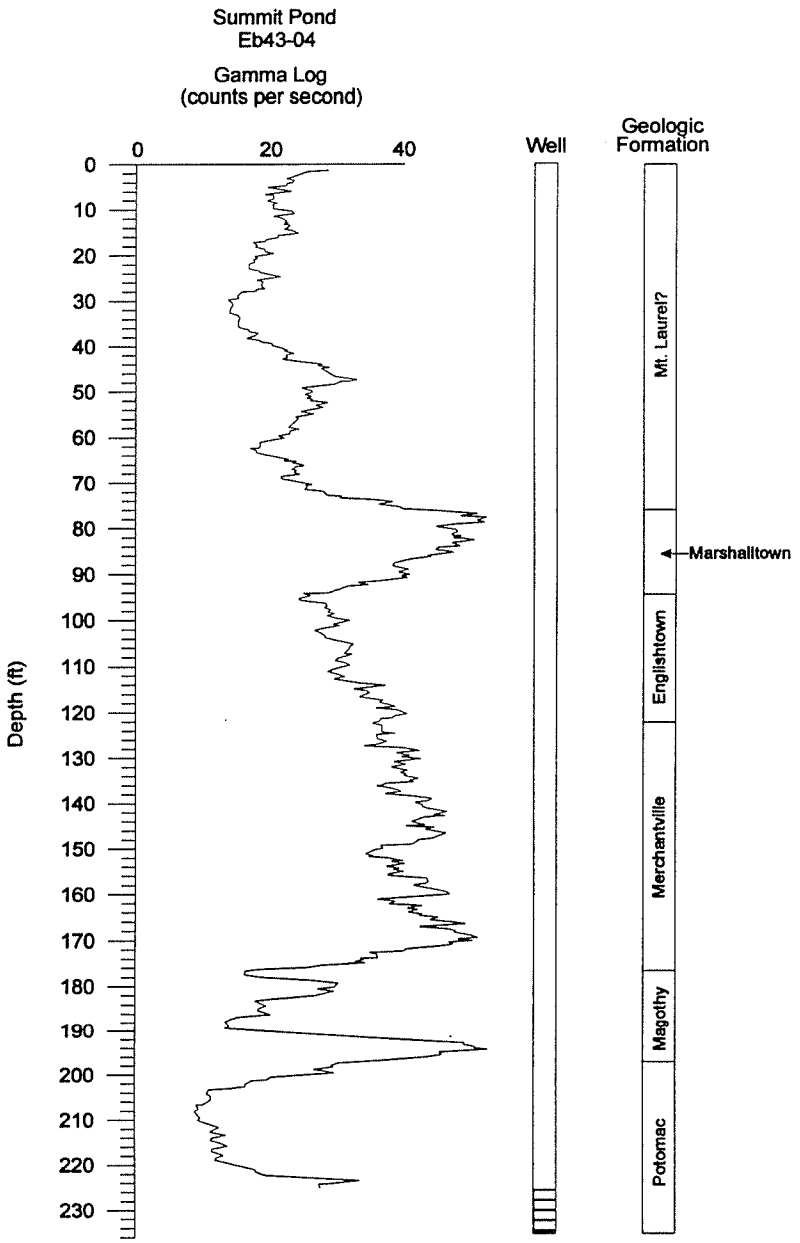
Time	Elapsed t Test (min)	Water Level (ft)	t Since Test Stop (min)	Recovery (ft)	Remarks

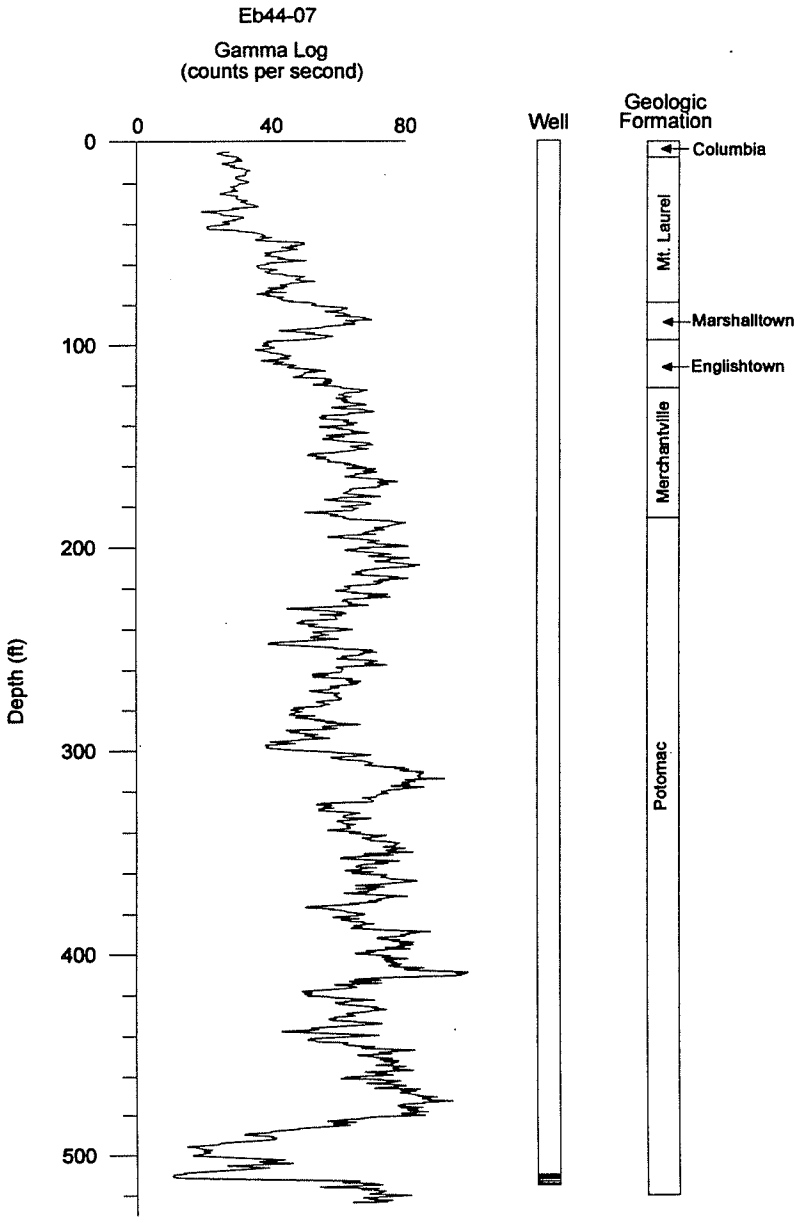
APPENDIX C
GEOPHYSICAL LOGS

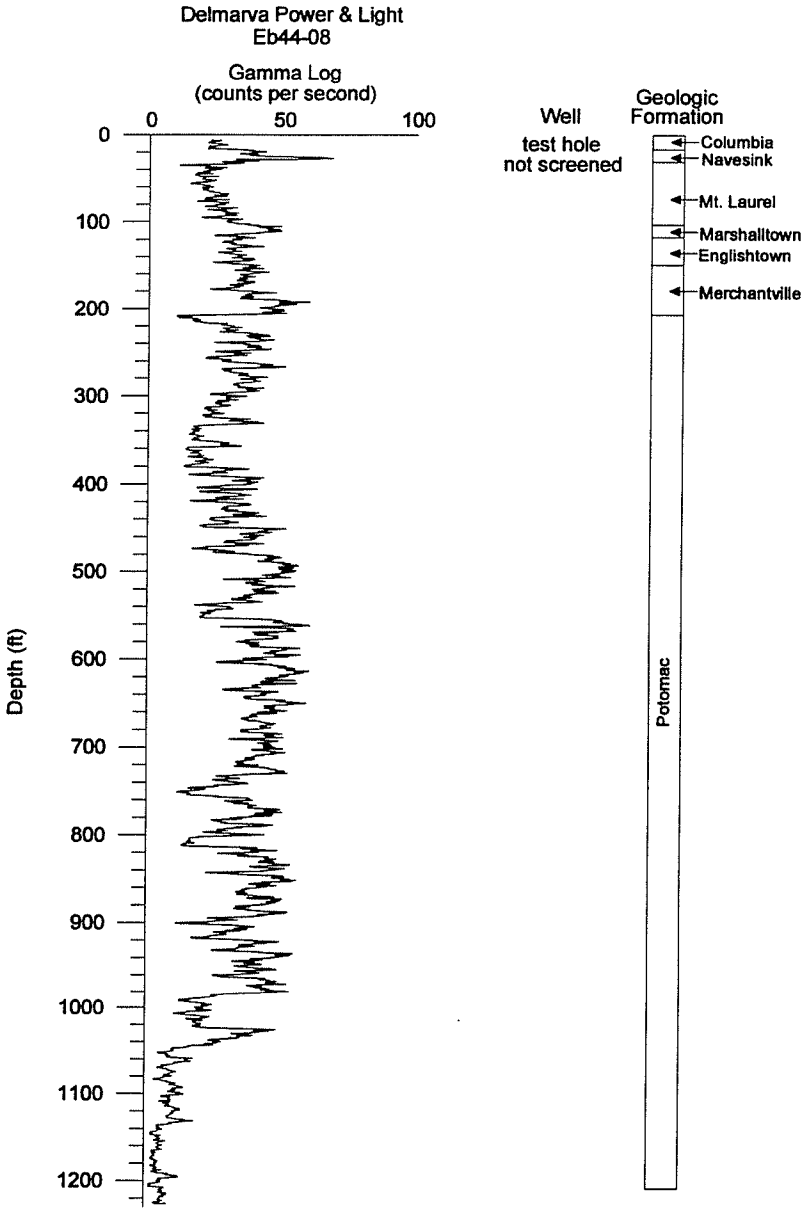

Nautical Cove
Ea44-12
Gamma Log
(counts per second)
0
20
40
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
Well
Geologic Formation
Columbia
Merchantville
Magothy
Potomac

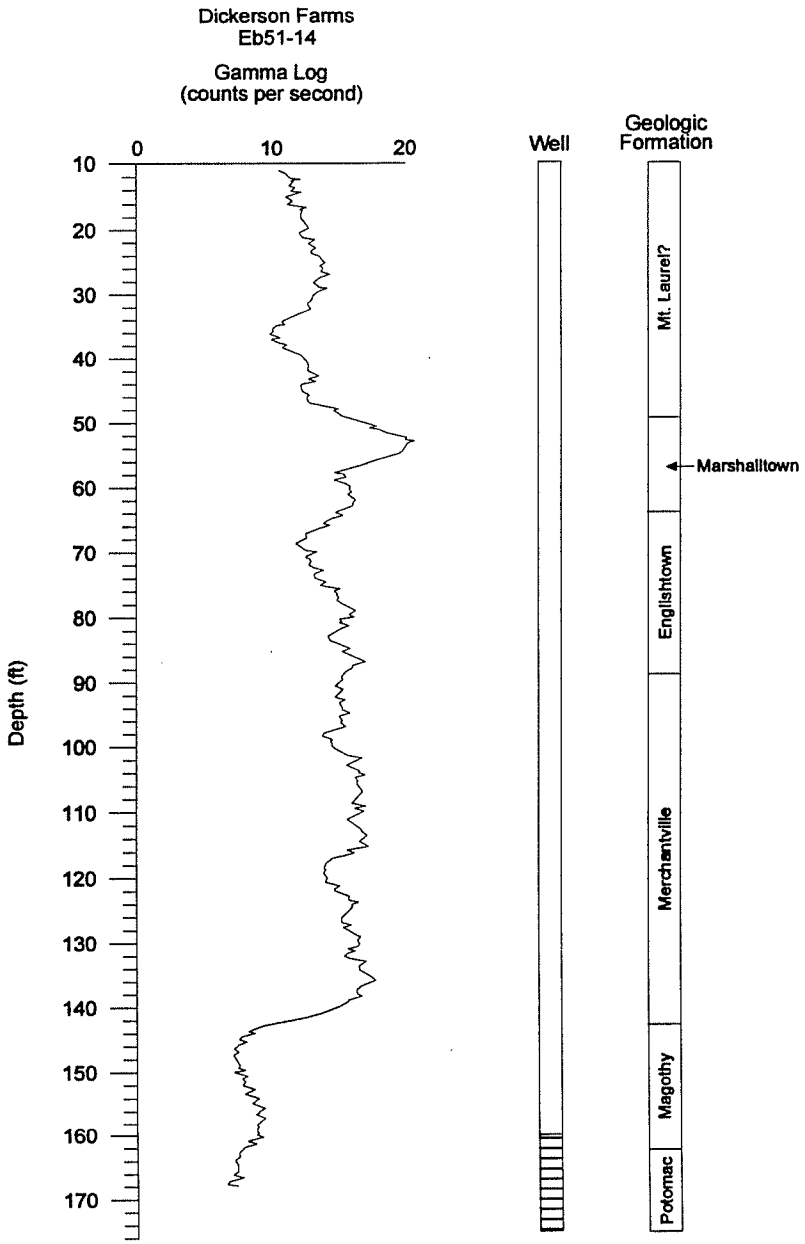

Eb23-22
Gamma Log
(counts per second)
0
40
80
Depth (ft)
0
100
200
300
400
500
600
700
Well
Geologic
Formation
Mt. Laurel?
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

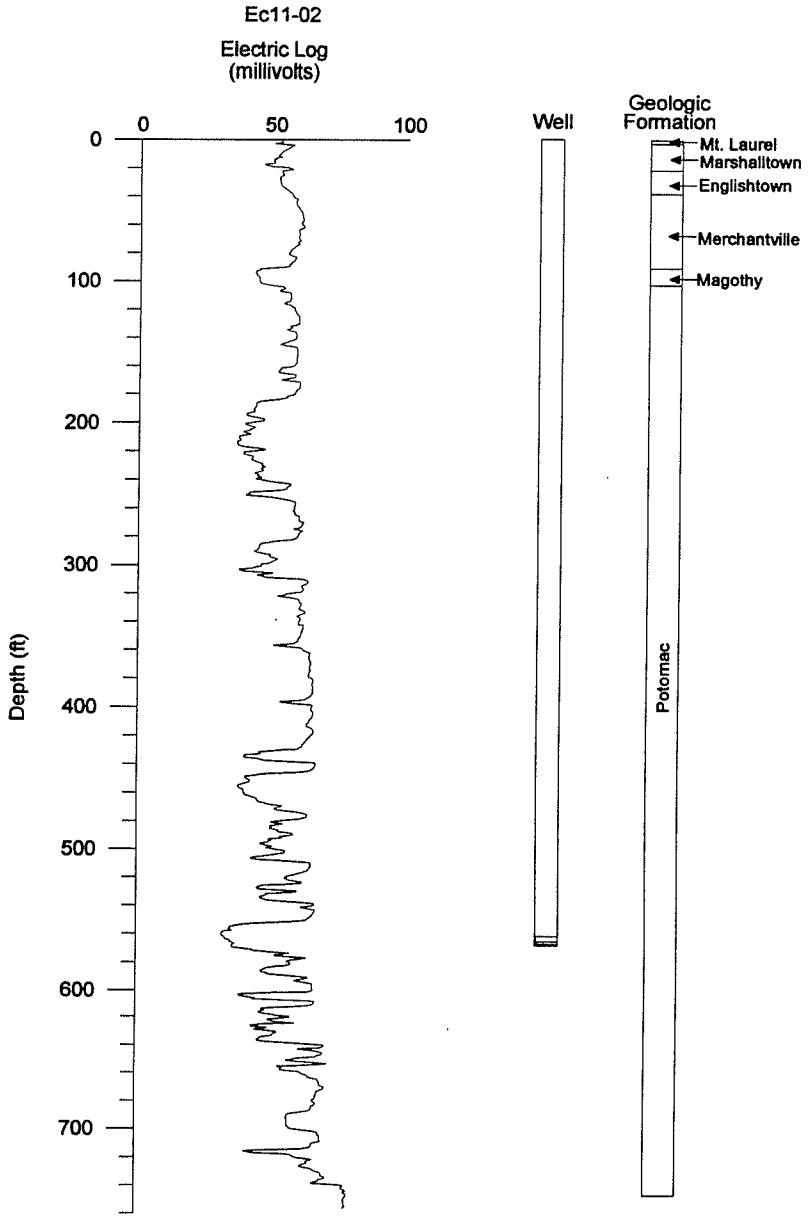

Eb31-42
Gamma Log
(counts per second)
0
50
100
0
100
200
300
400
Depth (ft)
Well
test well
not screened
Geologic
Formation
Columbia
Englishtown
Merchantville
Magothy
Potomac

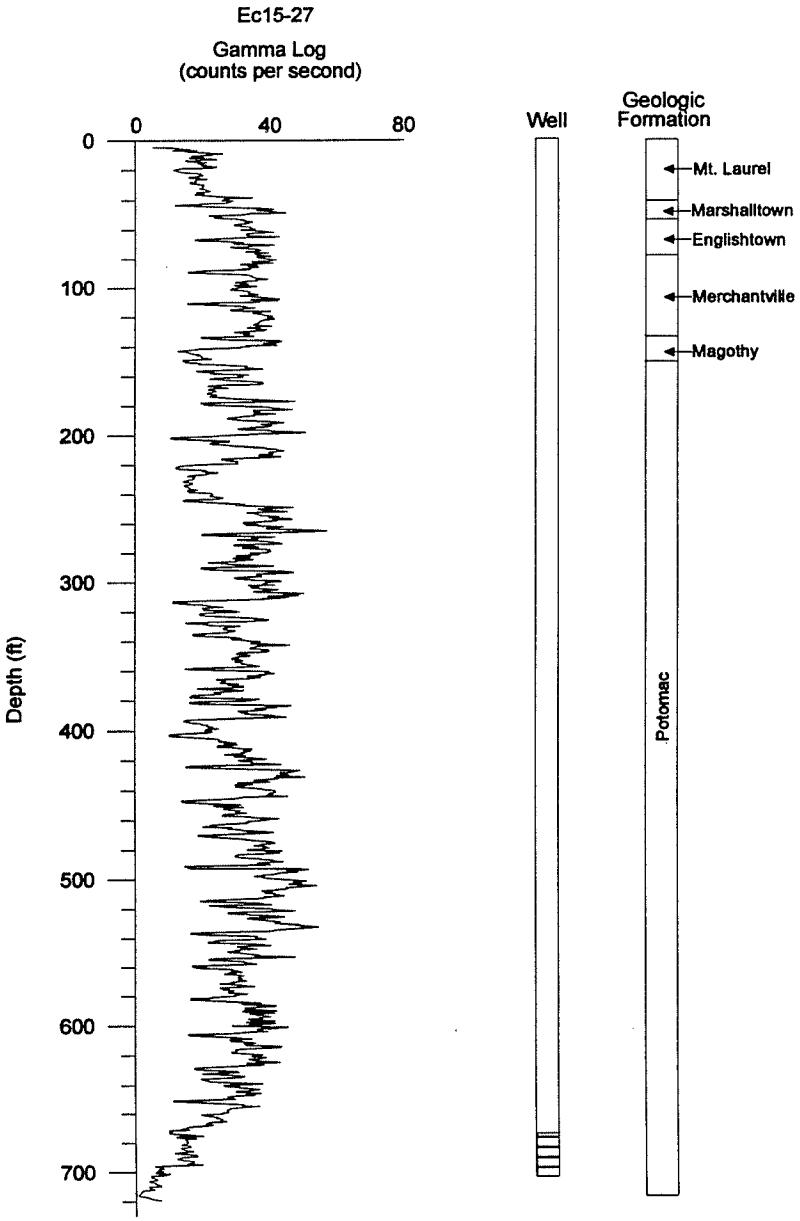

Summit Pond
Eb43-04
Gamma Log
(counts per second)
0
20
40
Well
Geologic Formation
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
Mt. Laurel?
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

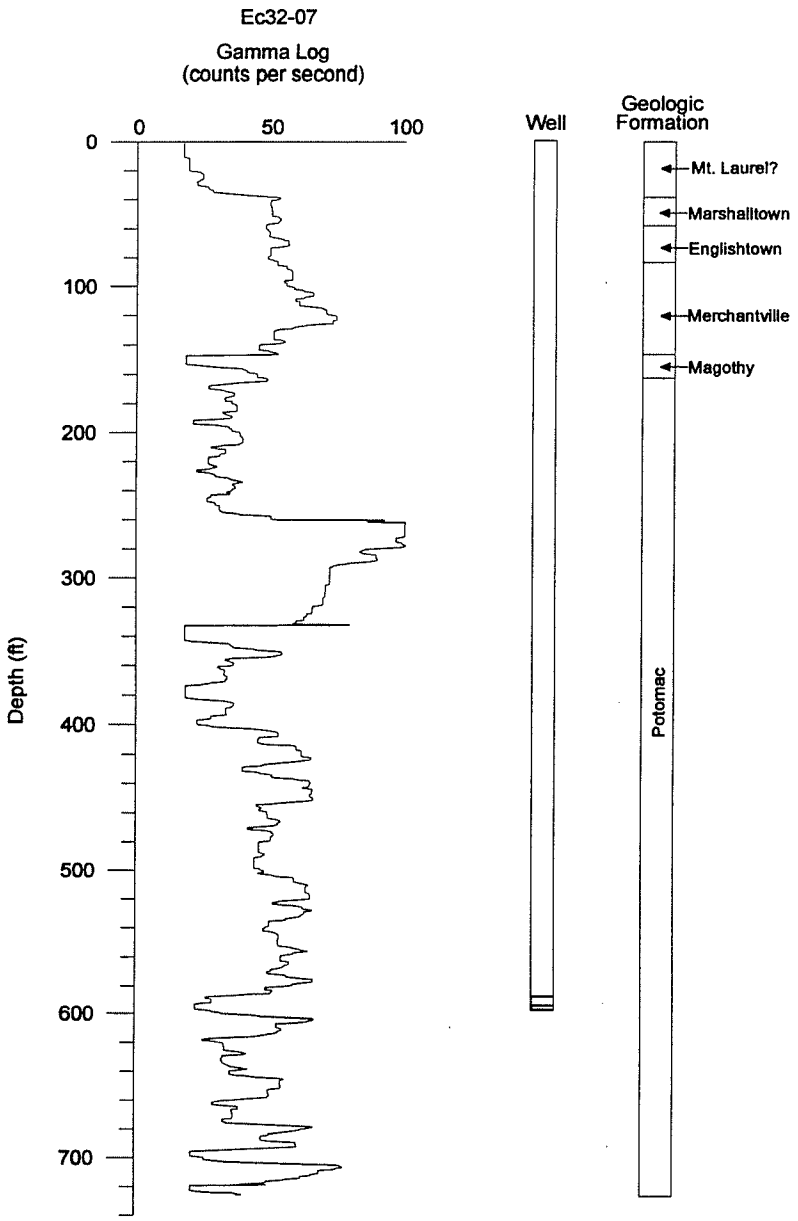

Eb44-07
Gamma Log
(counts per second)
0
40
80
Depth (ft)
0
100
200
300
400
500
Well
Geologic
Formation
Columbia
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Potomac

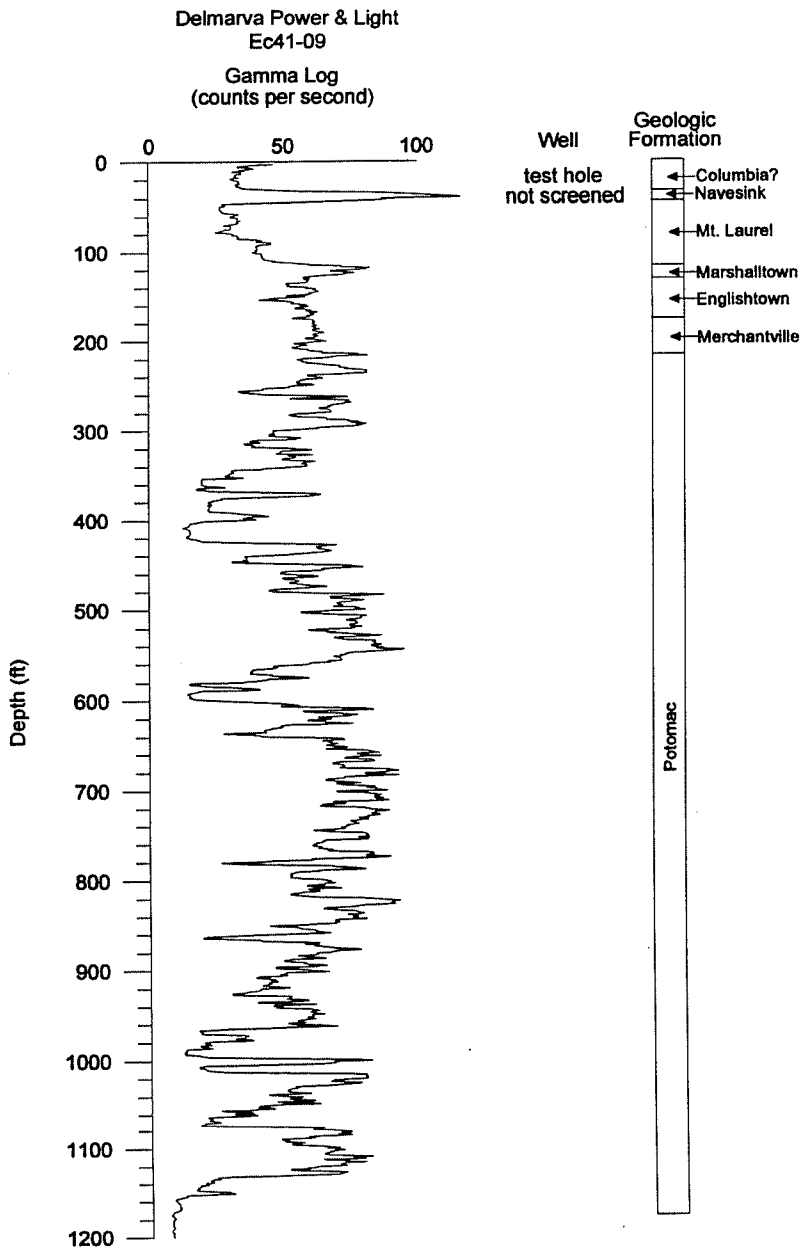

Delmarva Power & Light
Eb44-08
Gamma Log
(counts per second)
0
50
100
Depth (ft)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Well
test hole
not screened
Geologic
Formation
Columbia
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Potomac

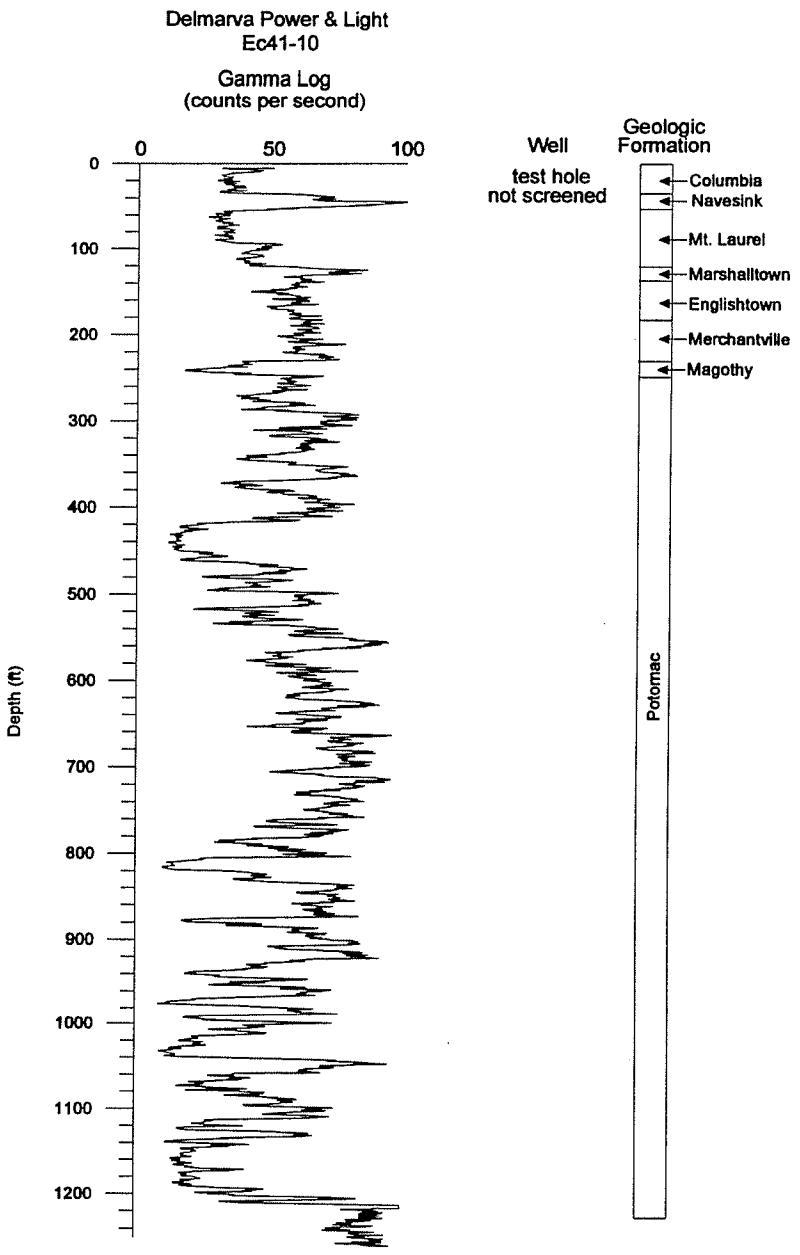

Dickerson Farms
Eb51-14
Gamma Log
(counts per second)
0
10
20
Depth (ft)
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
Well
Geologic Formation
Mt. Laurel?
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

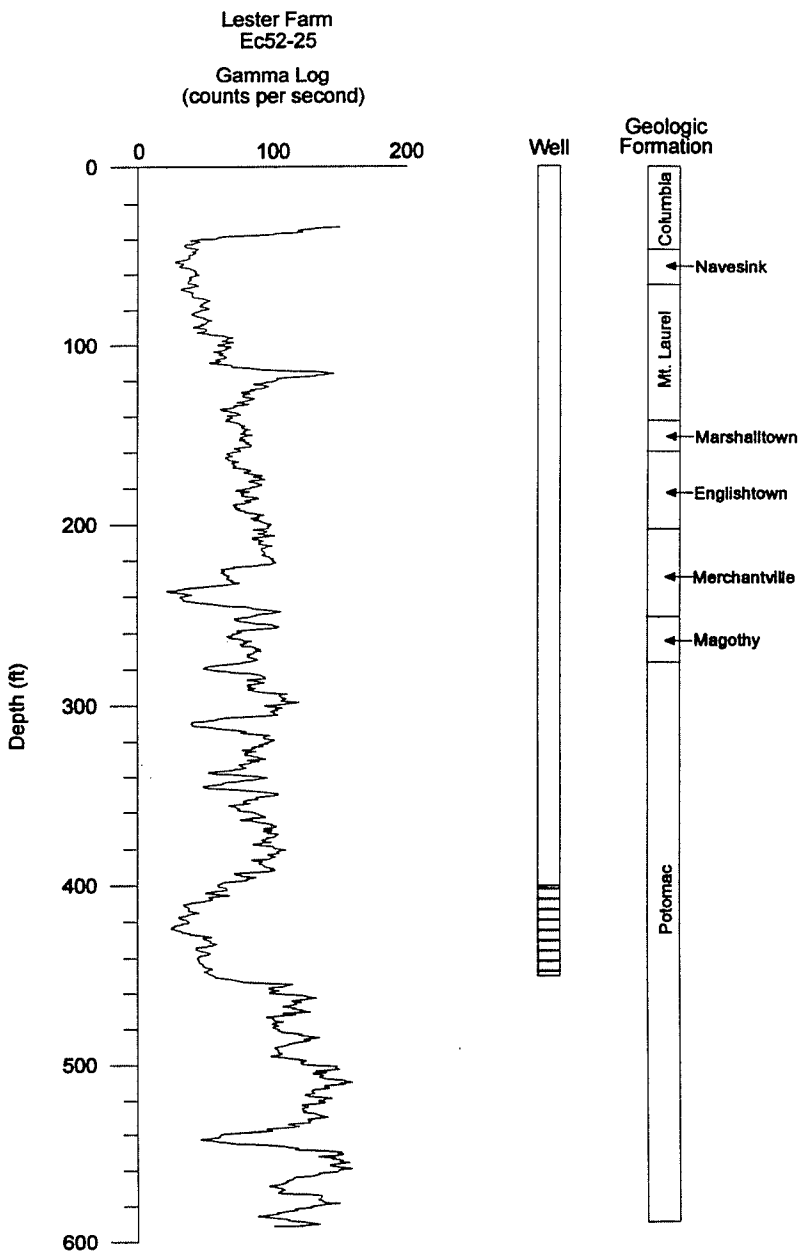

Ec11-02
Electric Log
(millivolts)
0
50
100
Depth (ft)
0
100
200
300
400
500
600
700
Well
Geologic
Formation
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

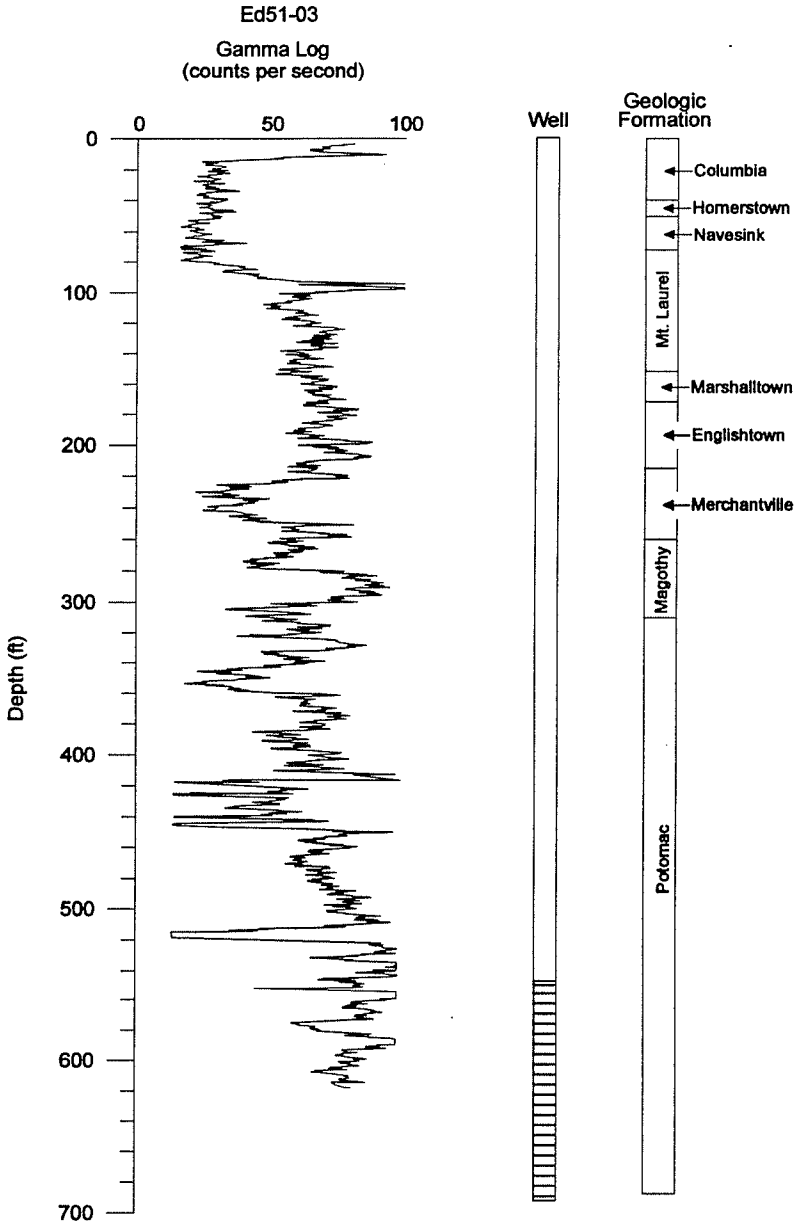

Ec15-27
Gamma Log
(counts per second)
0
40
80
Depth (ft)
0
100
200
300
400
500
600
700
Well
Geologic Formation
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

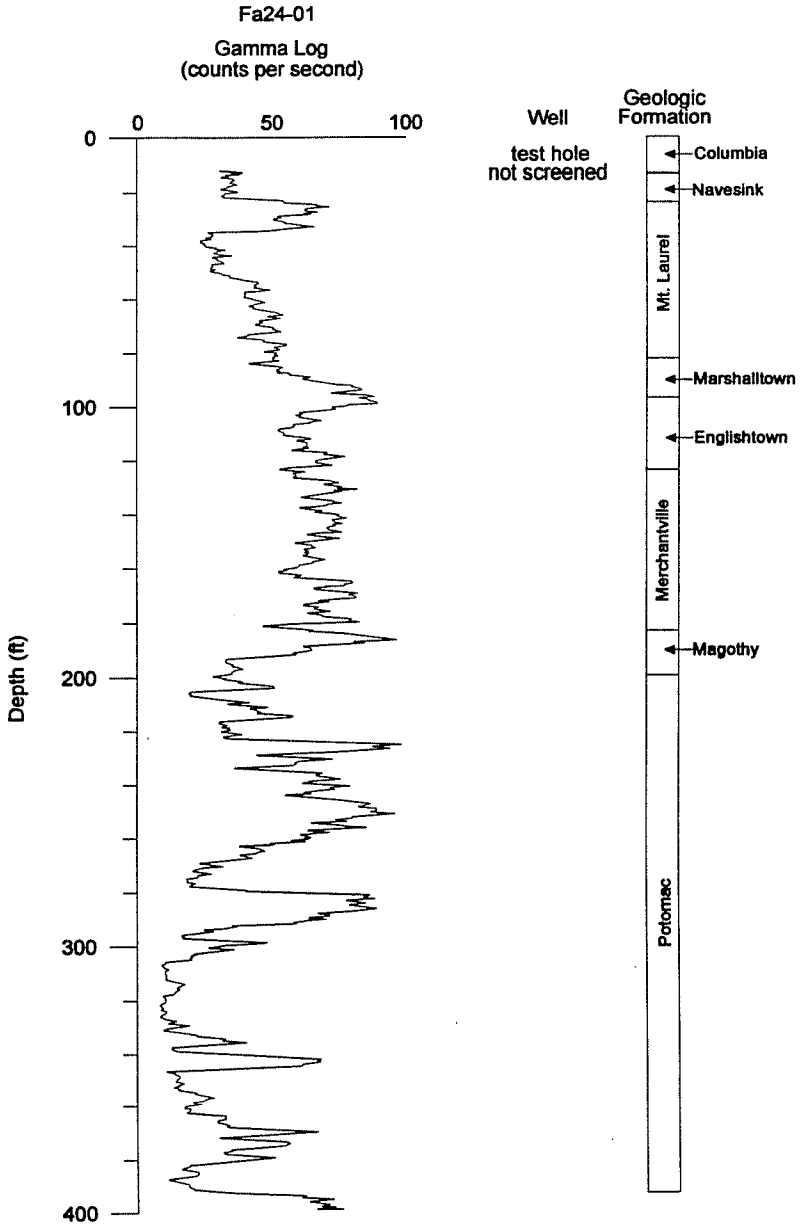

Ec32-07
Gamma Log
(counts per second)
0
50
100
Well
Geologic
Formation
Mt. Laurel?
Marshalltown
Englishtown
Merchantville
Magothy
Potomac
Depth (ft)
0
100
200
300
400
500
600
700

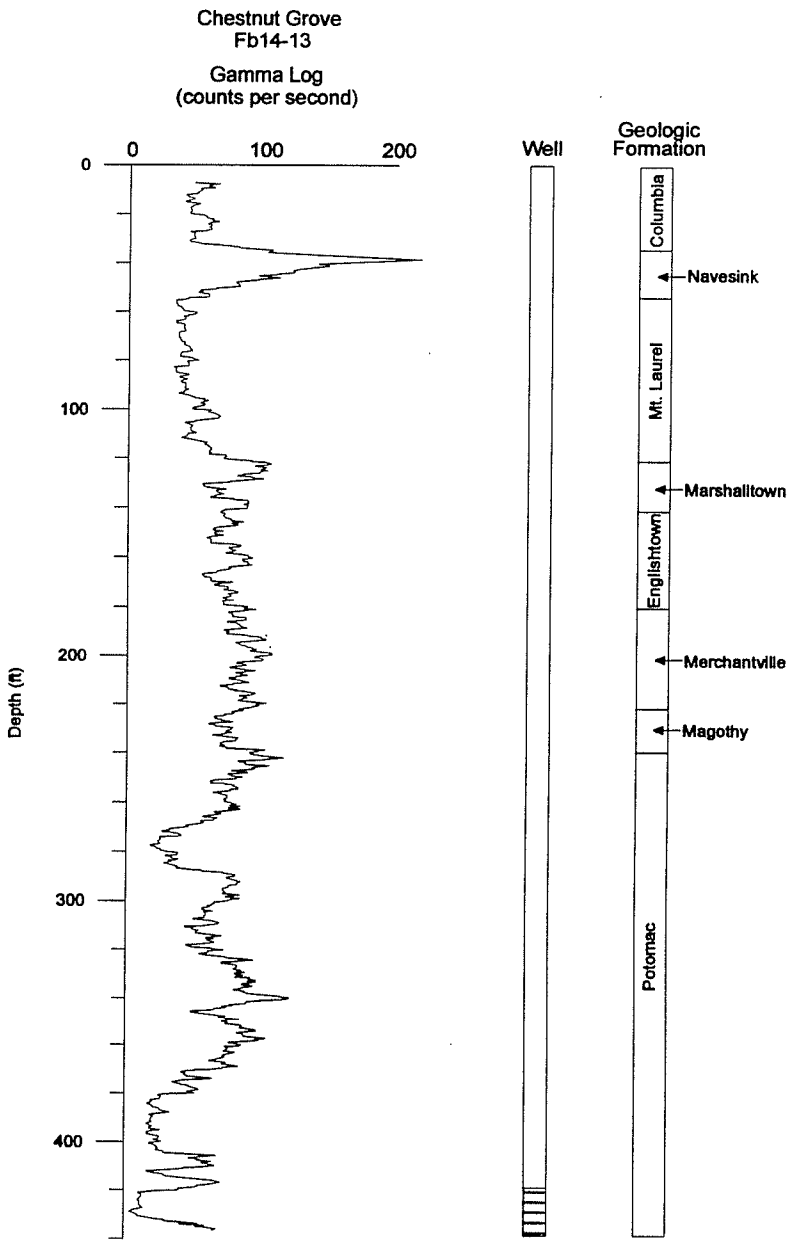

Delmarva Power & Light
Ec41-09
Gamma Log
(counts per second)
0
50
100
Depth (ft)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Well
Geologic Formation
test hole
not screened
Columbia?
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Potomac

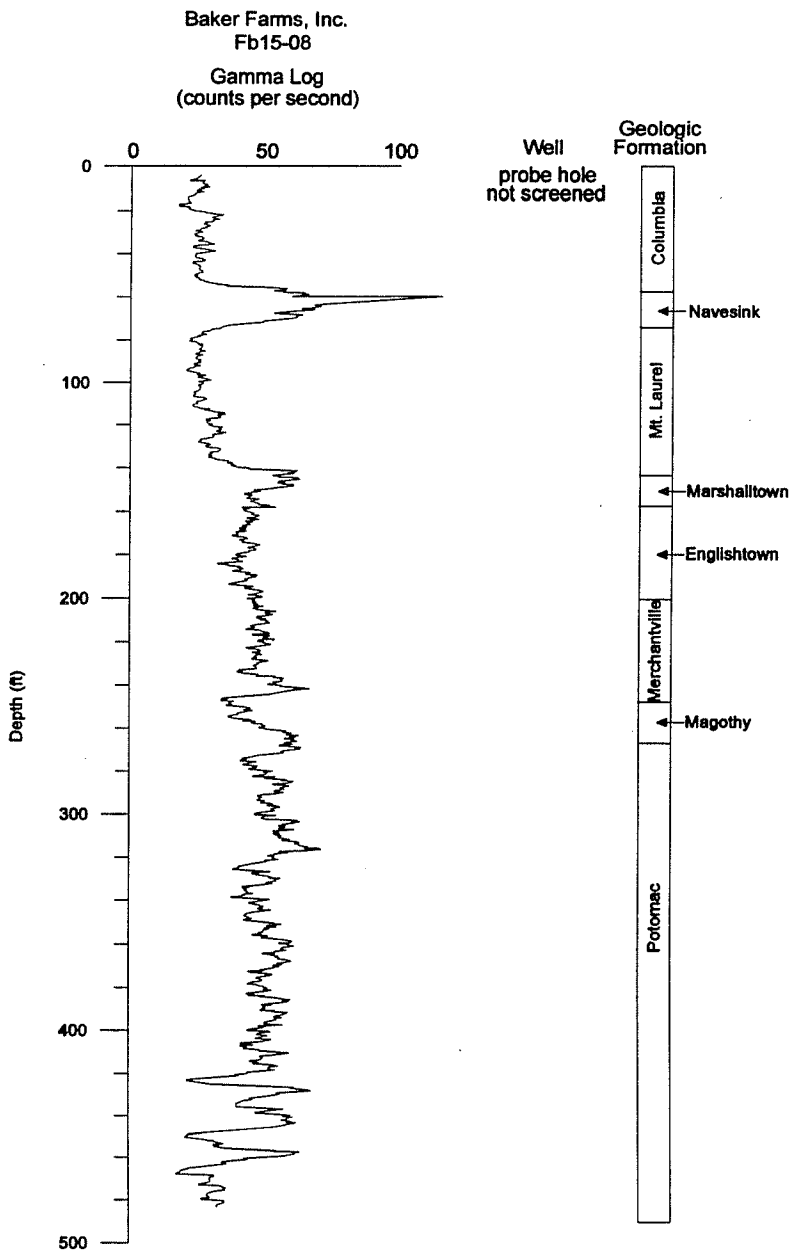

Delmarva Power & Light
Ec41-10
Gamma Log
(counts per second)
0
50
100
Depth (ft)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Well
test hole
not screened
Geologic
Formation
Columbia
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

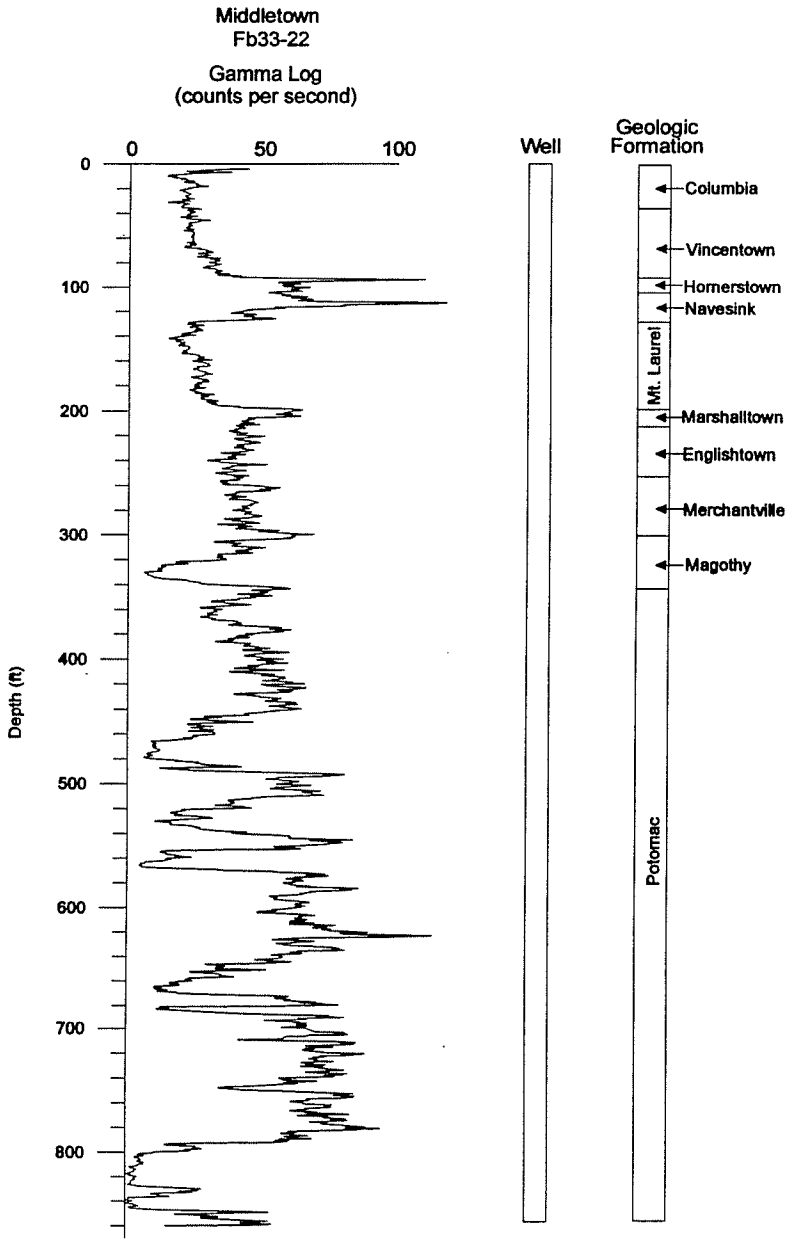

Lester Farm
Ec52-25
Gamma Log
(counts per second)
0
100
200
Depth (ft)
0
100
200
300
400
500
600
Well
Geologic Formation
Columbia
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

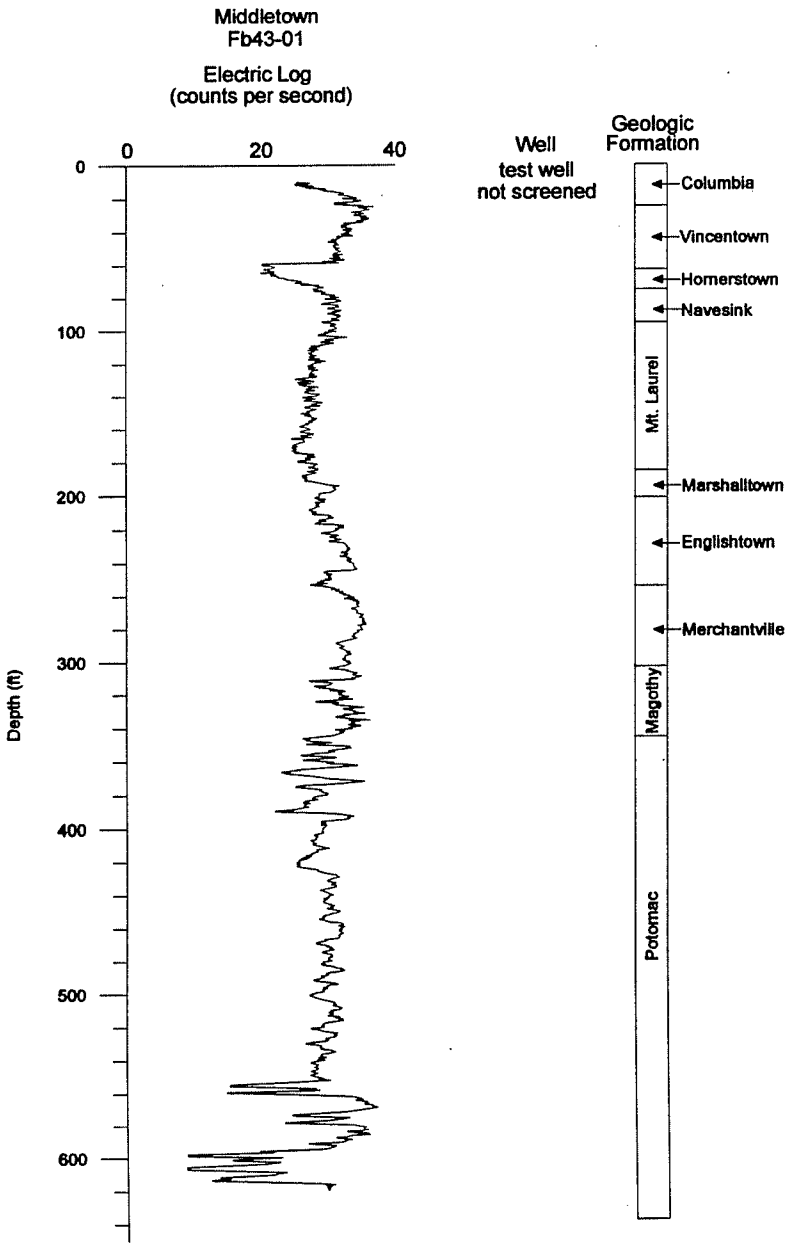

Ed51-03
Gamma Log
(counts per second)
0
50
100
Well
Geologic
Formation
0
100
200
300
400
500
600
700
Depth (ft)
Columbia
Homerstown
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

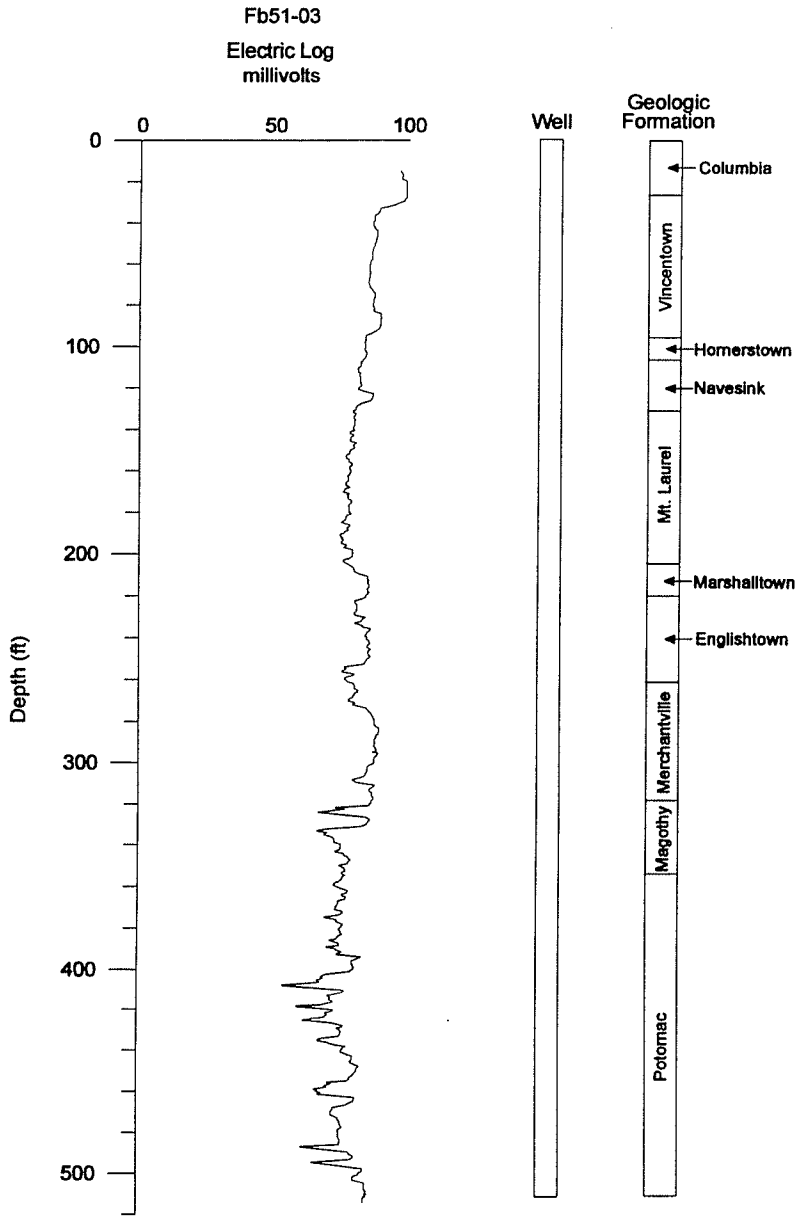

Fa24-01
Gamma Log
(counts per second)
0
50
100
0
100
200
300
400
Depth (ft)
Well
test hole
not screened
Geologic
Formation
Columbia
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

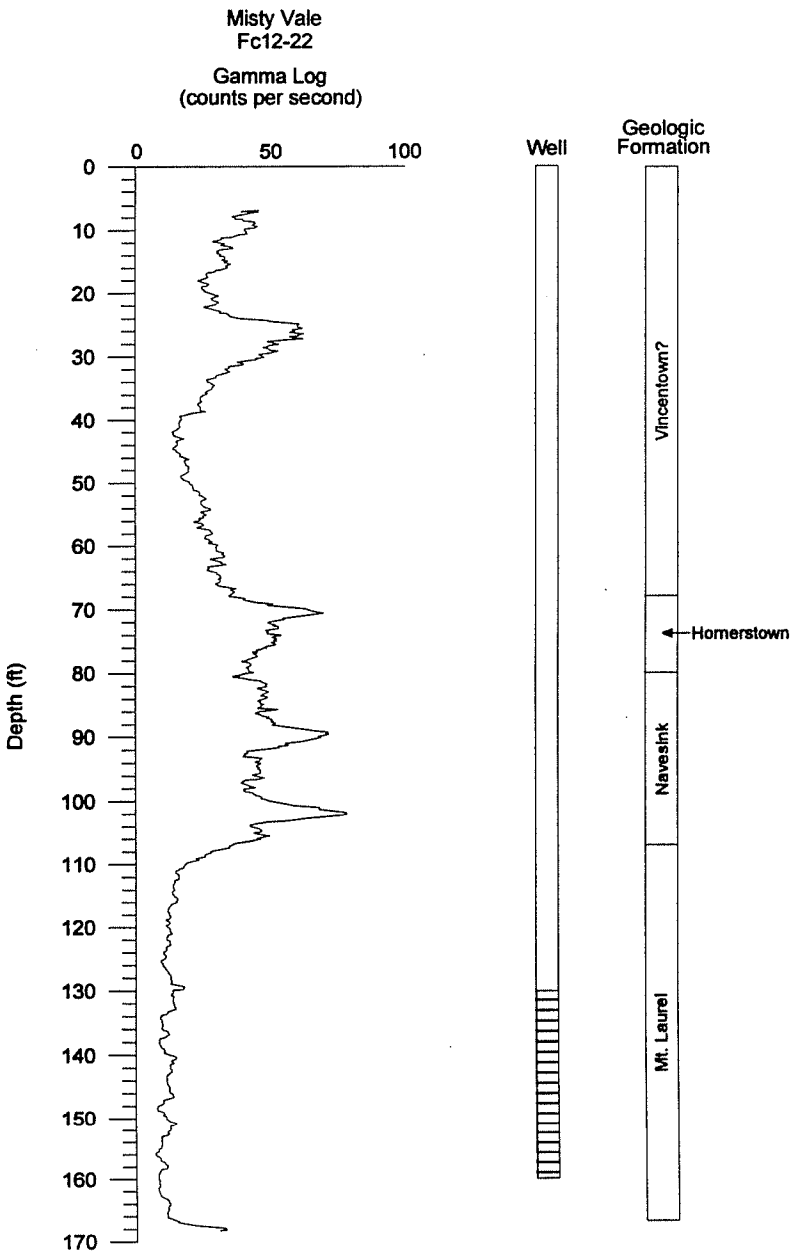

Chestnut Grove
Fb14-13
Gamma Log
(counts per second)
0
100
200
Depth (ft)
0
100
200
300
400
Well
Geologic Formation
Columbia
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

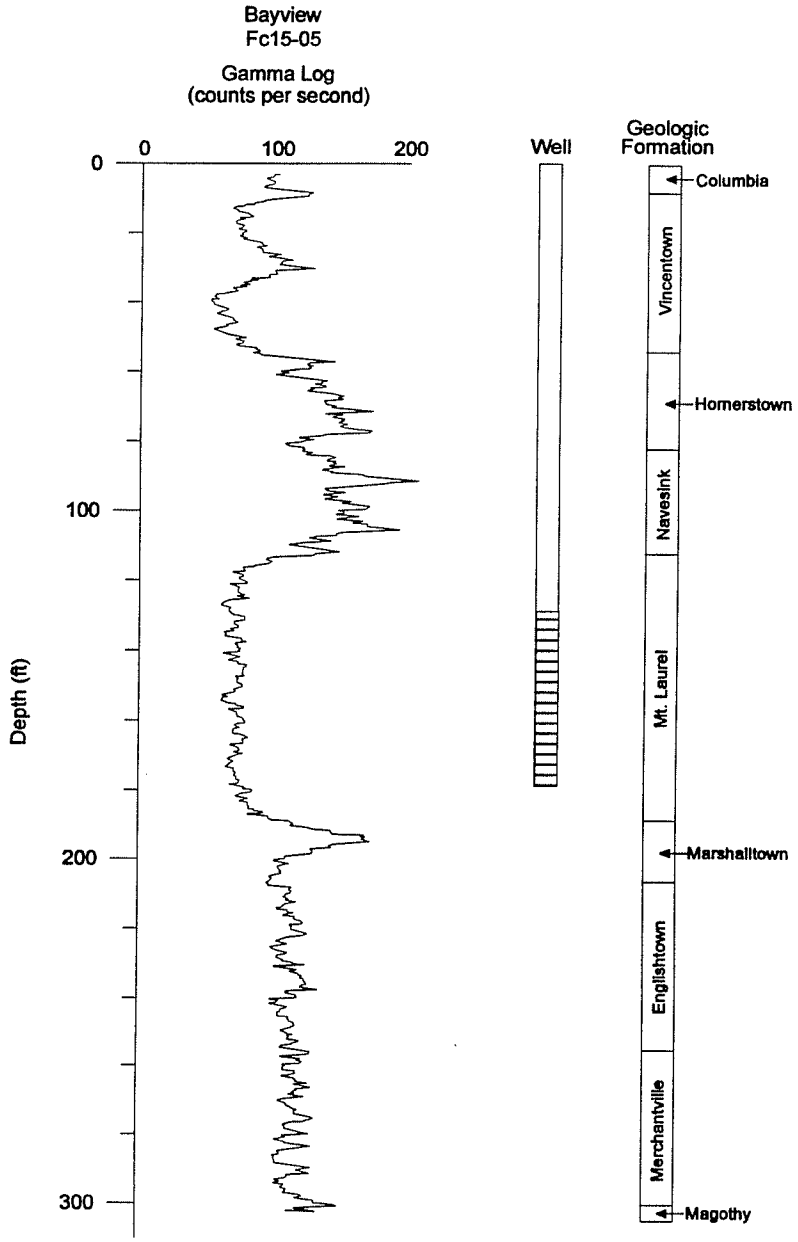

Baker Farms, Inc.
Fb15-08
Gamma Log
(counts per second)
0
50
100
Well
probe hole
not screened
Geologic
Formation
Depth (ft)
0
100
200
300
400
500
Columbia
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

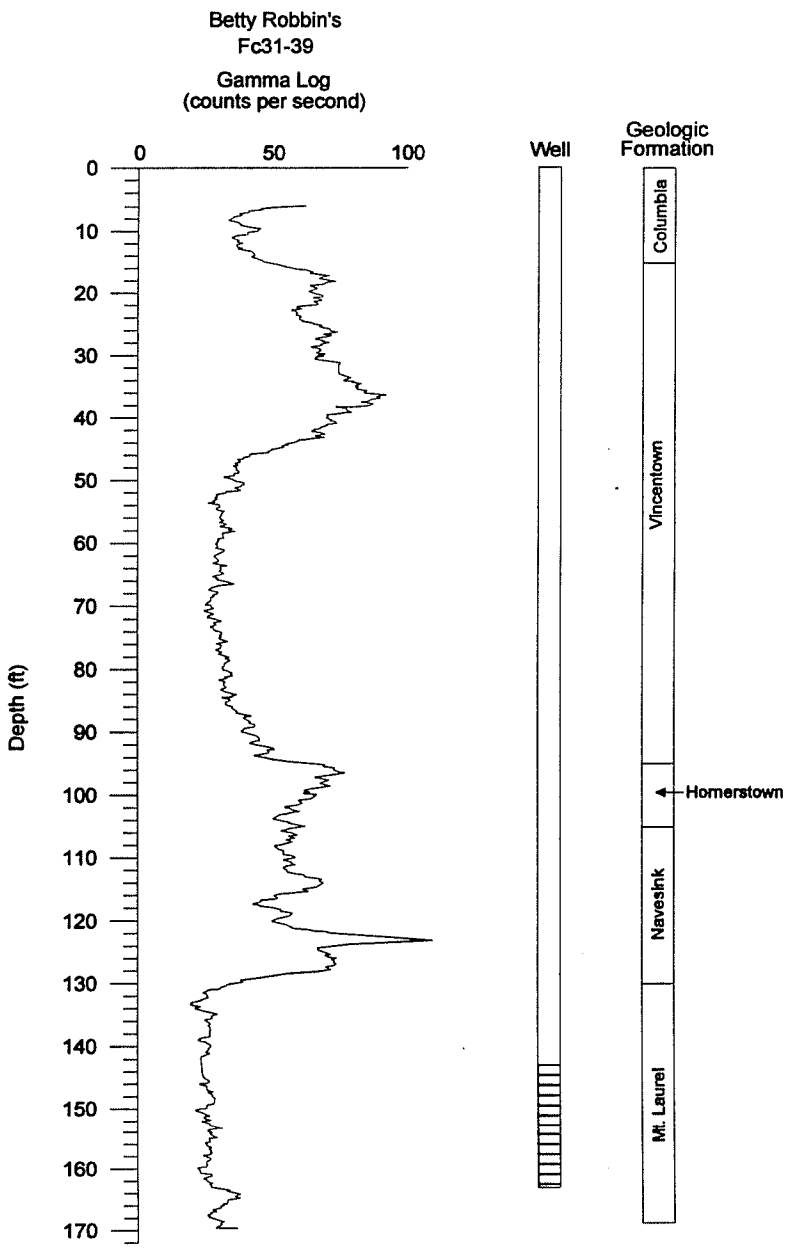

Middletown
Fb33-22
Gamma Log
(counts per second)
0
50
100
Well
Geologic Formation
Depth (ft)
0
100
200
300
400
500
600
700
800
Columbia
Vincentown
Hornerstown
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

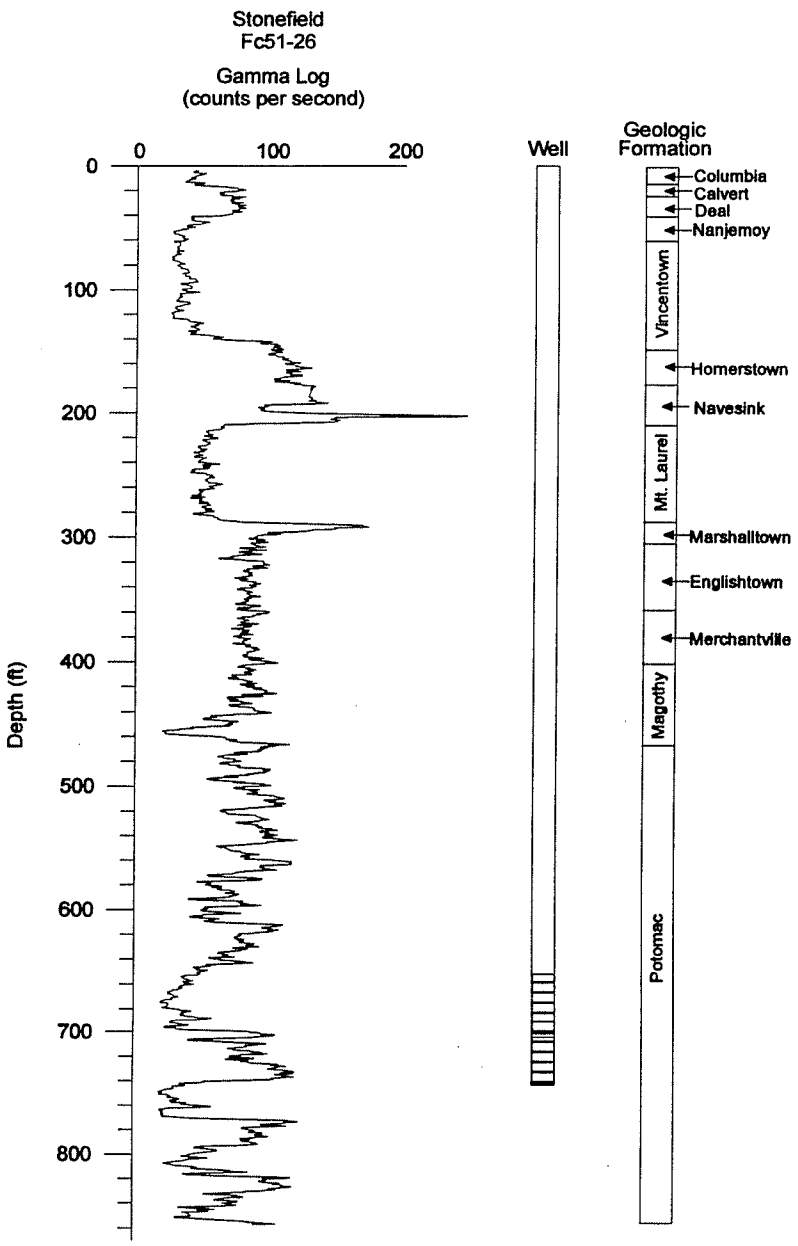

Middletown
Fb43-01
Electric Log
(counts per second)
0
20
40
0
100
200
300
400
500
600
Depth (ft)
Well
test well
not screened
Geologic
Formation
Columbia
Vincentown
Homerstown
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

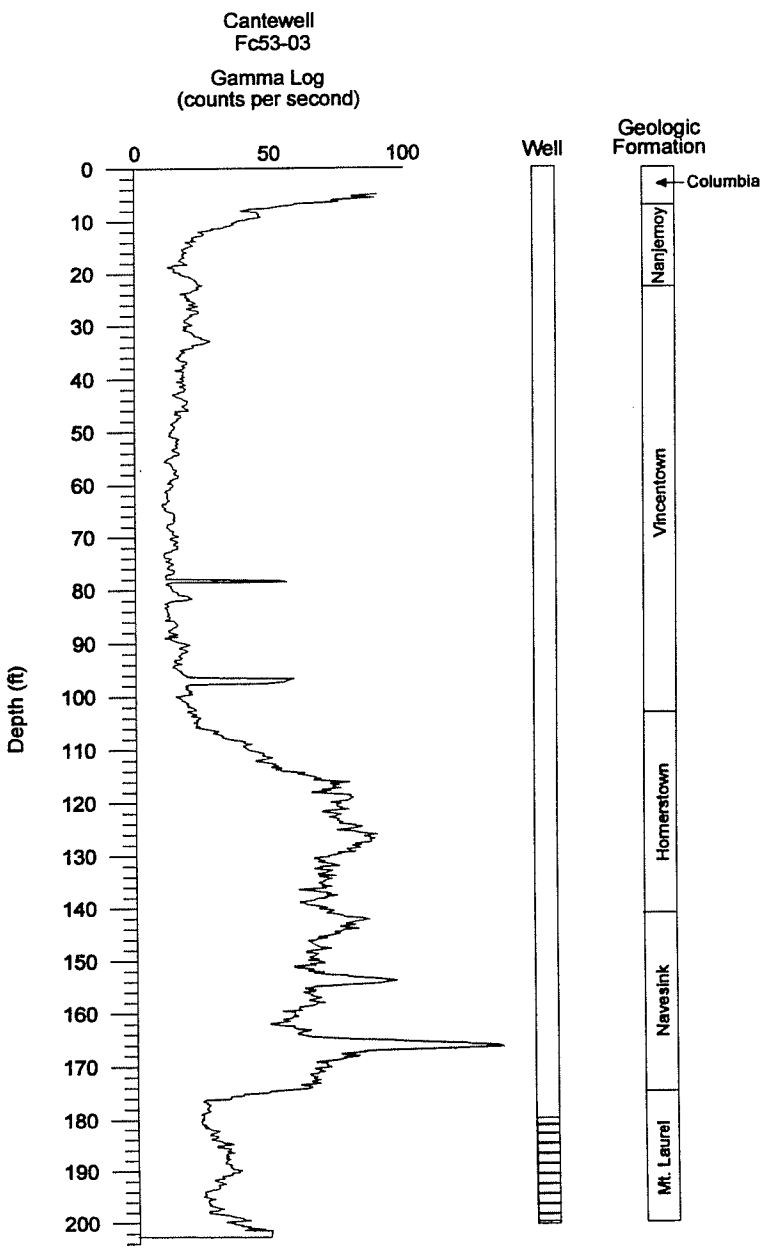

Fb51-03
Electric Log
millivolts
0
50
100
Well
Geologic Formation
Depth (ft)
0
100
200
300
400
500
Columbia
Vincentown
Homerstown
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac

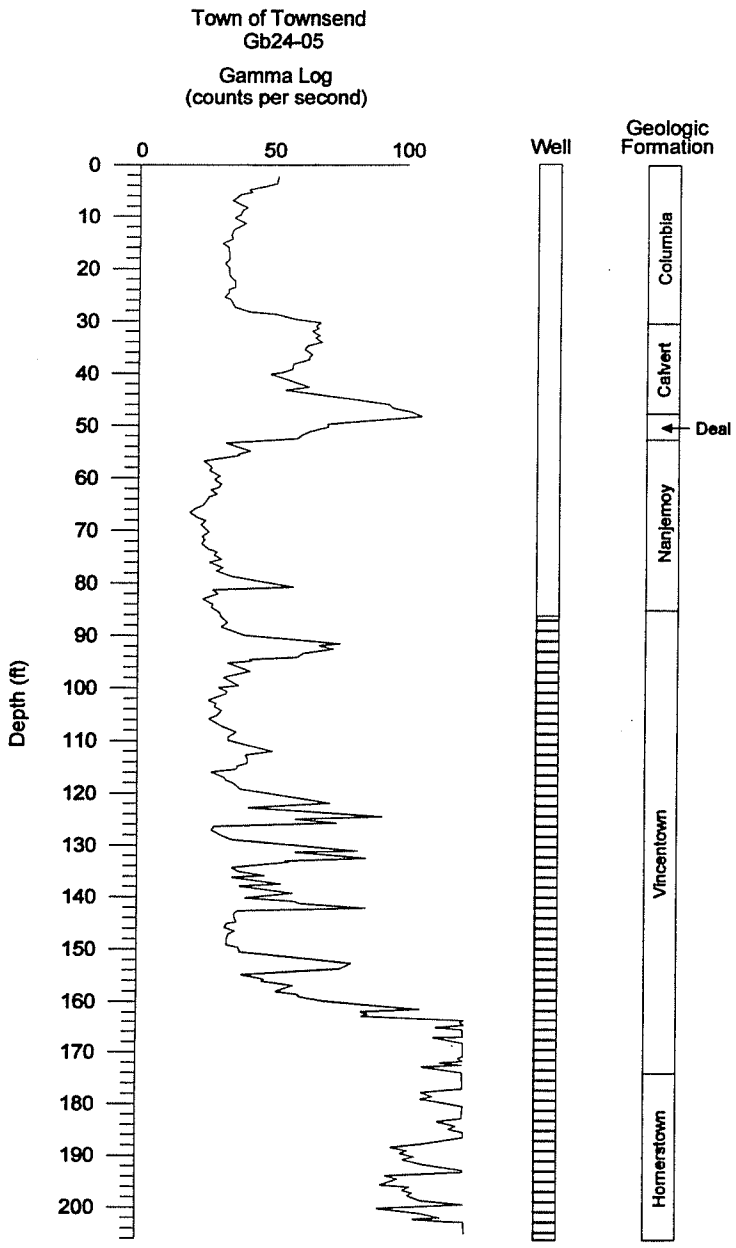

Misty Vale
Fc12-22
Gamma Log
(counts per second)
0
50
100
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
Well
Geologic Formation
Vincentown?
Homerstown
Navesink
Mt. Laurel

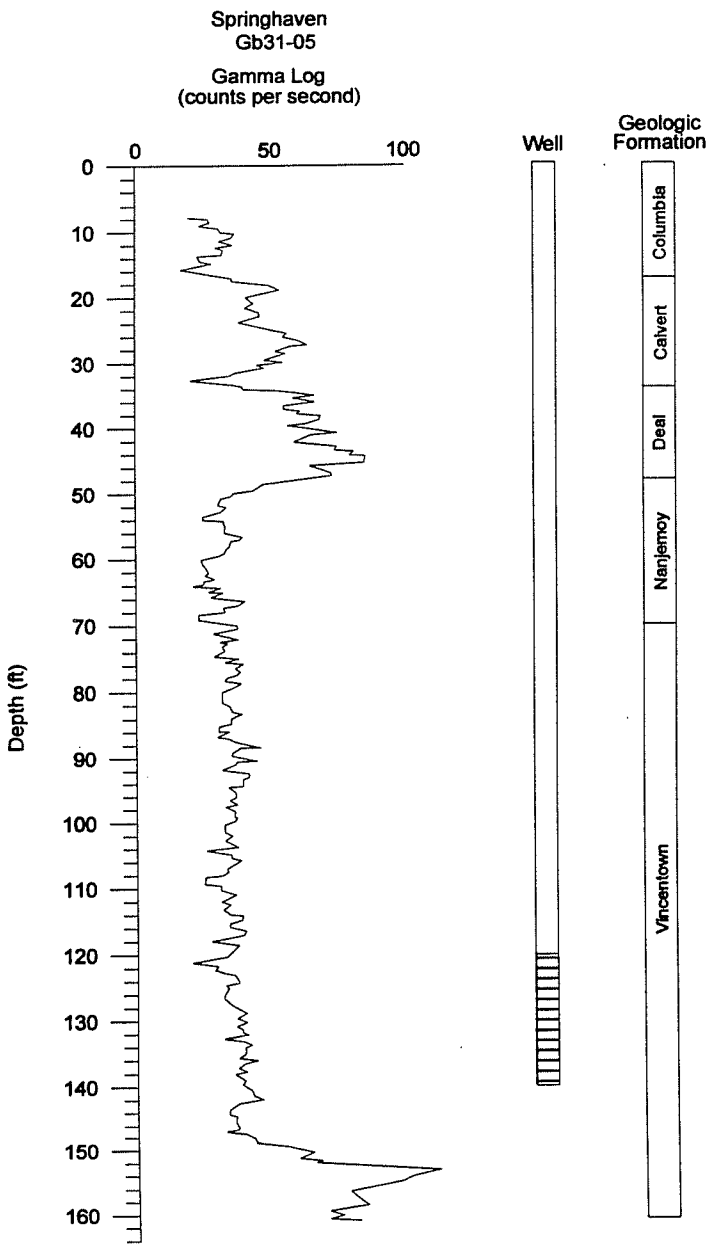

Bayview
Fc15-05
Gamma Log
(counts per second)
0
100
200
Depth (ft)
0
100
200
300
Well
Geologic
Formation
Columbia
Vincentown
Homerstown
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy

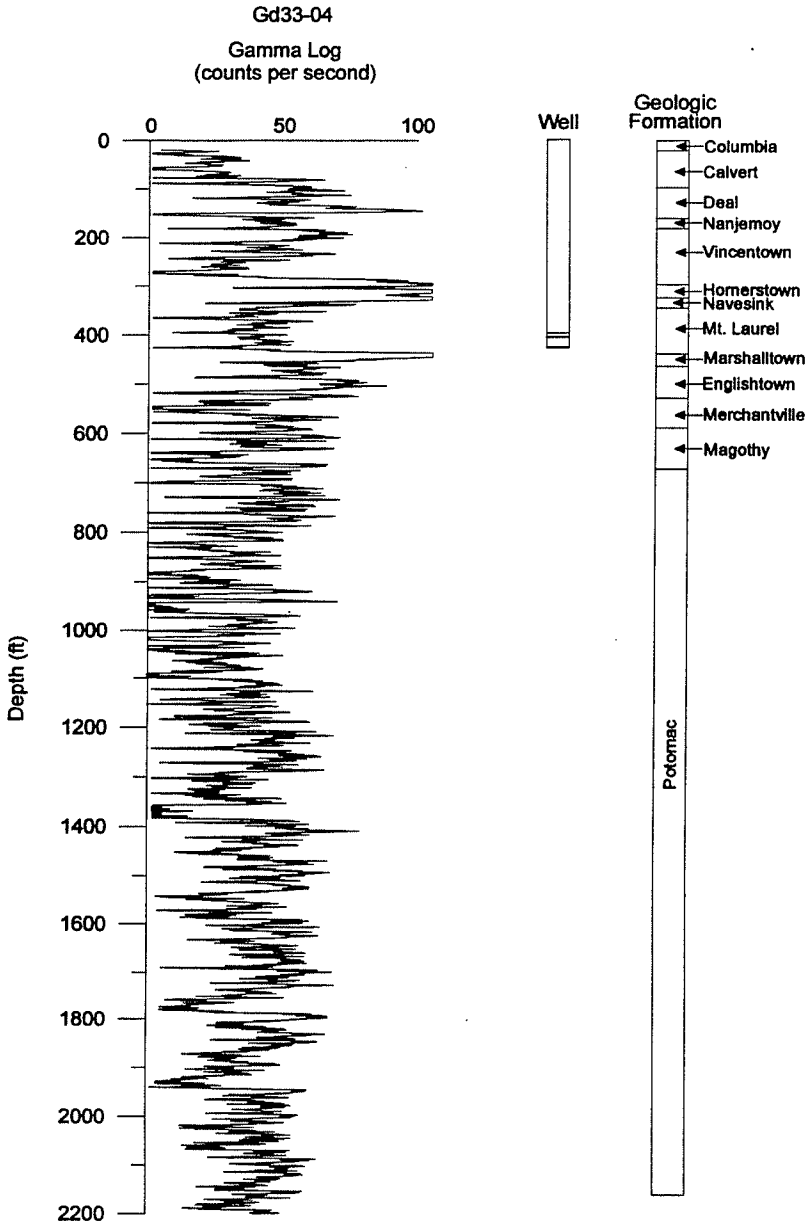

Betty Robbin's
Fc31-39
Gamma Log
(counts per second)
0
50
100
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
Well
Geologic Formation
Columbia
Vincentown
Homerstown
Navesink
Mt. Laurel


Stonefield
Fc51-26
Gamma Log
(counts per second)
0
100
200
Depth (ft)
0
100
200
300
400
500
600
700
800
Well
Geologic Formation
Columbia
Calvert
Deal
Nanjemoy
Vincentown
Homerstown
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac


Cantewell
Fc53-03
Gamma Log
(counts per second)
0
50
100
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Well
Geologic Formation
Columbia
Nanjemoy
Vincentown
Hornerstown
Navesink
Mt. Laurel


Town of Townsend
Gb24-05
Gamma Log
(counts per second)
0
50
100
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Well
Geologic Formation
Columbia
Calvert
Deal
Nanjemoy
Vincentown
Homerstown


Springhaven
Gb31-05
Gamma Log
(counts per second)
0
50
100
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
Well
Geologic Formation
Columbia
Calvert
Deal
Nanjemoy
Vincentown


Gd33-04
Gamma Log
(counts per second)
0
50
100
Depth (ft)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
Well
Geologic Formation
Columbia
Calvert
Deal
Nanjemoy
Vincentown
Homerstown
Navesink
Mt. Laurel
Marshalltown
Englishtown
Merchantville
Magothy
Potomac