STATE OF MARYLAND
BOARD OF NATURAL RESOURCES
DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES
JOSEPH T. SINGEWALD, JR., *Director*
Bulletin 5

THE WATER RESOURCES OF ANNE ARUNDEL COUNTY

THE SURFACE-WATER RESOURCES

By V. R. Bennion

THE GROUND-WATER RESOURCES

By J. W. Brookhart

BALTIMORE, MARYLAND
1949

COMPOSED AND PRINTED AT THE
WAVERLY PRESS, INC.
BALTIMORE, MD., U. S. A.

COMMISSION ON
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PREFACE

The Anne Arundel County report in the series of county reports was published in 1916, long before a systematic study of the water resources of the State had been started. In 1945, investigations of the ground-water resources of Southern Maryland were initiated. The first report on the results of these investigations covered Charles County and was published in 1948 as a part of the Charles County report. This bulletin on the Water Resources of Anne Arundel County serves to supplement the 1916 Anne Arundel County report.

The bulletin is based on investigations conducted jointly by the Maryland Department of Geology, Mines and Water Resources and the United States Geological Survey.

Stream-flow measurements were first made in Anne Arundel County in 1931. There are now 5 stream gaging stations in the county. The section on the Surface-Water Resources tabulates the stream-flow measurements that have been made in Anne Arundel County. This part of the report was prepared by Mr. V. R. Bennion, District Engineer of the United States Geological Survey.

The major part of the report presents the results of the ground-water investigation in the County and was prepared by Mr. J. W. Brookhart of the cooperative ground-water staff. It lists and gives the locations of about 600 water wells in Anne Arundel County. Data on the sub-surface formations and the water-bearing beds are presented in the drillers' logs of 153 wells and in the descriptions of well cuttings of 8 wells. The depths of the two principal water-bearing sands are given on county contour maps. The quality of the water in the various water-bearing sands is shown in 103 water analyses.

The physical character of the sub-surface formations is described in the text. These descriptions may be supplemented by the fuller descriptions of these formations in the systematic reports previously published. These are, in descending order of the formations, the Pliocene and Pleistocene (1906), the Miocene (1904), the Eocene (1901), the Upper Cretaceous (1916), and the Lower Cretaceous (1911). Additional information on the Eocene is contained in Bulletin 3 (1948), Eocene Stratigraphy and Aquia Foraminifera.

The areal distribution of the formations is shown on the geologic map of Anne Arundel County published in 1916. Surface elevations are shown on the county topographic map published in 1948.

The data presented in this report enable a well driller and prospective well owner to determine the depths at which ground-water may be obtained, the quantity of water obtainable, and the probable quality of the water. However, the Department of Geology, Mines and Water Resources can be called upon at any time for such information.

JOSEPH T. SINGEWALD, JR., *Director.*

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THE WATER RESOURCES OF ANNE ARUNDEL COUNTY

The Surface-water Resources

BY

V. R. BENNION

General

Water is the natural resource most vital to man's existence. It determines those places on the face of the earth where he can live. If there is insufficient water, as in the desert, he cannot live, or if there is too much water or a continual threat of it, as in the flood plains of the streams, he cannot live except in fear of his life. Without water the average man would live but a few days, and most of the modern industrial processes would cease operation immediately.

Many of the people of this country, and especially those in the eastern section, seem to assume that the water supply is inexhaustible. As a matter of fact, the water supply is definitely limited, and already in many places its scarcity has become an acute problem and it has been necessary to establish laws governing the use and conservation of this valuable resource. The quantity of available water in any region varies from year to year, month to month, and day to day, and it cannot be adequately determined by measurements covering a period of only a few months or even of a few years. The immediate source of nearly all water is precipitation from the clouds, and the wide variations in this factor are known to all. The relation between rainfall and the resulting surface-water and ground water supplies is also variable and complex; therefore, the records of rainfall alone do not serve as a measure of the water supply available for use.

The earth has a fixed amount of water which circulates in an endless cycle maintained in approximate balance by processes, the principal of which are precipitation, evaporation, transpiration from vegetation, and runoff in streams. This vast movement of water from the atmosphere to the land, from the land to the ocean, and from land and ocean back to the atmosphere is known as the hydrologic cycle. Figure 1 illustrates the operation of the hydrologic cycle and the methods used in measuring some of its factors.

The water resources of principal concern to man as sources of supply may be classified as surface water and ground water. Surface water is the water resting on the earth's solid surface, such as streams, lakes and ponds. Ground water is the water that accumulates in the ground below the water table. Although both surface water and ground water originate from precipitation, there is a distinct difference in their occurrence and behavior and the methods and science involved in their investigation and utilization are also distinctive. Ground-water investigation and utilization are discussed in another section of this report.

Surface water is easily accessible and has a wide variety of uses including potentialities for producing power. The force of gravity causes surface water to flow along the path of least resistance, as long as the ground surface is sloping or until it is halted by some barrier to form a lake or pond. Essential to consider-

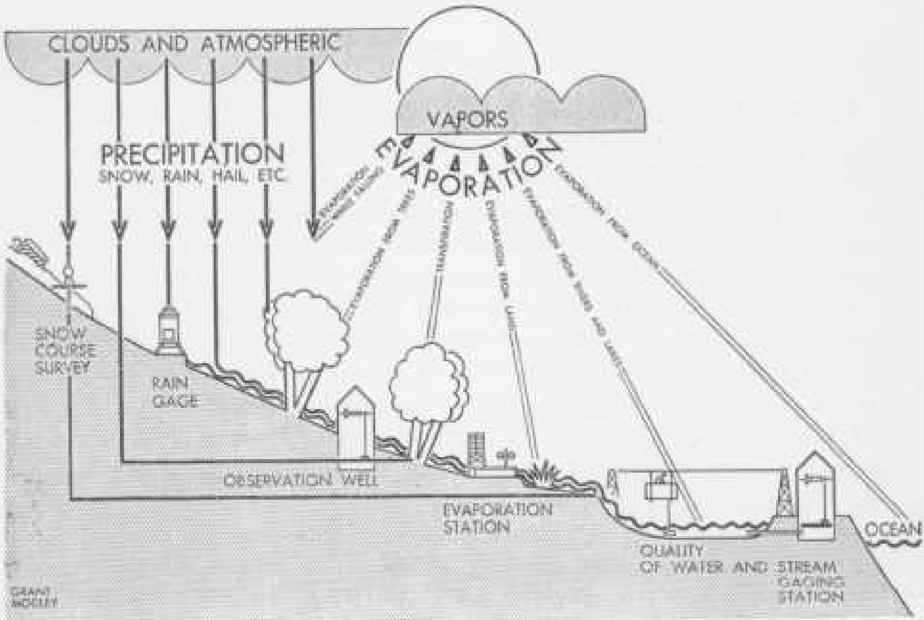

FIGURE 1. The Hydrologic Cycle and How It Is Measured

ing the utilization of surface water is a knowledge of the quantity and quality of the water, the topography of drainage basin, the type of soil, and the land use practices.

The development of any region is directly dependent upon the availability of an adequate water supply. The history of any country or community has shown the importance of water resources, and the future development and expansion will depend to a great extent on the wise use of these resources. Generally, as a community develops in density of population and scope of industry, little thought is given to the prospect that there may not be sufficient water in nearby stream sources to satisfy the demands. There comes a time when it is found necessary to extend its water supply system to more distant streams.

Many of the larger cities of the country are faced with an acute water problem today that threatens to stall their future development.

Streams may serve a community in several ways. Many streams are used as a municipal water supply, as a source of water for industrial uses, and for sewage disposal. Streams have an important role in the conservation of fish and wildlife. A recreational area would not be complete unless there was a good lake, pond, or stream for boating, fishing and swimming. Improvement of streams and adjacent areas and the construction of artificial ponds and pools contribute importantly to the program of recreation and to the conservation of fish and wildlife. In recent years greater attention has been directed to this improvement and the efforts of conservationists have produced good results. However many of our scenic streams are laden with waste and pollution which have resulted in the killing of vegetable and fish life. Under favorable conditions streams purify themselves in a relatively short distance, but when they become overloaded with pollution, the bacteria supplied by nature for purification are killed, the natural oxygen content of the water is depleted, and a so-called dead river results.

Streams are subject to great fluctuation of flow, depending upon the amount and intensity of the precipitation, and during floods a large portion of the water runs off without serving any useful purpose. In addition, the periodic flood damage to cities, highways, and other developments is tremendous. Much of this damage can be averted if there is proper planning and adequate knowledge of stream flow at the time the developments are made. In the early days, cities and municipalities were nearly all located along a stream so as to have a readily accessible water supply or means of transportation. As the towns grew into cities, the flood plains of the stream were encroached upon by structures of all kinds. The stream was crowded into a narrow channel of insufficient size to carry the flood flows, with resulting large flood damages in each major flood. In order to reduce or eliminate these damages, it is necessary to build flood control works, and these cannot be properly designed unless a record of the stream flow is available for a sufficient number of years to determine the flood-flow characteristics of the stream.

STREAM-FLOW MEASUREMENT STATIONS

The collection of systematic records of stream flow may be classified or divided into three major units: (1) establishment and construction of stream-flow measurement stations; (2) operating and maintaining those stations; and (3) computing, compiling and preparing stream-flow data for publication.

Establishment and Construction

Before a stream-flow measurement station is established or constructed, a general reconnaissance is made of the stream, in the reach where such records are needed, to determine the most suitable site. This survey is facilitated by an examination of topographic maps and all other maps of the area to determine the accessibility of the stream in all kinds of weather and for all stages of the stream. Tentative sites are generally indicated on the maps prior to an actual field survey. When the field reconnaissance is made the various sites indicated on the maps are examined in detail to determine the best one. Consideration should be given to the channel characteristics in the vicinity of each proposed site with particular reference to the hydraulic conditions necessary for maintaining a fixed relation between stage and discharge at the gage. The selection of a suitable cross section of the stream for making discharge measurements at various elevations of the stream and the proper placing of gages with respect to the measuring section and to that part of the channel which controls the stage-discharge relation are some of the factors to be considered in selecting the best site for a stream-measurement station.

The construction of a stream-measurement station includes all the work pertaining to the installation of some type of gage to determine the fluctuations of the stream. If the gage is to be read by a local resident once or twice daily, and more often during periods of rapidly changing stage, generally a staff gage or wire-weight gage is installed so that it will register the height of the water at all stages and be readily accessible to the observer. If the record of the stage is to be obtained automatically by a recording instrument, it is necessary to construct a gage well and shelter. The structure is either located on the bank or attached to a bridge pier. It must be deep enough in the ground to be below the lowest possible stage and high enough to be above the highest expected stage and must be accessible for all stages of the stream. The gage well is connected to the stream by one or more pipes, and the water in the well fluctuates the same as the stream. The type of instrument generally used to record the stage is designed to produce a graphic record of the rise and fall of the stream with respect to time and is called a water-stage recorder. In order to check elevation of gages and to be able to reset them to the correct datum in case they are disturbed by floods, ice, or vandals, reference marks are established on some permanent object, such as rock outcrops, bridge abutments, or specially constructed concrete monument.

In addition to installing a device to obtain a record of stage, it is necessary to have suitable facilities from which to make measurements of the amount of water in the stream for all stages. If there is a suitable bridge available near the gage, it may often be utilized. In the event such a structure is not available, it is the usual practice to construct a cableway across the stream sufficiently high so that all the flood flow will pass under the cable. On this cable is installed a small car to carry the engineer and the necessary measuring equipment. For low stages, stream-flow measurements are often made by wading at a favorable section of the stream near the gage.

Plate 1—Fig. 1. Stream Flow Measurement Station on Antietam Creek near Sharpsburg, Md.

Plate 1—Fig. 2. Automatic Water-stage Recorder and Engineer Making Inspection

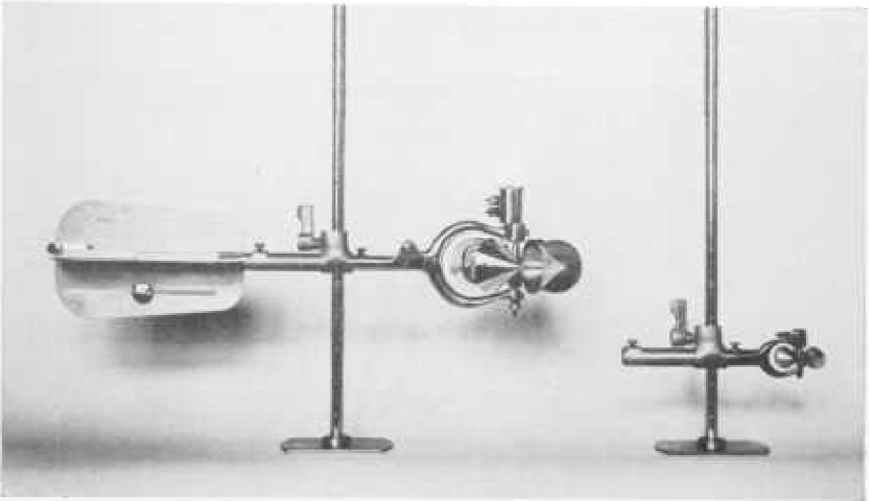

PLATE 2—Fig. 1. Standard Price Current Meter and Pygmy Meter, Suspended on Wading Rods, Used to Measure Discharge

PLATE 2—Fig. 2. Equipment Used in Making Discharge Measurements from Bridge

For smaller streams it is often desirable to improve the channel condition in the vicinity of the gage by removing logs or other debris. Quite often a weir or dam is built just below the gage to stabilize the stage-discharge so that it remains constant or nearly so. A concrete shelter for a water-stage recorder over a 5-foot square well, a cableway, and a concrete control at the gaging station on Antietam Creek near Sharpsburg, Md., are shown in Plate 1, fig. 1.

Operation and Maintenance

If the stream flow measurement station is not equipped with an automatic water-stage recorder, the elevation of the water on the gage is generally read twice a day by a person living near the station. His readings are recorded in a special notebook. He not only records the stage reading, but also the time the reading was made and any unusual conditions. These books hold readings for a three-month period and are transmitted to the central office after they have been filled. This constitutes the stage record, one of the basic components of stream-flow records. At times a reliable gage reader cannot be located or the stream may fluctuate, as by regulation by a mill, so that two readings a day are not sufficient to define the stage. The factor of personal or human errors is one of the large problems that is encountered in obtaining a reliable record by this type of installation. Automatic recording instruments have the advantage that they record an accurate and continuous record of the stage and result in a higher degree of accuracy. The recorder graphs are removed from the machine at regular intervals, usually about once a month. Plate 1, fig. 2, shows an automatic recorder in operation. The instrument is periodically checked by an engineer to see that everything is in good condition.

An engineer makes an actual determination of the amount of water flowing in the stream at each periodic visit. The measurement is made by the area-velocity method by means of an instrument called a current meter which is used to obtain the velocity of the stream at numerous selected points in the cross section. At each point he observes the velocity, obtains the depth, and records the distance of the point from some fixed point or edge of the stream. These flow measurements are made by wading if the stage is low or from bridge cableway, boat, or ice. Plate 2, figs. 1 and 2, show the type of current meters commonly used and equipment used to make a discharge measurement from a bridge. The purpose of making flow measurements is to define the stage-discharge relation. These measurements are distributed from the lowest to the highest stages of the stream. During periods of critical stream flow, either flood or drought, the gaging stations are visited to assure a satisfactory record.

Computation and Preparation of Records for Publication

A few technical terms are commonly used in the presentation of stream-flow records. As some of these terms may be unfamiliar, brief explanations follow:

Second-foot.—A measure of rate of flow of water—20 second-feet is 20 cubic feet of water flowing past a given point in every second.

Acre-foot.—A measure of volume—the quantity of water necessary to cover an acre to a depth of one foot.

Discharge.—Rate of flow of water, usually expressed in second-feet, gallons per minute, or gallons per day. One second-foot flowing for one day equals 86,400 cubic feet, equals 646,317 gallons, equals about 2.0 acre-feet.

Runoff.—The portion of precipitation that appears as flow in the stream,

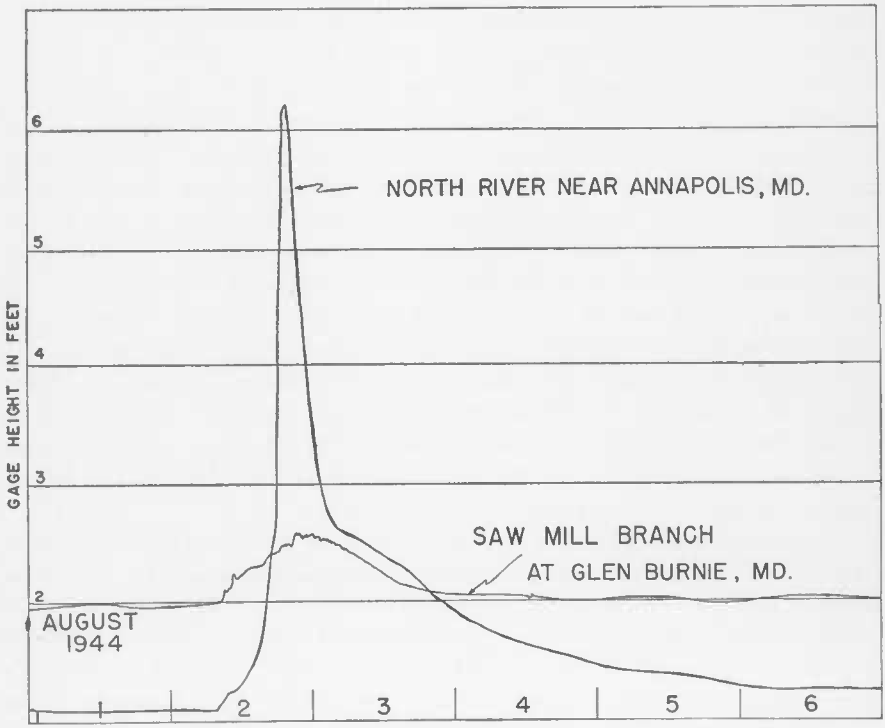

FIGURE 2. Graphs of River Stage Produced by a Water Stage Recorder

usually expressed in inches of water depth. For example, one inch of runoff means that if all the water draining from an area were uniformly distributed over the area, the layer of water would be one inch deep.

Second-foot-day.—One second-foot flowing continuously for one day.

Water year.—A special annual period selected to facilitate water studies, usually October 1 to September 30.

Watershed or drainage basin.—The area drained by a stream or stream system, usually expressed in square miles.

At periodic intervals, generally at the end of each water year, the field data collected during that year are analyzed and prepared for publication. The daily gage heights are computed by averaging the gage heights for each day. For a stream-flow station not equipped with automatic recorder, this is generally done by computing the arithmetical average of daily readings for days when stage of the stream did not fluctuate too widely. For days of rapidly changing stage a graph is drawn through the readings to approximate the shape of the hydrograph, and the mean stage is obtained from the graph. For stations

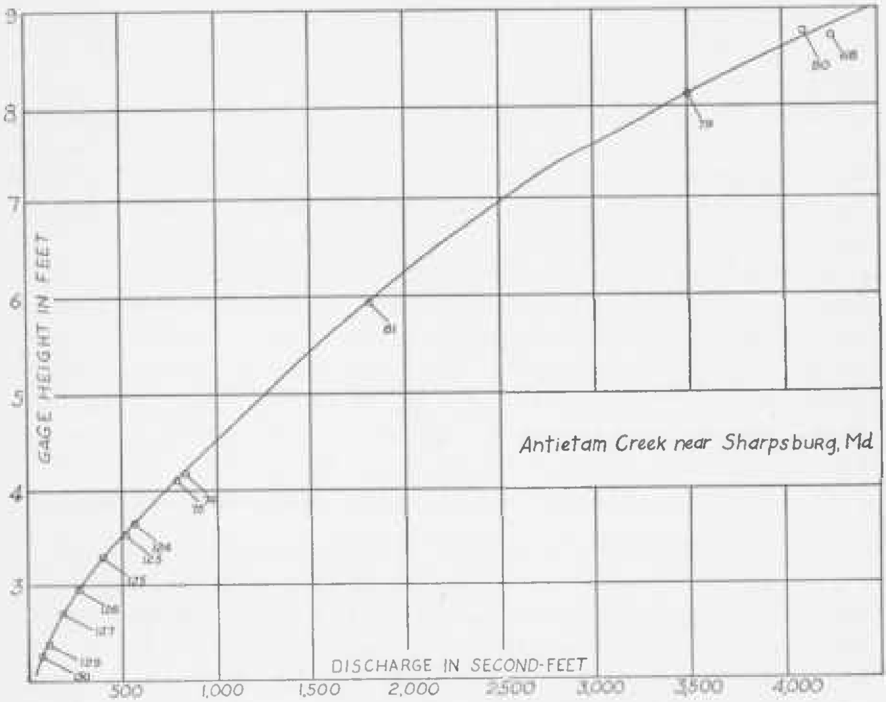

FIGURE 3. Typical Rating Curve Showing Relation between Stage and Discharge at a Stream-gaging Station

equipped with an automatic recorder, the mean daily gage heights are computed direct from the recorder graph. Figure 2 shows a typical graph made by a water-stage recorder at two gaging stations in Anne Arundel County during the same period. Note the difference in the magnitude of each graph for the same storm.

The data of the discharge measurements are tabulated on suitable cross section paper. The gage heights or stages of the measurement are plotted against the respective discharges, and a smooth curve averaging all the points is drawn. This is known as the rating curve and defines the stage-discharge relation (Figure 3). A table of stage and corresponding discharge is prepared from the curve. This table is called the rating table. If the stage-discharge relation changes it is necessary to develop additional rating curves and rating tables for each change. These new curves are based on additional groups of discharge measurements.

The daily gage heights are listed on a form and the daily discharge is computed for each day by entering the gage height in the rating table. The daily discharge is computed in second-feet or occasionally in gallons per day.

Stream-flow records are published annually in the series of Water Supply Papers of the U. S. Geological Survey. These data consist of a short description (giving location of gaging station, drainage area, records available, extremes of discharge during water year and period of record, remarks giving the accuracy of the records and explaining any unusual conditions), table of daily discharge and table of monthly discharge. The table of monthly discharge includes second-foot days, maximum and minimum daily discharge, average discharge, discharge per square mile, and runoff in inches or acre-feet. These publications make available, in statistical form, a permanent record of the stream flow for a given year. Many states issue bulletins containing compilation of records; for example, a bulletin may be published every ten years containing a concise summary of stream-flow records and related data during that period. Maryland has two such compilation reports; "Flow data and draft storage curves for major streams in Maryland—1927-39" published by the State Planning Commission and the Water Resources Commission and "Bulletin 1, Summary of Records of Surface Waters of Maryland and Potomac River Basin—1892-1943" published by the Department of Geology, Mines and Water Resources.

SURFACE WATER RESOURCES OF ANNE ARUNDEL COUNTY

The principal streams of this county are the Patuxent River along most of the western boundary; Patapsco River along part of the northern boundary; Magothy River, which drains the northeastern section; Severn River, which drains the northcentral section; and South River, which drains the central section. The southern part of the county is mainly drained by Rockhole Creek, West River, and Lyons Creek. The entire county is part of the west Chesapeake Bay drainage. The more important streams and their drainage areas in Anne Arundel County are:

Streams in Anne Arundel County

Stream	Drainage area (sq. mi.)
Curtis Creek	35.7
Little Patuxent River	161.0
Lyons Creek	19.5
Magothy River	39.9
Rockhole Creek	12.7
Severn River	68.9
South River	66.1
West River	32.4

Practically all of the streams are tidal for several miles above their mouths. There are no large streams flowing through the county. All of the streams are small and in general only a few miles in length, that is, even the larger streams are composed of numerous small streams generally flowing into a common drainage basin in the tidal section of the main stream. The slopes of the drainage basins are flat and many of the streams flow through swamp areas. During periods of medium and high flows the streams overtop the low banks and flow over a wide flood plain. This general characteristic tends to reduce the peak discharges and increase the low water flow.

The county is divided into two general drainage areas; the western portion drains directly into the Patuxent River, which in turn drains into the Chesapeake Bay nearly 30 miles further south, at the south end of Calvert County. The eastern portion drains directly into the Chesapeake Bay through several small river basins.

The topography of Anne Arundel County consists of low rolling hills in the western part, which gradually become flatter from west to east. For several miles inland from the Chesapeake Bay the land is flat with poor drainage. Practically no attempts have been made to drain the swamp areas.

Gaging Stations

Five gaging stations are being maintained in this county. All of the gaging stations are on small streams which might be used for domestic or industrial water supplies. The following is a list of the gaging stations operated in Anne Arundel County by the U. S. Geological Survey in cooperation with the Maryland Department of Geology, Mines and Water Resources and Maryland municipalities.

Station	Drainage area	Records
Bacon Ridge Branch at Chesterfield	6.9	1942
Dorsey Run at Annapolis Junction	11.6	1948
Little Patuxent River at Savage	98.4	1939
North River near Annapolis	8.5	1931
Sawmill Branch at Glenburnie	5.1	1944

Only the North River gaging station has been in operation long enough to use as an index for other streams in Anne Arundel County. This record is continuous since 1931. Using it as an index, the mean annual runoff for streams in this county would be about 1.4 second-feet per square mile or about 900,000 gallons per day per square mile. The minimum annual runoff is about 0.9 and the maximum about 1.9 second-feet per square mile or 580,000 and 1,200,000 gallons per day per square mile, respectively. The maximum instantaneous discharge at the gaging station on North River since 1931 occurred Aug. 2, 1944, with a dis-

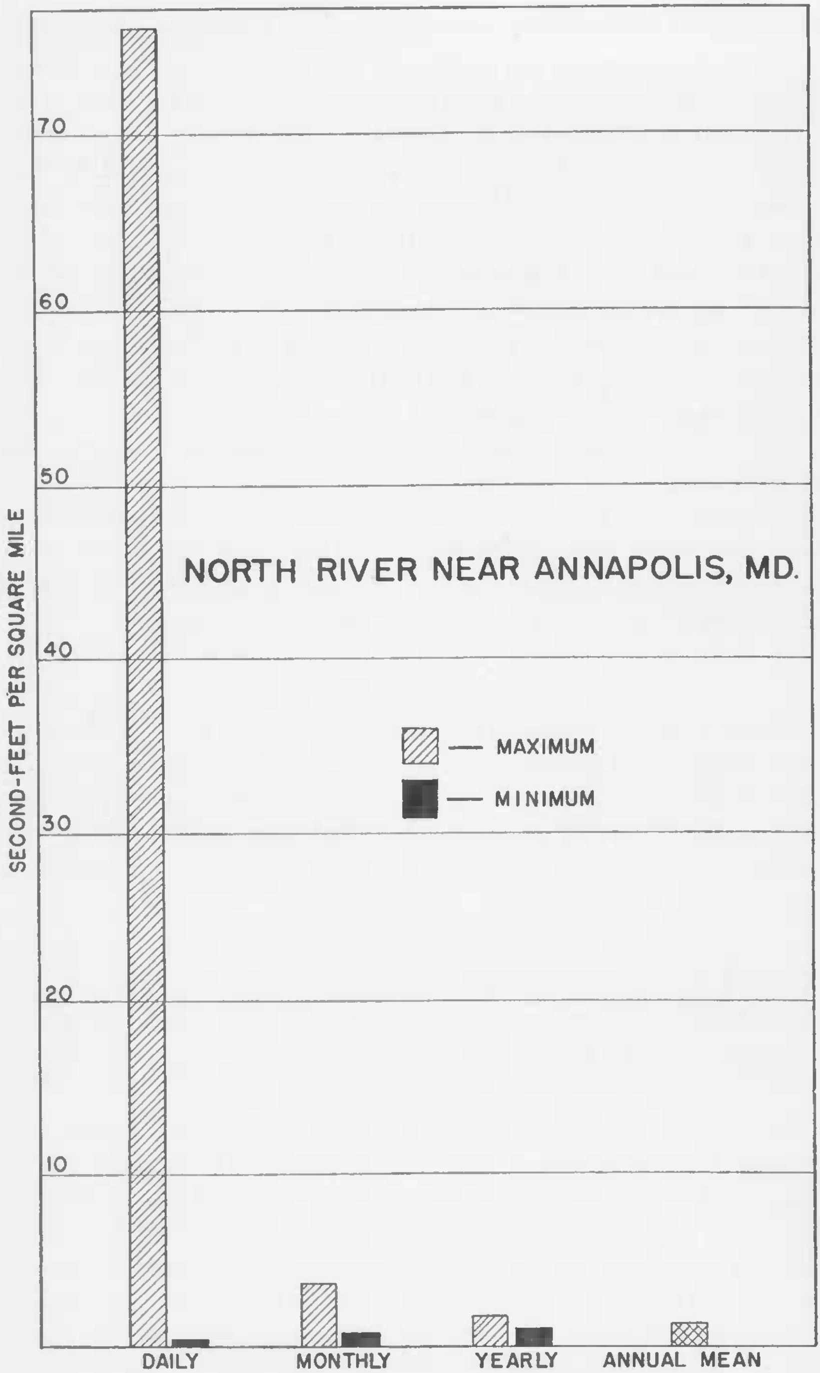

FIGURE 4. Extremes of Discharge in North River near Annapolis

charge of about 590 second-feet per square mile or 4,400 gallons per second per square mile; and the minimum instantaneous discharge occurred Sept. 1, 2, 4, 1932 in the amount of about 0.2 second-foot per square mile, or about 1.5 gallons per second per square mile. The records for this station do not include the great drought of 1930. The minimum annual discharge and instantaneous minimum discharge records would be lower had that period been included.

The records obtained at the gaging stations on Sawmill Creek at Glenburnie and Bacon Ridge Branch at Chesterfield are too short to attempt to determine the safe yield of these two streams. No records have yet been computed for the station on Dorsey Run at Annapolis Junction. For the station on Little Patuxent River at Savage, there are continuous records since 1939, which is too short a period to use for safe design of hydraulic projects. Also, the drainage area above this station is all outside Anne Arundel County and has a different type of topography and soil. However, for comparison, the mean annual discharge for the Little Patuxent River at Savage is about 0.9 second-feet per square mile or about 580,000 gallons per day per square mile. The minimum annual runoff is about 0.6 and the maximum about 1.2 second-feet per square mile, or 380,000 and 740,000 gallons per day per square mile. The yield of this stream is considerably different, therefore, than for North River. The records for the station on Little Patuxent River do not include any of the drought years, which occurred between 1930 and 1934. It would be very risky to use the records for the Little Patuxent River to help solve many of the supply or other hydraulic problems in Anne Arundel County, due to the short period of record and different type of drainage basin.

It must be borne in mind that the data given are annual averages. The minimum and maximum daily, weekly, or monthly will vary much more widely. Figure 4 indicates this variation. This rough computation indicates, however, that if sufficient reservoir capacity can be provided for storage over extended periods, there is ample supply of surface water for domestic and small industrial uses in this county. Due to the small size of the streams there would not be sufficient water in any one stream to supply sufficient surface water to a large industrial development unless such an industry could utilize the salt water in the tidal reaches of the streams. Swamps act as a natural reservoir, and they tend to reduce the peak flows and increase the low water flow. In other words, the swamps act as a flow-stabilizing agent, which should be taken into consideration when water supplies are investigated in this county. There are no factual data on the chemical quality of these waters such as are desirable prior to any domestic or industrial development.

SURFACE WATER RECORDS OF ANNE ARUNDEL COUNTY

PATAPSCO RIVER BASIN

Sawmill Creek at Glenburnie, Md.

Location.—Water-stage recorder and concrete control, lat. 39°10'12", long. 76°37'51", 300 feet upstream from bridge on State Highway 301 and 0.5 mile northeast of Glenburnie, Anne Arundel County.

Drainage area.—5.1 square miles.

Records available.—May 1944 to September 1948.

Extremes.—Maximum discharge, 47 second-feet Sept. 13, 1944 (gage height, 2.70 feet); minimum, 2.7 second-feet Feb. 20, 1947 (gage height, 1.85 feet). Flood of August 1933 reached a stage of about 4 feet.

Monthly discharge of Sawmill Creek at Glenburnie, Md.

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1944						
May 11–31	7.5	6.0	6.45	1.26	0.99	0.814
June	15	5.4	6.28	1.23	1.37	.795
July	7.5	4.9	5.49	1.08	1.24	.698
August	19	4.5	5.79	1.14	1.31	.736
September	26	4.3	6.26	1.23	1.37	.795
1944–45						
October	16	5.4	6.95	1.36	1.57	.879
November	13	5.7	6.84	1.34	1.50	.866
December	15	6.5	7.33	1.44	1.66	.930
January	18	7.2	8.58	1.68	1.94	1.09
February	11	6.8	7.98	1.56	1.63	1.01
March	9.4	7.5	8.17	1.60	1.85	1.03
April	12	7.5	8.45	1.66	1.85	1.07
May	9.0	5.7	7.00	1.37	1.58	.885
June	14	5.2	6.44	1.26	1.41	.814
July	29	5.2	9.16	1.80	2.07	1.16
August	12	6.8	8.15	1.60	1.84	1.03
September	21	6.5	9.10	1.78	1.99	1.15
The year	29	5.2	7.85	1.54	20.89	.995
1945–46						
October	8.0	6.5	7.06	1.38	1.60	.891
November	14	6.5	7.66	1.50	1.68	.969
December	20	7.5	9.36	1.84	2.12	1.19
January	11	7.8	8.91	1.75	2.01	1.13
February	14	7.5	8.85	1.74	1.81	1.12
March	12	7.8	9.12	1.79	2.06	1.16
April	9.8	7.2	7.63	1.50	1.67	.969
May	14	6.5	8.17	1.60	1.85	1.03
June	16	6.0	7.45	1.46	1.63	.943
July	16	5.4	6.75	1.32	1.53	.853
August	8.8	5.4	6.22	1.22	1.41	.788
September	16	4.9	6.19	1.21	1.35	.782
The year	20	4.9	7.78	1.53	20.72	.988

PATAPSCO RIVER BASIN—*Continued*

Monthly discharge of Sawmill Creek at Glenburnie, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1946–47						
October	9.9	5.5	6.31	1.24	1.43	.801
November	7.9	5.5	6.11	1.20	1.34	.775
December	12	5.2	5.77	1.13	1.31	.730
January	9.1	5.5	6.58	1.29	1.49	.833
February	6.4	4.4	5.34	1.05	1.09	.678
March	7.2	4.9	5.89	1.15	1.33	.743
April	7.5	4.9	5.64	1.11	1.23	.717
May	14	5.2	6.48	1.27	1.47	.820
June	18	4.6	7.04	1.38	1.54	.891
July	9.5	4.9	6.25	1.23	1.41	.795
August	14	4.6	5.98	1.17	1.35	.756
September	9.1	4.6	5.35	1.05	1.17	.678
The year	18	4.4	6.07	1.19	16.16	.769
1947–48						
October	7.9	4.6	5.09	.998	1.15	.645
November	17	4.6	7.52	1.47	1.64	.950
December	9.9	5.5	6.27	1.23	1.42	.795
January	23	6.0	8.15	1.60	1.84	1.03
February	13	5.8	7.29	1.43	1.54	.924
March	13	7.2	8.46	1.66	1.91	1.07
April	16	7.9	8.76	1.72	1.92	1.11
May	21	7.9	10.5	2.06	2.37	1.33
June	22	8.3	11.4	2.24	2.48	1.45
July	20	7.4	8.94	1.75	2.02	1.13
August	27	9.4	12.4	2.43	2.80	1.57
September	14	9.0	9.87	1.94	2.16	1.25
The year	27	4.6	8.71	1.71	23.25	1.10

Yearly discharge of Sawmill Creek at Glenburnie, Md.

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1945	7.85	1.54	20.89	0.995	8.10	1.59	21.56	1.03
1946	7.78	1.53	20.72	.988	7.28	1.43	19.40	.924
1947	6.07	1.19	16.16	.769	6.12	1.20	16.29	.775
1948	8.71	1.71	23.25	1.10	—	—	—	—

SURFACE WATER RECORDS OF ANNE ARUNDEL COUNTY—*Continued*

PATUXENT RIVER BASIN

Dorsey Run at Annapolis Junction, Md.

Location.—Water-stage recorder and concrete coatrol, lat. 39°07′15″, long. 76°47′00″, at bridge on State Route 647, 0.6 mile southeast of Annapolis Junction, Anne Arundel County and 1.0 mile upstream from mouth.

Drainage area.—11.6 square miles

Records available.—July to September 1948.

Extremes.—Maximum discharge, 497 second-feet Aug. 3 (gage height, 6.49 feet); minimum, 3.4 second-feet Sept. 17, 18, 21, 27, 28.

Monthly discharge of Dorsey Run at Annapolis Junction, Md.

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1948						
July	13	4.9	8.12	0.700	0.81	0.452
August	84	4.9	17.0	1.47	1.69	.950
September	11	3.6	4.80	.414	.46	.267

Little Patuxent River at Savage, Md.

Location.—Water-stage recorder and improved natural control, lat. 39°08′00″, long. 76°48′58″, 400 feet downstream from highway bridge, half a mile southeast of Savage, Howard County, and 1 mile downstream from Middle Patuxent River.

Drainage agea.—98.4 square miles.

Records available.—November 1939 to September 1948.

Extremes.—Maximum discharge, 5,080 second-feet July 18, 1945 (gage height, 12.14 feet); minimum daily, 7.0 second-feet (regulated) Sept. 19, 1943.

Maximum stage known, about 17 feet in August 1933, from information by local residents.

Remarks.—Regulation caused by power plant of Savage Manufacturing Company 1 mile above station.

Monthly discharge of Little Patuxent River at Savage, Md.

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1939–40						
December	89	35	43.5	0.442	0.51	0.286
January	462	27	56.7	.576	.66	.372
February	727	33	118	1.20	1.29	.776
March	602	66	127	1.29	1.49	.834
April	1,740	55	234	2.38	2.66	1.54
May	439	79	122	1.24	1.43	.801
June	168	41	65.2	.663	.74	.429
July	166	31	48.0	.488	.56	.315
August	257	9.1	43.2	.439	.51	.284
September	685	22	60.7	.617	.69	.399

PATUXENT RIVER BASIN—*Continued*

Monthly discharge of Little Patuxent River at Savage, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1940–41						
October	70	25	36.4	.370	.43	.239
November	666	38	117	1.19	1.33	.769
December	324	52	97.7	.993	1.14	.642
January	308	59	116	1.18	1.36	.763
February	212	76	109	1.11	1.16	.717
March	268	64	117	1.19	1.37	.769
April	584	67	124	1.26	1.40	.814
May	81	34	50.1	.509	.59	.329
June	309	32	65.0	.661	.74	.427
July	221	22	54.3	.552	.64	.357
August	114	13	28.3	.288	.33	.186
September	26	9.4	15.7	.160	.18	.103
The year	666	9.4	77.3	.786	10.67	.508
1941–42						
October	24	9.0	14.7	.149	.17	.096
November	45	14	22.5	.229	.25	.148
December	141	17	35.8	.364	.42	.235
January	96	21	34.0	.346	.40	.224
February	266	30	57.7	.586	.61	.379
March	381	35	87.8	.892	1.03	.577
April	512	52	121	1.23	1.37	.795
May	270	41	65.2	.663	.76	.429
June	657	26	76.0	.772	.86	.499
July	784	19	71.3	.725	.83	.469
August	507	24	95.2	.967	1.12	.625
September	104	14	31.2	.317	.35	.205
The year	784	9.0	59.3	.603	8.17	.390
1942–43						
October	940	23	133	1.35	1.56	.873
November	180	60	77.5	.788	.88	.509
December	885	46	122	1.24	1.43	.801
January	156	74	94.9	.964	1.11	.623
February	448	85	162	1.65	1.72	1.07
March	384	80	163	1.66	1.91	1.07
April	359	90	127	1.29	1.44	.834
May	1,220	84	162	1.65	1.89	1.07
June	121	45	70.0	.711	.79	.460
July	82	26	41.9	.426	.49	.275
August	26	7.8	19.0	.193	.22	.125
September	37	7.0	16.9	.172	.19	.111
The year	1,220	7.0	98.8	1.00	13.63	.646

SURFACE WATER RECORDS OF ANNE ARUNDEL COUNTY—*Continued*

PATUXENT RIVER BASIN—*Continued*

Monthly discharge of Little Patuxent River at Savage, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1943–44						
October	344	14	45.5	.462	.53	.298
November	1,670	34	118	1.20	1.34	.775
December	432	25	57.0	.579	.67	.374
January	1,710	40	152	1.54	1.79	.995
February	102	40	60.8	.618	.67	.399
March	600	57	157	1.60	1.84	1.03
April	398	76	123	1.25	1.40	.808
May	228	45	73.4	.746	.86	.482
June	402	32	59.2	.602	.67	.389
July	33	15	22.9	.233	.27	.151
August	186	11	27.1	.275	.32	.178
September	362	14	43.0	.437	.49	.282
The year	1,710	11	78.3	.796	10.85	.514
1944–45						
October	167	26	40.5	.412	.47	.266
November	256	29	49.2	.500	.56	.323
December	793	42	93.2	.947	1.09	.612
January	1,280	52	171	1.74	2.01	1.12
February	537	50	164	1.67	1.74	1.08
March	240	64	105	1.07	1.23	.691
April	242	56	80.8	.821	.92	.530
May	150	39	67.1	.682	.79	.441
June	556	34	75.5	.767	.86	.495
July	2,660	27	312	3.17	3.65	2.05
August	487	53	99.5	1.01	1.17	.652
September	812	47	106	1.08	1.20	.698
The year	2,660	26	114	1.16	15.69	.749
1945–46						
October	96	50	59.5	.605	.70	.391
November	662	47	105	1.07	1.19	.691
December	1,300	86	204	2.07	2.39	1.34
January	271	90	133	1.35	1.55	.872
February	487	94	166	1.69	1.76	1.09
March	258	101	133	1.35	1.55	.872
April	120	73	87.2	.886	.99	.572
May	340	66	113	1.15	1.33	.743
June	1,180	50	124	1.26	1.40	.814
July	570	33	69.2	.703	.81	.454
August	382	32	55.3	.562	.65	.363
September	191	22	41.5	.422	.47	.273
The year	1,300	22	107	1.09	14.79	.704

PATUXENT RIVER BASIN—*Continued*

Monthly discharge of Little Patuxent River at Savage, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1946–47						
October	94	30	41.6	.423	.49	.273
November	84	36	41.5	.422	.47	.273
December	238	35	54.7	.556	.64	.359
January	199	52	93.1	.946	1.09	.611
February	77	23	58.5	.595	.62	.384
March	192	52	85.3	.867	1.00	.560
April	108	46	60.0	.610	.68	.394
May	863	52	109	1.11	1.28	.717
June	634	31	87.6	.890	.99	.575
July	181	29	54.3	.552	.64	.357
August	316	24	43.3	.440	.51	.284
September	189	23	42.3	.430	.48	.278
The year	863	23	64.4	.654	8.89	.422
1947–48						
October	142	22	28.5	.290	.33	.187
November	869	28	145	1.47	1.65	.950
December	173	43	57.5	.584	.67	.377
January	1,210	58	175	1.78	2.05	1.15
February	1,400	70	208	2.11	2.28	1.36
March	302	75	118	1.20	1.39	.775
April	211	64	91.9	.934	1.04	.603
May	443	60	128	1.30	1.50	.840
June	685	56	131	1.33	1.49	.859
July	218	40	62.6	.636	.73	.411
August	218	35	69.0	.701	.81	.453
September	86	28	37.8	.384	.43	.248
The year	1,400	22	104	1.06	14.37	.685

Yearly discharge of Little Patuxent River at Savage, Md.

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1940					93.4	0.949	12.93	0.613
1941	77.3	0.786	10.67	0.508	62.4	.634	8.61	.410
1942	59.3	.603	8.17	.390	81.2	.825	11.20	.533
1943	98.8	1.00	13.63	.646	89.2	.907	12.30	.586
1944	78.3	.796	10.85	.514	75.3	.765	10.43	.494
1945	114	1.16	15.69	.749	129	1.31	17.85	.846
1946	107	1.09	14.79	.704	87.8	.892	12.11	.576
1947	64.4	.654	8.89	.422	72.0	.732	9.94	.473
1948	104	1.06	14.37	.685	—	—	—	—

SURFACE WATER RECORDS OF ANNE ARUNDEL COUNTY—*Continued*

SOUTH RIVER BASIN

Bacon Ridge Branch at Chesterfield, Md.

Location.—Water-stage recorder and concrete control, lat. 39°00′07″, long. 76°36′53″, 0.5 mile east of Chesterfield, Anne Arundel County, 1.4 miles upstream from confluence with North River, and 6.8 miles northwest of Annapolis.

Drainage area.—6.92 square miles.

Records available.—November 1942 to September 1948.

Extremes.—Maximum discharge, 2,100 second-feet Aug. 2, 1944 (gage height, 5.49 feet); minimum, 3.0 second-feet Aug. 4, 16, 19–27, 1943, July 13, 1944.

Remarks.—Figures of discharge include sewage from Crownsville State Hospital, which obtains its water supply from wells.

Monthly discharge of Bacon Ridge Branch at Chesterfield, Md.

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1942–43						
November 5–30	11	5.6	7.10	1.03	0.99	0.665
December	28	5.6	9.88	1.43	1.65	.924
January	14	7.0	9.13	1.32	1.52	.853
February	25	7.5	13.1	1.89	1.97	1.22
March	29	7.5	12.5	1.81	2.09	1.17
April	29	8.5	10.9	1.58	1.76	1.02
May	23	7.0	9.62	1.39	1.60	.898
June	14	3.8	6.15	.889	.99	.574
July	9.4	3.2	4.83	.698	.80	.451
August	3.8	3.0	3.25	.470	.54	.304
September	12	3.2	4.28	.618	.69	.399
1943–44						
October	74	3.4	8.92	1.29	1.49	.833
November	26	5.3	7.81	1.13	1.26	.730
December	17	3.6	5.52	.798	.92	.516
January	120	4.4	12.9	1.86	2.15	1.20
February	14	5.3	7.73	1.12	1.21	.724
March	33	7.7	12.9	1.86	2.15	1.20
April	18	8.2	10.8	1.56	1.74	1.01
May	12	4.9	6.98	1.01	1.16	.652
June	26	3.6	5.41	.782	.87	.505
July	12	3.2	4.76	.688	.79	.444
August	430	3.4	27.3	3.95	4.54	2.55
September	44	3.4	7.16	1.03	1.15	.665
The year	430	3.2	9.88	1.43	19.43	.924

SOUTH RIVER BASIN—*Continued*

Monthly discharge of Bacon Ridge Branch at Chesterfield, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1944–45						
October	50	4.5	8.40	1.21	1.40	.782
November	35	5.2	8.48	1.23	1.37	.795
December	35	6.5	10.3	1.49	1.72	.963
January	25	6.5	11.3	1.63	1.88	1.05
February	18	5.6	9.99	1.44	1.50	.930
March	15	7.5	9.58	1.38	1.60	.891
April	21	6.5	9.45	1.37	1.52	.885
May	185	4.5	14.0	2.02	2.33	1.30
June	71	4.8	10.1	1.46	1.63	.943
July	245	4.3	21.4	3.09	3.57	2.00
August	18	5.2	8.01	1.16	1.33	.749
September	61	5.2	12.3	1.78	1.98	1.15
The year	245	4.3	11.1	1.60	21.83	1.03
1945–46						
October	12	6.6	7.42	1.07	1.24	.691
November	22	7.1	10.0	1.45	1.61	.937
December	79	7.6	16.0	2.31	2.66	1.49
January	21	7.6	11.9	1.72	1.98	1.11
February	26	8.1	12.4	1.79	1.86	1.16
March	16	9.2	10.5	1.52	1.75	.982
April	18	7.1	8.98	1.30	1.45	.840
May	80	7.6	17.1	2.47	2.85	1.60
June	24	5.2	9.18	1.33	1.48	.859
July	20	4.3	6.10	.882	1.02	.570
August	36	4.3	6.90	.997	1.15	.644
September	20	4.1	6.00	.867	.97	.560
The year	80	4.1	10.2	1.47	20.02	.950
1946–47						
October	12	4.6	6.43	.929	1.07	.600
November	12	5.2	6.47	.935	1.04	.604
December	20	4.8	7.06	1.02	1.18	.659
January	16	6.6	10.6	1.53	1.76	.988
February	9.5	3.5	6.90	.997	1.04	.644
March	13	6.2	8.23	1.19	1.37	.769
April	13	6.2	8.57	1.24	1.38	.801
May	50	6.6	14.0	2.02	2.34	1.30
June	46	5.7	10.7	1.55	1.73	1.00
July	12	5.2	6.62	.957	1.10	.618
August	12	4.1	5.12	.740	.85	.478
September	31	3.8	5.86	.847	.94	.547
The year	50	3.5	8.06	1.16	15.80	.749

SURFACE WATER RECORDS OF ANNE ARUNDEL COUNTY—*Continued*

SOUTH RIVER BASIN—*Continued*

Monthly discharge of Bacon Ridge Branch at Chesterfield, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1947–48						
October	24	3.6	5.10	.737	.85	.476
November	207	5.5	18.8	2.72	3.03	1.76
December	20	5.5	7.48	1.08	1.25	.698
January	40	6.5	11.7	1.69	1.95	1.09
February	35	6.0	12.3	1.78	1.91	1.15
March	23	9.1	12.9	1.86	2.15	1.20
April	25	9.1	11.6	1.68	1.87	1.09
May	42	9.1	17.6	2.54	2.94	1.64
June	88	7.0	15.5	2.24	2.50	1.45
July	21	5.5	7.99	1.15	1.33	.743
August	74	6.5	18.0	2.60	3.00	1.68
September	13	5.5	6.84	.988	1.10	.638
The year	207	3.6	12.1	1.75	23.88	1.13

Yearly discharge of Bacon Ridge Branch at Chesterfield, Md.

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1943					7.97	1.15	15.63	0.743
1944	9.88	1.43	19.43	0.924	10.3	1.49	20.25	.963
1945	11.1	1.60	21.83	1.03	11.7	1.69	22.85	1.09
1946	10.2	1.47	20.02	.950	9.07	1.31	17.80	.846
1947	8.06	1.16	15.80	.749	9.00	1.30	17.64	.840
1948	12.1	1.75	23.88	1.13	—	—	—	—

North River near Annapolis, Md.

Location.—Water-stage recorder and concrete control, lat. 38°59′09″, long. 76°37′21″, 500 feet downstream from bridge on U. S. Hghway 50, 0.8 mile upstream from mouth, and 7 miles west of Annapolis, Anne Arundel County. Prior to Nov. 2, 1933, staff gage at same site and datum.

Drainage area.—8.5 square miles.

Records available.—December 1931 to September 1948.

Extremes.—Maximum discharge, about 5,000 second-feet Aug. 2, 1944 (gage height, 6.22 feet); minimum, 1.5 second-feet Sept. 1, 2, 4, 1932.

SURFACE WATER RECORDS OF ANNE ARUNDEL COUNTY—*Continued*

SOUTH RIVER BASIN—*Continued*

Monthly discharge of North River near Annapolis, Md.

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1931–32						
December 15–31	13	4.2	5.39	0.634	0.40	0.410
January	23	3.9	8.99	1.06	1.22	.685
February	22	4.7	7.51	.884	.95	.571
March	31	5.5	10.5	1.24	1.43	.801
April	28	6.0	9.90	1.16	1.29	.750
May	39	5.0	9.92	1.17	1.35	.756
June	14	3.2	5.38	.633	.71	.409
July	18	2.8	5.02	.591	.68	.382
August	6	1.8	2.95	.347	.40	.224
September	9.5	1.5	2.55	.300	.33	.194
1932–33						
October	45	2.0	7.21	.848	.98	.548
November	27	5.5	10.6	1.25	1.40	.808
December	28	5.5	9.45	1.11	1.28	.717
January	62	7.0	11.6	1.36	1.57	.879
February	19	7.5	10.3	1.21	1.26	.782
March	26	7.0	11.1	1.30	1.50	.840
April	71	9.0	18.0	2.12	2.36	1.37
May	20	8.0	11.6	1.36	1.57	.879
June	24	5.0	7.38	.868	.97	.561
July	48	4.8	9.32	1.10	1.27	.711
August	115	4.8	14.2	1.67	1.92	1.08
September	18	6.0	9.78	1.15	1.28	.743
The year	115	2.0	10.9	1.28	17.36	.827
1933–34						
October	19	7.2	9.40	1.11	1.28	.717
November	20	6.8	8.77	1.03	1.15	.666
December	24	6.2	9.64	1.13	1.30	.730
January	23	5.3	11.1	1.31	1.51	.847
February	14	5.6	8.20	.965	1.00	.624
March	106	8.0	22.5	2.65	3.06	1.71
April	28	10	14.9	1.75	1.95	1.13
May	31	8.4	13.1	1.54	1.78	.995
June	27	5.9	8.30	.976	1.09	.631
July	24	4.0	6.51	.766	.88	.495
August	17	4.0	5.45	.641	.74	.414
September	151	4.0	22.2	2.61	2.91	1.69
The year	151	4.0	11.7	1.38	18.65	.892

SOUTH RIVER BASIN—*Continued*

Monthly discharge of North River near Annapolis, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1934–35						
October	17	7.5	8.91	1.05	1.21	.679
November	30	7.5	9.87	1.16	1.29	.750
December	26	7.8	11.4	1.34	1.54	.866
January	34	7.8	13.6	1.60	1.84	1.03
February	29	9.2	14.8	1.74	1.81	1.12
March	36	10	13.5	1.59	1.83	1.03
April	143	11	22.1	2.60	2.90	1.68
May	25	7.8	11.8	1.39	1.60	.898
June	25	6.4	8.90	1.05	1.17	.679
July	32	5.6	8.82	1.04	1.20	.672
August	26	4.7	7.39	.869	1.00	.562
September	80	6.0	12.4	1.46	1.63	.944
The year	143	4.7	11.9	1.40	19.02	.905
1935–36						
October	20	6.4	8.13	.956	1.10	.618
November	48	8.3	14.6	1.72	1.92	1.11
December	18	6.7	9.97	1.17	1.35	.756
January	46	8.0	19.2	2.26	2.61	1.46
February	70	8.5	22.6	2.66	2.87	1.72
March	46	14	21.9	2.58	2.97	1.67
April	28	11	16.7	1.96	2.19	1.27
May	49	8.3	13.8	1.62	1.87	1.05
June	19	6.0	8.10	.953	1.06	.616
July	22	6.0	10.1	1.19	1.37	.769
August	32	5.4	8.29	.975	1.12	.630
September	11	4.9	5.99	.705	.79	.456
The year	70	4.9	13.2	1.55	21.22	1.00
1936–37						
October	30	6.0	8.67	1.02	1.18	0.659
November	11	6.0	7.24	.852	.95	.551
December	32	5.7	11.5	1.35	1.56	.873
January	55	11	18.9	2.22	2.56	1.43
February	42	11	15.8	1.86	1.94	1.20
March	17	9.2	11.9	1.40	1.61	.905
April	307	9.2	30.4	3.58	3.99	2.31
May	23	9.7	14.8	1.74	2.01	1.12
June	20	6.7	10.0	1.18	1.32	.763
July	19	5.4	8.38	.986	1.14	.637
August	169	4.9	17.6	2.07	2.39	1.34
September	11	5.7	7.23	.851	.95	.550
The year	307	4.9	13.5	1.59	21.60	1.03

SOUTH RIVER BASIN—*Continued*

Monthly discharge of North River near Annapolis, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1937–38						
October	108	6.0	17.9	2.11	2.43	1.36
November	342	8.7	26.4	3.11	3.47	2.01
December	19	8.5	11.9	1.40	1.61	.905
January	23	8.2	12.2	1.44	1.66	.931
February	26	9.4	13.1	1.54	1.60	.995
March	18	9.8	12.2	1.44	1.66	.931
April	21	9.0	10.9	1.28	1.43	.827
May	28	7.4	10.9	1.28	1.48	.827
June	20	6.0	8.20	.965	1.08	.624
July	24	4.4	8.25	.971	1.12	.628
August	11	4.4	5.74	.675	.78	.436
September	42	4.7	9.00	1.06	1.18	.685
The year	342	4.4	12.2	1.44	19.50	.931
1938–39						
October	16	5.4	7.26	.854	.98	.552
November	15	6.4	7.63	.898	1.00	.580
December	26	6.0	9.38	1.10	1.27	.711
January	71	5.7	10.4	1.22	1.41	.789
February	35	9.7	17.2	2.02	2.10	1.31
March	63	11	16.6	1.95	2.25	1.26
April	30	11	16.8	1.98	2.21	1.28
May	15	6.0	9.65	1.14	1.31	.737
June	68	5.3	9.25	1.09	1.22	.704
July	14	5.3	7.07	.832	.96	.538
August	46	4.5	7.36	.866	1.00	.560
September	35	5.1	7.06	.831	.93	.537
The year	71	4.5	10.4	1.22	16.64	.789
1939–40						
October	45	6.1	10.2	1.20	1.38	.776
November	23	6.4	8.41	.989	1.10	.639
December	12	6.0	7.45	.876	1.01	.566
January	25	4.5	6.19	.728	.84	.471
February	55	4.5	12.5	1.47	1.58	.950
March	42	7.2	11.7	1.38	1.59	.892
April	96	8.0	18.9	2.22	2.48	1.43
May	65	7.5	13.4	1.58	1.82	1.02
June	12	4.9	6.83	.804	.90	.520
July	54	4.3	8.41	.989	1.14	.639
August	18	4.0	6.42	.755	.87	.488
September	61	5.1	8.18	.962	1.07	.622
The year	96	4.0	9.86	1.16	15.78	.750

SOUTH RIVER BASIN—*Continued*

Monthly discharge of North River near Annapolis, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1940–41						
October	14	5.6	6.49	.764	.88	.494
November	46	6.4	12.4	1.46	1.62	.944
December	25	6.8	9.33	1.10	1.27	.711
January	23	6.4	10.3	1.21	1.40	.782
February	15	6.0	8.27	.973	1.01	.629
March	21	6.0	10.4	1.22	1.41	.789
April	37	7.2	12.3	1.45	1.61	.937
May	9.5	4.7	6.03	.709	.82	.458
June	30	4.7	8.95	1.05	1.17	.679
July	24	4.0	7.95	.935	1.08	.604
August	12	3.5	4.98	.586	.68	.379
September	4.2	2.8	3.15	.371	.41	.240
The year	46	2.8	8.37	.985	13.36	.637
1941–42						
October	5.2	2.8	3.84	0.452	0.52	0.292
November	8.3	4.2	4.96	.584	.65	.377
December	28	4.5	7.22	.849	.98	.549
January	24	3.1	7.49	.881	1.02	.569
February	36	4.3	8.47	.996	1.04	.644
March	34	6.1	11.6	1.36	1.57	.879
April	36	6.1	11.5	1.35	1.50	.873
May	13	4.0	6.47	.761	.88	.492
June	35	2.7	5.06	.595	.66	.385
July	21	2.9	5.47	.644	.74	.416
August	241	4.0	20.4	2.40	2.77	1.55
September	32	3.8	6.79	.799	.89	.516
The year	241	2.7	8.28	.974	13.22	.630
1942–43						
October	111	4.5	17.0	2.00	2.31	1.29
November	13	6.5	8.20	.965	1.08	.624
December	30	6.4	12.6	1.48	1.71	.957
January	16	7.2	10.2	1.20	1.38	.776
February	28	8.5	15.1	1.78	1.85	1.15
March	30	8.5	15.0	1.76	2.04	1.14
April	30	10	13.2	1.55	1.74	1.00
May	24	8.5	11.7	1.38	1.59	.892
June	16	4.9	7.84	.922	1.03	.596
July	8.0	3.7	5.09	.599	.69	.387
August	4.0	2.9	3.33	.392	.45	.253
September	24	3.3	5.42	.638	.71	.412
The year	111	2.9	10.4	1.22	16.58	.789

SOUTH RIVER BASIN—*Continued*

Monthly discharge of North River near Annapolis, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1943–44						
October	71	4.6	10.3	1.21	1.40	.782
November	29	6.4	9.82	1.16	1.29	.749
December	21	4.3	7.08	.833	.96	.538
January	100	6.0	14.1	1.66	1.91	1.07
February	16	6.0	8.88	1.04	1.13	.672
March	34	9.0	15.4	1.81	2.09	1.17
April	23	10	13.2	1.55	1.74	1.00
May	14	5.2	8.24	.969	1.12	.626
June	21	4.0	5.62	.661	.74	.427
July	21	2.9	5.85	.688	.79	.444
August	652	4.3	34.9	4.11	4.73	2.66
September	53	4.3	9.36	1.10	1.23	.711
The year	652	2.9	11.9	1.40	19.13	.904
1944–45						
October	46	6.4	10.3	1.21	1.39	.782
November	36	7.2	10.9	1.28	1.43	.827
December	44	9.0	13.4	1.58	1.81	1.02
January	29	8.0	13.6	1.60	1.85	1.03
February	22	7.0	12.0	1.41	1.47	.911
March	18	9.5	11.1	1.31	1.50	.846
April	27	8.5	11.4	1.34	1.49	.866
May	63	5.6	11.6	1.36	1.57	.879
June	62	6.0	12.7	1.49	1.66	.963
July	110	5.6	19.8	2.33	2.69	1.51
August	23	6.4	10.3	1.21	1.39	.782
September	82	6.4	16.7	1.96	2.19	1.27
The year	110	5.6	12.8	1.51	20.44	.975
1945–46						
October	15	8.0	9.34	1.10	1.27	.711
November	26	9.0	12.4	1.46	1.63	.943
December	71	9.5	18.8	2.21	2.55	1.43
January	26	10	14.6	1.72	1.98	1.11
February	31	9.5	14.8	1.74	1.81	1.12
March	19	12	13.4	1.58	1.81	1.02
April	23	7.6	10.5	1.24	1.37	.801
May	70	7.2	17.2	2.02	2.33	1.30
June	27	5.9	11.4	1.34	1.50	.866
July	32	4.2	8.30	.976	1.13	.630
August	36	5.5	8.06	.948	1.09	.612
September	23	4.6	7.19	.846	.94	.547
The year	71	4.2	12.2	1.44	19.41	.930

SURFACE WATER RECORDS OF ANNE ARUNDEL COUNTY—*Continued*

SOUTH RIVER BASIN—*Continued*

Monthly discharge of North River near Annapolis, Md.—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1946–47						
October	15	5.6	8.27	.973	1.12	.629
November	15	6.5	7.99	.940	1.05	.607
December	26	5.6	8.18	.962	1.11	.621
January	19	7.4	12.3	1.45	1.67	.937
February	11	3.6	8.12	.955	.99	.617
March	15	6.0	9.51	1.12	1.29	.724
April	14	6.4	8.97	1.06	1.18	.685
May	48	6.8	13.4	1.58	1.82	1.02
June	53	5.6	11.7	1.38	1.54	.891
July	15	4.3	6.84	.805	.93	.520
August	15	3.2	4.65	.547	.63	.353
September	38	3.7	6.95	.818	.91	.528
The year	53	3.2	8.92	1.05	14.24	.678
1947–48						
October	26	4.6	6.04	.711	.82	.459
November	77	5.9	16.6	1.95	2.18	1.26
December	24	6.3	8.76	1.03	1.19	.665
January	59	7.1	15.7	1.85	2.13	1.20
February	44	8.6	15.7	1.85	1.99	1.20
March	28	10	14.4	1.69	1.95	1.09
April	32	8.6	12.0	1.41	1.58	.911
May	42	8.6	16.9	1.99	2.29	1.29
June	76	7.1	14.9	1.75	1.95	1.13
July	28	5.5	8.93	1.05	1.21	.678
August	57	6.7	18.1	2.13	2.45	1.38
September	16	5.5	7.59	.893	1.00	.577
The year	77	4.6	12.9	1.52	20.74	.982

Yearly discharge of North River near Annapolis, Md.

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1932	—	—	—	—	7.50	0.882	12.02	0.570
1933	10.9	1.28	17.36	0.827	10.9	1.28	17.43	.827

SURFACE-WATER RECORDS OF ANNE ARUNDEL COUNTY—*Continued*

SOUTH RIVER BASIN—*Continued*

Yearly discharge of North River near Annapolis, Md.—*Continued*

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1934	11.7	1.38	18.65	.892	11.9	1.40	18.96	.905
1935	11.9	1.40	19.02	.905	12.1	1.42	19.35	.918
1936	13.2	1.55	21.22	1.00	12.8	1.51	20.54	.976
1937	13.5	1.59	21.60	1.03	15.9	1.87	25.42	1.21
1938	12.2	1.44	19.50	.931	9.55	1.12	15.24	.724
1939	10.4	1.22	16.64	.789	10.6	1.25	16.88	.808
1940	9.86	1.16	15.78	.750	10.0	1.18	16.06	.763
1941	8.37	.985	13.36	.637	7.36	.866	11.74	.560
1942	8.28	.974	13.22	.630	10.1	1.19	16.17	.769
1943	10.4	1.22	16.58	.789	9.47	1.11	15.13	.717
1944	11.9	1.40	19.13	.904	12.6	1.48	20.11	.956
1945	12.8	1.51	20.44	.975	13.3	1.56	21.26	1.01
1946	12.2	1.44	19.41	.930	10.8	1.27	17.24	.820
1947	8.92	1.05	14.24	.678	9.49	1.12	15.15	.724
1948	12.9	1.52	20.74	.982	—	—	—	—
Highest	13.5	1.59	21.60	1.03	15.9	1.87	25.42	1.21
Average	11.2	1.32	17.93	.853	10.9	1.28	17.42	.829
Lowest	8.28	.974	13.22	.630	7.36	.866	11.74	.560

THE GROUND-WATER RESOURCES

BY

J. W. BROOKHART

ABSTRACT

This report gives the basic data obtained during an investigation of the ground-water resources of Anne Arundel County, Maryland. Anne Arundel County is in the central part of Maryland adjoining the western shore of Chesapeake Bay. The county may be considered to lie wholly within the Coastal Plain, although the area near the northwestern edge of the county contains crystalline rocks that characterize the Piedmont Plateau. The Coastal Plain formations in Anne Arundel County are of Lower and Upper Cretaceous, Eocene, Miocene, and Pleistocene age, and all are sediments consisting chiefly of sand, gravel and clay. All the formations, except the Pleistocene deposits, strike northeast and dip gently to the southeast. The Pleistocene deposits are essentially flat-lying and form terraces.

The coastal plain sediments contain several water-bearing formations of which the Patuxent, Patapsco, Raritan, Magothy, and Aquia are the most important. About 35,000,000 gallons of water a day are pumped from the Patuxent formation in the Baltimore area, which adjoins Anne Arundel County on the north; however, this formation is not utilized extensively in Anne Arundel County because, in general, it lies at a relatively great depth. The Patapsco formation probably is utilized more than any other formation for ground-water supplies in the County. It yields as much as 1,000 gallons a minute to large-diameter wells in the Annapolis area. The Raritan formation yields adequate supplies of water for domestic and farm use and probably furnishes a part of the water for the Naval establishments and public supply at Annapolis. The Magothy formation yields as much as 1,000 gallons a minute to wells in the Annapolis area. However, a part of the water from these wells may be derived from the Raritan formation. It also yields adequate supplies of water to many domestic and farm wells. The Aquia formation is present in the southern part of the County where it yields adequate supplies of water for domestic and farm use. One well ending in the Aquia formation yields about 150 gallons a minute.

All of the aquifers yield water of a quality that is satisfactory for most uses, but, in a large part of the area, treatment is required for removal of iron.

Water-level measurements obtained during a $3\frac{1}{2}$-year period show no appreciable change. Available hydrologic data indicate that pumpage from the important aquifers could be increased considerably without serious depletion of the supply.

INTRODUCTION

LOCATION OF THE AREA

Anne Arundel County is in the central part of Maryland, bordered on the north by Baltimore County and Baltimore City, on the west by Howard and Prince Georges Counties, on the south by Calvert County, and on the east by Chesapeake Bay (Figure 5).

PURPOSE, SCOPE, AND METHODS OF THE INVESTIGATION

The investigation of the ground-water resources of Anne Arundel County was conducted under the cooperation of the Maryland Department of Geology, Mines and Water Resources and the Geological Survey, United States Department of the Interior. The work was started late in 1945 and carried on for about 9 months. The investigation was resumed in June, 1948, and field work was completed in May, 1949.

The purpose of this report is to compile all the existing basic data on the ground-water resources of Anne Arundel County, to show on structure-contour maps the approximate altitude of certain water-bearing formations, and to give the available data on the chemical properties of the water and the general hydrologic characteristics of the aquifers. These data were obtained from an inventory of about 600 wells, the sampling of water for chemical analysis, the contacting of drillers, the study of well cuttings, and the well records in the files of the Maryland Department of Geology, Mines and Water Resources. Much of the well information was obtained from well-completion reports submitted by the drillers to the Maryland Department of Geology, Mines, and Water Resources in accordance with the State law.

The wells inventoried during this investigation are plotted on a county map (Plate 3), which is divided into 5-minute quadrants. Each quadrant is lettered from north to south by upper-case letters and from west to east by lower-case letters. The wells are numbered in each 5-minute quadrant in the order in which they were inventoried.

The investigation was made under the general supervision of A. N. Sayre, Geologist in Charge of the Ground Water Branch of the U. S. Geological Survey, and under the immediate supervision of R. R. Bennett, District Geologist of the U. S. Geological Survey in charge of the cooperative ground-water investigations in Maryland.

PHYSICAL FEATURES

Maryland has been divided into five physiographic provinces (*15*)*: the Appalachian Plateaus, the Valley and Ridge, the Blue Ridge, the Piedmont and the Coastal Plain (Figure 5). Anne Arundel County may be considered to lie

* Numbers in parentheses refer to the references cited.

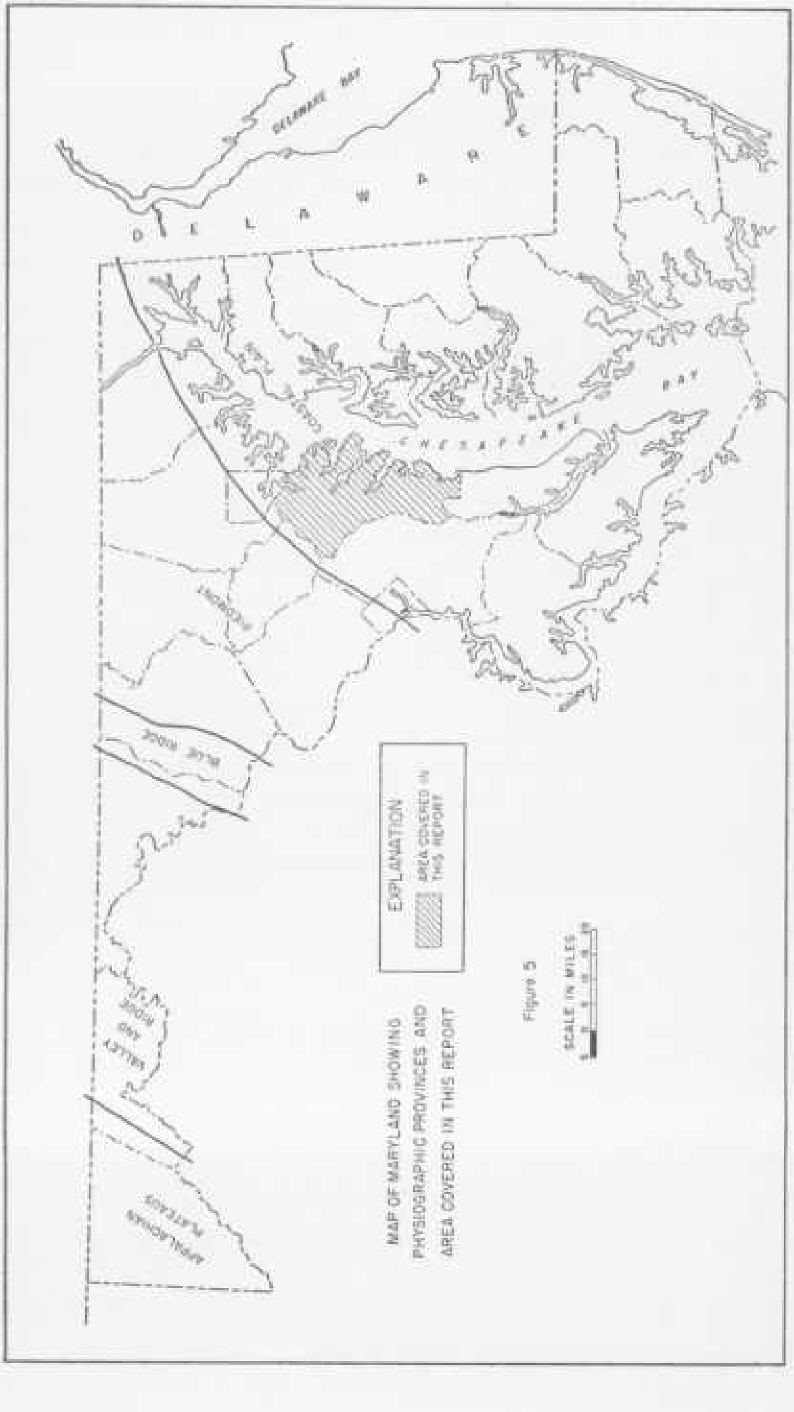

FIGURE 5. Location of the Area and Physiographic Provinces of Maryland

wholly within the Coastal Plain province, though crystalline rocks that characterize the Piedmont province are exposed in some of the stream valleys in the northwestern part of the county.

Coastal Plain is a term applied to an area extending along the Atlantic and Gulf coasts from Martha's Vineyard, Massachusetts, southwestward to Texas. In Anne Arundel County, Coastal Plain sediments are made up largely of unconsolidated gravels, sands and clays. Most of the ground-water supplies of Anne Arundel County are derived from the sands and gravels of the Coastal Plain.

Stream erosion has dissected much of the county to give it a rolling to hilly topography, except for the easternmost part where Recent and Pleistocene deposits form a low, flat surface.

PREVIOUS INVESTIGATIONS

The ground-water resources of Anne Arundel County have been discussed by several geologists. One of the first was Miller (*20*, p. 8), who gave a brief discussion of the wells in the Annapolis area. Little (*17*) gave a brief description of a few water wells. Clark, Mathews, and Berry (*9*), in a report on the water resources of Maryland, Delaware, and the District of Columbia, devoted eight pages to the county in which they include information on 92 wells. Since 1918 there have been no publications discussing the ground-water resources of Anne Arundel County.

ACKNOWLEDGMENTS

The initial field work for this investigation was done by C. W. Merrels during 9 months in 1945–46. Field work was resumed by the writer during June, 1948, and continued through May, 1949. The drillers of the county collected samples and furnished well information. Mr. W. C. Munroe, Chief Engineer of the Anne Arundel Sanitary Commission, furnished data on the Commission's wells and pumpage records and permitted the writer to make a pumping test in the Glen Burnie well field. Mr. E. G. Otton prepared the sample logs (Table 4) from a microscopic examination of well cuttings. Dr. R. M. Overbeck, of the Maryland Department of Geology, Mines and Water Resources, accompanied the writer on several field trips and gave many helpful suggestions in the writing of the report.

SOURCE OF MAPS

The base maps for this report are drawn from a topographic map of Anne Arundel County (scale 1:62,500) published in 1940 by the Maryland Geological Survey (now the Maryland Department of Geology, Mines and Water Resources). Basic field data were plotted on maps to a scale of 1:31,680 published by the Corps of Engineers, U. S. Army, and the U. S. Geological Survey. The geologic map used in this investigation was that compiled by Little (*17*) to accompany his 1916 report.

General Principles of the Occurrence of Ground Water

POROSITY OF ROCKS

Ground water occurs in the pore spaces and cavities of rocks. Porosity may be expressed quantitatively as the percentage of the total volume of rock that is occupied by voids. In the Coastal Plain sediments the porosity is controlled by the size, shape, degree of assortment, compaction, and cementation of the particles. In the crystalline rocks underlying these sediments the porosity is controlled by the degree of weathering and fracturing. For a more complete discussion of porosity see Meinzer's work on the occurrence of ground water (*18*, p. 3).

PERMEABILITY OF ROCKS

Hydraulic permeability may be defined as the ability of a rock to transmit water under pressure. A coefficient of permeability has been established by the U. S. Geological Survey to express quantitatively the hydraulic permeability of an aquifer. This coefficient, for field use, may be defined as the number of gallons of water a day that percolates through each mile of water-bearing bed for each foot of thickness of the bed and for each foot per mile of hydraulic gradient at existing ground-water temperatures (*24*, p. 7).

The size of the pore spaces and other openings in rocks and the degree to which they are interconnected largely govern the permeability. In fine-grained material, such as a clay, the water is held between the grains by molecular attraction, and the material is said to be impermeable. Materials of this type are usually regarded as non-water-bearing, although the total quantity of water entrapped in the clay may be as great as or greater than the amount of water in loose sand or gravel where the voids are many times larger. In sand or gravel only a small percentage of the water is held by molecular attraction, and the rest is free to move under the influence of gravity or hydrostatic pressure.

ZONE OF SATURATION AND WATER TABLE

When rain falls or snow melts, some of the water is absorbed into the ground and percolates downward under the force of gravity until it reaches the zone where the pore spaces and cavities of the rocks are saturated. The water-filled portion of the rocks is known as the zone of saturation. The upper surface of the zone of saturation is called the water table. The water table fluctuates, generally rising rather quickly when recharge occurs and then declining, quickly at first and then more slowly, between periods of recharge as the water drains out of the rocks. Wells drilled or dug into the zone of saturation will fill up to the level of the water table.

ZONE OF AERATION AND RECHARGE OF GROUND WATER

The zone of aeration is the zone of unsaturated material between the water table and the land surface. In this zone the pore spaces are filled partly with air and partly with water. Some of the water, especially that in the smaller pores, is held by capillary force and is not free to move downward. When sufficient water has entered the ground to satisfy the capillary requirements, addition of more water will result in downward movement of water to the zone of saturation. Much of the water that enters the upper part of the zone of aeration is drawn back to the surface by the roots of plants and evaporated from their leaves (transpiration), or is evaporated directly. Thus it is apparent that the amount of recharge depends not only on the total amount of precipitation, but on the rate at which it occurs and the extent to which it runs off directly into streams or is diverted by vegetation or evaporated before it can reach the water table.

ARTESIAN CONDITIONS

Artesian conditions occur where water moving along a water-bearing bed passes under a relatively impermeable bed and becomes confined there under hydrostatic pressure. The amount of this pressure depends on the elevation of the water table in the unconfined area, and on the amount of energy lost by friction as the water moves through the aquifer away from the unconfined area. Part of the precipitation enters the water-bearing bed where it is exposed at the surface and percolates down dip to replenish water that has been discharged either through wells or at points of natural discharge. In a well drilled through the confining bed the water will rise in the well above the base of the confining bed, the height to which it will rise depending on the hydrostatic pressure. The imaginary plane defined by the height to which the water will rise in wells is known as the piezometric surface. Because some pressure is lost by friction when the water moves through the aquifer, the altitude of the water surface in an artesian well must be lower than the altitude of the water table at the outcrop of the aquifer. If the mouth of the well is at a lower altitude than that of the pressure surface the well will flow. Artesian conditions are more fully explained by Meinzer in Water-Supply Paper 489 (*18*, p. 166).

In the Coastal Plain sediments of Anne Arundel County important artesian aquifers exist in the Patuxent, Patapsco, Raritan, Magothy, and Aquia formations.

NATURAL DISCHARGE OF GROUND WATER

Water is being added periodically to the zone of saturation. This increment of water would cause a rise of the water table to the land surface were it not that the water flows away underground from areas of recharge to areas where water is discharged naturally by springs, the transpiration of plants, and evaporation from the soil. Under artesian conditions natural discharge occurs chiefly by slow percolation through the confining bed.

Discharge by Seepage and Springs

Springs occur at points of intersection between the water table and the land surface. The commonest types occur where a stream has cut down below the water table, or where an impermeable bed, that prevents the water from moving downward, causes the ground water to issue at the surface. Springs differ greatly in the size and number of the openings through which the water issues, the areas over which the openings are distributed, and the rate at which the water flows out of them. Seepage areas occur where the water oozes from the aquifer in small quantities; where the quantities are still smaller there may be no moist ground at all, but simply a relatively dense growth of vegetation. Springs which are partly the result of water discharging at the contact of an impervious bed and an overlying water-bearing bed may be observed along U. S. Highway 50 between Annapolis and U. S. Highway 301. In some of the road cuts along this route dense dark sandy clays are overlain by more permeable sand and gravel. Another type of spring may occur as a result of artesian conditions where water under pressure comes to the surface through openings in the confining bed. However, in Anne Arundel County no springs of this type are known.

Discharge from seeps and springs maintains the flow of streams during periods of no rainfall. Although no quantitative measurements have been made in Anne Arundel County, data compiled from similar areas indicate that this type of discharge may range between 15 and 30 per cent of the total annual precipitation. For example, in the Salisbury area, Maryland, where conditions for recharge are good, the ground-water discharge into Beaverdam Creek, above the gaging station at Schumaker's dam, averages about 600,000 gallons a day per square mile of drainage area (*2*, p. 14). Inasmuch as the annual precipitation averages about 44 inches, the average rate of ground-water discharge into Beaverdam Creek represents about 30 per cent of the precipitation.

Discharge by Evaporation and Transpiration

A significant quantity of natural discharge occurs as a result of evaporation, either directly from the soil or by plant transpiration. White (*25*), in a study of evaporation in the Escalante Valley in Utah, found that the shallow water table was lowered by plant use in a daily cycle during the growing season, and that a large amount of ground water was returned to the atmosphere in the form of water vapor. Climatic conditions in Maryland and Utah are quite different, but in both states large amounts of water are discharged by evaporation and transpiration where the water table is at shallow depth. Meinzer and Stearns (*19*, p. 142) found that in the Pomeraug River Basin in Connecticut, where the average annual precipitation is approximately the same as in Anne Arundel County, the evaporation (including transpiration) is equal to approximately 15 per cent of the precipitation.

ARTIFICIAL DISCHARGE OF GROUND WATER

Discharge by Artesian Flow

Where a water-bearing formation occurs under artesian conditions and the artesian head is above the land surface, water may be discharged from the formation through flowing wells. The continual or intermittent flow from such wells, or leakage into shallower aquifers through defective casings, may discharge appreciable quantities of ground water. There are a large number of flowing wells in Anne Arundel County, most of which are found near the shore of Chesapeake Bay or in the river valleys where the altitude is near sea level. Well Ad 3, however, flows at an altitude of about 50 feet above sea level. It is illegal in Maryland to permit wells to discharge water that runs to waste and not put to useful service. Some of the wells near the bay which formerly flowed constantly now flow only at high tide. The artesian head has been lowered by the long-continued discharge of flowing wells, but at high tide the head rises above the surface because the added weight of the bay water compresses the aquifer and increases the hydrostatic pressure.

Figure 6 shows the change in water level in well Ce 49 caused by tide, as recorded by an automatic water-stage recorder. The well is about half a mile from the Severn River and is approximately 450 feet deep.

Discharge by Pumping

In the northern part of Anne Arundel County the estimated daily pumpage by industrial and municipal users is about 750,000 gallons of which nearly all is pumped from the public-supply well field at Glen Burnie. In the Annapolis area the U. S. Naval installations pump about 2,250,000 gallons a day. The city of Annapolis normally depends on surface water for all of its supply, but in dry periods some of the supply is obtained from ground water. During 1948 the average daily water consumption is estimated to have been about 2,250,000 gallons. It is not known accurately how much of this average daily consumption is derived from ground water, but from the few data available it would not seem to average more than 10 per cent or about 225,000 gallons a day. At times, however, ground water is utilized for nearly all of the supply. In the central and western parts of the county, the Crownsville Hospital, the U. S. Naval Academy Dairy, and the National Plastics Corporation pump an estimated 500,000 gallons a day.

In Anne Arundel County about 25,000 people depend on small domestic or farm wells for their water supply. Assuming that water is used at an average

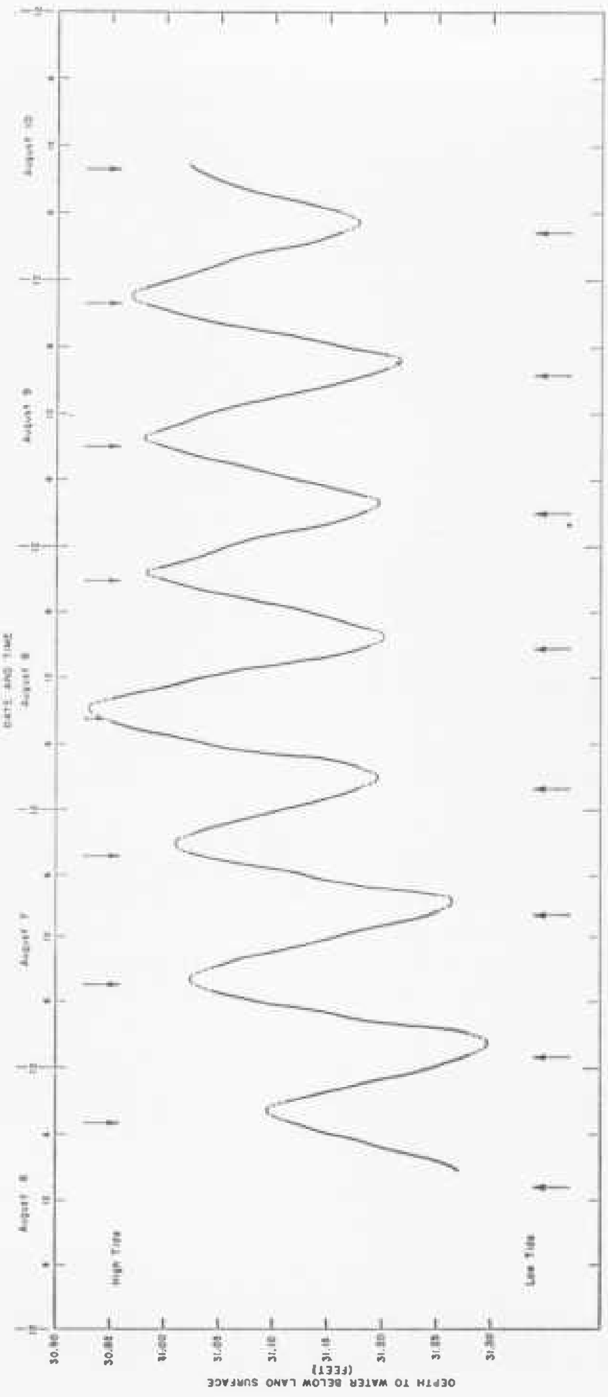

FIGURE 6. Graph Showing Daily Water-level Fluctuation in Well Ce 49 Due to Tide

rate of 50 gallons a day per person, the total quantity of water pumped daily from these wells would be 1,250,000 gallons. During the summer, however, the increased population from the influx of thousands of people to summer homes along the Chesapeake Bay, and the Patapsco, Magothy, Severn, and South Rivers, increases the ground-water consumption for domestic purposes. Although no accurate data are available, it seems likely that the average daily pumpage of ground water, during the year, for domestic and farm use is about 2,000,000 gallons a day.

From estimated and known values of pumpage, and other data, the total average daily discharge of ground water from wells in Anne Arundel County is estimated to be about 5,000,000 to 7,000,000 gallons a day.

PUMPING TESTS

When a well is pumped the water table or piezometric surface in the vicinity of the well declines and forms an inverted cone with the apex of the cone at the pumped well. By measuring the water levels in the pumped well and in observation wells at known distances from the pumped well, the size, shape, and rate of growth of this cone (cone of depression) can be determined. These data provide a means by which the ability of the aquifer to store and transmit water can be determined. The ability of an aquifer to store water is expressed by the coefficient of storage, which may be defined as the amount of water, in cubic feet, discharged from each column of the aquifer with a basal area of 1 square foot as the water level falls 1 foot. The ability of an aquifer to transmit water may be expressed by means of the coefficient of transmissibility which may be defined as the amount of water, in gallons a day, at the existing ground-water temperature, that will percolate through a section of the aquifer 1 mile wide, at right angles to the direction of flow, for each foot per mile of slope of the water table or piezometric surface (*24*, p. 87). The coefficients of storage and transmissibility of an aquifer can be used to predict the effect of pumping given quantities of water on the water levels in the pumped wells themselves, or on the levels in other wells in the same aquifer. In other words, the data can be used to determine the availability of given quantities of water and the effect of the withdrawal at any time and place. Comprehensive pumping tests made under favorable conditions can determine also the amount of decrease in natural discharge or increase in recharge, if any, due to pumping, and the areal extent and structure of the water-bearing formation.

The formulas are based on a set of ideal conditions that are rarely found in nature. For example, it is assumed that the water-bearing formation is of constant thickness, and unlimited areal extent, the material is the same throughout, and natural recharge and discharge remain the same during the test. Since these conditions are rarely found in nature, it is necessary that the geologic conditions be fully understood in order to evaluate the results of a pumping test.

In this report the results of a pumping test in the Patapsco formation are given in the discussion of the hydrology of this formation.

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

The geologic formations in Anne Arundel County present a nearly complete Coastal Plain section. The exposures of the type sections of the Arundel, Magothy, and Patapsco formations lie wholly or in part within the county, and all the other formations are exposed at the surface in different parts of the county. Table 1 lists the geologic sequence and briefly describes the lithology and water-bearing properties of the formations. Figure 7 shows a cross section of the geologic formations in the northern and central parts of Anne Arundel County. The location of the section (A–A′) is shown on Plate 3.

PRE-CAMBRIAN CRYSTALLINE ROCKS

In Anne Arundel County the only area where crystalline rocks or "bedrock" are exposed is the northwestern part in the valleys of the Patuxent River and its tributaries. Near the county line at Laurel and Savage, exposures of gabbro and metagabbro are found in the valley bottoms. Gneiss, granite, pegmatite, diorite, and serpentine are exposed in the Piedmont plateau not far west of Anne Arundel County. These rocks underlie the Coastal Plain sediments and may be encountered in wells drilled through those sediments near the Fall Line.

In most places fractures have been formed in the crystalline rocks by earth movements. They may extend for some distance, both vertically and laterally, but generally they narrow and become fewer with depth. Weathering of the crystalline rocks may occur along fracture openings, thereby increasing the porosity and permeability of the rocks. Ground water accumulates in the fractures and weathered zones, where it may be tapped by drilled wells. Most wells drilled into crystalline rocks in or near Anne Arundel County yield less than 10 gallons a minute; however, two wells (Bb 7 and 8) are reported to yield about 50 gallons a minute each, and well Bc 8, now abandoned, had a yield of 100 gallons a minute. Where bedrock occurs at or near the land surface, users of large quantities of water have been forced to develop surface-water supplies.

CRETACEOUS SYSTEM

Lower Cretaceous Series (Potomac group)

Patuxent Formation. The Patuxent formation is named from the type area, in the valleys of the Little and Big Patuxent Rivers, and is the basal formation of the Coastal Plain sediments in Anne Arundel County. The formation lies directly upon the crystalline rocks. The Patuxent formation crops out in a narrow belt in the north and northwest parts of the county.

The formation consists of lenticular beds of sand, gravel, and clay; and in some places clay balls are present in the sand and gravel. The color ranges from

TABLE 1

Geologic Formations in Anne Arundel County

System	Series		Formation	Thickness (feet)	General Character	Water-Bearing Properties
Quaternary	Pleistocene		Talbot Wicomico Sunderland Brandywine	0–100(?)	Gravel, sand, silt, and clay	Yields water to dug wells in Anne Arundel County.
Tertiary	Miocene		Choptank	0– 50(?)	Sandy clay	Not a water-bearing formation in Anne Arundel County.
Tertiary	Miocene		Calvert	100–150	Diatomaceous earth with shell beds and some sand lenses	Sand lenses yield small supplies to dug wells in southern part of county.
Tertiary	Eocene	Pamunkey group	Nanjemoy	75–120	Green glauconitic sand mixed with clay in upper part of formation. Dense pink or gray clay in lower part	Poor water-bearing formation in Anne Arundel County. May yield moderate supplies in a few places.
Tertiary	Eocene	Pamunkey group	Aquia	75–150	Green glauconitic sand. Sand brown to green in color and fine- to medium-grained	Main aquifer used in southern part of county. Yields as much as 150 g.p.m.
Cretaceous	Upper		Monmoutb	50– 80	Dark gray or black, sandy clay with some glauconitic sand	Not an important water-bearing formation in Anne Arundel County.
Cretaceous	Upper		Matawan	50±	Similar to Monmouth formation but contains less glauconite	Not an important water-bearing formation in Anne Arundel County.
Cretaceous	Upper		Magothy	25– 60	Brown clay underlain by coarse light-gray sand containing lignite and pyrite	Excellent water-bearing formation, some wells yielding up to 1,000 g.p.m. Water usually high in iron.
Cretaceous	Upper		Raritan	100±	Variegated sand and clay. Sand may become case-hardened at outcrop	Excellent water-bearing formation.
Cretaceous	Lower	Potomac group	Patapsco	200–300	Variegated sand and clay with some thin lenses of iron oxides	Chief water-bearing formation in central part of county. Large-diameter drilled wells yield up to 1,000 g.p.m.
Cretaceous	Lower	Potomac group	Arundel	30–150	Tough red to brown clay. In some places contains nodules of iron oxides, and plant remains	Not a water-bearing formation in Anne Arundel Co.
Cretaceous	Lower	Potomac group	Patuxent	100–300+	Sand, gravel, and variegated clay	Excellent water-bearing formation. Few wells tap this formation because water is generally available from Patapsco formation above.
Pre-Cambrian(?)					Gabbro, metagabbro, gneiss, granite, pegmatite, diorite and serpentine	Poor water-bearing formation. Some water occurs in fractured and weathered zones. Maximum reported yield 50 g.p.m.

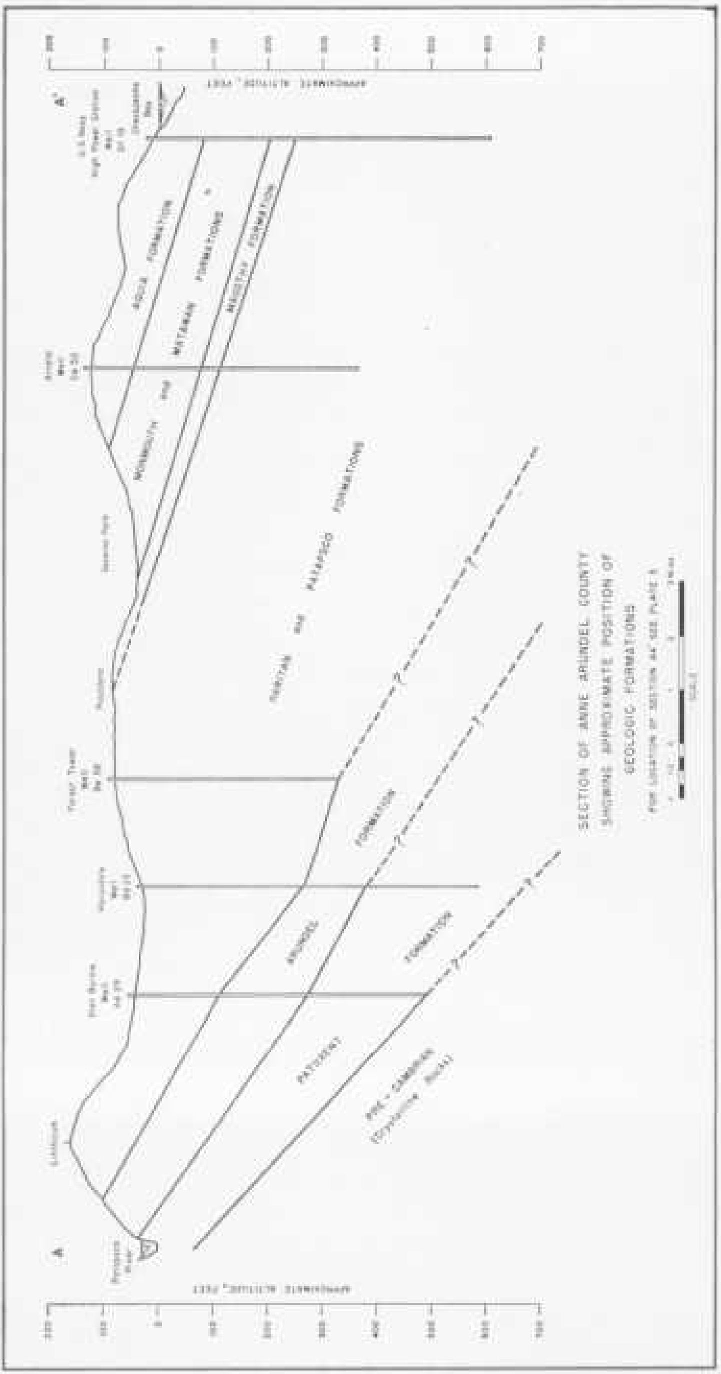

FIGURE 7. Section A–A' across Anne Arundel County Showing Approximate Positions of Geologic Formations

dark red and brown to a very light gray. At some localities in the outcrop the formation contains coarse sand with numerous clay balls. These clay balls are mixed with sand in the process of drilling and may give the impression that the material is a sandy clay rather than a water-bearing sand.

The sediments of the Patuxent formation are lenticular, grading laterally from sand to clay, and because of this lenticularity sands are probably continuous hydrologically only over relatively short distances. Because of lithologic similarity and scarcity of fossils, the Patuxent formation is difficult to distinguish from the Patapsco formation, except where the tough clay of the Arundel formation, which separates the Patuxent and Patapsco, is present.

In the Baltimore area about 35,000,000 gallons of water a day are pumped from the Patuxent formation (*1*). In Anne Arundel County the southeastward dip of the Patuxent formation carries the water-bearing sand to progressively greater depths, and the shallower formations are the main source of ground water.

In the Patuxent formation highly mineralized water has been encountered in some deep oil-test wells drilled on the Eastern Shore of Maryland. The southeasternmost well known to penetrate the Patuxent formation in Anne Arundel County is well Bd 23, a test well, about $1\frac{1}{2}$ miles southeast of Glen Burnie. The driller's log and chemical analysis of the water (see tables 3 and 5) of this well show that the Patuxent contains several water-bearing sands with water of excellent quality, none of which are tapped in this part of the area by producing wells. Since in Anne Arundel County no wells draw water from the Patuxent formation southeast of well Bd 23, the position of the salt-water front in the formation is not known. Nevertheless it seems probable that the formation may contain potable water as far southeast as Annapolis. However, before drilling production wells to this formation in any part of the county as far southeast of the outcrop as Annapolis, it would be desirable to drill a test well to determine the character of the water-bearing material and the quality of the water contained in it.

In general the Patuxent formation strikes northeast and dips about 80 feet to the mile to the southeast. The thickness ranges from about 100 to 300 feet in the northern part of the county and probably increases considerably down dip.

Quality of Water: Samples of water from six wells ending in the Patuxent formation were analyzed for their mineral content (see table 5). These show that the total dissolved solids range from 18 to 56 parts per million, and the total hardness from 3.3 to 20 parts per million. The iron content, which ranges from 1 to 11 parts per million, is sufficiently high to require treatment of the water for some uses.

Arundel Formation. The Arundel formation is named for the type area in northern Anne Arundel County where the formation is well developed and exposed. This formation lies unconformably upon the Patuxent formation and consists essentially of a tough red to brown clay that locally contains small lenses of "ironstone."

In a few scattered places the Arundel formation may contain thin sand lenses that may be water-bearing, but none of the wells inventoried in this report obtain water from such lenses.

The Arundel formation is hydrologically important because the dense clay is practically impervious and is effective in confining the water in the underlying Patuxent formation.

The Arundel formation ranges from about 25 to 200 feet in thickness but averages about 100 feet thick. The strike is generally northeast, and the dip is about 60 feet to the mile to the southeast.

Patapsco Formation. The Patapsco formation is named from the Patapsco River Valley, where it is typically developed. Much of the type area lies within Anne Arundel County. The Patapsco formation is bounded unconformably by the overlying Raritan and underlying Arundel formations. It is composed chiefly of clay and sand that range from red and brown to light gray. In general the sediments in the Patapsco and Patuxent formations are lithologically similar. Thin layers of "ironstone" are common in some localities. Most of the individual beds of clay or sand probably are not continuous for any great distance, and in most localities they cannot be correlated between wells, even those relatively close together. The rapid changes in facies of the Patapsco formation are illustrated by Plate 4, showing an exposure of the Patapsco formation in a road cut. Point "A" and point "B" in the picture are approximately 100 feet apart.

A description of the 40-foot section at point "A" is:

	Depth below top of section	Thickness
Pleistocene		
Sand and gravel	0 –10	10
Lower Cretaceous		
Patapsco formation		
Red clay	10 –20	10
Gray clay	20 –30	10
"Ironstone" layer	30 –30.1	0.1
Gray sand	30.1–40	9.9

At point "B" the section is:

	Depth below top of section	Thickness
Pleistocene		
Sand and gravel	0 –10	10
Lower Cretaceous		
Patapsco formation		
Red and gray clay	10 –12	2
"Ironstone" layer	12 –12.1	0.1
Gray sand	12.1–40	27.9

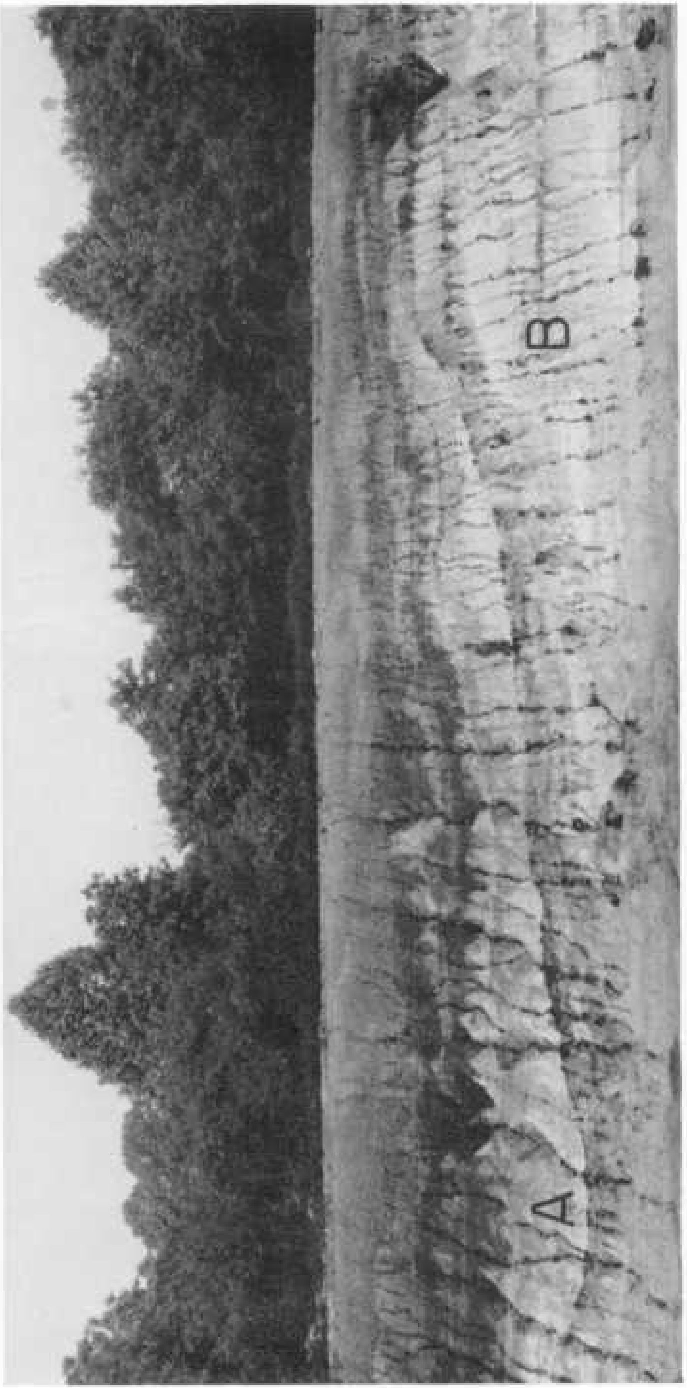

PLATE 4. Patapsco Formation 2½ miles North of Linthicum on New Highway between Baltimore and Washington (in Baltimore County)

Other examples of facies changes over short distances can be found in the drillers' logs of wells drilled in the Patapsco formation in the Glen Burnie and Annapolis areas. Although the sand beds of the formation cannot be correlated by well logs or drill cuttings, water-level information indicates that many of them are connected and act as a hydrologic unit. Because of changes in lithology over such short distances, it is impossible to predict with accuracy the exact depth a well must be drilled to reach the water-bearing sands of the Patapsco formation in Anne Arundel County. However, in most places a yield of at least 100 gallons a minute may be obtained from a properly constructed and developed well screened opposite a large part of the water-bearing material in the formation; in some localities large diameter wells may have yields of several hundred gallons a minute.

In the northern part of the county, where the entire formation is exposed, the Patapsco ranges in thickness from 200 to 300 feet, and it probably thickens considerably down dip. The general strike of the formation is northeast, and the dip is about 45 feet to the mile to the southeast.

The Patapsco is one of the most productive water-yielding formations in the State and the most extensively developed in Anne Arundel County. In the Baltimore area the estimated daily pumpage from the Patapsco formation during 1945 was about 5,000,000 gallons a day; in the Glen Burnie area the Anne Arundel County Sanitary Commission takes all its water for local municipalities from wells drilled into the Patapsco formation. The average daily pumpage in the Glen Burnie area, in 1948, was about 600,000 gallons a day, and it was reported that it will be increased to about 1,000,000 gallons a day in 1949 when large real estate developments in the area are completed.

In the Annapolis area 17 of 21 wells that supply or have supplied the U. S. Naval Academy, Engineering Experiment Station, and High Power Radio Station take their water from the Patapsco formation. The estimated daily pumpage from these wells is about 1,500,000 gallons. Near Odenton the pumpage from this formation by the U. S. Naval Academy Dairy and the National Plastics Corporation is estimated to be about 500,000 gallons a day. In addition to these developments hundreds of farm and domestic wells in the northern and central parts of the county take their water from sands of the Patapsco.

Quality of Water: The Patapsco water is generally low in dissolved solids in the northern part of the county in and near the outcrop area. Analyses of water from 25 wells in this area have a range, in total dissolved solids, of 12 to 58 parts per million; and a range, in total hardnesss, of 2 to 87 parts per million (see table 5). The mineral content increases to the southeast. Analyses of water from 5 wells in the Annapolis area have a range, in total dissolved solids, of 66 to 111 parts per million; and a range, in total hardness, of 25 to 42 parts per million.

The analyses show that, in the outcrop area, the iron content ranges from

0.04 to 4.0 parts per million; but in the Annapolis area it ranges from 18 to 26 parts per million. Consequently, in many places, the water is treated to remove the iron.

Possibility of Salt-Water Contamination: Heavy pumping from the Patapsco formation in the Baltimore area has caused a decline in water level sufficient to permit brackish water from the Patapsco River to enter the aquifer (*1*, p. 11). At present there is no evidence of such contamination in Anne Arundel County. However, the hydrologic conditions are similar to those in the Baltimore area, and heavy pumping may result in contamination by brackish water, particularly in the upper part of the formation where it is exposed to the brackish water in the Patapsco River.

Pumping Tests: In the spring of 1948 a pumping test was made in the well field of the Anne Arundel County Sanitary Commission at Glen Burnie. Three wells equipped with pumps were used in an interference test, and two wells without pumps were equipped with recorders to record changes in water level. The test lasted 4 days. One well was started, and after 24 hours a second well was started, and after 24 more hours the third well was started and the three pumped together for 24 hours. At the end of the third 24 hour period two of the pumps were cut off for 24 hours in order that the recovery of the water levels in the well field could be measured. The results of the test, analyzed by the Theis nonequilibrium formula, show that the aquifer in the Glen Burnie well field has a coefficient of transmissibility of about 35,000 gallons a day per foot, and a coefficient of storage of about 0.001. The average specific capacity of the three wells, which is the yield per unit of drawdown, was about 10 gallons per minute per foot of drawdown after 12 hours of pumping.

Figure 8 shows the theoretical drawdown in an aquifer, having the coefficients of transmissibility and storage determined at the Glen Burnie well field at various distances from a pumped well for different periods of time (30, 100, and 365 days) after pumping is started at the rate of 100 gallons per minute. The theoretical drawdowns for other rates of pumping may be computed from this graph, as the drawdown is directly proportional to the discharge; for example, doubling the pumping rate would double the drawdown shown in Figure 8.

The wells used in this test range in depth from 60 to 95 feet and do not penetrate the full thickness of the Patapsco formation, therefore, the transmissibility and storage coefficients for the entire formation are greater than determined by this test.

Upper Cretaceous Series

Raritan Formation. The Raritan formation was named by Clark (*4*, pp. 181–186) for excellent exposures along the Raritan River in New Jersey. In Anne Arundel County the formation is exposed in a belt about 5 miles wide from the mouth of the Patapsco River to the Patuxent River above Priest

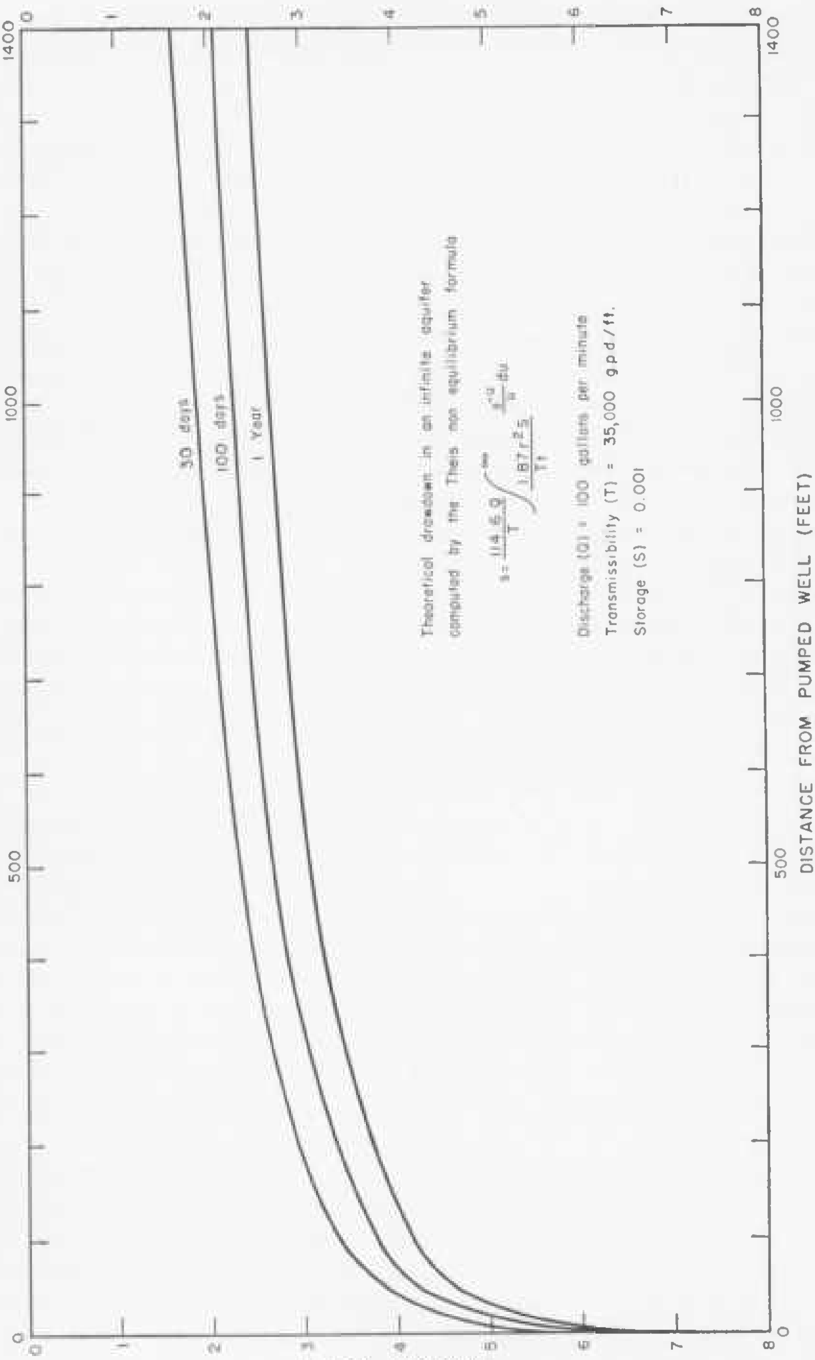

FIGURE 8. Graph Showing Theoretical Drawdown by Pumping

Bridge. In some localities the gray sand in the Raritan becomes case-hardened upon exposure to form resistant rock masses. A typical exposure of this sort is on the hills southeast of Lipins Corner. The hard phase of the Raritan is apparently confined to the surface, because at depth the material is penetrated easily by drilling. Owing to the similarity in lithology, it is difficult to distinguish the Raritan from the Patapsco and Magothy formations. Moreover, in some places, the three formations probably form a single ill-defined hydrologic unit.

The Raritan strikes northeastward and dips to the southeast at about 35 feet to the mile. Little (*17*, p. 71) reports the average thickness in the county to be about 100 feet.

The Raritan sands form good aquifers, and the water is similar in quality to that of the Patapsco formation. A large number of wells in the central part of the county develop water supplies from strata of the Raritan.

Magothy Formation. The term Magothy was introduced by Darton (*12*) in 1893 for a series of transition beds above the Raritan formation and below the Matawan formation. The formation is well exposed along the Magothy River, where it consists essentially of a coarse light gray sand containing lignite and pyrite, overlain by a chocolate-brown clay.

The top of the coarse sand is an excellent marker horizon, both at the outcrop and in well samples. It is on the top of this sand that the contours in Plate 5 are drawn. The base of the Magothy generally cannot be determined accurately from drillers' logs or drill cuttings. The top of the Magothy formation can usually be identified by means of the brown clay which underlies the glauconitic sand and dark-gray clay of the Matawan formation.

The Magothy formation is usually about 40 to 60 feet thick. The strike in the central part of the county is northeast but trends to a more easterly direction near the Chesapeake Bay (Plate 5). The formation dips to the southeast at about 30 feet to the mile.

The coarse sand of the Magothy formation is an excellent aquifer. The wells at the Annapolis Water Works take their water from the Magothy, and two of them, De 45 and De 46, yield about 1,000 gallons per minute each and have an average specific capacity of 10 gallons per minute per foot of drawdown. Two wells, Df 15 and Df 9, at the U. S. Naval installations at Annapolis, are pumped at rates of 200 and 900 gallons per minute, respectively; and two wells at the Crownsville State Hospital, Cd 11 and Cd 12, yield about 200 gallons per minute each.

Quality of Water: The water from the Magothy formation is generally more highly mineralized than the water from the Patapsco or Raritan formations. Analyses of water from 8 wells ending in the Magothy show a range of 62 to 209 parts per million of total dissolved solids, 26 to 164 parts per million total hardness, and 1.2 to 30 parts per million of iron. Public supplies deriving their water from the Magothy formation treat the water to remove the iron.

Matawan Formation. The Matawan formation was named by Clark (*5*, pp.

163–164) for exposures along Raritan Bay and Matawan Creek in New Jersey. In Anne Arundel County this unit crops out in an irregular northeast-trending belt from Sillery Bay on the Magothy River to Conaways near the Prince Georges County line.

The Matawan formation is strikingly different in appearance from the underlying Magothy. Where the formation is unweathered, it consists of a very uniform black sandy clay with mica and glauconite. At the outcrop the Matawan formation may weather into buff sandy clay.

Because of its high percentage of clay, the Matawan formation is of little importance as an aquifer, and its chief hydrologic importance is that it confines the water in the underlying Magothy formation.

The Matawan formation is about 50 feet thick. The unit strikes northeast and has a dip of about 20 feet to the mile to the southeast.

Monmouth Formation. The Monmouth formation was named by Clark (*7*, p. 331) for Monmouth County, New Jersey, where the formation is well exposed. In Anne Arundel County the Monmouth formation is exposed in an irregular belt that increases in width from Gibson Island southwestward to Governor Bridge on the Patuxent River.

The lithology of the formation in Anne Arundel County is similar to that of the Matawan formation, the only great difference being an increase in the amount of glauconite in the Monmouth formation. In the drill cuttings it is difficult to distinguish between the two formations, and they are considered as one unit in the sample studies (table 4).

Although the Monmouth contains more glauconitic sand than the Matawan, the large amount of associated clay makes the Monmouth formation of little importance as a source of ground-water supply.

In Anne Arundel County the Monmouth ranges in thickness from 50 to 80 feet. The unit has a northeast strike, and dips to the southeast at about 20 feet to the mile.

TERTIARY SYSTEM

Eocene Series

Aquia Formation. The Aquia formation was named by Clark (*6*, p. 3) for Aquia Creek, a stream in Virginia which flows into the Potomac River. Along Aquia Creek the formation is particularly well exposed. In Anne Arundel County the formation is exposed over a large area, the most striking exposures being along the Severn River where the Aquia formation forms the high bluffs across the river from Annapolis. These bluffs extend up the river several miles and in some places attain a height of about 100 feet. The Aquia formation is composed chiefly of a green glauconitic, argillaceous sand that grades in texture from fine to coarse. In the southeastern part of the county, in the Shadyside, Deale, and Fairhaven areas, the Aquia formation changes in color and texture from a fine green glauconitic sand at the top to a coarse brown glauconitic sand near the base. The log of well Ge 4 shows this size and color gradation. However, the size and color gradation does not hold throughout the county, as illustrated by the log of the Southern High School well, Fd 13, where 145 feet of the Aquia formation is present, and the entire formation is a fine green glauconitic sand with included clay. The Aquia formation has a good microfossil fauna (*23*).

The top of the Aquia formation is shown by contours on Plate 6 which indicate that the strike is northeast in the southern part of the county and east in the eastern part of the county. The formation dips to the southeast at about 20 feet to the mile. Where the entire thickness of the Aquia formation is present, the range in thickness is 75 to 150 feet. Plate 6 may be used to determine at any point the approximate depth to the top of the Aquia formation, if the surface altitude at the well site is known.

The Aquia is a good water-bearing formation, and in general a yield of at least 20 gallons a minute can be expected from small diameter wells drilled to its sands. Most of the wells tapping the Aquia formation in Anne Arundel County are domestic or farm wells with pumps having capacities of 5 to 10 gallons a minute, but one well (Ge 2) in the southeastern part of the county supplies more than 100 houses and is reported to yield 150 gallons a minute.

Quality of Water: Water from the Aquia formation is usually more satisfactory for domestic use than water from the older Coastal-Plain formations, chiefly because it contains less iron.

Analyses of water from seven wells show that the total dissolved solids ranges from 121 to 285 parts per million and averages 228 parts per million. The total hardness, based on analyses of water from fifteen wells, ranges from 15 to 225 parts per million and averages 120 parts per million. Analyses of water from sixteen wells shows that the iron content ranges from 0.1 to 4.0 parts per million and averages 1.2 parts per million.

Nanjemoy Formation. The Nanjemoy formation is named for exposures in the vicinity of Nanjemoy Creek, a tributary of the Potomac River in Maryland. The unit was named by Clark and Martin (*8*, p. 64) in 1901. The Nanjemoy formation is exposed in an irregular belt across Anne Arundel County westward from Glebe Creek to the Patuxent River south of Davidsonville.

The upper part of the Nanjemoy formation consists largely of green glauconitic sand with some gray clay. The basal part consists of a dense, even-textured clay, pink to gray, which is known as the Marlboro clay member. The Nanjemoy formation ranges in thickness from 75 to 120 feet. The formation strikes northeast in the southern part of the county and swings to a more easterly direction in the eastern part. The formation dips generally southesast at 15 to 20 feet per mile.

Although the Marlboro clay member is a relatively thin unit (20± feet) it is sufficiently persistent that Darton (*13*) was able to map it from the Potomac River in Prince Georges County to the Chesapeake Bay in Anne Arundel County. In Anne Arundel County the clay is exposed at Upper Marlboro, Central Avenue and U. S. Route 301 in Prince Georges County, 2 miles east of Davidsonville along Beards Creek, $1\frac{1}{4}$ miles south of Woodland Beach in a road cut 0.1 mile northwest of Collinsons Corner, in an excavation 1 mile southeast of Collinsons Corner, and at the bluff on the north side of Turkey Point. The exposure of the Marlboro clay member at Turkey Point is light to medium gray, in contrast to most other exposures which are light pink. Hand-augering at Turkey Point revealed a total thickness of 16 feet of clay. Below the clay the auger penetrated 1 foot of greensand, representing the upper most part of the Aquia formation. Because of the color change in this area from the characteristic pink to a dull gray, it is possible that additional exposures may be located in areas where the Marlboro clay member has not previously been recognized. The clay has been identified in samples from wells Fd 13, Fd 16, Ge 3, and Ge 4.

Because of the distinctive color and texture of the Marlboro clay member, its wide areal extent, the relative thinness of the bed, and the sharp contact between it and the greensand of the Aquia formation, the Marlboro clay member makes an excellent marker horizon for the base of the Nanjemoy formation. Plate 6 is based on the contact of the Marlboro clay member and the underlying Aquia formation.

The Marlboro clay member is not a water-bearing formation, but it confines the water in the underlying Aquia.

The upper part of the Nanjemoy is a green glauconitic sand containing varying amounts of clay. At the exposure 0.1 mile north of Collinsons Corner, the Marlboro clay member grades into the upper greensand of the Nanjemoy, gray clay being mixed with the glauconitic sand, but 1 mile southeast of Collinsons Corner the contact is a sharp break as seen in Plate 7.

Because of the varying amounts of clay the upper part of the Nanjemoy is not a persistent water-bearing formation in Anne Arundel County, but Overbeck (*21*) has found that the formation becomes more sandy to the south and is water bearing throughout southern Calvert County.

Because the underlying Aquia formation is a more persistent and permeable aquifer in Anne Arundel County, most of the wells have been drilled through the Nanjemoy formation into the Aquia. However, local sand lenses probably do occur in the Nanjemoy which will supply enough water for domestic use. No chemical analyses are available from wells known to obtain water from sands of the Nanjemoy.

Miocene Series

Calvert Formation. The Calvert formation is named for exposures along Calvert Cliffs in Calvert County. These cliffs extend for about 30 miles along the bay and in some places reach a height of 100 feet. The Calvert formation unconformably overlies the Nanjemoy formation and extends across the southern part of Anne Arundel County into Prince Georges County and southward to the Potomac River.

The Calvert formation is a sandy clay with associated diatomaceous earth. The upper part of the Calvert is usually a brown sandy clay containing shell beds that range from a few inches to 4 feet in thickness. The shell beds are made up primarily of pelecypods but contain well-preserved *Pectens* and species of barnacles. Diatoms occur throughout the formation, but are more abundant in the lower part. The basal unit of the formation, known as the Fairhaven diatomaceous earth member, is a diatomaceous earth containing a few shells or shell fragments. Some sand lenses up to a foot thick are present. In a fresh cut or in drill samples, the Fairhaven member is greenish blue and is often described by well drillers as a marl, but in many outcrops it is bleached to a light ash gray. Nearly all drill samples from the Calvert formation contain shell fragments.

The Calvert formation strikes northeast and dips to the southeast at about 10 feet to the mile. In Anne Arundel County the formation ranges in thickness from about 100 to about 150 feet; it thickens progressively down dip from the outcrop area.

The Calvert formation is not considered an important water-bearing formation in Anne Arundel County (*9*, p. 367), but the well inventory (see table 2) shows that a large number of dug wells derive water for domestic and farm supply from sand lenses in the Calvert formation. Nearly all the wells in the Calvert formation are reported not to have failed during the dry years of the early 1930's.

No samples of water from the Calvert formation in Anne Arundel County have been analyzed, but the water is reported by users to be of satisfactory chemical quality.

Choptank Formation. The Choptank formation, composed essentially of sandy clay, is named for exposures along the Choptank River in Talbot County, Maryland. It lies unconformably on the Calvert formation and in places is overlain by sediments of Pleistocene age.

Little (*17*, p. 94) mapped only a small outlier of the Choptank formation in Anne Arundel County. This outlier, less than a square mile in areal extent, is at Marriott Hill in the central part of the county and about 6 miles from the southern border. Future paleontologic study, particularly of microfossils, may show that the Choptank formation has a larger areal extent in Anne Arundel County than mapped by Little. Owing to its small areal extent this formation is of no importance as a water bearer in the county. No wells inventoried for this report derive water from the Choptank formation.

QUATERNARY SYSTEM

Pleistocene Series

Terrace Deposits. In Maryland the Pleistocene terrace deposits have been mapped as four formations, the Brandywine, Sunderland, Wicomico, and

PLATE 7. Contact between the Marlboro Clay Member (below) and Glauconitic Sand (above) of the Nanjemoy Formation, 1 Mile Southeast of Collinsons Corner on Maryland Highway 253

Talbot. The formations, composed of sand, gravel, silt, and clay, form terraces which are distinguished by their differences in altitude. These terrace deposits cannot be separated by lithology or faunal content. For detailed reports on the geology of the Pleistocene of the Coastal Plain see Shattuck (*22*), Cooke (*10, 11*) Campbell (*3*), Dryden (*14*, p. 67–72) and Flint (*16*).

The Pleistocene deposits range from a few feet of gravel and sand that cap some of the highest hills in the county to more than 100 feet of sediments in the valley fill of the Patapsco River. The Pleistocene deposits in Anne Arundel County are of minor importance as aquifers, as only a few shallow dug wells produce water from these deposits.

Quality of Water: Chemical analyses have been made on water from a number of shallow wells in the county, but only one of these, Cc 15, appears to obtain water only from material of Pleistocene age. The results of the latter analysis show that the total hardness is 15 parts per million and the iron content 0.4 part per million. The total dissolved solid content probably is low as the chloride is 4.0 parts per million and the sulfate is 1.0 part per million. It is not known if this analysis is representative of water from the Pleistocene, but, in general, it is reported that wells ending in the Pleistocene yield water of satisfactory chemical quality for domestic use.

WATER-LEVEL FLUCTUATIONS

During this investigation 20 observation wells were established in which the depth to water was measured periodically by means of a chalked steel tape, or continuously by means of an automatic water-stage recorder. Wells were selected that would provide water-level data on artesian aquifers and on shallow nonartesian aquifers. Some water-level measurements were made in wells in areas of heavy ground-water pumpage, chiefly to determine the effect of pumping on the artesian head. The periods of measurement for different wells range from 4 to 46 months between January 1946 and June 1949.

The observation wells and their approximate locations are:

Well number	Location
Ad 10	3 mi. north of Marley
Ad 24	In Linthicum
Ad 27	1½ mi. northeast of Glen Burnie
Ad 29	North part of Glen Burnie
Ad 30	North part of Glen Burnie
Ae 4	Northeast of Arundel Cove
Bb 17	¼ mi. north of Benfield
Bb 18	2¼ mi. north of Gambrills
Be 13	At Riviera Beach
Be 54	At Riviera Beach
Cc 2	At Gambrills
Cd 8	½ mi. southwest of Crownsville
Cd 10	½ mi. southwest of Crownsville
Cd 21	¾ mi. south of Severn Crossroads

Well number	Location
Ce 24	½ mi. north of Crownsville
Ce 49	1 mi. northwest of West Annapolis
Df 14	½ mi. north of Carrs Point on the Severn River
Df 17	U. S. Navy Radio Station
Ee 14	½ mi. southwest of Selby Beach
Ef 3	½ mi. south of Arundel on the Bay

The fluctuations of water levels in wells reflect the changes in hydrostatic head in artesian aquifers, or the changes in the height of the water table in non-artesian aquifers. In areas of little or no pumpage the fluctuation of the water table generally follows a seasonal pattern, being high in the spring when recharge is relatively high, and low in late summer and fall. In Anne Arundel County the water levels in artesian wells, situated a long distance from the outcrop, are not affected materially by seasonal differences in the rate of recharge. Where unaffected by pumpage, the amplitude of the fluctuations is generally much less in these wells. In areas of heavy pumpage, the artesian head or water table fluctuates in accordance with the rate of withdrawal.

Although there is little pumpage from the Patuxent formation in Anne Arundel County, the heavy withdrawal from this formation in the nearby Baltimore area has an effect on the artesian head in the Patuxent formation in the northern part of the county. For example, the water-level record of well Ad 29 (at Glen Burnie), which ends in the Patuxent formation, shows a net decline of about 2.5 feet between October 1948 and July 1949. This decline probably was caused by a relatively small increase in pumpage in the Baltimore area. However, the water level in well Bb 18 (near Fort Meade Junction), a Patuxent well near the outcrop of the formation where recharge occurs, showed a net rise of about 2 feet between April 1946 and July 1949. In general, there probably was no appreciable change in artesian head of the Patuxent formation in Anne Arundel County between 1946 and 1949, the period of record.

Water-level records of 12 observation wells ending in the Patapsco formation show that in some areas the artesian head declined about 1 to 2 feet but rose about 1 to 4 feet in other areas. Although some of these observation wells are near centers of heavy pumpage, there does not seem to be a persistent decline in head. (See Figure 9.)

Water-level measurements in wells Ee 14 and Ef 3, which end in the Aquia formation, show no appreciable net change during the period of record. (See Figure 10.)

In summation, the water-level measurements in most of the observation wells in Anne Arundel County show no appreciable change during the period of record, 1946 to 1949. Thus there is no reason to believe that the aquifers are being seriously depleted by the present rate of pumpage.

As a part of the observation-well program periodic water-level measurements will be continued in 8 wells in the county. These are wells Ad 10, Ad 29, Ad 30, Bb 18, Be 59, Cd 10, Df 14, and Ef 3.

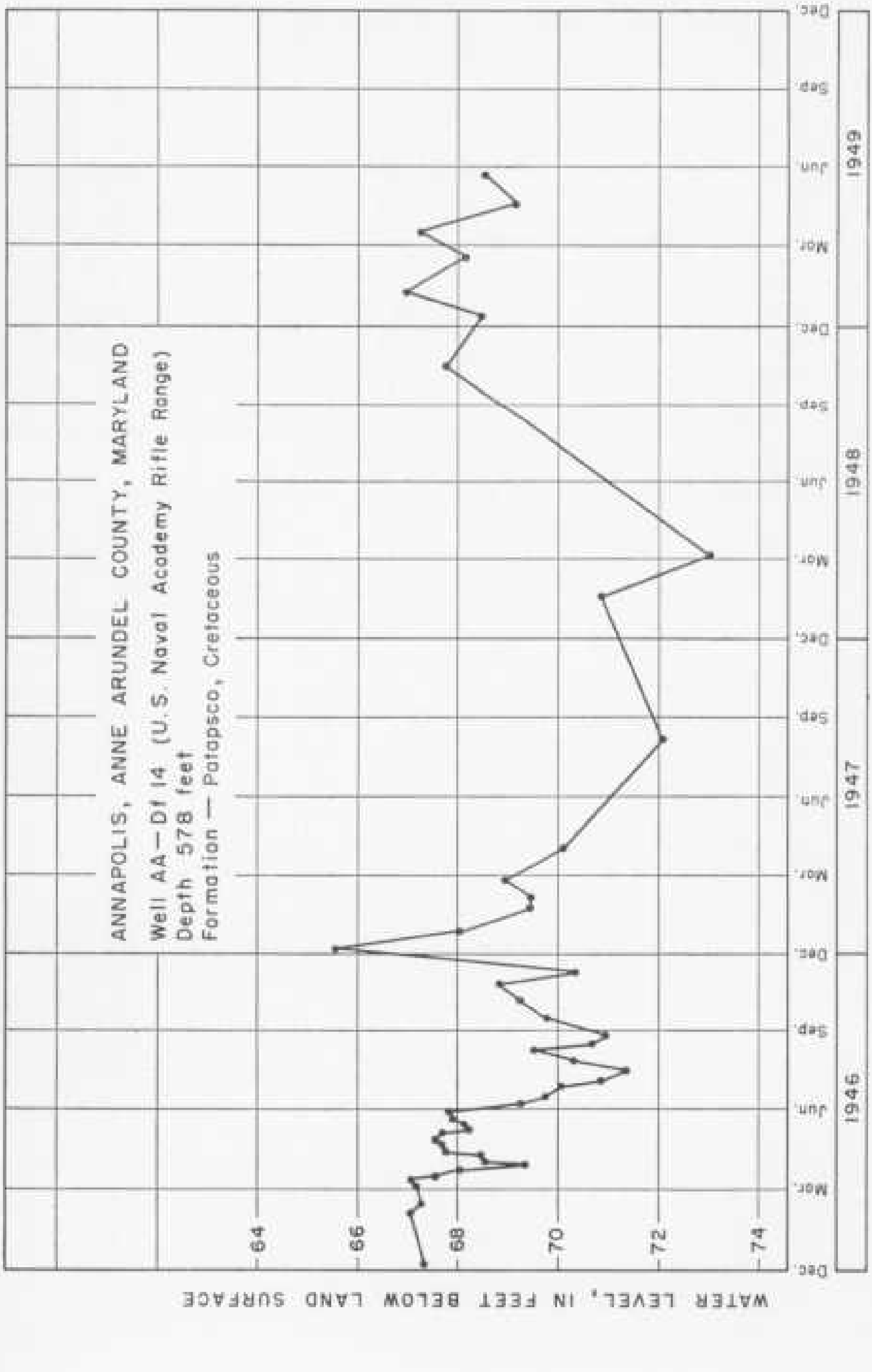

FIGURE 9. Graph Showing Water-level Fluctuation in Patapsco Formation

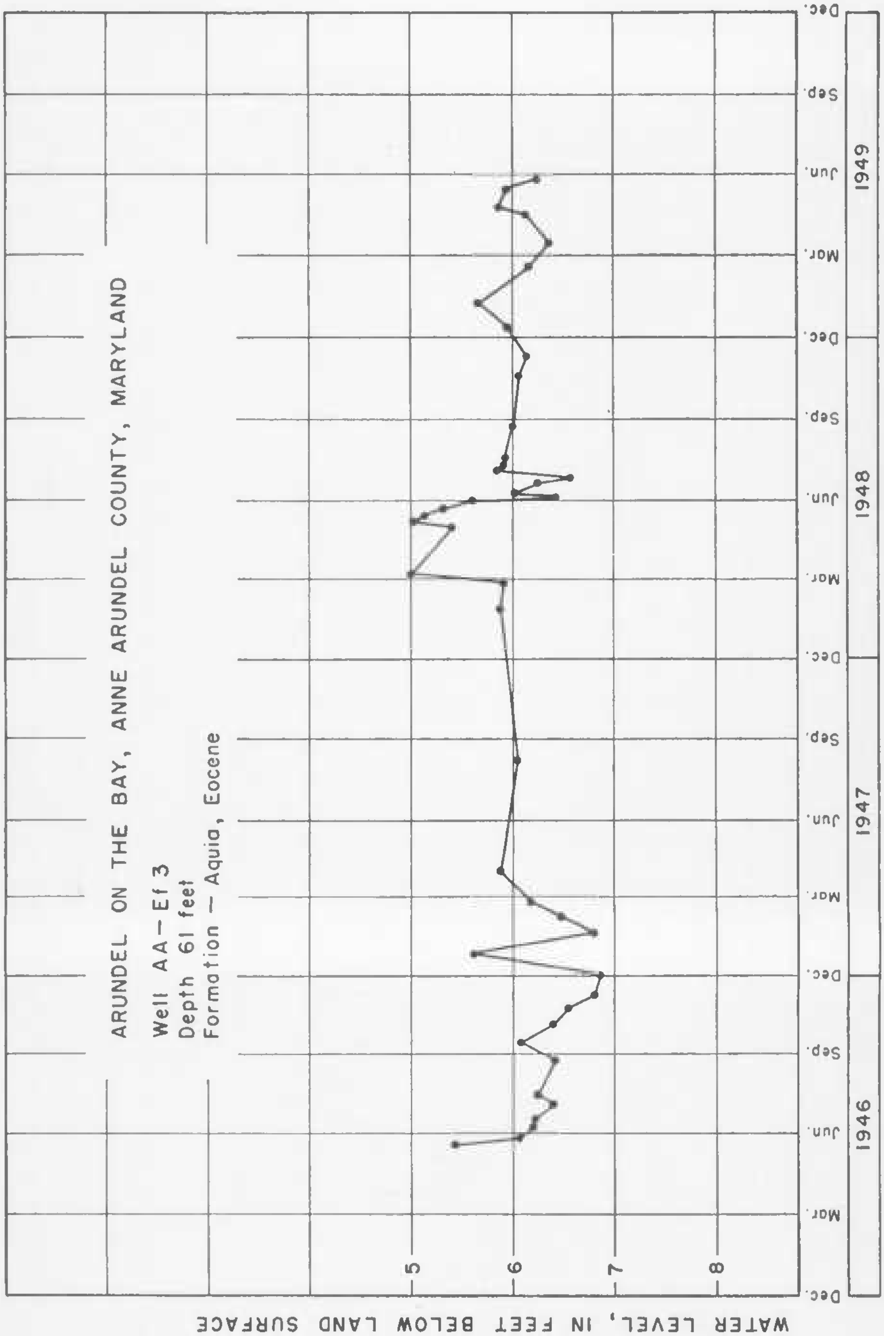

FIGURE 10. Graph Showing Water-level Fluctuation in Aquia Formation

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TABLE

Records of Wells in Anne

Pumping equipment: A, air lift; B, bucket; C, cylinder; E, electric motor; G, gasoline or oil engine; H, hand; I, impeller, either
Use of water: C, commercial; D, domestic; F, farming; N, not used; P, public supply; S, school.
Static Water Level: reported depths are designated by a.

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Ac 1	John Mathai	—	About 1845	130	Dug	90	—	Patuxent
Ac 2	Board of Education	—	—	90	do	16.3	—	Pleistocene
Ac 3	Old Oak Dairy	Bunker (?)	About 1933	190	Drilled	290	6	Patuxent
Ac 4	Do	Washington Pump & Well Co.	1945	190	do	165	6	Patapsco
Ac 5	James Pitzinger	—	1941	70	Dug	61	48	Pleistocene or Patapsco
Ac 6	Eddie Sacks	—	1916	140	Drilled	196	4	Patuxent
Ac 7	Slater	Slater	About 1916	160	do	110	—	Patapsco
Ac 8	C. E. Duckworth	Randallstown Pump & Well Co.	1945	180	do	128	6–5½–4½	Patuxent
Ac 9	John Wosk	—	—	170	do	88	5	Patapsco
Ac 10	C. E. Giles	Rogers	1947	120	do	153.5	6	Patuxent
Ad 1	County Sanitary Commission	Layne-Atlantic	1926	45	Drilled	65	18	Patapsco
Ad 2	Do	do	1941	40	do	95	18–8	do
Ad 3	Do	—	1927	50	do	62.5	18	do
Ad 4	Chas. S. Walton Co.	Hoshall	1919	45	do	94–126	6	do
Ad 5	Do	do	1919	45	do	127	6	do
Ad 6	Do	do	1919	45	do	157	6	do
Ad 7	Do	do	1923	45	do	312	6	do
Ad 8	U. S. Army Ordnance Depot	—	1918	49.1	do	390.5	8–6	Patuxent
Ad 9	Do	—	1918	46.1	do	149.5	8–6	Patapsco
Ad 10	Do	—	1918	44.9	do	108.5	8–6	do
Ad 11	Do	—	1918	39.9	do	300(?)	10–8	Patuxent
Ad 12	Royland M. Phelps	—	1879	60	Dug	32	48	Pleistocene or Patapsco
Ad 13	D. L. Topping	—	—	65	Drilled	80	6	Patapsco
Ad 14	Baltimore City	Underground Exploration Co.	—	0	do	35.5	—	do
Ad 15	Do	do	—	0	do	41	—	do
Ad 16	U. S. Army Ordnance Depot	—	—	35.3	do	83	8	do
Ad 17	E. Linthicum Hts.	—	1909	160	do	80–90	6	do
Ad 18	Do	—	1909	160	do	108	6	do
Ad 19	W. Linthicum Hts.	—	—	—	do	—	—	—
Ad 20	Kavanaugh Products, Inc.	Washington Pump & Well Co.	1944	40	do	392	8	Patuxent
Ad 21	Board of Education	—	—	35	Drilled	160	6	Patuxent
Ad 22	—	—	—	180	—	—	—	—
Ad 23	County Sanitary Commission	Layne-Atlantic	1945	45	do	78	18 or 20	Patapsco

2

Arundel County, Maryland

turbine or centrifugal; N, none; W, windmill.

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F.	Remarks
Below land surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
72[a]	10 -44	C, E	15	—	—	D	—	
7	12 -45	—	—	—	—	S	—	
145–160[a]	1946	I, E	12	—	—	C	55	
70[a]	—	I, E	55	50	—	C	52.5	See well log.
57	1 -9 -46	I, E	—	—	—	D	—	
25–30[a]	—	N	—	—	—	D, F	—	Well dug to 110 feet about 1896; deepened to 196 feet about 1916.
45[a]	1- 9-46	C, H	—	—	—	F	—	
39.4	1-14-46	I, E	—	—	—	F	—	Well drilled to 115 feet in 1939; deepened to 128 feet in 1945. See chemical analysis
—	—	C, E	—	—	—	D	—	
105	11- 3-48	C, E	—	10	11 -48	D	—	See well log.
—	—	I, E	—	220–225	1943	P	55	Flowing well. Flowed 75 G.P.M. on 6-43. See well log and chemical analysis.
22[a]	—	I, E	320	280	—	P	55	See well log and chemical analysis.
—	—	I, E	—	175	1943	P	54.5	Flowing well. See chemical analysis
—	—	A	—	28	1942	C	—	See chemical analysis.
—	—	A	—	32	1942	C	—	Do.
—	—	A	—	46	1942	C	—	Do.
—	—	A	—	48	1942	C	—	Do.
50[a]	11 -18	N	—	100	1918	N	—	See well log.
48[a]	11 -18	N	—	75	1918	N	—	Do.
34.19	1–10–46							
36.56	8–21–44	N	—	50	1918	N	—	Do.
24.70	1–10–46							
26.85	8–21–44	N	—	—	—	N	—	Do.
26[a]	—	C, E	—	—	—	D	—	
—	—	—	—	—	—	N	—	
—	—	—	—	—	—	N	—	Test well. See well log.
								Do
—	—	—	—	—	—	N	—	
41[a]	11 -18	—	—	30	1918	N	—	Well drilled to 182 feet. Plugged back to 83 feet. See well log.
—	—	W	—	45	—	N	—	See chemical analysis.
50[a]	—	G	—	12	—	N	—	
—	—	—	—	—	—	N	—	
76.13	8 -44	I, E	300	—	—	C	—	See well log and chemical analysis.
—	—	C, E	—	—	—	S	—	
—	—	—	—	—	—	N	—	Formerly supplied several houses in Shipley Hgts. and Linthicum Hgts.; well now abandoned and covered.
—	—	I, E	—	150	1945	P	—	

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Ad 24	Seth H. Linthicum	—	About 1920	170	drilled	225	6	Patuxent
Ad 25	Lillian Williams	Cunningham	—	140	do	130	4	Patapsco
Ad 26	Thomas Martin	McCarthy	1945	2	Driven	63	2	do
Ad 27	S. S. Tracey	Craig	About 1916	30	Bored	73	4	do
Ad 28	Mrs. Wm. G. Lehr		Before 1920	165	Drilled	170(?)	6	do
Ad 29	County Sanitary Commission	Layne-Atlantic	1945	40	do	530	3–2	Patuxent
Ad 30	Do	U.S.G.S.	1948	40	do	13.2	4	Patapsco
Ad 31	Layne-Atlantic Co.	Layne-Atlantic	1946	60	do	155	6	do
Ad 32	Lillian Miller	G. E. Crouse	1947	40	Driven	80	4	do
Ad 33	Adrian Hall	do	1947	140	do	147	4	do
Ad 34	John A. Evans	do	1948	105	do	30	4	do
Ad 35	F. Ludwig	—	About 1857	45	Dug	41	48	do
Ad 36	Frank Haberkorn	—	—	20	do	—	36	Pleistocene
Ad 37	L. Strauss	—	About 1928	45	Drilled	52	4	Patapsco
Ad 38	Paul Haberkorn	—	About 1929	50	Dug	13	36	Pleistocene (?)
Ae 1	Armour Fertilizer Co.	—	1918	10	Drilled	350	8	Patapsco
Ae 2	Cooperative Fertilizer Co.	Cooperative Fertilizer Co.	1936	10	Dug	23	48	Pleistocene or Patapsco
Ae 3	Do	do	1936	10	do	65	48–6	do
Ae 4	U. S. Coast Guard	—	1934	22	Drilled	195	12–10–8	Patapsco
Ae 5	Do	—	—	15	do	189	6	do
Ae 6	Do	Downin	1901	20	do	216	6	do
Ae 7	Do	—	—	20	do	100	—	do
Ae 8	Solley's Grocery	—	About 1893	50	Dug	43	—	do
Ae 9	Do	—	About 1883	50	do	45	48	Pleistocene or Patapsco
Ae 10	U. S. Army Ordnance Depot	—	1917	16	Drilled	75.5	10	Patapsco
Ae 11	Do	—	1918	16.8	do	75	8–6	do
Ae 12	Baltimore City	Underground Exploration Co.	—	0	do	38.5	—	do
Ae 13	Do	do	—	0	do	39	—	do
Ae 14	Do	do	—	0	do	52	—	do
Ae 15	Do	do	—	0	do	51.5	—	do
Ae 16	Do	do	—	0	do(?)	40	—	do
Ae 17	U. S. Coast Guard	—	—	22	Drilled	192	—	do
Ae 18	Do	—	—	20	do	190	—	do
Ae 19	Do	—	—	20	do	195	—	do
Ae 20	Do	—	—	20	do	400(?)	—	do
Ae 21	C. L. Larkin	—	1940	25	Dug	31.4	36	Pleistocene or Patapsco
Ae 22	Zamostmy's Amoco Station	Deitz	About 1937	50	Drilled	150	6	Patapsco
Ae 23	Henry Schriver	—	—	25	do	250(?)	6	do
Ae 24	Ciordano Bros.	—	About 1936	0(?)	do	84	4–1½	do
Ae 25	Mrs. Lillian Smith	—	—	20	do	150	3½	do
Ae 26	John L. Feddon	Eiler	1946	10	do	55	3	do
Ae 27	Geo. J. Reinhardt	do	1946	10	do	54	3	do
Ae 28	Harry M. Clark	do	1946	10	do	238	3–2	do

Continued

Static water level: Below land surface (feet)	Static water level: Date of measurement	Pumping equipment	Capacity of pump (gal. a min.)	Yield: Rate (gal. a min.)	Yield: Date of measurement	Use of water	Temperature °F.	Remarks
98	1-7-46	—	—	—	—	N	—	Measured depth of well 175 feet.
96[a]	—	C, E	—	—	—	D	—	
—	—	N	—	—	—	D	—	Flowing well.
20.53	1-15-46	C, H	—	—	—	D, F	—	
—	—	C, E	—	—	—	N	—	
—	6-4-48	N	—	12	6-3-48	N	59	Static water level 10.93 feet above land surface. See well log and chemical analysis.
8.78	6-17-48	N	—	—	—	N	—	
42[a]	—	—	50	—	—	C	—	
33[a]	7-28-47	I, E	—	—	—	D	—	See well log.
123[a]	10-31-47	C	5	8	10-31-47	D	—	Do.
20[a]	3-20-48	H	3	5	3-20-48	D	—	Do.
—	—	N	—	—	—	N	—	
14.42	11-5-48	C, H	—	—	—	D	—	
9.46	11-5-48	C, E	—	—	—	D	—	
7.62	11-5-48	C, H	—	—	—	D	—	
41.96	8-24-43	A	—	—	—	C	56.5	See chemical analysis.
14.46	8-24-43	C, E	9	9	8-24-43	C	—	Do.
6.8	8-24-43	C, E	—	—	—	C	—	Do.
24[a]	1941	C, E	—	—	—	N	—	See well log and chemical analysis.
—	—	—	150	150	—	N	—	See well log.
10[a]	—	—	—	20+	—	N	—	
—	—	—	—	—	—	N	—	
—	—	H	—	—	—	D	—	
—	—	H	—	—	—	D	—	
13[a]	1918	—	—	35	1918	N	—	
15.5[a]	1918	—	—	20	11-22-18	N	—	Do.
—	—	—	—	—	—	N	—	Test boring. See well log.
—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	N	—	Do.
24[a]	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	See well log.
—	—	—	—	—	—	—	—	Do.
—	—	—	—	—	—	—	—	Do.
26.5	1-14-46	I, E	—	—	—	D	—	
60[a]	—	C, E	—	—	—	D	—	See chemical analysis.
30[a]	—	C, H	—	—	—	D	—	
—	—	—	—	3	1-15-46	D	—	Flowing at high tide.
25.80	1-15-46	I, E	—	—	—	D	—	
13[a]	3 -46	I, E	15	10	1946	D	—	
11[a]	5-23-46	C, H	5	10	5-23-46	D	—	See well log.
19[a]	6-7-46	C, H	6	6	6-7-46	D	—	Do.

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Bb 1	District Training School	Hagmann	1927	150	Drilled	135	—	Patuxent
Bb 2	Do	Sydnor Pump & Well Co.	1928	150	do	222	8–6	do
Bb 3	Do	Virginia Machinery & Well Co.	1930	150	do	240	10	do
Bb 4	Do	Layne-Atlantic	1932	110	do	195	30–24	do
Bb 5	Do	Washington Pump & Well Co.	1944	115	do	199	12	do
Bb 6	James Lewald	Mitchell	1930	220	do	186	6	do
Bb 7	Maryland House of Correction	Downing	1907	225	do	675	6	Pre-Cambrian
Bb 8	Do	do	1907	225	do	675	6	do
Bb 9	Fort Meade	—	1917	160	do	96	—	—
Bb 10	Do	—	1917	183.08	do	186	—	Patuxent
Bb 11	Do	—	1917	296	do	352	—	do
Bb 12	Do	Sydnor Pump & Well Co.	1917	200.82	do	188	10–8–6	do
Bb 13	Do	do	1917	158.33	do	166	10–8	do
Bb 14	Paul Barber	Hagmann	1943	225	do	174	6	do
Bb 15	Do	do	—	240	do	182	6–4	do
Bb 16	Do	Washington Pump & Well Co.	About 1905	160	do	80	8	do
Bb 17	Board of Education	do	1932–33	170	do	46.25	6	do
Bb 18	Wm. J. Harris	—	—	170	Dug and drilled	108	6	do
Bb 19	Do	Washington Pump & Well Co.	1946	170	Drilled	72	6	do
Bb 20	District Training School	Shannahan	—	210	do	208	5	do
Bb 21	Edward Hall	Smith	1946	180	do	160	6	do
Bb22	Maryland State Fair	Layne-Atlantic	1947	150	do	60.5	12–6	do
Bc 1	Nat. Plastic Products Co.	Shannahan	1944	120	do	174.5	10–8	Patapsco
Bc 2	Do	do	1908	120	do	165	4	do
Bc 3	Board of Education	Washington Pump & Well Co.	1932–33	150	do	105	6	do
Bc 4	Fort Meade	Sydnor Pump & Well Co.	1917	114.12	do	43	—	do
Bc 5	Do	do	1917	124.16	do	253	—	Patuxent
Bc 6	Do	—	1917	149.98	do	138	—	Patapsco
Bc 7	Do	—	1917	183.21	do	292	—	Patuxent
Bc 8	Do	Sydnor Pump & Well Co.	1917	138.92	do	593	10–8–6	Pre-Cambrian
Bc 9	Do	—	1917	147.83	do	245	—	Patuxent
Bc 10	Do	—	1917	164.25	do	243	—	do
Bc 11	Meadaway Restaurant	Washington Pump & Well Co.	1942	170	do	127	6	Patapsco
Bc 12	Louis Barattini	Leatherbury	1942	170	do	125	3	do
Bc 13	I. E. Stevenson	—	1943	190	Dug	87	48	do
Bc 14	G. H. Clark	—	1932	150	Driven	132	4(?)	do
Bc 15	H. E. Wagner	Washington Pump & Well Co.	1930	170	Drilled	118	6	do

Continued

Static water level: Below land surface (feet)	Static water level: Date of measurement	Pumping equipment	Capacity of pump (gal. a min.)	Yield: Rate (gal. a min.)	Yield: Date of measurement	Use of water	Temperature °F.	Remarks
—	—	—	—	—	—	N	—	Pumping level 58 ft. below land surface.
—	—	I, E	—	7	1944	S	—	
24[a]	1943	C, E	50	43	9 –44	S	—	
20[a]	1932	I, E	100	110	—	S	—	
13.07	9-29-44	I, E	—	53–69	1944	S	—	See well log.
36[a]	—	C, E	—	10	—	D	—	
60[a]	—	N	—	50	—	N	—	
60[a]	—	N	—	50	—	N	—	Rock at 180 feet. See chemical analysis.
—	—	—	—	—	—	N	—	
—	—	—	—	0	—	N	—	Not in water-bearing strata.
—	—	—	—	—	—	N	—	Do.
85[a]	—	N	—	115	—	N	—	
50[a]	—	G	50	100	—	N	—	
98.20	2- 8-46	C, E	—	3–10	—	D	—	
—	—	C, E	—	2½	—	D	—	
24.10	12-17-45	I, E	—	40	—	D	—	
44.07	12-17-45	—	—	15+	—	N	—	
—	—	N	—	—	—	N	—	
20.70	2-19-46	N	—	8	2-16-46	D	—	See well log.
80.07	2- 8-46	N	—	—	—	S	—	Measured depth of well 123.12 feet. See well log.
51[a]	4-10-46	—	—	19	4-10-46	D	—	See well log.
1[a]	5- 9-47	I, E	60	60	5- 9-47	C	—	Do.
41[a]	—	I, E	250	280	—	C	—	See well log and chemical analysis.
—	—	I, E	80	80	1944	C	—	
—	—	C, E	15	15	—	—	—	
18[a]	—	N	—	20	1917	N	—	
60[a]	1917	N	115	115	1917	N	—	
38[a]	1917	N	—	50	1917	N	—	
80[a]	1917	N	—	65	1917	N	—	
70[a]	1917	N	—	100	1917	N	—	
—	—	—	—	—	—	N	—	
80[a]	1917	N	—	100	1917	N	—	
—	—	C, E	—	15	1942	C	—	See well log.
—	—	C, E	—	3	—	C, F	—	
84.5[a]	—	C, E	—	—	—	D, F	—	
77[a]	1932	C, E	—	5	1932	D, F	—	
70[a]	—	C, E	—	5	—	D, F	—	

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Bc 16	W. Bussey	Cunningham	About 1933	200	Dug and drilled	152	4	Patapsco
Bc 17	George Weber	—	—	150	Dug	49.8	48	do
Bc 18	Harold Fisher	Crouse	1945	125	Drilled	86	4	do
Bc 19	W. Rose	Crouse	1944	130	Drilled	150	4	do
Bc 20	Nat. Plastic Products Co.	Shannahan	1945	125	do	180	10–8	do
Bc 21	Louis Barattini	Bunker	1946	170	do	96	6	do
Bc 22	Odenton Volunteer Fire Co.	—	1946	165	Dug	25	36	Raritan and Patapsco
Bc 23	Lester L. Disney	Washington Pump & Well Co.	1942	165	Drilled	175	4	Patapsco
Bc 24	Murray F. O'Malley	Cunningham	—	150	do	315	6–4½	Patuxent (?)
Bc 25	Mrs. J. Irving Waters	Stone & Crouse	—	150	do	103	4	Patapsco
Bc 26	James Shaw	—	1883	230	Dug	100	36	Raritan and Patapsco
Bc 27	John Habel	—	—	105	do	32	48	do
Bc 28	Steve Kowatski	Smith	1946	200	Drilled	210.5	6	Patuxent
Bc 29	John O'Lexey's Restaurant	Bunker	1942	280	do	140.1	4	Patapsco (?)
Bc 30	J. H. Otto	Crouse	1946	180	do	176	4	do
Bc 31	A. D. Riden and Co.	Washington Pump & Well Co.	1947	145	do	91	6	Raritan and Patapsco
Bd 1	Anne Arundel Sand Corp.	Layne-Atlantic	1927	140	Drilled	65	48	Patapsco
Bd 2	Maryland Training School	Shannahan	1932	90	do	91	10	do
Bd 3	John Palberg	Novak	1941	60	do	147.4	4	do
Bd 4	J. W. Meyer	—	About 1934	10	do	110	—	do
Bd 5	Howard Della	Novak	1945	40	do	136	4	do
Bd 6	Rae	Bunker	1945	2	do	84	2	do
Bd 7	George B. Furman	—	—	20	do	80	—	do
Bd 8	Robert Kamsch	Novak	1945	10	—	81	—	do
Bd 9	John A. Scherer	—	—	70	Drilled	29	4	Patapsco
Bd 10	Herbert Wolf	—	—	130	Dug	36	36	Raritan and Patapsco
Bd 11	J. C. Stevenson	—	1927	100	do	25	48	do
Bd 12	Geroge B. Furman	—	About 1918	80	Drilled	100(?)	4	do
Bd 13	H. Pumphrey	Crouse	1942	100	do	125(?)	4	Patapsco
Bd 14	Adam Neidert	—	1915	130	Bored	100	6	Raritan and Patapsco
Bd 15	Do	—	1926	130	Dug	25	36	Raritan
Bd 16	Wm. P. Manning	—	—	70	do	80	48	Raritan and Patapsco
Bd 17	Albert Franklin	Stone & Crouse	—	160	Drilled	145	6	Patapsco
Bd 18	George Crouse	Crouse	1941	100	do	106	4	do
Bd 19	Gilbert Pumphrey	Pumphrey	—	110	Driven	52(?)	6	Raritan and Patapsco
Bd 20	Mrs. E. W. Anderson	Crouse	1946	70	do	75	4	Patapsco
Bd 21	Old Glen Theatre	Bunker	1939	45	Drilled	108	6–4	do
Bd 22	New Glen Theatre	do	1941	45	do	110	6	do
Bd 23	County Sanitary Commission	Layne-Atlantic	1948	30	do	617	2	Patuxent
Bd 24	Agnes W. Payne	Campbell	1947	85	do	120	4	Patapsco
Bd 25	William Fisher	Crouse	1947	85	Driven	76(?)	4	do
Bd 26	M. F. Dicus	do	1946	115	do	73	4	do
Bd 27	Wm. G. Churchill	do	1946	120	do	105	4	do
Bd 28	Bernard G. Kiersey	Campbell	1946	140	Drilled	68	4	Raritan and Patapsco

Continued

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F.	Remarks
Below land surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
—	—	I, E	—	—	—	F	—	
33	3-27-46	C, E	—	—	—	D	—	
75[a]	—	I, E	—	—	—	D	—	
—	—	I, E	—	—	—	D	—	
38.10	3-27-46	I, E	300	307	—	C	—	
30[a]	2 — -46	C, E	8	35	—	C, F	—	See well log.
17[a]	—	I, E	—	—	—	D	—	
84	4-23-46	C, E	—	10	—	D	—	
—	—	N	—	50	—	N	—	
—	—	N	—	—	—	N	—	
53	4-23-46	N	—	—	—	D	—	Measured depth of well 56 feet.
24[a]	—	H	—	—	—	D	—	
106.31	7-24-46	—	—	—	—	D, F	—	See well log.
120[a]	—	C, E	5	—	—	C, D, F	—	
113[a]	12- 4-46	C, E	—	—	—	D	—	Do.
30[a]	11-25-47	C, E	25	15	—	D	—	Do.
—	—	—	—	178	1927	N	—	See well log.
5[a]	1932	—	—	96	1932	N	—	Do.
48[a]	—	I, E	—	6	—	D	—	
—	—	I, E	—	—	—	D	—	Flowing well.
24.8	1-17-46	—	—	10	—	—	—	See well log.
—	—	I, E	—	6	3- 6-46	D	56.5	Flowing well. See chemical analysis.
—	—	N	—	20	—	D	—	Do. Do.
—	—	C, E	—	10	—	D	—	See well log.
9.40	3-27-46	C, E	—	—	—	D	—	
30[a]	—	H	—	—	—	D	—	
17[a]	—	I, E	—	—	—	D	—	
—	—	I, E	—	—	—	N	—	
—	—	N	—	—	—	N	—	
—	—	N	—	—	—	N	—	
—	—	C, E	—	—	—	D	—	
—	—	I, E	—	—	—	D, F	—	
—	—	C, E	—	—	—	D	—	
43.03	5- 1-46	C, E	—	—	—	D	—	
—	—	I, E	—	—	—	D	—	
29[a]	6-21-46	I, E	5	—	—	D	—	See well log.
—	—	I, E	—	—	—	C	—	
8[a]	—	I, E	—	100	—	C	—	
—	1948	N	—	—	—	P	—	Flowing well. See well log and chemical analysis.
33[a]	8- 1-47	I, E	5	5	8- 1-47	D	—	See well log.
55[a]	4-24-47	I, E	5	5	4-24-47	D	—	Do.
47.25	7-12-48	H	—	3	1948	D	—	Do.
33[a]	8- 7-48	N	—	—	—	D	—	Do.
51[a]	12-27-46	C, H	4	4	12-27-46	D	—	Do.

TABLE—2

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Be 1	Walter F. Gardner	Bunker	1941	30	Drilled	70(?)	2	Patapsco
Be 2	Hillman's Store	—	Before 1900	110	Dug	22	48	Raritan
Be 3	Board of Education	Washington Pump & Well Co.	1932	115	Drilled	385	4	Patapsco
Be 4	N. H. Mathews	Novak	1944	50	do	125	4½	do
Be 5	Do	do	1944	50	do	120	4	do
Be 6	Board of Education	do	1944	40	do	134	6	do
Be 7	Williams	Eiler	1945	20	do	99	2	Raritan and Patapsco
Be 8	Earl R. Cristy	do	1945	20	do	157	3	Patapsco
Be 9	John Power Greene	do	1945	20	do	146	3	do
Be 10	Culotta	do	1945	20	do	Over 90	2	do
Be 11	Andrew and Roselle Katoski	do	1945	50	do	96	4–3	do
Be 12	Conway	Novak	1941	40	do	106.5	4	do
Be 13	R. LeMoine	do	1940	20	do	231.6	4	do
Be 14	Znramirowsky	do	1938	20	do	122	4	do
Be 15	Joseph Kue	do	1938	20	do	121.5	4	do
Be 16	Ben Miksinski	do	1938	20	do	109	4	do
Be 17	Alger	do	1940	70	do	145	4	Raritan and Patapsco
Be 18	Frank Klimer	do	1945	15	do	77	4	Patapsco
Be 19	Mrs. Dolow	Eiler	1944	10	do	42	2 or 3	Raritan and Patapsco
Be 20	O. C. Robinson	Bunker	1946	30	do	118	3–2	Patapsco
Be 21	G. Bryce	Bryce	1943	0	do	150	3	do
Be 22	Bill Clements	Novak	1942	30	do	122	4	do
Be 23	C. & P. Telephone Co.	do	1945	60	do	45	4–1	Raritan
Be 24	Reamers Store	—	—	40	—	51	—	Raritan and Patapsco
Be 25	Thomas R Burger	Bunker	1942	20	Drilled	113	2	do
Be 26	Realty Corp.	—	1926	−9	do	480	4	Patapsco
Be 27	Do	—	1926	−9	do	510	4	do
Be 28	Klingelhoefer	—	—	80	Dug	60	48	Raritan
Be 29	Wolfe's Tavern	—	—	100	Drilled	52.73	4	Patapsco
Be 30	B.B.L. Research Farm	Novak	1938	50	do	82	4	Raritan and Patapsco
Be 31	E. Jubb	—	—	65	Dug	34	—	do
Be 32	Webster Griebel	Garvan	1925	3	Drilled	160–210	3	do
Be 33	George H. Mank	do	1928	2	do	180	4	do
Be 34	Joseph Booker	—	—	0	do	350	4	Raritan and Patapsco
Be 35	Charles Boyer	Eiler	1946	23	do	100	4–2½	Patapsco
Be 36	Board of Education	Leatherbury	1932–33	80	do	120	6	Patapsco
Be 37	Wolle	Bunker	1942–43	5	do	50	4	Raritan and Patapsco
Be 38	Van Metre	—	1934	15	do	35	4	Raritan
Be 39	Earl M. Banks	—	1944	60	Dug	35	48	do
Be 40	Harold E. West	Crouse & Stone	About 1930	30	Drilled	140	4	Raritan and Patapsco
Be 41	Do	Bunker	1942	30	do	61.6	4	Raritan
Be 42	W. R. Young	Young	—	5	do	110(?)	—	Raritan and Patapsco
Be 43	Mrs. J. I. Garcelon	Dill	1925	40	do	29	6	Raritan
Be 44	Rosella Katoski	Eiler	1946	45	do	98	4–3–2	Patapsco
Be 45	Harold Bunker	Bunker	1945	80	do	67	—	Raritan and Patapsco
Be 46	Mrs. Appleton	—	1939	65	Dug	24.2	48	Raritan
Be 47	Harry J. Klasmeier	Eiler	1946	20	Drilled	147	3–2	Patapsco
Be 48	John Reiser, Jr.	do	1946	23	do	254	3–2	do

Continued

Static water level: Below land surface (feet)	Static water level: Date of measurement	Pumping equipment	Capacity of pump (gal. a min.)	Yield: Rate (gal. a min.)	Yield: Date of measurement	Use of water	Temperature °F.	Remarks
34[a]	—	C, E	—	8	1941	D	—	
—	—	C, E	—	—	—	D	—	
—	—	C, E	—	15	—	S	—	See chemical analysis.
28.06	9-25-44	—	—	15	1944	D	—	See well log.
28(?)[a]	9 -44	I, E	6-8	10	9 -44	D	—	
39.08	11-22-44	—	—	10	1945	S	—	Do.
14	1945	—	—	5	1945	D	—	Do.
17.5	1945	I, E	5	5	11 -45	D	—	Do.
13	11 -45	I, E	6	10	11 -45	D	—	Do.
—	—	—	—	—	—	D	—	Do.
38.72	12- 3-45	I, E	8	8	—	D	—	Do.
30[a]	—	H	—	8	—	D	—	
18.47	2- 8-46	I, E	10(?)	7	1940	D	—	
19[a]	—	—	—	6	—	D	—	
11[a]	—	H	—	6	—	D	—	
10[a]	—	—	—	6	—	D	—	
29[a]	—	C, E	—	7	—	D	—	
10[a]	—	C, E		8	—	D	—	
—	—	—	—	—	—	D	—	See well log.
32[a]	—	I, E	—	7	—	D	—	
—	—	C, E	—	10	1-15-46	D	—	Flowing well, 10 G.P.M. See chemical analysis.
12.5	—	—	—	7	—	D	—	
17[a]	—	C, E	—	—	—	D	—	
—	—	—	—	—	—	D	—	
16[a]	—	C, E	—	5	—	D	—	
—	—	N	—	—	—	N	—	Flowing well.
—	—	N	—	—	—	N	—	Do.
50(?)[a]	—	H	—	—	—	D, F	—	
23.35	2-15-46	N	—	—	—	N	—	
18[a]	—	I, E	—	6	—	D	—	
32(?)[a]	2 -46	—	—	—	—	D	—	
—	—	I, E	—	3	2-15-46	D	56.5	Flowing well. See chemical analysis.
—	—	I, E	4	4	2-15-46	D	53(?)	Do. Do.
—	—	N	—	—	—	N	56	Flowing well. Measured depth of well 64.3 feet.
18[a]	2 -46	I	6	6	2 -46	D	—	See well log.
—	—	I, E	—	15	—	S	—	See chemical analysis.
3.89	2-26-46	I, E	—	—	—	D	—	Measured depth of well 42.27 feet.
—	—	E	—	—	—	D	—	
28[a]	—	I, E	—	—	—	D	53	
12.33	2-26-46	—	—	—	—	N	—	Measured depth of well 19.70 feet.
28.45	2-26-46	I, E	—	—	—	D	—	
—	—	C, E	—	—	—	D	56	Flowing well. See chemical analysis.
—	—	E	—	—	—	D	—	
40[a]	3 -46	I, E	6	6	—	D	—	See well log.
32[a]	—	C, E	—	25	—	P	56	See chemical analysis.
18.67	4-16-46	C, E	—	—	—	P	56	Do.
14[a]	4-25-46	I, E	—	8	4-25-46	D	—	See well log.
18[a]	4-17-46	I, E	—	8	4-17-46	D	—	Do.

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Be 49	A. Neirenburg	—	—	100	Dug	51	48	Raritan
Be 50	Richard J. Foster	Eiler	1946	25	Drilled	97	3	Patapsco
Be 51	Charles T. Corrigan	Novak	1946	20	do	57	4	Raritan and Patapsco
Be 52	Russell Wallace	Eiler	1946	20	do	158	3–2	Patapsco
Be 53	Charles Shriver	Campbell	1946	100	do	145	4	do
Be 54	R. LeMoine	—	—	20	Dug	15.5	36	Raritan
Be 55	Frank E. Graham	Bunker	1947	70	Drilled	63	4	Raritan and Patapsco
Be 56	Irvin	do	1948	115	do	108	4–2	do
Be 57	James B. Stallings	Campbell	1947	65	do	128	4	Patapsco
Be 58	Maryland Department of Forests and Parks	Layne-Atlantic	—	160	do	494	4	do
Be 59	Whiting Turner Contracting Co.	Sherman	1946	0	do	90	—	do
Bf 1	Fort Smallwood	Hoshall and Shannahan	—	10	Drilled	376.5	6–4½	Patapsco
Bf 2	Do	Shannahan	—	10	do	378.1	8–6	do
Bf 3	Do	—	—	10	Dug	21.8	48	Raritan
Bf 4	Rogers Townsend Boat Co.	—	1936	5	Drilled	140	5	Raritan and Patapsco
Bf 5	E. E. Robinson	Shannahan	1926	10	do	173	6	do
Bf 6	Do	do	1926	10	do	276	8–6–4½	Patapsco
Bf 7	Charles Pumphrey	—	About 1906	20	do	365	—	do
Bf 8	Meagher	Novak	1941	15	do	75.5	4	Raritan
Bf 9	Wilson	do	1941	10	do	172.5	4	do
Bf 10	Southern Products Co.	Shannahan	1908	10	Drilled	431	8	Patapsco
Bf 11	Do	do	1908	10	do	431	8	do
Bf 12	Do	do	1908	10	do	431	8	do
Bf 13	Montillaro	Novak	1941	5	do	56	4	Raritan
Bf 14	R. B. Hancock	—	About 1866–76	20	Dug	32	—	do
Bf 15	N. J. Utterback	—	About 1846	30	do	36	48	Magothy and Raritan
Bf 16	W. K. Horton	—	—	50	do	25.7	48	do
Bf 17	Mrs. Wenger	—	—	30	do	85	—	Raritan
Bf 18	R. P. Milldurn	Eiler	1946	2	Drilled	85	4	do
Bf 19	Wm. L. Musch	do	1946	15	do	56	3	do
Cc 1	U. S. Naval Academy Dairy	Layne-Atlantic	1941	200	Drilled	408	10	Patapsco
Cc 2	Do	Shannahan	1914	200	do	397	10	do
Cc 3	Do	do	1914	200	do	241	8	do
Cc 4	Do	—	—	200	Dug	60	—	Raritan
Cc 5	Board of Education	Washington Pump & Well Co.	1932–33	160	Drilled	210	6	Patapsco
Cc 6	Irving Turner	do	1945	140	do	171	6	Raritan
Cc 7	A. D. Riden Co.	—	1910	80	do	300	5	Patuxent (?)
Cc 8	Mary B. Myers	—	1908	160	do	100	4	Raritan and Patapsco
Cc 9	C. W. Clutz	—	1941	200	Dug	63	—	do
Cc 10	Dallas Higgins	—	—	210	do	30	42–18	Pleistocene and Raritan
Cc 11	C. L. Miller	—	1900	150	Dug and drilled	72	60–4	Raritan
Cc 12	J. W. Wagner	—	About 1910	210	Drilled	92	4	do
Cc 13	Alan E. Barton	—	—	65	Dug	14	30	Pleistocene
Cc 14	Richard Gant	Bunker	1941	125	Drilled	71	2	Magothy and Raritan

Continued

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F.	Remarks
Below land Surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
42.7	5- 1-46	B	—	—	—	D	—	
15[a]	3-23-46	C, E	15	10	—	D	—	See well log
17[a]	4 -46	I, E	7	10	4 -46	D	—	Do.
13[a]	6-25-46	I, G	6	6	6-25-46	D	—	Do.
76[a]	7-15-46	H	—	5	7-15-46	D	—	Do.
14.22	9-26-46	N	—	—	—	N	—	
31[a]	11- 6-47	C, H	4	—	—	D	—	Do.
63[a]	2-26-48	I, E	4	4	1948	D	—	Do.
41[a]	4- 7-47	I, E	3	3	1947	D	—	Do.
165[a]	10-15-47	C, E	10	—	—	D		Do.
—	—	N	—	12	11 -46	D		Flowing well.
—	—	C, E	—	50	—	P	57	See chemical analysis.
88	8- 3-43	I, E	—	84	—	P	60	See well log and chemical analysis.
14.1	1-27-44	C, H	—	—	—	N	—	
0	8- 3-43	G	—	3	1-18-46	D	58	Flowing well. See chemical analysis.
—	—	—	—	50	—	N	—	
15[a]	—	I, E	50	90	—	P	—	See well log.
—	—	N	—	—	—	N	—	
23[a]	—	I, E	—	6	—	D	—	
7.5[a]		C, E	—	6	—	D	—	
4[a]	—	—	—	10	—	N	—	See well log.
4[a]	—	—	—	10	—	N	—	
4[a]	—	—	—	10	—	N	—	
4.5	—	C, E	—	6	—	D	—	Do.
6[a]	—	I, E	—	—	—	D	—	
32[a]	—	H	—	—	—	D	—	
21.0	—	I, E	—	—	—	D	—	
—	—	H	—	—	—	D	—	
—	—	I, E	10	10	—	C	—	See well log. Flows at high tide.
13[a]	7- 3-46	I, E	15	15	—	D	—	Do.
108.64	3- 7-46	I, E	—	260	1941	C	55.5	Filled back to 245 feet. See chemical analysis.
108.66	3- 7-46	A	—	42	—	N	—	
—	—	A	—	10	—	N	—	
—	—	H	—	—	—	C	—	
—	—	C, E	—	15	—	S	—	
92[a]	—	C, E	75	—	—	F	—	See well log.
7.15	4-23-46	C, E	—	40-50	—	D	55.5	See chemical analysis.
45[a]	—	H	—	—	—	D	—	
60[a]	—	C, E	—	—	—	D	—	
—	—	C, E	—	—	—	D	—	
62[a]	—	C, E	—	—	—	D	—	
—	—	C, E	—	—	—	D	—	Do.
11.03	5- 6-46	C, E	—	—	—	D	—	
—	—	C, E	—	—	—	D	—	

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Cc 15	Joseph Chowanetz	—	—	90	Dug	21	30	Pleistocene
Cc 16	Rudy Walch	—	—	60	do	19.2	48	do
Cc 17	S. W. Duckett	—	—	145	Drilled	100	4	Magothy and Raritan
Cc 18	L. J. Shaw	Bunker	1939	130	do	86	6	do
Cc 19	J F. Lloyd	Smith	1946	220	do	136.5	6	Raritan
Cc 20	Allen C. Barton	Washington Pump & Well Co.	1947	70	do	143	6	Patapsco
Cc 21	Levi C. Beck	Raynor Heights Drilling Co.	1948	230	do	200	6	do
Cc 22	Board of Education	Layne-Atlantic	1948	120	do	166	4	Raritan and Patapsco
Cd 1	Summerfield Baldwin Estate	—	About 1914	100	do	195(?)	6	Raritan
Cd 2	Do	—	—	100	Dug and drilled	94	48-6	Magothy and Raritan
Cd 3	Board of Education	Washington Pump & Well Co.	1943	110	Drilled	146	6-2½	do
Cd 4	Do	Leatherbury	About 1938	125	do	130(?)	6	do
Cd 5	S. H. Wilhelm	Smith	1945	100	do	142	6	Patapsco
Cd 6	M. W. Schaul	Washington Pump & Well Co.	1946	180	do	153	6	Magothy and Raritan
Cd 7	Baldwin Memorial Church	do	1946	100	do	97	6	Raritan
Cd 8	Crownsville State Hospital	—	—	130	do	380.5	4½	Patapsco
Cd 9	Do	Shannahan	1915	130	do	400	6	do
Cd 10	Do	do	1915	137	do	668	8-6	do
Cd 11	Do	do	1930	110	do	232	20-16-10	Raritan
Cd 12	do	do	1936	110	do	230	10-8	Magothy and Raritan
Cd 13	George Baum	Campbell	—	70	do	142	4	do
Cd 14	Samuel D. Hecht	—	—	120	do	90(?)	4	do
Cd 15	Dorr's Restaurant	Cunningham	1928	125	do	96	4	Raritan
Cd 16	Edwin P. Jones	—	—	170	Dug	30	48	Pleistocene or Monmouth
Cd 17	Wm. A. Boehm, Jr.	—	1945	140	do	32	48	Matawan (?)
Cd 18	Mrs. A. G. Cook	Washington Pump & Well Co.	1944	140	Drilled	179	6	Magothy and Raritan
Cd 19	Mrs. Richard Whitall	Hagmann	1931	180	do	208	6	do
Cd 20	Do	do	1931	100	do	49.5	4	Magothy (?)
Cd 21	Do	do	1931	100	do	55.3	6	do
Cd 22	Mrs. Raney	Crouse and Stone	—	40	do	55	—	Raritan
Cd 23	Frank Kaczynski	Crouse	1939	65	do	107	4	do
Cd 24	J. D. Ogden	—	1910	140	Dug	110	60	Magothy
Cd 25	Gertrude Erdman	Campbell	1946	80	Drilled	126	4	Patapsco
Cd 26	Isaac W. Machin	do	1946	80	do	112	4	do
Cd 27	G. C. Chance	Crouse	—	170	do	67.8	4	Raritan
Cd 28	Stephen Pawlik	do	1947	100	do	125	4	Raritan and Patapsco
Cd 29	W. J. O'Hara	Stone	1948	150	do	95	6	Raritan
Ce 1	County Sanitary Commission	Bunker	1933	12.83	Drilled	213	8	Raritan and Patapsco

Continued

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F	Remarks
Below land surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
17[a]	—	C, H	—	—	—	D	—	See chemical analysis.
12.38	5- 6-46	H, E	—	—	—	C, D	—	
50(?)[a]	—	C, H	—	—	—	N	—	
—	—	C, E	—	—	—	D, F	—	
104.12	5-16-46	—	—	—	—	D, F	—	
—	8-11-48	C	10	10	7-15-47	D		Well flowing 3 gal. a min. See well log.
128.72	8-10-48	N	—	—	—	D	—	
75[a]	9-13-48	—	150	150	9-13-48	S	—	See well log.
1(?)[a]	1943	C, E	—	5-10	—	D	—	
68[a]	1944	H	—	—	—	N	—	
—	—	E	—	—	—	S	—	See chemical analysis.
—	—	E	—	—	—	S	—	Depth 80(?) feet, according to driller.
84[a]	1945	C, E	4	4	—	D	—	See well log.
119[a]	2 -46	C, E	—	15	2 -46	D	—	See chemical analysis and well log.
38[a]	3-21-46	C	50	25	3-21-46	D	—	See well log.
86.94	4-10-46	N	—	—	—	N	—	
—	—	A	—	175	—	N	—	
109.64	3- 3-49	A	—	175	—	N	—	Do.
79[a]	1930	I, E	—	175	—		55.5	Well supplies hospital. See well log and chemical analysis.
78[a]	1936	I, E	200	175	—	—	—	Well supplies hospital. See well log.
68[a]	—	N	—	7	—	D	—	
—	—	C, E	—	—	—	D	—	
—	—	C, E	—	—	—	C, D	—	
21[a]	—	I, E	—	—	—	D	—	
27.5[a]	—	H	—	—	—	D	—	
105.24	5- 6-46	C, E	—	—	—	D	—	
—	—	I, E	—	—	—	D	56	See chemical analysis.
47.80	5- 6-46	N	—	—	—	N	—	
45.72	5- 6-46	H	—	—	—	N	—	
—	—	E	—	—	—	D	—	
—	—	H	—	—	—	D, F	57	Do.
100[a]	—	C	—	—	—	D, F	—	
75.14	7- 9-46	I, E	—	5	—	D	—	Well sanded up to 108 feet. See well log.
77[a]	7- 2-46	C, E	—	—	—	D	—	See well log
60.63	7- 9-46	N	—	—	—	D	—	Do.
78[a]	9-12-47	I	—	10	—	D	—	Do.
82[a]	5-13-48	—	—	3	5-13-48	D	—	Do.
9[a]	1933	I, E	—	50	—	P	—	See chemical analysis.

TABLE 2-

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Ce 2	County Sanitary Commission	Bunker	1933	12.38	drilled	200	4	Raritan and Patapsco
Ce 3	Burnett	do	—	6	do	210	4	do
Ce 4	Charles A. Ernest	Smith	1945	5	do	106	6	do
Ce 5	J. J. Jessa	Washington Pump & Well Co.	—	65	do	92	6	Magothy
Ce 6	Peter J. Dalton	Eiler	—	32	do	170	3–2	Raritan and Patapsco
Ce 7	H. F. Hilgenberg	Edmonston	1945	15	do	350(?)	6–4	Patapsco
Ce 8	Do	—	—	15	Dug	11.75	—	Pleistocene
Ce 9	Forman	—	1945	15	do	13.22	48	do
Ce 10	J. H. Jacobs	—	1932	10	Drilled	150–200	4	Magothy and Raritan
Ce 11	Do	—	1944	10	Dug	18	60	Matawan and Magothy
Ce 12	Zepp	Novak	—	10	Drilled	130	4	Magothy and Raritan
Ce 13	Goska	—	1923	50	Dug	24	48	do
Ce 14	Folger McKinsey	—	About 1920	2	Drilled	140	4	do
Ce 15	I. L. Jennings	—	—	3	do	120(?)	—	—
Ce 16	Raymond Wolf	Wolf	1923	40	do	40	5	Pleistocene and Magothy
Ce 17	H. B. Little	Garvan	1928	1	do	220	2	Raritan and Patapsco
Ce 18	John Heinstadt	do	—	1	do	90	2	Magothy and Raritan
Ce 19	Robert J. Stewart	Washington Pump & Well Co.	1933	120	do	171	6	do
Ce 20	Salmon	Novak	1939	140	do	255	6–4	Raritan and Patapsco
Ce 21	Mrs. N. P. Chapman	Garvan (?)	About 1923	3	do	164–166	—	Raritan
Ce 22	Do	do	do	3	do	do	—	do
Ce 23	Do	do	do	3	do	do	—	do
Ce 24	Mrs. Alfred Thompson	—	1925	60	do	211	6	Raritan and Patapsco
Ce 25	Morris	Novak	1942	45	do	159	4	do
Ce 26	Rugby Hall	Bunker	1940	10	do	266	6	do
Ce 27	D. Preston	Dowin	1905	140	do	150	6	Magothy
Ce 28	Mrs. Weisman	—	1921	140	Dug	103	48	Magothy (?)
Ce 29	C. E. Pulsefer	—	—	70	do	65.1	48	Magothy
Ce 30	Joyce Lane Community Water Supply	Bunker	—	60	Drilled	183	5½	Magothy and Raritan
Ce 31	Lottie Dorsey	—	—	65	Dug	30.3	48	Matawan (?)
Ce 32	Elinor Clifford	Bunker	—	13	Drilled	512	10	Patapsco (?)
Ce 33	Do	do	—	5	do	200	—	Patapsco
Ce 34	County Sanitary Commission	Layne-Atlantic	1944	5	do	165	3	Raritan and Patapsco
Ce 35	Do	do	1944	5	do	160	3	do
Ce 36	L. S. Zimmerman	—	1920	3	do	100	—	Raritan
Ce 37	Elizabeth Fulton	Bunker	1941	40	do	160	4	Raritan and Patapsco
Ce 38	W. Mentzell	—	1926	3	do	208	3	do
Ce 39	Wm. C. Rogers	—	1920	170	Dug	85.5	48	Monmouth or Matawan
Ce 40	Otto Kubitz	—	—	165	do	104	72	do
Ce 41	Sherwood Forest Co.	—	1920	5	Drilled	337	6	Patapsco
Ce 42	Margaret W. Stewart	Washington Pump & Well Co.	1930–34	100	do	175	6	Magothy (?)

Continued

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F	Remarks
Below land surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
9[a]	—	I, E	—	150	1942	P	—	Test well; seldom used.
—	—	—	—	10	1- 7-46	D	—	Flowing well.
—	—	I, E	8	5	1-17-46	D		Flowing well. See well logs and chemical analysis.
52[a]	—	C, H	—	20	—	D	—	See well log.
26[a]	1 -46	I, E	5	5	1 -46	D	—	Do.
—	—	N	—	—	—	N	—	
10.33	2-18-46	H	—	—	—	D	—	Driven well inside dug well. Depth unknown.
11.44	2-18-46	N	—	—	—	D	—	
—	—	N	—	4	2-18-46	N	57	Flowing well. See chemical analysis.
15[a]	—	I, E	—	33	1944	D, F	—	
4.3	2-27-46	I, E	—	10	—	—	—	Measured depth of well 132.60 feet.
19[a]	—	I, E	—	—	—	D	—	
—	—	—	—	—	—	D	57	Flowing well. See chemical analysis.
—	—	I, E	—	4	2-28-46	D	57	Flowing well.
34(?)[a]	—	I, E	—	—	—	D	—	
—	—	C, E	—	4	2-28-46	D	57.5	Flowing well. See chemical analysis.
—	—	—	—	4	2-28-46	N	58	Do. See chemical analysis.
—	—	C, E	—	65	—	D	—	Yield 10 g.p.m.
133.49	6-10-46	—	—	20	—	N	—	
—	—	C, E	40	—	—	P	—	Three flowing wells, two of which are in use.
—	—	C, E	40	—	—	P	—	
—	—	C, E	40	—	—	P	—	
73.08	3- 1-46	—	—	—	—	N	—	
44[a]	—	I, E	—	9	—	D	—	
5.79	3- 6-46	C, E	—	50	1940	S	—	
—	—	—	—	15	—	N	—	
92.4	3- 6-46	H	—	—	—	D	—	Measured depth of well 96.5 feet.
62	3- 8-46	I, E	—	—	—	D	—	
11.44	3- 8-46	C, E	—	17	—	P	—	Measured depth of well 149.3 feet.
22.30	4-10-46	C, E	—	—	—	D	—	
—	—	Water wheel	—	100	—	D	62	Flowing well. See chemical analysis.
—	—	N	—	20	—	D	59	Do. Do.
—	—	C	—	43	—	P	—	Do. Do.
—	—	C	—	—	—	P	—	Do.
—	—	C, E	17	5	—	D	57	Do. Do.
70[a]	—	I, E	—	—	—	D	—	See chemical analysis.
—	—	C, E	—	3	5- 7-46	D	57	Flowing well. See chemical analysis.
77	5- 7-46	C, E	—	—	—	D, F	—	
81	5- 8-46	C, E	—	—	—	D	—	Measured depth of well 89.5 feet.
—	—	N	—	—	—	N	—	Flowed; abandoned & plugged.
—	—	H, E	—	5	—	D	—	

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Ce 43	Epping Forest Water Co.	Leatherbury	1928	3	Drilled	96	1½	Magothy
Ce 44	Do	do	1928	4	do	96	1½	do
Ce 45	Do	do	1929	5	do	96	1½	do
Ce 46	Do	do	1931	3	do	96	8	do
Ce 47	G. G. Ridgley	Hoshall	1909	20	do	135	6	do
Ce 48	Do	—	1934	40	do	175	4	do
Ce 49	Do	—	1938	50	do	450(?)	8	Raritan and Patapsco
Ce 50	W. F. Hilgenberg	Eiler	—	10	do	68.5	3	Magothy
Ce 51	Mathais J. Reckenwald	Layne-Atlantic	1947	40	do	60	4–2	Magothy
Ce 52	Board of Education	do	1947	125	do	492.5	6–2	Raritan and Patapsco
Cf 1	Gibson Island Corp.	Shannahan	1923	25	do	319	10–8	Raritan and Patapsco
Cf 2	Do	do	1929	25	do	324	10–8–6	do
Cf 3	H. L. Grymes	Harr	1942	25	do	630	6	Patapsco (?)
Cf 4	L. V. Hare	do	1932	10	do	205	6	Raritan and Patapsco
Cf 5	De Grucy	—	1933	10	do	—	3½	—
Cf 6	F. P. Chelton	Leatherbury	1945	15	do	93	4	Magothy (?)
Cf 7	B. J. Fishpole	—	—	146	Dug	78.3	60	Aquia
Cf 8	Charles B. Lynch	—	—	15	do	18	120	Pleistocene
Cf 9	Henry Haneke	—	1924	115	do	77	48	Aquia
Cf 10	Sam Fertitta	Bunker	1925	0	do	200–300	2	Raritan and Patapsco
Cf 11	Frank Dipaula	do	1933	5	do	95	2	Magothy
Cf 12	W. Thompson	Leatherbury	1945	15	do	42½	2	Aquia
Cf 13	Leonard Ruck	Bunker (?)	1938	10	do	190(?)	4	Magothy
Cf 14	Durm's Boat Yard	—	1945	10	Dug	12	36	Pleistocene
Cf 15	William Labrot	Leatherbury	1945	3	Drilled	280	2	Magothy and Raritan
Cf 16	Do	—	1914	15	do	704	3	Patapsco
Cf 17	Manresa on the Severn	Bunker (?)	1939	5	do	85	4	Monmouth or Matawan
Cf 18	O. K. Hirschfeld	—	—	80	Dug	72	60	Aquia
Cf 19	Weems R. Duvall	Bunker	1932	100	Drilled	107	4	do
Cf 20	John Ritterbusch	Novak	1941	10	do	54.1	4	do
Cg 1	State Roads Commission	Leatherbury	About 1941	9	do	270	3–2–1½	Magothy and Raritan
Cg 2	Do	do	About 1941	9	do	138	6	Monmouth and Matawan
Cg 3	William Labrot	—	—	15	do	400(?)	—	Raritan and Patapsco
Cg 4	Do	—	About 1938	10	do	700(?)	—	Patapsco
Cg 5	Do	Leatherbury	1936	10	do	300(?)	—	Raritan
Dc 1	H. M. O'Dell	—	1942	130	Dug	27	24	Pleistocene (?)
Dc 2	Rosbeck	—	—	110	do	30	48	Aquia
Dc 3	Howard D. Lerch	—	—	85	do	25	48	do
Dc 4	B. A. King	Bunker	1937	170	Drilled	46	6	do
Dc 5	E. S. Barber	Layne-Atlantic	1949	165	do	263	4 to 146′ 2 to 244′	Raritan
Dd 1	Joseph Bottner	—	1928	200	Dug	98	72	Aquia
Dd 2	Stanton Nutwell	—	1937	180	do	36.5	48	Calvert

Continued

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F.	Remarks
Below land surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
—	—	N	—	—	—	N	—	Flowed; abandoned and covered over.
—	—	N	—	—	—	N	—	Do.
—	—	—	—	—	—	N	—	Do.
—	—	I, E	—	—	—	P	57	Flowing well. See chemical analysis.
—	—	N	—	—	—	N	—	Small flow; formerly flowed 120 gal. a min
—	—	N	—	—	—	N	—	
31.98	6-13-46	N	—	—	—	N	—	
9[a]	1946	I, E	11	11	1946	D	—	See well log.
44[a]	9-11-47	I, E	5	20	9-11-47	D	—	See well log.
128[a]	9-24-47	I, E	20	90	9-24-47	S	—	Do.
32	1941	C, E	—	130	1941	P	—	See well log and chemical analysis.
—	—	C, E	230	100	—	P	—	
—	—	C, E	—	—	—	D	—	
15[a]		I, E	—	25	—	D	56	See chemical analysis.
8.45	1-25-46	C, E	—	—	—	D	—	
12.35	2-18-46	H	—	7	—	D	—	
72.80	4-10-46	C, E	—	—	—	D	—	
16.08	4-10-46	C, E	—	—	—	D, F	—	
68.8	4-16-46	C, E	—	—	—	D	—	Measured depth of well 74 feet.
—	—	N	—	—	—	N	57	Flowing well.
—	—	C, E	—	—	—	D	—	Flowing well; depth about 60 feet; reported by driller.
—	—	C, E	—	—	—	D	—	
—	—	—	—	2	4-18-46	D	58	Flowing well. See chemical analysis.
8[a]	—	C, E	—	—	—	C	—	
—	—	N	—	12	—	F	58.5	Do.
10.07	4-17-46	N	—	—	—	N	—	Measured depth of well 123 feet.
—	—	C, E	—	—	—	S	—	
66	4-26-46	W	—	—	—	D	—	
75	—	C, G	—	—	—	D, F	—	
—	—	C, E	6	6	—	D	—	Pumping level 16.5 feet at 5.5 g.p.m.
8.58	5-21-45	I, E	—	4	1943	D	—	See chemical analysis.
5.80	5-21-45							
6.82	1- 8-46	N	—	20	1943	N	—	Measured depth of well 135 feet. See chemical analysis.
—	—	N	—	—	—	F	55	Flowing well. Cl 16 ppm. Field test, 6-11-46
—	—	N	—	—	—	F	58.5	Do. Cl 14 ppm. Do.
—	—	N	—	—	—	F	56	Do. Cl 16 ppm. Do.
11.30	6- 3-46	C, E	—	—	—	D	—	Measured depth of well 11.5 feet.
22[a]	—	I, E	—	—	—	D, F	—	
20[a]	—	C, E	—	—	—	D, F	—	
22[a]	—	C, E	—	—	—	D	—	
130[a]	3-22-49	(?)	10	15	3-22-49	D	—	See well log.
69.80	6- 3-46	C, E	—	—	—	F	—	Measured depth of well 87.8 feet.
27[a]	—	C, E	—	—	—	D, F	—	

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Dd 3	C. E. Hopkins	—	1925	150	Dug	65	36	Aquia (?)
Dd 4	Mrs.St.Geo.Barbour	Bunker	1934	140	Drilled	285	4	Raritan
Dd 5	M. Burch Beard	—	—	120	Dug	58	48	Aquia (?)
Dd 6	J. E. Wood	—	1946	110	do	21	48	Pleistocene (?)
Dd 7	Board of Education	—	—	140	Drilled	—	—	—
Dd 8	George King	—	—	150	Dug	65	48	Aquia
Dd 9	Mrs. St. Geo. Barbour	—	—	100	do	65	48	Monmouth or Matawan
Dd 10	Robert Nevin	—	—	100	Dug	60	48	Aquia
Dd 11	Frank Mueller	—	1933	80	do	110	36	do
Dd 12	Kenneth Hauer	Miller	—	40	Drilled	45	2½	Monmouth and Matawan
Dd 13	R. E. Dickerson	Leatherbury	—	100	do	60(?)	3	Aquia
Dd 14	Richard Williams	—	1946	110	Dug	14.0	4	Calvert
Dd 15	Benjamin Carr	—	1943	120	Drilled	136	4–2	Aquia
Dd 16	Board of Education	Layne-Atlantic	1947	145	do	331	4–2	Raritan
Dd 17	H. B. Winant	Leatherbury	1948	40	do	78	3	Aquia
De 1	Annapolis Water Co.	Layne-Atlantic	1939	20	do	—	6(?)	Magothy and Raritan
De 2	Do	do	1939	20	do	—	8(?)	do
De 3	Do	—	1930	40	do	244	—	do
De 4	Leroy Meyette	—	—	100	Dug	48	60	Aquia
De 5	Harbonim Camp	—	—	40	do	48.3	60	do
De 6	David R. Lehman	—	—	60	do	67	36	do
De 7	W. T. Shawn	—	—	40	do	41	48	do
De 8	Harry Krouse	Leatherbury	1939	40	Drilled	35	3	do
De 9	Howard Tucker	Bunker	1926	35	do	29.4	6	do
De 10	Fred Shaw, Sr.	—	—	45	Dug	53	—	do
De 11	P. A. Donald	Leatherbury	1943	100	Drilled	85	—	do
De 12	A. J. Daniels	McKnight	—	70	do	65	2	do
De 13	L. M. Nims	Leatherbury	—	15	do	75	1½	do
De 14	J. D. Stenchcomb	Purner	—	40	Drilled	60–65	1½	Aquia
De 15	L. C. Davis	Bunker	1946	10	Dug and drilled	52	36–4	do
De 16	State Roads Commission Garage	do	1931	85	Drilled	43	6	do
De 17	R. C. Giffen	—	—	40	do	60	4	do
De 18	Annapolis Dairy	—	1928	40	do	80	4	do
De 19	Do	—	1929	40	do	160	4	Magothy
De 20	W. M. Vickers	—	—	35	do	31.2	2	Aquia
De 21	J. E. Glose	Leatherbury	1945	15	do	60	2	do
De 22	J. S. Falck	Atwell	1924	15	do	45–60	1½	do
De 23	J. R. Easterday	—	—	10	Driven	85	4	do
De 24	Clarence M. White	—	1910	40	Dug	30	36	do
De 25	Robert Bass	—	1920	35	do	30	36	do
De 26	Wm. J. Vanous	—	—	52	do	55	48	do
De 27	Carl W. Riddick	Leatherbury	About 1931	2	Drilled	55	6	do
De 28	Do	do	About 1931	2	do	55	6	do
De 29	Do	do	About 1931	2	do	55	6	do
De 30	Do	Halleck	1930	2	do	55	6	do
De 31	Do	Leatherbury	About 1931	2	do	55	6	do
De 32	Do	do	About 1931	2	do	55	—	do

Continued

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F.	Remarks
Below land surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
47.0	6- 4-46	B	—	—	—	D	—	Measured depth of well 53.3 feet.
50(?)[a]	—	—	—	—	—	N	—	
49[a]	—	I, E	—	—	—	D, F	—	
12.0	6- 5-46	N	—	—	—	D	—	Measured depth of well 15.5 feet.
—	—	H	—	—	—	S	—	
54[a]	—	C, E	—	—	—	D, F	—	
57.0	6- 4-46	C, H	—	—	—	D, F	—	Measured depth of well 64 feet.
57.0	6-10-46	C, E	—	—	—	D, F	—	
—	—	C, E	—	—	—	D	—	
36[a]	—	C, E	—	—	—	D	—	See chemical analysis.
—	—	H	—	—	—	D	—	
10.52	6-25-46	N	—	—	—	D	—	
90[a]	—	C, E	3	—	—	D	—	
105[a]	8-16-47	I, E	8	20	—	S	—	
52[a]	3-22-48	C, E	—	3	3-22-48	D	—	See well log.
—	—	I, E	—	400	4 -42	P	—	Flowing well.
—	2-15-43	I, E		2,000(?)	1942	P	—	Do.
—	2-15-43	—	—	—	—	N	—	Flowing well. Measured depth of well 152 feet. See well log and chemical analysis.
41[a]	—	E	—	—	—	D, F	—	
42.0	6-11-46	C, E	—	—	—	D	—	
61	6-11-46	C, E	—	—	—	D	—	
30[a]	—	C, E	—	—	—	D	—	
22.33	6-11-46	C, E	—	—	—	D, F	—	
21.96	6-11-46	C, E	—	—	—	D	—	
42.0	6-11-46	H	—	—	—	N	—	
—	—	C, E	—	—	—	D	—	Flowing well. See chemical analysis.
40[a]	—	C, E	—	—	—	D	—	See chemical analysis.
—	—	I, E	—	—	—	D	—	
—	—	H	—	—	—	N	—	
—	—	C, E	—	—	—	D	—	
—	—	C, E	—	4	—	—	—	
—	—	C, E	—	—	—	D	—	
—	—	—	—	—	—	N	—	
—	—	—	—	15	1929(?)	N	—	
24.63	6-14-46	C, E	—	—	—	D	57	See chemical analysis.
—	—	C, E	—	—	—	D	—	
—	—	I, E	—	—	—	D	—	
—	—	C, E	—	—	—	D	—	
—	—	N	—	—	—	—	—	Used for sewage disposal since 1946.
—	—	—	—	—	—	—	—	Do.
32.95	6-25-46	C, E	—	—	—	D	—	Measured depth of well 42 feet.
—	—	C, E	—	—	—	P	—	Measured depth of well 19 feet.
3.04	6-24-46	C, E	—	—	—	P	—	
—	—	C, E	—	—	—	P	—	Probably less than 20 feet deep.
—	—	N	—	—	—	N	—	Measured depth of well 22 feet.
—	—	C, E	—	—	—	P	—	
—	—	C, E	—	—	—	P	—	Measured depth of well 13 feet.

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
De 33	James M. Adams	Phipps	1935	30	Drilled	90	3	Aquia
De 34	A. Gordon Fleet	Bunker	1941	20	do	60	3	do
De 35	George C. Meeks	Phipps	1937	10	do	81	1½	do
De 36	E. B. McCord	—	1929	20	do	65	—	do
De 37	C. A. Duval	Bunker	—	80	do	100	2	do
De 38	Do	Purner	—	7	do	100	4	Monmouth (?)
De 39	Arundel Gas Co.	Leatherbury	1945	30	do	50	3–1¼	Aquia
De 40	Robert A. Hale	Bunker	1935	5	Driven	20	1¼	do
De 41	N. C. Hines	Leatherbury	1942	5	Drilled	60–70	—	do
De 42	J. B. Semple, Jr.	Bunker	1941	14	do	230	6	Magothy
De 43	Mrs. Pearl Addison	—	About 1910	40	Dug	48	36	Aquia
De 44	Annapolis Water Co.	Layne-Atlantic	1947	20	Drilled	793	4	Patapsco
De 45	Do	do	1947	20	do	300	20–10	Magothy and Raritan
De 46	Do	do	1947	20	do	300	20–10	do
De 47	Do	do	1931	20	do	258	—	do
Df 1	U.S. Naval Academy	Conlon	1902	10	do	587	8	Patapsco
Df 2	Do	Shannahan	1904	10	do	601	12–10–8	do
Df 3	Do	do	1910	13	do	602	12–10–8–6	do
Df 4	Do	do	1912	10	do	602.7	12–10–8–6	do
Df 5	Do	—	1918	10	do	587.7	15–12–10	do
Df 6	Do	—	1918	10	do	601	12–10–8	do
Df 7	Do	—	1925	10	do	585.5	12½–10–8	do
Df 8	Do	—	1925	10	do	588	12½–10–8	do
Df 9	Do	—	1933	9.3	do	306.5	16–12–10	Magothy and Raritan
Df 10	Do	Bunker	1933	10	do	350	6–4	do
Df 11	Do	—	1936	10	do	588	16–12	Patapsco
Df 12	Do	Layne-Atlantic	1939	10	do	600	18	do
Df 13	Do	do	1945	13.6	do	606.1	18–8	do
Df 14	Do Rifle Range	—	1920	60	do	578	8–6–4	do
Df 15	Do Exp. Sta.	Bunker	1932	20	do	210	6	Magothy and Raritan
Df 16	Do	Layne-Atlantic	1944	10	do	597	12–8	Patapsco
Df 17	Do High Power Radio Station	—	—	23	do	600(?)	3	do
Df 18	Do	—	—	15	do	587	—	do
Df 19	Do	—	1931	13	do	626.5	10–8–6	do
Df 20	Do	Washington Pump & Well Co.	1933	23	do	680	10–8–6	do
Df 21	Sylvester Labrot	—	—	3	—	—	—	—
Df 22	Do	—	—	10	—	88	—	Aquia
Df 23	Do	—	—	15	do	500+	3	Patapsco
Df 24	Do	—	—	15	Dug	21	36	Pleistocene
Df 25	Severn Restaurant	Bunker	1938	5	Drilled	48	4	Aquia
Df 26	Gus Diamond	do	1940	25	do	75	—	do
Df 27	Irving Hall	—	1945	80	Dug	86	36	do
Df 28	Irene Hall	Leatherbury	1942	80	Drilled	135	4	do
Df 29	Snador	do	1946	55	do	70	4	do
Df 30	C. J. Mack	Bunker	1946	25	do	94	4	do

Continued

Static water level: Below land surface (feet)	Static water level: Date of measurement	Pumping equipment	Capacity of pump (gal. a min.)	Yield: Rate (gal. a min.)	Yield: Date of measurement	Use of water	Temperature °F.	Remarks
18[a]	6-25-46	C, E	—	—	—	C, D	—	Well probably 40–60 feet deep.
34.70	6-25-46	I, E	—	—	—	D	—	Measured depth of well 57.4 feet. See chemical analysis.
10[a]	6-25-46	C, E	—	—	—	D	56	See chemical analysis.
—	—	C, E	—	—	—	D	—	
—	—	C, E	—	—	—	D	—	
3[a]	—	I, E	—	—	—	D	—	
18[a]	—	I, E	—	—	—	C, D	—	
4[a]	—	I, E	—	—	—	D	—	
—	—	I, E	—	—	—	D	—	
—	—	I, E	—	22	—	N	61	Flows at 14 feet above sea level. See chemical analysis.
42.6	3-27-47	C, E	—	—	—	D	53.5	See chemical analysis.
—	—	N	—	—	—	N	—	See well log.
8[a]	8- 1-47	I, E	1,000	1,000	8- 1-47	P	—	Test Hole.
12[a]	7- 7-47	I, E	1,200	1,000	7- 7-47	P	—	See well log.
—	—	N	—	—	—	N	—	Flowing well. See well log and chemical analysis.
—	—	N	—	250	1903	N	—	
—	—	N	—	50–75	—	N	—	See well log.
—	—	N	—	478	5-27-10	N	—	Do.
—	—	N	—	300	1912	N	—	Do.
0[a]	9-11-18	N	—	750	9-11-18	N	61	
4.7[a]	8- 8-18	N	—	375	—	N	—	
14[a]	3-26-25	N	—	501	3-26-25	N	56	See well log.
2[a]	6-15-25	N	—	499	6-15-25	N	—	Do.
7.5[a]	1933	I, E	—	—	—	S	—	Do. See chemical analysis.
—	—	—	—	—	—	N	—	Do. Flowing well; test hole now plugged.
—	—	N	—	—	—	N	—	See well log.
2[a]	1- 4-39	I, E	—	1,000	2-27-46	S	—	See chemical analysis.
—	—	I, E	—	920	11-10-45	S	—	See well log and chemical analysis.
67.57	1- 7-46	N	—	20–30	—	N	—	
—	—	I, E	200	170	—	S	—	Flowing well, reported 25 g.p.m. See chemical analysis.
—	—	I, E	600	620	1944	S	55–56	Flowing well. See well log and chemical analysis.
13.54	2-28-46	—	—	—	—	N	—	
3.40	2-28-46	—	—	—	—	N	—	
—	—	A	—	79	3-11-31	S	—	See well log.
8[a]	1933	I, E	—	28	1933	S	—	Do.
—	—	—	—	—	—	F	59	Flowing well.
—	—	N	—	—	—	F	—	Well reported to flow.
15.45	4-17-46	N	—	—	—	N	—	Well not used.
18	4-17-46	C, E	—	—	—	D	—	
—	—	C, E	—	—	—	C, D	—	
—	—	I, E	—	—	—	D	—	
79[a]	—	I, E	—	—	—	D	—	
—	—	C, E	—	—	—	D	—	
30[a]	4-16-46	(?)	4	8	4-16-46	C	—	See well log.
36[a]	4 -46	—	—	5	4 -46	D	—	Do.

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Df 31	Mrs. E. H. Paulson	Bunker	1946	20	Drilled	70	2	Aquia
Df 32	Dr. Herbert Gates	do	1946	20	do	65	2	do
Df 23	George Hane	do	1946	20	do	100	2	do
Df 34	Dixon	do	1946	15	do	100	2	do
Df 35	K. W. Kingsbury	do	1946	20	do	100	2½	do
Df 36	Witt	do	1946	30	do	75	2½	do
Df 37	Robert Trullinger	do	1946	25	do	100	3-2	do
Df 38	Louis H. Towbes	do	1946	15	do	95	4	do
Df 39	I. S. Burka	do	1946	15	do	90	4	do
Df 40	J. L. B. Murray	do	1946	10	do	73	2	do
Df 41	Braun Packing Co.	Downin or Hoshall	1908	10	do	218	6	Magothy
Df 42	Annapolis Ice Manufacturing Co.	Star Drilling Co.	—	5	do	285	2	Magothy and Raritan
Df 43	A. G. Newmyer	Turner	1943	3	do	52	1½	Aquia
Df 44	Charles Smith	Boucher	1900	3	do	202	1½	Magothy
Df 45	John L. Boucher	do	1911	3	do	203	1½	do
Df 46	Do	Halleck	1927	4	do	25	2	Aquia
Df 47	County S.P.C.A. Shelter	Bunker	1936	25	do	—	—	—
Df 48	Do	do	1946	15	do	56.7	2	Aquia
Df 49	Mrs. M. H. Smith	—	1916	35	Dug and drilled	35	36(?)-6	Pleistocene or Aquia
Df 50	Do	—	—	35	Drilled	48.3	6	Aquia
Df 51	Annapolis Roads Club	Columbia Pump & Well Co.	1926-29	40	do	700-750	8	Patapsco
Df 52	Do	Bunker	—	20	do	110	3	Aquia
Df 53	Do	do	—	20	do	100	3	do
Df 54	Do	do	—	20	do	60	3	do
Df 55	Do	do	—	20	do	70	3	do
Df 56	Do	do	1930	20	do	90	3	do
Df 57	Do	do	1930	20	do	100	3	do
Df 58	Star Theatre	do	1940	20	do	207	6	Magothy
Df 59	U.S. Navy Experiment Station	American Drilling Co.	1948	36	do	1,000	8	Patapsco
Ec 1	Jerry Giles	—	1945	55	Dug	48	48	Pleistocene or Aquia
Ed 1	J. C. Puiles	—	—	120	Dug	66.2	48	Aquia
Ed 2	Grymes	—	—	160	do	47.2	48	Nanjemoy or Aquia
Ed 3	Mrs. F. L. Hanly	Leatherbury	—	120	Drilled	300	1½	Magothy
Ed 4	R. B. Tucker	—	1945	170	Dug	54.8	48	Nanjemoy (?)
Ed 5	Hollis Hardesty	—	1910	180	do	40	36	Calvert or Nanjemoy
Ed 6	Mrs. Floyd Lankford	—	1931	160	Drilled	—	3	—
Ed 7	Floyd Lankford, Jr.	Leatherbury	1941	150	do	265	2	Magothy
Ed 8	Do	do	1945	125	do	265	2	do
Ed 9	W. Thomas Jones	—	1925	120	Dug	44	48	Nanjemoy
Ed 10	Dr. J. C. Giddings	—	—	175	Drilled	168.8	2	Aquia
Ed 11	Roland Hall	—	1938	170	Dug	42.5	48	Calvert
Ed 12	Board of Education	Leatherbury	1932-33	160	Drilled	325	6	Magothy (?)
Ed 13	Christ Church Rectory	do	1940	160	do	300-400	2	Aquia
Ed 14	Thomas Moreland	—	—	130	Dug	62	36	Calvert
Ed 15	T. Clyde Collinson	Leatherbury	1946	140	Drilled	274	2	Aquia (?)
Ed 16	Francis Gardiner	do	1948	150	do	190	2	Aquia

Continued

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F.	Remarks
Below land surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
6[a]	4 -46	—	—	4	4 -46	D	—	See well log.
6[a]	4 -46	—	—	4	4 -46	D	—	Do.
12[a]	4 -46	—	—	4	4 -46	D	—	Do.
12[a]	4 -46	—	—	4	4 -46	D	—	Do.
18[a]	4-12-46	—	—	4	4 -46	D	—	Do.
20[a]	4 -46	—	—	4	4 -46	D	—	Do.
24[a]	4-16-46	H	—	4	4-16-46	D	—	Do.
25[a]	4 -46	—	—	12	4 -46	D	—	Do.
24[a]	4 -46	—	—	12	4 -46	D	—	Do.
5[a]	4 -46	—	—	4	4 -46	D	—	Do.
—	—	—	—	50	—	N	—	Flowing well, abandoned
20(?)[a]	—	—	—	—	—	N	—	
2.04	6-18-46	I, E	—	—	—	D	—	
—	—	N	—	39	—	N	—	Flowing well.
—	—	N	—	1	—	N	59	Flowing well.
19[a]	—	H	—	—	—	N	—	
—	—	C, E	—	—	—	C	—	
5.57	6-21-46	H	—	—	—	C	—	
22[a]	—	C, E	—	—	—	D, F	—	
29.26	6-24-46	H	—	—	—	N	—	
—	—	C, E	—	—	—	N	—	
—	—	I, E	—	—	—	C	—	
—	—	I, E	—	—	—	C	—	
—	—	I, E	—	—	—	C	—	
—	—	I, E	—	—	—	C	—	
—	—	N	—	—	—	N	—	
—	—	N	—	—	—	N	—	
19[a]	—	I, E	—	100	—	C	—	
—	—	N	—	—	—	N	—	Test well. See well log.
44[a]	—	H	—	—	—	D	—	
23.4	6- 5-46	H	—	—	—	N	—	
34.6	6- 5-46	C, E	—	—	—	D	—	
—	—	C	—	—	—	D	—	
40.2[a]	6-26-46	I, E	—	—	—	D	—	
—	—	H	—	—	—	D	—	
—	—	C, E	—	—	—	D	—	
—	—	C, E	—	—	—	D	—	
—	—	C, E	—	—	—	F	—	See chemical analysis.
30[a]	—	H	—	—	—	D	—	
160.29	7-12-46	C, E	—	—	—	D	—	
35	7-16-46	I, E	—	—	—	D	—	
143.68	6-16-46	C, E	—	15	—	S	—	
—	—	C, E	—	—	—	D	—	
28.8	7-16-46	H	—	—	—	N	—	
140[a]	—	C, E	—	—	—	D	—	Do.
—	—	C, E	3	5	3-24-47	D, F	—	See well log.

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Ee 1	Leatherbury Bros.	Leatherbury	—	4	Drilled	200	2	Aquia (?)
Ee 2	Do	do	1939	4	do	150	6	Aquia
Ee 3	A. Cysinger	do	1946	20	do	110	1½	do
Ee 4	James Stewart	Washington Pump & Well Co.	1946	40	do	140	6	do
Ee 5	George Ford	—	1931	130	Dug	32–36	36–48	Calvert or Nanjemoy
Ee 6	Robert L. Forest	Layne-Atlantic	1933	10	Drilled	138	8	Aquia (?)
Ee 7	Winterson Hardesty	—	—	60	Dug	30	48	Nanjemoy
Ee 8	Arthur Owens	—	—	100	do	35	48	do
Ee 9	Camp Letts	Bunker	1928	10	Drilled	105	4	Aquia
Ee 10	Do	do	1934	5	do	72	4	do
Ee 11	Do	do	1934	3	do	75	4	do
Ee 12	H. R. Robey	Purner	1931	5	do	104	1½	do
Ee 13	Mrs. Ann Hauxhurst	do	1941	35	do	60–65	—	do
Ee 14	A. B. Smith	Leatherbury	1941	40	do	101	2	do
Ee 15	Board of Education	Washington Pump & Well Co.	1939	40	do	107	6	do
Ee 16	Beverly Beach Club	Leatherbury	—	4	do	50	2	do
Ee 17	Do	do	—	4	do	60	2	do
Ee 18	Do	do	—	4	do	80	5	do
Ee 19	Do	do	—	10	do	103	2	do
Ee 20	St. Joseph's Summer Normal School	—	—	10	Dug	30	—	Nanjemoy
Ee 21	Do	Washington Pump & Well Co.	1941	10	Drilled	95	—	Aquia
Ee 22	Murray Estate	Rude	—	5	do	329	2½	Magothy and Raritan
Ee 23	Douglas Connolly	Leatherbury	1943	60	do	125	4	Aquia
Ee 24	E. Churchill Murray	—	1894	40	Dug	34.1	36	Nanjemoy
Ee 25	A. B. Menefee	Windsor	About 1930	5	Drilled	—	—	—
Ee 26	J. B. Skinner	—	—	105	Dug	99	36	Nanjemoy
Ee 27	Woodfield Fish & Oyster Co.	Leatherbury	1926	5	Drilled	180(?)	2	Aquia
Ee 28	Do	do	1936	5	do	180(?)	2	do
Ee 29	Andrews Hotel	do	1906	9	do	120(?)	2	do
Ee 30	Do	do	1923	9	do	—	1½	—
Ee 31	Do	do	1946	9	do	139	1½	Aquia
Ee 32	Hartge's Boatyard	Purner	1935	1	do	150	2	do
Ee 33	St. Johns Church	Wilde	1932	10	do	156	1½	do
Ee 34	J. D. Williams	Leatherbury	1947	10	do	160	3	do
Ee 35	R. May	do	1947	5	do	160	2	do
Ee 36	F. Thomas	do	1947	5	do	140	1½	do
Ee 37	R. Hartge	Purner	1947	5	do	140	1½	do
Ee 38	John Owens	Leatherbury	1947	110	do	180	2	do
Ee 39	Norman Carr	do	1947	10	do	160	1½	do
Ef 1	Dr. A. E. Goldstein	Atwell	1926	15	Drilled	40	1½	Aquia
Ef 2	E. L. Rudd	—	1928	5	do	65	1½	do
Ef 3	C. L. Meredith	—	1928	5	do	61	1½	do
Ef 4	H. B. Stonebraker	—	—	10	do	—	—	—
Ef 5	Do	—	—	20	Dug	44	48	Pleistocene or Aquia

Continued

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F.	Remarks
Below land surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
2[a]	—	C, E	16	20	—	C	—	
4.24	4-24-46	C, E	—	30	—	C	—	
9[a]	2-27-46	I, E	4	6	1946	D	—	See well log.
40[a]	4-20-46	C, E	75	20	4-20-46	—	—	Do.
28[a]	—	H	—	—	—	D	—	
13[a]	—	I, E	210	210	—	D, F	55	See chemical analysis.
14	6-28-46	I, E	—	—	—	D	—	Measured depth of well 22.6 feet.
—	—	I, E	—	—	—	D	—	
15[a]	—	H	—	25	—	—	—	Used as a stand-by well.
5[a]	—	I, E	—	50	—	—	58.5	Used to supply camp. See chemical analysis.
3[a]	—	I, E	—	50	—	—	58.5	Used to supply camp.
—	—	C, E and H	—	—	—	D	57	See chemical analysis.
—	—	C, E	—	—	—	D	—	
23.95	6-29-46	H	—	—	—	N	—	
39[a]	1939	C, E	—	20	—	S	—	See well log.
4[a]	—	C, E	8	—	—	C	—	
4[a]	—	C, E	8	—	—	C	—	
4[a]	—	C, E	—	—	—	C	—	
10[a]	—	C, E	8	—	—	D	—	
11	7- 1-46	C, E and H	—	—	—	S	—	
12.80	7- 1-46	I, E	—	27	—	N	—	Do.
—	—	N	—	15	—	N	60	Flowing well. See chemical analysis.
—	—	C, E	—	—	—	D	—	
21.0	7-17-46	B	—	—	—	N	—	
—	—	I, E	—	—	—	D	—	
77.67	7-17-46	H	—	—	—	D	—	Measured depth of well 87 feet.
10[a]	—	I, E	—	—	—	C	—	
10[a]	—	I, E	—	—	—	C	—	
7.29	7-19-46	N	—	—	—	N	—	Measured depth of well 19.5 feet.
—	—	N	—	—	—	N	—	
—	—	I, E	4	—	—	C	—	
—	—	C, E	—	1.5	7-29-46	C	59	Flowing well. See chemical analysis.
6[a]	—	H	—	—	—	D	—	
6.43	7-12-48	—	—	6	4- 7-47	D	—	See well log.
6.31	7-28-48	H	—	6	—	D	—	Do.
9.42	7-28-48	H	—	8	—	D	—	Do.
4[a]	—	E	5	8	—	D	—	
80[a]	10-15-47	C, E	—	4	10-15-47	D	—	Do.
9.43	8-18-48	H	—	6	5- 6-47	D	—	Do.
15.11	6-18-46	C, E	—	—	—	D	—	
5[a]	—	I, E and H	—	—	—	D	57	See chemical analysis.
5.43	6-20-46	N	—	—	—	N	—	
—	—	C, E	—	—	—	—	—	Do.
18	6-29-46	I, E	—	—	—	D	—	Measured depth of well 39.2 feet. See chemical analysis.

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Ef 6	Charles B. Eckloff	Leatherbury	1938	10	Drilled	22	2	Pleistocene (?)
Ef 7	Triton Beach Club	do	1941	5	do	40	2	Nanjemoy (?)
Ef 8	Do	do	1941	5	do	40	2	do
Ef 9	Do	do	1941	5	do	40	2	do
Ef 10	Do	do	1941	5	do	130	8	Aquia
Ef 11	Idlewilde Hotel	Wilde	1945	5	do	180	2	do
Ef 12	Idlewilde Development Co.	Leatherbury	1935	10	do	175	1½	do
Fc 1	Morgan B. Wayson	Leatherbury	1939–40	45	Drilled	120	6	Aquia
Fc 2	G. A. Prout	—	1942	150	Dug	40	48	Calvert
Fc 3	T. H. Welch	—	1941	160	do	87	60	Nanjemoy (?)
Fc 4	F. C. Krauss	Purner	1940	3	Drilled	327	2	Magothy and Raritan
Fc 5	J. W. Crosby	—	1932	90	Dug	36.5	48	Nanjemoy
Fc 6	A. L. Shepherd	Leatherbury	1947	45	Drilled	105	3	Aquia
Fc 7	Walter Hunter	do	1948	30	do	125	4	do
Fd 1	T. H. Watts	—	—	150	Dug	50–60	—	Calvert
Fd 2	C. R. Moreland	—	1880	160	do	65	60	do
Fd 3	William O'Neil	—	1940	155	do	50	48	do
Fd 4	Charles Griffith	—	1944	145	do	66.3	36	do
Fd 5	Amos Moore	—	1941	145	do	45	48	do
Fd 6	Do	—	—	125	do	22	—	do
Fd 7	James F. Faust	—	1920	90	do	72	48	Nanjemoy
Fd 8	Moody Paddy	—	—	120	do	54	48	Calvert
Fd 9	J. J. Paddy	—	—	178	Dug	60	36	Calvert
Fd 10	Board of Education	Washington Pump & Well Co.	1932	165	do	330	6	Aquia
Fd 11	Morris Powers	—	—	140	Drilled	65	48	Calvert
Fd 12	Board of Education	Leatherbury	1939–40	130	do	280	—	Aquia
Fd 13	Do	Layne-Atlantic	1949	175	do	585	8	Magothy
Fe 1	Leatherbury Bros.	Leatherbury	1940	20	Drilled	160	2	Aquia
Fe 2	W. M. Thomas Lumber Co.	do	1940	10	do	120	1½	Nanjemoy or Aquia
Fe 3	Camp Kahlert	Crandall (?)	1925	7	do	150(?)	1½	Aquia
Fe 4	Do	—	1925	5	do	150(?)	1½	do
Fe 5	Artivous Thompson	Leatherbury	1939	20	do	96.5	1½	Pleistocene or Nanjemoy
Fe 6	Francis Medley	—	—	130	Dug	62	48	Calvert or Nanjemoy
Fe 7	Leroy Ward	Phipps	1935	3	Drilled	160	1½	Aquia (?)
Fe 8	Franklin Thomas	Leatherbury	1935	5	do	400(?)	4	Magothy (?)
Fe 9	W. W. Oliff	Wilde	1926	10	do	195	1½	Aquia
Fe 10	Mrs. Julius A. Hobson	do	1923	3	do	190	2	do
Fe 11	Do	—	1922	3	do	130.4	1½	do
Fe 12	George R. Taylor	Leatherbury	1939	10	do	260	1½	do
Fe 13	James H. Rogers	Johnson	About 1900	3	do	147	1½	do
Fe 14	R. T. Brooke	Wilde	1926	4	do	156	2	do
Fe 15	Tacaro Farm	Leatherbury (?)	1937	23	do	222(?)	2	do

Continued

Static water level		Pumping equipment	Capacity of pump (gal. a min.)	Yield		Use of water	Temperature °F.	Remarks
Below land surface (feet)	Date of measurement			Rate (gal. a min.)	Date of measurement			
—	—	I, E & H	—	—	—	D	—	See chemical analysis.
5[a]	—	C, E	—	—	—	C	—	
5[a]	—	C, E	—	—	—	C	—	
5[a]	—	C, E	—	—	—	C	—	
—	—	N	—	—	—	N	—	
5[a]	—	I, E	—	—	—	C	—	
—	—	H	—	—	—	D	—	
34[a]	—	C, E	—	—	—	C, D	—	
38[a]	—	H	—	—	—	F	—	
45.0	7-10-46	C, E	—	—	—	D	—	Measured depth of well 78.6 feet.
—	—	—	—	9	7-12-46	D	60	Flowing well. Equipped with hydraulic ram. See chemical analysis.
28.1	7-12-46	H	—	—	—	D	—	
32[a]	7-14-47	C, E	4	4	7-14-47	C	—	See well log.
31[a]	3-31-48	C, E	8	8	3-31-48	D	—	Do.
—	—	H	—	—	—	F	—	
28.14	7-10-46	C, E	—	—	—	D	—	Measured depth of well 50 feet.
30	7-10-46	H	—	—	—	D	—	
32.6	7-10-46	I, E	—	—	—	D	—	
15[a]	—	C, E	—	—	—	D	—	
—	—	B	—	—	—	F	—	
13.5	7-12-46	C, E	—	—	—	D	—	Measured depth of well 64 feet.
18[a]	—	B	—	—	—	D	—	
—	—	H	—	—	—	D, F	—	
—	—	C, E	—	15+	—	S	—	
35.58	7-29-46	B	—	—	—	D	—	Measured depth of well 49 feet.
—	—	C, E	—	—	—	S	—	
—	—	I, E	—	200	5-17-49	S	—	See well log and chemical analysis
15[a]	—	I, E	—	4½	—	F	—	
6[a]	—	I, E	4	30	—	C, D	—	
—	—	N	—	—	—	N	60.5	Flowing well. Measured depth of well 63 feet.
—	—	I, E	—	—	—	—	—	Used for camp supply. Flowing well.
5.80	7-30-46	H	—	—	—	D	—	
53.60	7-30-46	B	—	—	—	D	—	
1.37	7-30-46	H	—	—	—	D	—	
—	—	N	—	18.75	7-29-46	N	60	Flowing well. See chemical analysis.
30[a]	—	H and I, E	—	—	—	D	—	
—	—	H	—	—	—	D	—	
1.48	7-30-46	N	—	—	—	N	—	
—	—	I, E	—	—	—	D	59	
10[a]	About 1900	I, E	—	5	About 1900	D	—	Well flows at high tide.
—	—	I, E	—	—	—	D	59	Do. See chemical analysis.
19.04	7-31-46	I, E	—	—	—	D	—	

TABLE 2—

Well	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Water-bearing formation
Fe 16	Tacaro Farm	Leatherbury	1937	15	Drilled	222	1½	Aquia
Fe 17	Do	do	1943	20	do	—	6	—
Fe 18	Do	do	1938	20	do	—	1½	—
Fe 19	Do	do	1939	70	do	165	1½	Nanjemoy
Fe 20	Do	do	1941	140	do	165	1½	Calvert or Nanjemoy
Fe 21	Do	do	1940	160	do	166.4	1½	Calvert (?)
Fe 22	Do	do	1946	100	do	167.35	2	Nanjemoy (?)
Fe 23	Philip Ettlestein	Wilde	1946	18	do	—	1½	—
Fe 24	Allison-Marshall	Leatherbury	1947	10	do	210	1½	Aquia (?)
Fe 25	A. Edwards	do	1947	4	do	200	2	Aquia
Fe 26	J. Anderson	do	1947	10	do	180	1½	do
Fe 27	A. Euike	do	1947	5	do	210	1½	do
Fe 28	G. G. August	do	1947	5	do	200	1½	do
Fe 29	G. E. Frazier	Ward	1949	10	do	270	1½	do
Ge 1	H. P. LeClair	Leatherbury	1936	140	Drilled	420	3	Aquia
Ge 2	J. E. Rose	Washington Pump & Well Co.	1948	5	do	325	8	do
Ge 3	N. J. Fauble	Ward	1949	30	do	315	2½–1½	do
Ge 4	E. S. Summerfield	do	1949	60	do	354	1½	do

[a]Water level reported.

Concluded

Static water level: Below land surface (feet)	Static water level: Date of measurement	Pumping equipment	Capacity of pump (gal. a min.)	Yield: Rate (gal. a min.)	Yield: Date of measurement	Use of waler	Temperature °F.	Remarks
—	—	N	—	4	—	F	59	Flowing well.
0	7-31-46	C, E	—	—	—	D, F	—	
—	7-31-46	N	—	—	—	N	—	Well formerly flowed.
—	—	C, E	—	—	—	D, F	—	
—	—	C, G	—	—	—	D	—	
—	—	C, E	—	—	—	D, F	—	
84.34	7-31-46	N	—	—	—	D	—	
16.88	7-31-46	H	—	—	—	D	—	
4.73	7-48	H	—	—	—	D	—	See well log.
6[a]	—	H	4	8	—	D	—	Do.
6.43	7-48	H	—	—	—	C	—	Do.
3.73	8-13-48	H	4	8	—	D	—	Do.
3[a]	—	H	—	8	—	D	—	Do.
6[a]	3-29-49	C	5	12	3-29-49	D	—	
140[a]	—	C, E	—	5	—	D	—	
2[a]	2-25-48	I, E	200	125	2-25-48	P	61.5	See well log and chemical analysis.
18	3-23-49	C, E	3	3	3-23-49	D	—	
50	5- 5-49	—	—	—	—	D	—	See well log.

TABLE 3

Drillers' Logs of Wells in Anne Arundel County

	Thickness (feet)	Depth (feet)
Well AA-Ac 4		
Pleistocene deposits:		
Soil	6	6
Yellow clay	19	25
Patapsco formation:		
Dry sand and gravel	125	150
Fine water-bearing sand	5	155
Medium-coarse water-bearing sand	10	165
Well AA-Ac 10		
Pleistocene deposits:		
Yellow clay and gravel	15	15
Arundel formation:		
Red clay	15	30
Yellow mixed clay	55	85
Patuxent formation:		
Yellow sand and clay (water)	10	95
Red clay	10	105
Yellow and red clay	25	130
Yellow sand and clay and gravel	23	153
Well AA-Ad 1		
Pleistocene deposits:		
Sand	15	15
Patapsco formation:		
Red clay	23	38
Conglomerate	2	40
Medium sand	23	63
Gravel (well plugged back to 65 feet)	2	65
Sand rock	6	71
Fine sand	22	93
Sand rock	18	111
Well AA-Ad 2		
Pleistocene deposits:		
Top soil and sand	6	6
Sandy clay and gravel	4	10
Patapsco formation:		
Hard red clay	6	16
Fine white sand	2	18
Soft white clay	12	30
Hard white sandy clay	17	47
Brown sand	18	65
Sand and gravel; water-bearing	30	95
White clay	12	107
Silty white sand	12	119

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Well AA-Ad 8		
Patapsco formation:		
Sandy loam	35	35
Sand	6	41
Sand and gravel	39	80
White clay	50	130
Arundel formation:		
Red clay	24	154
Patuxent formation:		
Brown clay, dark and drab, very stiff and tough	46	200
Brown clay and sand	75	275
Brown clay, sand and gravel	20	295
Sand and gravel	6	301
Sand	4	305
Brown clay	25	330
Red clay	2	332
Brown clay	18	350
White clay, sand, and gravel	27	377
Brown sandstone	8	385
Sand and gravel	5.5	390.5
Well AA-Ad 9		
Patapsco formation:		
Sandy loam	34	34
Clay and gravel	14	48
White clay	15	63
Red clay	14	77
Blue clay	13	90
Sand and clay	59.5	149.5
Well AA-Ad 10		
Patapsco formation:		
Sandy loam	20	20
Sand	9	29
Sand and gravel	9	38
White clay	9	47
Sand	55	102
Iron cemented gravel	6.5	108.5
Well AA-Ad 11		
Patapsco formation:		
Sandy loam	20	20
Coarse sharp sand	10	30
Gravel	4	34
White clay	13	47
Sand and clay	48	95
Fine sand (water)	11	106

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
White clay, sand and gravel	22	128
Sand	23	151
Arundel formation:		
Red clay	9	160
Patuxent formation:		
Brown clay	83	243
Sand	12	255
Red clay	7	262
Unrecorded	38	300
Well AA-Ad 14		
Water	9	9
Recent deposits:		
Soft river muck	8	17
Patapsco formation:		
Clay	5	22
Fine sand, trace clay	13.5	35.5
Well AA-Ad 15		
Water	24	24
Recent deposits:		
Soft river muck	8	32
Patapsco formation:		
Sand, medium to hard	9	41
Well AA-Ad 16		
Patapsco formation:		
Sandy loam	12	12
Sand and clay	58	70
Red clay	5	75
Coarse sharp sand (water)	10	85
Sand and red clay	43	128
Arundel formation:		
Red clay	42	170
Not reported	12	182
Well AA-Ad 20		
Potomac group:		
Soil	4	4
Sand and gravel	68	72
Mud and sand	13	85
Sandy white clay	40	125
Fine sand and mud	8	133
Red and white clay	12	145
Very fine sand	15	160
Muddy sand	90	250
Red clay	10	260

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Red and blue clay, tough	72	332
White clay	8	340
Green sandy clay	24	364
Fine water-bearing sand	16	380
Medium water-bearing sand	12	392
Well AA-Ad 29		
Pleistocene (?) deposits:		
Sand and gravel	19	19
Patapsco formation:		
White clay, hard and soft spots	39.5	58.5
White clay and brown sand	4	62.5
Brown sand and gravel; good water-bearing formation	9	71.5
Hard white clay	2.5	74
Sandy white clay	7	81
Sandy gray clay	10	91
Sandy white clay	21	112
Sandy white clay (a little finer)	17	129
Hard white clay with very thin layers of sand	15.9	144.9
Gravel and varicolored clay	4.6	149.5
Arundel formation:		
Hard red clay	10.5	160
Yellow clay with spots of white clay	26	186
Sandy red clay, hard	26	212
Sandy white clay, some very hard spots	56	268
Hard white clay and sandstone in streaks	26	294
Patuxent formation:		
Fine white sand	19	313
Fine white sand, packed tight; drilled slowly	17	330
Fine gray sand and clay in streaks	45	375
Medium coarse gray sand with some clay	12	387
Blue clay and sand; slow drilling	8	395
Coarse gray sand; fast drilling	5	400
Sandy blue-red clay with some gravel in it; slow drilling	26	426
Sandy blue clay; fast drilling	22	448
Sand and red clay; fast drilling	9	457
Blue clay and some sand	13	470
Gray sand, rather fine; fast drilling	19	489
Gray sand, with more sandstone than sand; slow drilling	14	503
Patuxent formation and pre-Cambrian rocks:		
Sandstone slowly changing to what appears to be rotten granite and getting harder and slower to drill	27	530
Well AA-Ad 32		
Pleistocene deposits:		
Sand	15	15

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Patapsco formation:		
Yellow clay	10	25
White clay	5	30
Coarse sand	6	36
Fine sand	12	48
White clay	10	58
Fine water sand	10	68
White clay	12	80
Coarse water sand		80
Well AA-Ad 33		
Pleistocene deposits:		
Red sand	10	10
Patapsco formation:		
White sand	10	20
Coarse sand	10	30
Fine gravel	10	40
Red clay	10	50
White clay	12	62
Red clay	8	70
Red sand	10	80
Coarse gravel	25	105
White sandy clay	40	145
Water sand	2	147
Well AA-Ad 34		
Patapsco formation:		
Yellow loam	20	20
White clay	5	25
Large gravel	5	30
Water-bearing sand		30
Well AA-Ae 4		
Pleistocene deposits:		
Sandy clay	28	28
Patapsco formation:		
Hard white clay	34.6	62.6
Sandy clay, brown streaks	20	82.6
White sand; drilled hard	5.4	88
Hard clay	1.5	89.5
Hard sand	2.5	92
Very hard clay	5	97
Fine sand	16	113
Hard and soft streaks	10	123
Sand and gravel, good	11	134
Hard white clay	6	140
Free brown sand	3.6	143.6

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Hard brown sand	2.4	146
Hard white clay	1	147
Hard sand	5	152
Sandy clay	2	154
Hard white clay	7	161
Sandy clay	3.7	164.7
Sandy clay; hard place	3.1	167.8
Sandy clay	1.4	169.2
Hard clay	9.5	178.7
Sand	.3	179
Hard clay	.5	179.5
Free brown sand	2.7	182.2
Very hard red clay	1.8	184
Sand and gravel; water-bearing	9	193
Arundel (?) formation:		
Clay	2	195
Well AA-Ae 5		
Pleistocene deposits:		
Soft yellow clay	5	5
Soft yellow sand	7	12
Soft blue clay	4	16
Soft yellow sand	3	19
Soft black mud	7	26
Patapsco formation:		
Soft white sand	9	35
Hard red and white clay	25	60
Hard red clay	18	78
Soft white sandy clay	10	88
Free white sand	34	122
Free brown sand	3	125
Free white sand	10	135
Soft white sandy clay	5	140
Hard white sandstone	4	144
Soft and hard white sandy clay	26	170
Very hard rock (sandstone)	2	172
Soft white sandy clay	5	177
Very hard rock	4	181
Hard white clay	2	183
Free sand and gravel	6	189
Well AA-Ae 11		
Pleistocene deposits and Patapsco formation:		
Blue clay	40	40
Sandy loam	29	69
Sand and gravel	6	75

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Well AA-Ae 12		
Water	21	21
Recent deposits:		
Soft river muck	6	27
Patapsco formation:		
Fine sand, clay and gravel	3	30
Sand and clay, medium-hard	6	36
Hard white clay	2.5	38.5
Well AA-Ae 13		
Water	21.5	21.5
Recent deposits:		
Soft river muck	6.5	28
Patapsco formation:		
Fine sand	2	30
Fine sand, medium-hard	5	35
Hard white clay	4	39
Well AA-Ae 14		
Water	22	22
Recent deposits:		
Soft river muck	15	37
Patapsco formation:		
Fine sand	6	43
Moderately stiff clay	9	52
Well AA-Ae 15		
Water	21.5	21.5
Recent deposits:		
Soft river muck	9.5	31
Patapsco formation:		
Fine sand, medium-hard	20.5	51.5
Well AA-Ae 16		
Water	20	20
Recent deposits:		
Soft river muck	7	27
Patapsco formation:		
Fine sand and clay	3	30
Sand and white clay	2	32
Fine sand	8	40
Well AA-Ae 18		
Pleistocene deposits and Patapsco formation:		
Clay	5	5
Sand	6	11
Clay	4	15

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Sand	5	20
Clay	8	28
Sand	7	35
Clay	53	88
Sand	47	135
Sandy clay	5	140
Sand	3	143
Sandy clay	35	178
Clay	4	182
Gravel	8	190
Well AA-Ae 19		
Pleistocene deposits:		
Sandy clay	28	28
Patapsco formation:		
Clay	34	62
Sandy clay	10	72
Sand	12	84
Clay	4	88
Sand	24	112
Sandy clay, hard and soft	12	124
Sand and gravel	11	135
Sandy clay	5	140
Sand	2	142
Sandy clay	36	178
Sand	5	183
Sand and gravel	11	194
Well AA-Ae 20		
Pleistocene deposits and Potomac group:		
Sandy clay	60	60
Clay	65	125
Sandy clay, to clay at bottom	40	165
Clay	11	176
Sand	12	188
Clay	7	195
Sand	30	225
Sandy clay	20	245
Sand and gravel	22	267
Sandy clay	13	280
Sand	22	302
Sandy clay	53	355
Sand	9	364
Clay	5	369
Sand, gravel and boulders	21	390
Clay	10	400

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Well AA-Ae 26		
Raritan and Patapsco formations:		
Topsoil	1	1
Subsoil	3	4
Yellow sand	10	14
Yellow clay	4	18
Yellow sand	16	34
Rock	1	35
White clay	2	37
Yellow clay	4	41
White sand	2	43
White clay	7	50
White sand	5	55
Well AA-Ae 27		
Patapsco formation:		
Topsoil	1	1
Yellow sand	10	11
White clay	5	16
Light gray clay	6	22
White clay and sand	10	32
White sand	12	44
White clay and sand	10	54
Well AA-Ae 28		
Patapsco formation:		
Topsoil	1	1
Yellow sand	5	6
Yellow clay	1	7
Yellow sand	6	13
White clay	12	25
Red clay	1	26
Fine sand	7	33
White clay	18	51
Coarse sand	13	64
Red clay	1	65
Red and white clay	90	155
Gray clay	15	170
Red clay	30	200
Red clay and sand	30	230
Sand	8	238
Well AA-Bb 5		
Pleistocene (?) deposits:		
Soil	3	3
Sand and gravel	27	30

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Patuxent formation:		
Blue clay with streaks of white clay	20	50
White clay	14	64
White sandy clay, some water	24	88
White clay	2	90
Red clay	42	132
Light blue clay	10	142
Stiff blue clay	6	148
Fine sand; water-bearing	4	152
Blue and pink clay	5	157
Medium-fine sand; water-bearing	21	178
Blue clay	12	190
Rock	9	199
Well AA-Bb 19		
Pleistocene deposits:		
Yellow clay	25	25
Arundel (?) and Patuxent formations:		
Blue clay	5	30
Red clay	5	35
Blue clay	3	38
Red clay	20	58
Gray clay	4	62
White clay	1	63
Water-bearing sand	9	72
Well AA-Bb 20		
Patapsco formation:		
Red sand and gravel	18	18
Soft white clay	2	20
Arundel formation:		
Hard red clay	29	49
Hard sand	10	59
Hard red clay	21	80
Patuxent formation:		
Soft white sandy clay	43	123
Hard red clay	22	145
White sand, gravel	63	208
Pre-Cambrian rocks:		
Bed rock		208
Well AA-Bb 21		
Pleistocene deposits:		
Sandy clay and gravel	15	15
Sand and gravel, water-bearing	5	20
Patuxent formation:		
Mixed clays, different colors	25	45

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Blue clay	10	55
Fine sand silt, water-bearing	5	60
White clay	15	75
Fine sand, some gravel, white clay; layers of irony rock; water-bearing	10	85
Fine sand, gravel and clay; irony layers of rock, all red; water-bearing	5	90
Red clay	35	125
Streak of mixed sand and clay	2	127
Red clay	8	135
Mixed clays	8	143
Gray shaly rock	10	153
Sand and gravel, some peat, water-bearing	7	160
Well AA-Bb 22		
Patuxent formation:		
Topsoil and surface sand	5	5
Hard gray and white clay with sand	36	41
Brown sand, fine at top, coarser at bottom	10.5	51.5
Coarse sand and gravel	9	60.5
Granite		60.5
Well AA-Bc 1		
Raritan and Patapsco formations:		
Loose yellow sand	48	48
Free sand and clay streaks	4.5	52.5
Light gray clay	5.5	58
Hard red and white clay	13	71
Softer red and white clay	24	95
Sandy clay and free streaks	29	124
Very free fine yellow sand	10	134
Clay	5.5	139.5
Free sand	30.5	170
Clay	.5	170.5
Very free sand	3	173.5
Clay	1	174.5
Well AA-Bc 11		
Raritan and Patapsco formations:		
Clay	32	32
Brown sand	3	35
Red clay	50	85
Fine sand	32	117
Coarse sand; water-bearing	6	123
Fine sand	4	127

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Well AA-Bc 21		
Raritan and Patapsco formations:		
Sand	30	30
Clay	30	60
Sand; water-bearing	15	75
Clay	10	85
Sand; water-bearing	11	96
Well AA-Bc 28		
Pleistocene deposits:		
Sandy soil, gravel	5	5
Arundel and Patuxent formations:		
Varicolored clays	10	15
Red clay	9	24
Varicolored clays	6	30
Sandy layers and clay	5	35
Red clay	15	50
Mixed clays	5	55
Red clay	5	60
Brown and white clay	5	65
Yellow sandy clay	5	70
Red and brown clay	4	74
Red clay; some coarse sand	21	95
Brown and yellow clay	15	110
Yellow loam	15	125
Fine sands and clays; water-bearing	7	132
Mixed clays, mostly red	58	190
Yellow and white sand and clay	14	204
White sand, sand crust; water-bearing	6.5	210.5
Well AA-Bc 30		
Pleistocene deposits, Raritan and Patapsco (?) formations:		
Sand	6	6
Yellow clay	20	26
White clay and gravel	24	50
White clay	30	80
Coarse sand	30	110
Yellow clay	25	135
Water-bearing sand	10	145
Hard white clay	3	148
Well AA-Bc 31		
Pleistocene deposits:		
Sand and gravel	10	10
Patapsco formation:		
Iron ore	15	25

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Yellow sand and gravel	10	35
Yellow sand	40	75
Red clay	10	85
Water-bearing sand	6	91
Well AA-Bd 1		
Patapsco formation:		
Clay	42	42
Fine sand	23	65
Well AA-Bd 2		
Pleistocene deposits:		
Sandy (surface)	7	7
Patapsco formation:		
Clay	1	8
Sand, streaks of clay	23	31
White clay	5	36
Sand, white	25	61
Sand, some gravel	2	63
White clay	9	72
Free sand, reddish	19	91
Well AA-Bd 5		
Pleistocene (?) deposits and Patapsco formation:		
Red clay	40	40
Pink clay	12	52
Blue clay	7	59
Blue sand, water-bearing	6	65
Blue clay	1(?)	66
Brown clay	19(?)	85
Green clay and sand	13(?)	98
Black clay	7	105
Brown clay	16	121
Red clay	2	123
Red sand	1	124
White clay	3	127
Hit white sand; water-bearing	(?)	131
Well AA-Bd 8		
Pleistocene deposits:		
Gravel and sand	9	9
Patapsco formation:		
Red clay	2	11
Gray water-bearing sand	24	35
Blue clay	24	59
Brown clay	4	63
Pink clay	8	71

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Red clay	4	75
White clay	1	76
Water sand, white	1	77
Hard sand	3	80
Yellow sand; water-bearing	1	81
Well AA-Bd 20		
Patapsco formation:		
Sand	20	20
Yellow clay	20	40
Water sand	5	45
White clay	15	60
Coarse sand; water-bearing	15	75
Well AA-Bd 23		
Patapsco formation:		
Surface soil	2	2
Light brown clay	4	6
Red clay mixed with gravel	26	32
Red clay	8	40
White chalky clay	23	63
Blue clay	7	70
Red clay	12	82
Red clay mixed with white	19	101
Coarse water-bearing sand	11	112
White clay	1	113
Coarse water-bearing sand	12	125
Red clay	13	138
Blue clay	12	150
White clay	53	203
Red and white clay; gravel in streaks	33	236
Blue clay	34	270
Sand and gravel	8	278
Arundel formation:		
Yellow clay	20	298
Red clay and streaks of sand	32	330
Red clay and brown clay mixed	81	411
Patuxent formation:		
Fine water-bearing sand	31	442
Fine white water-bearing sand	25	467
Red clay	9	476
Fine water-bearing sand	20	496
Blue and brown clay	26	522
Fine mucky gray sand	10	532
Blue and red clay	5	537
Coarse sand	7	544
Sand	11	555

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Blue and red clay	5	560
Sand and gravel	8	568
Coarse water-bearing sand	24	592
Red clay	4	596
Coarse sand and gravel	11	607
Red clay	10	617
Well AA-Bd 24		
Raritan and Patapsco formations:		
Surface sand	17	17
White clay	10	27
White sand	5	32
Red clay	30	62
Blue slate	14	76
Red clay	20	96
Blue slate	10	106
Sand	14	120
Well AA-Bd 25		
Raritan and Patapsco formations:		
Yellow clay	18	18
White clay	5	23
Sandy clay	5	28
Water sand	2	30
Sandy clay	8	38
White clay	4	42
Heavy sand	10	52
White clay	7	59
Rock	1	60
Gravel	3	63
White clay	11	74
Coarse water-bearing sand	2	76
Well AA-Bd 26		
Raritan and Patapsco formations:		
Red clay	30	30
White clay	11	41
Sandy loam	19	60
White clay	11	71
Coarse sand	2	73
Well AA-Bd 27		
Magothy, Raritan and Patapsco formations:		
Coarse sand	20	20
Loam	5	25
Sand	10	35
Water sand	5	40

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Yellow clay	10	50
Red clay	30	80
Dark brown clay	10	90
Sand rock	5	95
Not reported	10	105
Well AA-Bd 28		
Pleistocene deposits, Raritan and Patapsco formations:		
Surface sand	5	5
Hard gray sand	12	17
White clay	8	25
Loose sand	15	40
Hard sand	12	52
White clay	12	64
Water sand	4	68
Well AA-Be 4		
Patapsco formation:		
Sand	17	17
Red clay	73	90
Sand	2	92
Clay	25	117
Sand	8	125
Well AA-Be 6		
Raritan and Patapsco formations:		
Not reported	60	60
Red clay	35	95
White sand; water-bearing	5	100
Blue clay	25	125
Iron-crusted sand	1	126
White clay	3	129
Sand	2	131
Sandy clay. (Sample bailed out at 132 feet consisted of red sand, balls of red and blue clay, and small pieces of lignite.)	14	145
Well AA-Be 7		
Raritan and Patapsco (?) formations:		
Loam	3	3
Yellow clay	6	9
Fine sand	8	17
White sand	9	26
Coarse sand	10	36
Fine sand	10	46
Red clay	2	48
Fine sand	6	54

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
White clay	3	57
Fine sand	10	67
Yellow clay	3	70
Fine sand	10	80
Yellow clay	1	81
Fine sand	11	92
Coarse sand	7	99
Well AA-Be 8		
Patapsco formation:		
Sand	17	17
White clay	1	18
Red clay and sand	2	20
Bright red clay	8	28
Terra cotta clay	5	33
Bright red clay	2	35
Red and white clay mixed	29	64
Bright red clay	10	74
Red and white clay mixed	22	96
White clay	3	99
Bright red clay	15	114
Sand and clay mixed	22	136
Fine sand	19	155
Not reported	2	157
Well AA-Be 9		
Patapsco formation:		
Topsoil	1	1
Sandy loam	3	4
White sand	1	5
Yellow sand	1	6
Sand, red clay, and gravel	4	10
Yellow sand (3 inch charcoal)	10	20
White clay	2	22
Red clay	5	27
Yellow clay	7	34
Yellow sand and clay	1	35
Tan clay	4	39
Light yellow clay	1	40
Red clay	4	44
Fine sand	1	45
Tan clay	4	49
Fine sand	1	50
Red clay	2	52
Pink clay	6	58
Red clay	6	64
Tan clay	1	65

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Bright red clay	15	80
Fine sand	5	85
Bright red clay	20	105
Fine sand	5	110
Tan clay	3	113
Bright red clay	2	115
Fine white sand	30	145
Coarse sandy gravel	1	146
Well AA-Be 10		
Raritan and Patapsco formations:		
Yellow clay	10	10
Fine sand	10	20
Gray clay	7	27
White clay	4	31
Red clay	2	33
Dark-yellow clay	2	35
Yellow clay	1	36
White clay	2	38
Yellow clay	1	39
Red clay	2	41
Fine sand	9	50
White clay	2	52
Coarse sand	2	54
White clay	2	56
Yellow clay	4	60
Yellow sand	10	70
White clay	5	75
Red clay	3	78
Sand	1	79
White clay	3	82
Yellow sand	1	83
White clay	4	87
Coarse sand	3	90
Not reported	?	?
Well AA-Be 11		
Patapsco formation:		
Topsoil	1	1
Sandy loam	2	3
Yellow sand	6	9
Red clay and sand	2	11
Red clay	18	29
Brown clay and sand	6	35
Red clay	4	39
Gray clay	4	43
Red and white clay	6	49

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Red clay	12	61
Bright red clay	8	69
Yellow sand	1	70
Fine white sand	26	96
Well AA-Be 19		
Raritan and Patapsco (?) formations:		
Yellow sand	20	20
Yellow clay	2	22
Yellow sand	4	26
Yellow clay	1	27
Yellow sand	5	32
White clay	3	35
Yellow clay	5	40
Reddish coarse sand	2	42
Well AA-Be 35		
Patapsco formation:		
Red and white clay mixed	19	19
Red clay	15	34
Pink clay	11	45
Bright red clay	5	50
Tan clay	7	57
Bright red clay	3	60
Fine sand	1	61
Red clay	4	65
Tan clay	5	70
Fine sand	1	71
Red clay	3	74
Tan clay	4	78
Fine sand	21	99
Coarse sand	1	100
Well AA-Be 44		
Patapsco formation:		
Not reported	70	70
Fine white sand	20	90
Red clay	4	94
Coarse sand	4	98
Well AA-Be 47		
Patapsco formation:		
Topsoil	1	1
Brown sand and clay	15	16
White clay	2	18
Gravel and red clay	6	24
Bright red clay	50	74

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Tan clay	6	80
Fine sand	1	81
Gray clay and sand	13	94
Red clay	2	96
Rock	1	97
Sand	1	98
Rock	1	99
Sand and gray clay	30	129
Red clay and sand	2	131
Bright red clay and sand	1	132
Sand	15	147
Well AA-Bc 48		
Patapsco formation:		
Topsoil	1	1
Red clay and sand	3	4
Yellow clay and sand	2	6
Light gray clay	3	9
Dark gray clay	6	15
Red and white clay	6	21
Tan clay	7	28
Yellow clay and sand	4	32
Red clay	8	40
Tan clay	4	44
Red and white clay	16	60
Red clay	5	65
Tan clay	2	67
Gray clay	2	69
Gray clay, sand, and charcoal	71	140
Tan clay	7	147
Gray clay	6	153
Red clay	4	157
Red clay and sand	2	159
Tan clay	1	160
Bright red clay and sand	4	164
Fine sand	2	166
Red clay	16	182
Fine sand	11	193
Coarse sand	1	194
White clay	4	198
Light yellow clay	1	199
Pink clay	3	202
White clay and sand	10	212
White sand	8	220
Red clay	1	221
Orange clay	1	222
Bright red clay	3	225

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Fine sand	1	226
White clay and sand	5	231
Tan clay	1	232
Red clay	2	234
White clay and sand	10	244
White sand	10	254
Well AA-Be 50		
Raritan and Patapsco formations:		
Not reported	15	15
Gray clay	13	28
Rock	1	29
Yellow sand	4	33
Rock	1	34
Coarse sand and gravel	15	49
Rock	10	59
Yellow sand	2	61
White clay and sand	8	69
Red clay	1	70
White clay and sand	14	84
Red clay	1	85
White sand	12	97
Well AA-Be 51		
Raritan and Patapsco (?) formations:		
White sand	5	5
Brown clay, sand	18	23
White clay	4	27
Yellow sand; water-bearing	1	28
White clay	7	35
Yellow sand	5	40
Blue clay	8	48
White clay	5	53
Yellow sand; water-bearing	4	57
Well AA-Be 52		
Pleistocene deposits:		
Topsoil	1	1
Yellow sand	3	4
Rock	1	5
Patapsco formation:		
Red and white clay	10	15
Bright red clay	25	40
White clay	4	44
Pink clay	13	57
Bright red clay	3	60
Tan clay and sand	4	64
Red clay	4	68

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Tan clay	18	86
Gray clay and sand	28	114
Rock	1	115
Brown clay	19	134
Fine sand	6	140
Bright red clay	2	142
Fine sand	16	158
Well AA-Be 53		
Magothy formation:		
Sand	20	20
Raritan and Patapsco (?) formations:		
Fuller's earth	6	26
Sand	30	56
White mud	20	76
Sand	24	100
White mud	15	115
Coarse sand	15	130
Water sand	15	145
Well AA-Be 55		
Raritan and Patapsco (?) formations:		
Sand	20	20
Red clay	30	50
Water-bearing sand	13	63
Well AA-Be 56		
Raritan and Patapsco (?) formations:		
Sand and fuller's earth	80	80
Clay	14	94
Sand	14	108
Well AA-Be 57		
Patapsco formation:		
Red clay	88	88
Sand	4	92
White clay	28	120
Water sand	8	128
Well AA-Be 58		
Magothy formation:		
Surface clay and stone	5	5
Raritan and Patapsco formations:		
Brown sand	60	65
White clay	35	100
White sandy clay	18	118
White hard clay	12	130
Hard streaks of red clay	3	133

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Sandy white clay	7	140
Hard red clay	20	160
Red clay, soft in spots	55	215
Fine water-bearing sand in streaks and white clay, mixed	25	240
White clay and sandstone in streaks	65	305
Fine water-bearing sand and some gravel mixed	21	326
Hard red clay	42.5	368.5
Blue clay, soft in spots	18.5	387
Medium hard blue clay	25	412
White and red streaks in spots	54	466
Water-bearing sand and gravel	28	494
Arundel (?) formation:		
Hard red clay		494+
Well AA-Bf 2		
Raritan and Patapsco formations:		
Yellow fine sand	40	40
Red and brown clay	235	275
Coarse sand	80	355
Fine sand	5	360
Well AA-Bf 6		
Pleistocene deposits:		
Sand	4	4
Raritan and Patapsco formations:		
Clay	19	23
Iron ore	2	25
Sand	9.5	34.5
Sandy clay	40.3	74.8
Sand; water-bearing	3	77.8
White clay	23.2	101
Sand	10	111
Clay	4	115
Free sand	6	121
Yellowish clay	26	147
Clay, some sand	14	161
Water-bearing sand	19	180
Clay	9	189
Sand	1	190
Clay	23	213
Sandy clay	11	224
Sand; water-bearing (2 feet free)	9	233
Red clay	26	259
Water-bearing sand, free	17	276
Well AA-Bf 10		
Raritan and Patapsco formations:		
Hard white sand	20	20

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Hard white clay	2.5	22.5
Coarse yellow sand	2	24.5
Free white sand	5.5	30
Yellow sand, not free	24	54
Hard white sandy clay	18	72
Free yellow and white sand	8	80
Hard white sandy clay	15	95
Hard dark gray clay	5	100
Hard white sandy clay	5	105
Hard red sandy clay	20	125
Free red sand	16	141
Hard white clay	2	143
Red sand, not free	7	150
Hard red clay	1	151
Hard white clay	3	154
Yellow sand, not free	6	160
Tough red clay	75	235
Soft brown clay	31	266
Soft red sandy clay	9	275
Free red sand	2	277
Soft red clay	2	279
Soft brown clay	9	288
Tough red clay	7	295
Hard white sand	95	390
Free white sand	41	431
Well AA-Bf 13		
Raritan formation:		
Not reported	33	33
Hard white clay		33
Not reported	7	40
White clay	12	52
Sand; water-bearing	4	56
Well AA-Bf 18		
Raritan formation:		
Mud	6	6
Coarse sand	3	9
Yellow clay	20	29
Fine sand	2	31
Yellow clay	6	37
White clay	4	41
Yellow clay	15	56
Fine sand	2	58
Yellow clay	4	62
Fine sand	2	64
Yellow clay	3	67
Fine sand	3	70

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
White clay	10	80
Coarse sand	5	85
Well AA-Bf 19		
Raritan formation:		
Topsoil	1	1
Light cream-colored clay	5	6
Bright yellow clay	1	7
White sand and yellow clay	27	34
White sand	8	42
Yellow clay and sand	10	52
White sand	4	56
Well AA-Cc 6		
Monmouth (?) and Matawan formations:		
Sand and gravel	20	20
Soft black clay	40	60
Magothy formation:		
Brown sand and gravel	62	122
Raritan formation:		
Red and white clay	4	126
Brown sand and gravel	17	143
Fine yellow sand	20	163
White clay	2	165
Brown and gray medium water-bearing sand	6	171
Well AA-Cc 20		
Patapsco formation:		
Blue clay	30	30
Yellow sand	10	40
Red clay	50	90
Yellow clay	5	95
Red clay	33	128
Fine sand	5	133
White clay	2	135
Water-bearing sand	8	143
Well AA-Cc 22		
Matawan formation:		
Rusty rock in layers	6	6
Brown sand, dry	6	12
Rusty sand, dry	5	17
Dark blue clay, soft	33	50
Magothy formation:		
Coarse sand	15	65
Coarse sand and gravel; water-bearing	19	84
White clay, medium	6	90
Coarse sand	15	105

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Raritan and Patapsco (?) formations:		
White and red clay, sand in streaks	12	117
Coarse water-bearing sand	13	130
Fine sand	18	148
Light blue sand, white streaks, blue clay	18	166
Well AA-Cd 5		
Magothy formation:		
Not reported	4.4	4.4
Layer of rock	.6	5
Sandy	16	21
Raritan and Patapsco formations:		
Streaks of white clay	2	23
Sand; seeping water at 65 and 100 feet	95	118
Red clay	3	121
Mixed clay and loam	15	136
Water-bearing sand	6	142
Well AA-Cd 6		
Monmouth and Matawan formations:		
Sandy clay	47	47
Yellow sand	5	52
Black marl	26	78
Mud and sand	5	83
Black marl	9	92
Iron pyrites	10	102
Magothy formation:		
Yellow sand and gravel	40	142
Raritan formation:		
White clay	5	147
Water-bearing sand and gravel	6	153
Well AA-Cd 7		
Matawan and Magothy formations:		
Brown sand	42	42
Raritan formation:		
White clay	6	48
Brown sand	15	63
White clay	2	65
Brown sand	11	76
Yellow sand	11	87
White clay	3	90
Water-bearing sand	7	97
Well AA-Cd 10		
Pleistocene deposits and Aquia formation:		
Yellow sandy clay	50	50

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Monmouth and Matawan formations:		
Lead colored sandyclay	90	140
Magothy, Raritan and Patapsco formations:		
Sand, gravel, with hard places	92	232
Clay	16	248
Sandy	7	255
White hard clay with gravel in it	24	279
Not reported	29	308
Hard clay	7	315
Softer clay	9	324
Sand	6	330
White clay	5	335
Sandy	10	345
Hard sand	3	348
Clay	1	349
Sand; water-bearing	39	388
Hard	13	401
Red clay	6	407
Iron ore	45	452
Drilled like rock	89	541
Hard, then sand	3	544
Red, changing to gray, clay	92	636
Rock 2 inches, then sand	12	648
Hard clay	2	650
Soft clay	2	652
Coarse sand and water	16	668
Well AA-Cd 11		
Aquia (?) formation:		
Yellow or tan sandy clay	18	18
Monmouth and Matawan formations:		
Soft black mud	20	38
Gray sand	10	48
Slate colored clay	83	131
Magothy and Raritan Formations:		
Hard sandy clay	5	136
Sand and gravel, hard streaks	19	155
White gravel and sand	4	159
Hard streaks of white clay with streaks of gravel and sand	8	167
Hard gravel and clay, almost rock	2	169
White sand and gravel, tight	9	178
Hard white clay	3	181
Sand, free	2	183
Gravel, not free	2	185
White clay	1	186
White sand	2	188
Hard white clay	3	191

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
White free sand	2	193
Hard white clay	1	194
Free white sand mixed with gravel	37	231
Clay	1	232
Well AA-Cd 12		
Aquia (?) formation:		
Yellow sandy clay	17	17
Monmouth and Matawan formations:		
Black soft clay	22	39
Gray sandy clay	11	50
Dark clay	55	105
Gray sand	2	107
Hard sandy clay	25	132
Hard clay	5	137
Magothy and Raritan formations:		
Hard white sand and gravel	18	155
Hard white sand and gravel with clay streaks	12	167
White sand and gravel	13	180
Hard white clay	2	182
Free sand	2	184
Gravel	2	186
White clay	.5	186.5
White sand	1.5	188
Hard white clay	3	191
Free white sand	2.1	193.1
Hard white clay	.9	194
Free white sand and gravel	25	219
Well AA-Cd 25		
Raritan and Patapsco formations:		
Surface	3	3
Hard sand	17	20
White mud	22	42
Sand	5	47
White mud	10	57
Sand	15	72
Red sand	12	84
White mud	14	98
Sand	15	113
Water sand	12	125
White mud	1	126
Well AA-Cd 26		
Raritan and Patapsco formations:		
Hard sand	35	35
White mud	11	46

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Coarse blue sand	5	51
Gravel bed	9	60
Settling sand	12	72
White mud	15	87
Sand	3	90
White mud	7	97
Coarse water-bearing sand	13	110
Well AA-Cd 27		
Magothy formation:		
Yellow clay	16	16
Rock	11	27
Gravel	4	31
White clay	8	39
Sand	10	49
Raritan formation:		
Red clay	10	59
Water sand	5	64
Fine gravel	4	68
Well AA-Cd 28		
Pleistocene deposits:		
Yellow loam	12	12
Magothy, Raritan and Patapsco (?) formations:		
Sand, rock	8	20
Yellow sand	20	40
White clay	5	45
Fine sand	5	50
Coarse sand	20	70
White clay	30	100
Coarse sand and gravel	7	107
White clay	18	125
Water		125
Well AA-Cd 29		
Magothy formation:		
Clay	5	5
Sand	18	23
Raritan formation:		
Black clay	24	47
Sand	23	70
White clay	19	89
Water sand	4	93
White clay	2	95
Well AA-Ce 4		
Raritan and Patapsco formations:		
Sandy clay	7	7

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Sandy	23	30
Loam	40	70
White clay	15	85
Loam, fine sand	2	87
Medium sand	5	92
Coarse sand	6	98
Fine sand	8	106
Well AA-Ce 5		
Matawan formation:		
Yellow sandy soil	22	22
Black marl	46	68
Magothy (?) formation:		
Black sand	17	85
Magothy formation:		
White water-bearing sand	7	92
Well AA-Ce 6		
Matawan and Magothy formations:		
Topsoil	1	1
Light brown sand	5	6
Greenish gray sand	21	27
Bright yellow sand	8	35
Greenish white sand	8	43
Brown sand and charcoal	2	45
Rock	.5	45.5
Dark gray clay	7	52.5
Gray clay	8	60.5
Rock	.5	61
Raritan and Patapsco (?) formations:		
Brown and white sand	1	62
White sand	3	65
White clay	2	67
Coarse sand and clay	13	80
White sand	21	101
Gray sand	2	103
White clay	3	106
White sand	15	121
Green sand	4	125
White clay	2	127
White sand	13	140
White clay	2	142
White sand	13	155
White clay	2	157
White sand	13	170
Well AA-Ce 50		
Pleistocene deposits and Magothy formation:		
Loam	4	4

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Red sand	6	10
Yellow sand	7	17
Red sand	2	19
Gray clay	6	25
Fine sand	10	35
Blue clay	10	45
Sandstone	3	48
Black clay	1	49
Sandstone	3	52
Fine gray sand	6	58
Coarse gray sand	1	59
Gray clay	7	66
Coarse sand	2	68
Well AA-Ce 51		
Matawan formation:		
Sandy yellow clay	12	12
Gray clay	18	30
Soft blue clay	10	40
Hard blue clay	7	47
Magothy formation:		
Coarse sand; water-bearing	13	60
Well AA-Ce 52		
Pleistocene (?) deposits and Aquia formation:		
Hard yellow clay	17	17
Hard yellow clay, soft in spots	8	25
Brown sandstone, hard in spots	20	45
Brown sandy clay, soft in spots	33	78
Monmouth and Matawan formations:		
Fine blue mucky sand	122	200
Magothy, Raritan and Patapsco formations:		
Very hard sandstone	9	209
Soft, fine, mealy sand	79	288
Blue clay and streaks of rock	4	292
White clay and streaks of rock	12	304
White sand and streaks of white clay	14	318
Sandy clay, hard in spots	19	337
Hard red clay	33	370
Soft white clay	19	389
Red clay	6	395
White sand and streaks of red clay	31	426
Red clay streaked with white	11	437
Fine white sand; water-bearing	32	469
Medium coarse sand; water-bearing	8	477
Hard red clay	15.5	492.5

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Well AA-Cf 1		
Matawan and Magothy formations:		
Light red clay	15	15
Sandy clay	28	43
Hard red clay	10	53
Sandy white clay	27	80
Raritan and Patapsco formations:		
Red clay	5	85
White sand	5	90
White sandy clay	30	120
Red clay	32	152
Hard sand	7	159
Sandy clay with wood	7	166
Red clay	4	170
Hard sand	11	181
Sandy clay with gravel	16	197
White clay	23	220
Yellow clay	11	231
Sandy white clay	29	260
Red clay	15	275
Fine sand	10	285
Red clay	1	286
White clay	8	294
White sand	28	322
Well AA-Dc 5		
Pleistocene deposits:		
Top soil	5	5
Yellow clay	12	17
Aquia, Monmouth and Matawan formations:		
Hard brown sandy clay	9	26
Soft muddy sand	32	58
Brown sandy clay	10	68
Dark gray sandy mud	16	84
Hard black gummy mud	68	152
Magothy formation:		
Fine gray sand	3	155
Hard rough streak	1	156
Hard coarse gray sand; trace of rotten wood and chunks of gray clay	26	182
Hard coarse gray sand and small gravel with thin layers of gray clay	18	200
Hard coarse gray sand	15	215
Hard fine gray sand	8	223
Raritan formation:		
Hard white clay	2	225
Medium to fine gray sand	10	235

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Hard white clay	2	237
Medium coarse gray sand	19	256
White clay	7	263
Well AA-Dd 17		
Aquia formation:		
Sandy with brown clay	40	40
Brown clay	13	53
Brown sand with some iron ore lenses; water-bearing	25	78
Well AA-De 3		
Monmouth and Matawan formations:		
Red sand	3	3
Fine black sand	12	15
Fine gray sand; water-bearing	31	46
Black muck	26	72
Gray sand	8	80
Soft clay	11	91
Hard black clay	17	108
Muck	7	115
Magothy and Raritan formations:		
Fine sand	18	133
Sand and wood	5	138
Sand; water-bearing	25	163
Hard sand	4	167
Sand, hard streaks	49	216
Sand and clay	17	233
Sand	11	244
Well AA-De 44		
Monmouth and Matawan formations:		
Surface sand and clay	5	5
Gray sand	15	20
Sandy blue clay	20	40
Blue clay with imbedded gravel	21	61
Sandy blue clay	30	91
Soft sandy blue silt	22	113
Brown and yellow sandy clay	2	115
Sand and gravel with streaks of blue clay	7	122
Gray sand	9	131
Blue clay	6	137
Magothy, Raritan and Patapsco formations:		
Gray sand and wood	14	151
Gray sand and more wood	20	171
Gray sand and less wood	13	184
Coarse gray sand	17	201
Coarse gray sand and wood	11	212

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Coarse gray sand	22	234
Fine gray sand	8	242
Sand and gravel; water-bearing	29	271
Varicolored clay; hard slow drilling	148	419
Gray sand with layers of red clay; water-bearing	69	488
Hard sandstone; iron pyrite	7	495
Red clay imbedded with sand and gravel	12	507
Red clay	15	522
Varicolored clay	50	572
Gray sand and streak of clay	18	590
Red clay	44	634
Red sandy clay	10	644
Brown sandy clay	18	662
Varicolored sandy clays	64	726
Varicolored clays	24	750
Sand and gravel; water-bearing	42	792
Hard rock. "Granite"	1	793
Well AA-De 46		
Monmouth and Matawan formations:		
Red sandy clay	8	8
Yellow sandy clay	13	21
Fine gray sand	14	35
Fine blue sand	39	74
Blue mucky clay	56	130
Magothy and Raritan formations:		
Coarse sand and gravel. Wood	30	160
Fine mucky sand	34	194
Coarse sand	48	242
Hard coarse sand	6.7	248.7
Fine yellow sand	11.3	260
White, blue-gray, and some reddish-brown clay	15	275
White, gray, and red clay, sand and gravel	25	300
Well AA-De 47		
Monmouth and Matawan formations:		
Sand and muck	50	50
Hard clay	20	70
Black muck and wood	20	90
Fine sand	30	120
Clay	8	128
Magothy and Raritan formations:		
Sand	16	144
Sand	25	169
Sand rock	3	172
Sand	18	190
Hard sand	26	216

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Soft sandy clay	22	238
Sand and gravel	20	258
Well AA-Df 2		
Recent Deposits:		
Made ground	20	20
Aquia, Monmouth and Matawan formations:		
Dark sand and clay	120	140
Tough clay	40	180
Magothy formation:		
Sand; water-bearing	40	220
Raritan and Patapsco formations:		
Tough clay	30	250
Fine sand; water-bearing	20	270
Coarse sand	36	306
Sand with water	109	415
Crust of iron ore	20	435
Sand and water	30	465
Hard shell of iron ore		465
Sand with water; hard crust of iron ore at 510 feet	45	510
Dark blue clay; hard crust of iron ore at 524 feet	6	516
Red or pink clay; hard crust of iron ore at 545 feet	32	548
Yellow sand and water	18	566
Coarse sand and water	17	583
Pink clay	4	587
Coarse sand and gravel, pebbles ½ inch in diameter	14	601
Well AA-Df 3		
Recent deposits:		
Made ground, brown, soft	10	10
Aquia formation:		
Soft black clay	2	12
Soft black and brown sand	8	20
Soft brown clay	30	50
Monmouth and Matawan formations:		
Soft nearly black sand	4	54
Soft dark gray clay	76	130
Tough dark gray clay	7	137
Soft gray sand rock	10	147
Soft dark gray sand	1	148
Soft dark gray clay	4	152
Magothy, Raritan and Patapsco formations:		
Free, white sand; water-bearing	28	180
Coarse, white sand, free; water and wood, streaks of clay at 217 feet	20	200
Gray sandy clay; hard and soft	35	235
Free gray sand; water with wood	45	280

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Tough red clay	26	306
Tough pink clay	10	316
Tough yellow clay	4	320
White very sandy clay, soft; flowing water	5	325
White very sandy clay; not so soft	21	346
Free, white sand; flowing water	4	350
Free red sand	20	370
Tough red clay	5	375
Drab clay	6	381
Tough gray clay	3	384
Soft pink sandy clay	9	393
Free white sand	11	404
Soft white clay; water-bearing	9	413
Soft red clay; a tough streak at 418 feet	5	418
Free white sand	5	423
White sand; not so free	11	434
Soft pink sandy clay	15	449
Soft white sandy clay	5	454
Very sandy clay; a crust of iron ore at 462 feet	10	464
Hard red clay	4	468
Soft red and white sandy clay	10	478
Hard red clay	1	479
Free white sand	13	492
Soft and hard white sandy clay	12	504
Free and coarse drab sand; water-bearing	38	542
Free reddish sand	7	549
Soft white sandy clay; mostly sand with hard streaks	24	573
Soft pink clay	1	574
Free pink sand	10	584
Tough red clay	3	587
Hard sand; iron and boulders	7	594
Free reddish sand; water-bearing	8	602
Well AA-Df 4		
Recent deposits:		
Fill	10	10
Aquia formation:		
Reddish clay with streaks of iron ore	50	60
Monmouth and Matawan formations:		
Black sand	15	75
Green sandy marl, hard in places	50	125
Dark gray clay	28.7	153.7
Hard sandstone	.3	154
Soft dark green clay	1	155
Tough dark green clay	20	175
Sandy dark green clay	13	188

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Magothy, Raritan and Patapsco formations:		
White free sand with water	62	250
Gray clay	10	260
White sand with streaks of clay	48	308
Tough red clay	12	320
Pink clay	10	330
Sandy white clay	45	375
Sandy red clay	5	380
Tough red clay	10	390
Sandy pink clay	56	446
Red clay	9	455
Sandy pink clay	5	460
Tough white clay	6	466
Tough red clay	2	468
Red clay	4.5	472.5
Iron ore	.2	472.7
Sandy red clay	3.3	476
Tough red clay	3	479
Hard white sand	1	480
Soft sandy pink clay, almost free sand	32	512
White clay	8	520
Free drab sand; water-bearing	15	535
Pink clay	6	541
Pink sand	4	545
Pink clay	2	547
Purple sand	3	550
Sandy pink clay	21.5	571.5
Iron ore	.5	572
Free drab sand, water runs away freely	12	584
Pink clay	2.5	586.5
Hard boulders with gravel and sand in between	6.5	593
Reddish sand with water; rock	9.7	602.7
Well AA-Df 7		
Aquia formation:		
Soft black sand	15	15
Soft river mud	5	20
Sand and clay	30	50
Monmouth and Matawan formations:		
Sand and clay, tough	40	90
Fine gravel, hard	10	100
Dark clay and sand, hard	5	105
Blue clay and sand, hard	30	135
Black sand, some clay, tough	2	137
Iron pyrites, hard	1	138
Blue clay, some sand, tough	22	160

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Magothy, Raritan and Patapsco formations:		
Sand	10	170
Water-bearing sand; easy drilling	26	196
Water-bearing sand and wood; flowing 100 g.p.m. at 217 feet	23	219
Pink sand and clay; easy drilling, small flow of water	3	222
Soft gray sand	8	230
Hard dark sand and wood	26	256
Hard dark sand	41	297
Coarse yellow sand,	3	300
Red clay and some sand, tough	4	304
Yellow clay and some sand, tough	26	330
Soft yellow clay	17	347
Soft yellow sand	13	360
Tough red clay	16	376
Hard red and brown clay	8	384
Tough red clay	6	390
Drab clay and sand	26	416
Soft white clay and water sand	24	440
Extremely hard red clay	6	446
Hard light brown sand	14	460
Hard red clay	13	473
Chocolate colored sand	14.7	487.7
Hard red sand	3.3	491
Water sand, soft	19	510
Red clay and sand, hard	11	521
Red sand, soft	16	537
Light brown sand; water-bearing	10	547
Hard red sandy clay	9	556
Light colored sand; water-bearing	12	568
Salt-and-pepper sand; water-bearing	14	582
Extremely hard solid rock	3.5	585.5
Well AA-Df 8		
Recent deposits:		
Black sand and cinders	35	35
Aquia formation:		
Soft brown sand	45	80
Monmouth and Matawan formations:		
Soft dark sand	5	85
Light coarse sand	23	108
Dark coarse sand	12	120
Dark clay, some sand	31	151
Dark coarse sand, some clay	15	166
Sand and mud	11	177
Tough blue clay	6	183
Magothy, Raritan and Patapsco formations:		
Blue clay and sand	72	255

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Salt-and-pepper sand; water-bearing	43	298
White sand	9	307
Very hard buff clay	10	317
Red clay and some sand, hard	6	323
Buff clay and sand, hard	47	370
Salt-and-pepper sand; water-bearing	5	375
Very hard buff clay	35	410
White sand and little clay	30	440
Hard red clay	36	476
Extremely hard iron ore	2	478
Red clay, some sand, tough	82	560
Water-bearing sand	23	583
Hard solid rock	5	588
Well AA-Df 9		
Aquia formation:		
Brown sandy clay	13	13
Soft blue sandy mud	10	23
Blue sandy mud	16	39
Fine blue sand; water-bearing	6	45
Fine blue sandy clay; water-bearing	2	47
Brown sandy clay	3	50
Brown sandy clay, (trace red)	12	62
Monmouth and Matawan formations:		
Gray and black clay and sand, soft	7	69
Green sand and clay, soft	5	74
Brown and black clay and sand, medium	4	78
Brown and black clay and sand; fine-grained	24	102
Brown and black clay and sand	1	103
Gray and black coarse sand; water-bearing	2	105
Gray fine sand and mud, soft	15	120
Black mud and little sand, soft	6	126
Soft black mud	14	140
Black clay and sand, soft	20	160
Blue clay and fine sand	14	174
Black clay and sand, fine sand	6	180
Magothy and Raritan formations:		
Gray sand; water-bearing	9	189
Gray coarse sand; water-bearing	24	213
Gray sand; water-bearing	5	218
Gray fine sand and wood; water-bearing	3	221
Tough gray clay	3	224
Gray sand; water-bearing, water flowing	11	235
Gray sand; water flowing	14	249
Tough gray clay	21	270
Dark gray quicksand; water-bearing	25	295
Gray coarse sand; water-bearing	11.5	306.5
Tough white clay		306.5+

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Well AA-Df 10		
Aquia formation:		
Brown sandy clay	20	20
Blue sandy mud	28	48
Brown sandy clay	13	61
Monmouth and Matawan formations:		
Brown clay, black sand	11	72
Hard brown clay	17	89
Blue mud and black sand, water	3	92
Brown sandy clay	3	95
Green sandy clay	5	100
Gray coarse sand and gravel	5	105
Brown clay and sand	22	127
Tough blue mud	13	140
Soft brown sandy clay	7	147
Tough blue clay	27	174
Magothy and Raritan formations:		
Soft gray sand and clay	12	186
Coarse water-bearing sand; flowing 35 g.p.m.	4	190
Particles of wood and coarse gray sand	9	199
Fine water-bearing sand; flowing	10	209
Fine sand, wood and mud	8	217
Sand, wood, and little clay	5	222
Tough gray clay	3	225
Gray water-bearing sand; flowing, 20 g.p.m.	27	252
Gray clay	18	270
Fine gray sand (quicksand)	30	300
Gray water-bearing sand; flowing 20 g.p.m.	7	307
Red clay	30	337
Fine gray sand and clay, white clay	13	350
Well AA-Df 11		
Recent deposits:		
Made ground	10	10
Aquia formation:		
Green sandy marl	12	22
Soft green sandy marl	20	42
Yellow sandy marl	22	64
Soft green sandy marl	4	68
Soft light green sandy marl	39	107
Very soft dark green sandy marl	43	150
Black and tough sandy marl	23	173
Black, sandy marl	8	181
Magothy, Raritan and Patapsco formations:		
Soft, gray sand; water-bearing	6	187
Gray sand (quicksand)	32	219
Tough dark gray clay	2	221
Very fine gray sand; water-bearing	2	223

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Dark gray coarse sand; water-bearing	52	275
Soft white clay	7	282
Coarse white sand	8	290
Pepper and salt sand; water-bearing	17	307
Hard red and white clay	18	325
Soft buff clay	2	327
Hard red clay	47	374
Soft dark gray clay, sticky	12	386
Soft brown clay	29	415
Brown water-bearing sand	10	425
Tough brown clay	15	440
Tough red clay	43	483
Fine red sand; water-bearing	60	543
Coarse brown sand; water-bearing	2	545
Brown water-bearing sand	2	547
Tough gray clay	5	552
Brown water-bearing sand	10	562
Clay and sand, gray, tough	10	572
Sticky gray clay	16	588
Well AA-Df 13		
Aquia formation:		
Surface sand and clay	28.2	28.2
Monmouth and Matawan formations:		
Sandy green clay	99	127.2
Hard gray sandy clay	49.5	176.7
Soft green sandy clay	6	182.7
Magothy, Raritan and Patapsco formations:		
Water-bearing sand	25.5	208.2
Medium water-bearing sand and clay streaks	41.8	250
Coarse sand and green clay, hard	12	262
Coarse sand and green clay	40.6	302.6
Water-bearing coarse sand, green clay	12.3	314.9
Water-bearing coarse sand with some clay	54.6	369.5
Fine sand and shell with clay streaks	10.4	379.9
Fine sand and gravel, streaks of clay, hard	6	385.9
Gray clay and small gravel	45.3	431.2
Blue clay and gravel in layers	22.6	453.8
Red clay	8.3	462.1
Red and blue clay and fine gravel, hard	12.7	474.8
Red and white clay and fine gravel, hard	12.7	487.5
Red clay and sand	27.5	515
Fine water-bearing sand	24.8	539.8
Clay, hard	6	545.8
Fine water-bearing sand	6	551.8
Water-bearing gravel	16	567.8
Clay, hard	5	572.8
Water-bearing gravel	15	587.8

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Layers of rock and red clay (hard), also fine gravel	13.5	601.3
Not reported	4.8	606.1
Well AA-Df 16		
Recent deposits:		
Top fill	6	6
Aquia formation:		
Red sand	19	25
Sand. Iron pyrite	30	55
Monmouth and Matawan formations:		
Fine sand and clay	14	69
Coarse sand and clay	22	91
Gray sand and blue clay	35	126
Blue clay, with some fine sand	10	136
Blue clay and fine sand	53	189
Magothy, Raritan and Patapsco formations:		
Very coarse sand with iron pyrite: } water-bearing	15	204
Coarse sand, with spots of iron: } water-bearing	10	214
Coarse sand, fine gravel, blue clay and sand	27	241
Fine sand mixed with soft clay	29	270
Coarse sand, streaks of white clay	22	292
Coarse sand mixed with white clay and iron	23	315
Sand, fine gravel, white clay and wood	45	360
Sand with fine gravel and white clay	17	377
Sand, clay (red and white), cut very hard	27	404
Sand, red and white clay, cut hard	44	448
Red and white sandy clay	50	498
Very coarse sand, drilled soft; water-bearing	19	517
Clay and sand, drilled hard	6	523
Very coarse sand and gravel; water-bearing	57	580
Granite	1	581
Soft granite and soft streaks of iron ore	14	595
Hard granite	2	597
Well AA-Df 19		
Aquia formation:		
Not reported	40	40
Yellow sand, fine	10	50
Yellow sand, medium, with iron pyrites	10	60
Yellow sand, coarse, with iron pyrites	15	75
Yellow sand, fine	18	93
Rock, hard	2	95
Monmouth and Matawan formations:		
Blue clay, hard	1	96
Rock, hard	9	105
Gray sand, fine	80	185
Rock	1	186
Black sand and clay	22	208

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Magothy, Raritan and Patapsco formations:		
Hard clay (wood)	6	214
Fine gravel and coarse sand	26	240
Light hard clay	20	260
Clay and sand	10	270
Coarse sand	6	276
Light hard clay	4	280
Medium sand	13	293
Black clay	15	308
Light sandy clay	8	316
Medium sand	20	336
White clay	5	341
Fine gray sand	17	358
Gray to red clay	7	365
Medium sand	7	372
Red clay	8	380
Coarse sand	10	390
Hard red sandy clay	80	470
Rock	2	472
Red clay strata	13	485
Very tough red clay, traces of gray clay	8	493
Rock	2	495
Very fine gray sand	18	513
Very hard rock	2	515
Semi-hard rock	2.3	517.3
Very hard rock	12.7	530
Sand and red clay	52	582
Rock	3	585
Red clay strata	5	590
Red clay	25	615
Rock	3	618
Red clay	6	624
Rock	2.5	626.5
Well AA-Df 20		
Aquia formation:		
Yellow clay and fine sand	7	7
Hard brown clay	15	22
Clay, fine sand, and iron pyrites	19.5	41.5
Yellow clay, medium sand and pyrites	29.5	71
Very little clay, gray and brown sand and pyrites	12	83
Monmouth and Matawan formations:		
Blue clay and sand	8	91
Brown clay and fine sand	7.5	98.5
Soft blue clay	4	102.5
Hard rock	1	103.5
Blue sandy clay	1.5	105
Dark gray sandy clay. 40 g.p.m. water at 125 feet	72.5	177.5

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Rock, not hard	39.5	217
Dark gray clay, like putty	2	219
Dark gray sand, very little clay	3	222
Dark gray sand	7	229
Black clay and wood	10	239
Magothy (?), Raritan and Patapsco formations:		
Coarse, gray, water-bearing sand	12	251
Fine gray sand	6	257
Medium sand and wood	23	280
Gray sand and rock	3	283
Gray clay	17	300
Gray clay and sand	3	303
Rock, hard	2	305
Gray sand	53	358
Gray clay	3	361
Gray clay and sand	9	370
Fine white sand	20	390
Gray sand	8	398
White clay and sand	4	402
Light brown sandy clay	10	412
Gray and red sandy clay	7	419
Gray sandy clay	8	427
Gray water-bearing sand	19	446
Gray sand	29	475
Brown water-bearing sand	5	480
Iron pyrites	7	487
Brown clay	12	499
Iron pyrites	3	502
Red clay	39	541
Iron pyrites	6	547
Red clay	14	561
White clay and gravel	1.5	562.5
Brown and gray water-bearing sand	4.5	567
Red clay	36	603
Red sandy clay	77	680
Well AA-Df 29		
Pleistocene deposits and Aquia formation:		
Sandy clay	40	40
Clay	5	45
Water-bearing sand	25	70
Well AA-Df 30		
Pleistocene deposits:		
Sand and gravel—no water	35	35
Aquia formation:		
Water-bearing sand and mud	50	85
Water-bearing sand	7	92

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Well AA-Df 31		
Aquia formation:		
Clay	5	5
Water-bearing sand and mud	45	50
Rock	10	60
Water-bearing sand	10	70
Well AA-Df 32		
Aquia formation:		
Soil. No water	5	5
Water-bearing sand and mud	41	46
Rock	9	55
Water-bearing sand	10	65
Well AA-Df 33		
Pleistocene deposits:		
Sand and gravel; no water	12	12
Aquia formation:		
Water-bearing sand and mud	60	72
Rock	18	90
Water-bearing sand	10	100
Well AA-Df 34		
Pleistocene deposits:		
Sand and gravel. No water	13	13
Aquia formation:		
Water-bearing sand and mud	57	70
Rock	20	90
Water-bearing rock	10	100
Well AA-Df 35		
Pleistocene deposits:		
Sand and gravel. No water	20	20
Aquia formation:		
Water-bearing sand and mud	50	70
Rock	20	90
Water-bearing sand	10	100
Well AA-Df 36		
Pleistocene (?) deposits and Aquia formation:		
Hard mixture of sand and clay. No water	20	20
Sand and mud, water-bearing	28	48
Rock	12	60
Water-bearing sand	15	75
Well AA-Df 37		
Pleistocene deposits:		
Sand and gravel. No water	20	20
Aquia formation:		
Water-bearing sand and mud	57	77

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Rock	13	90
Water sand	10	100
Well AA-Df 38		
Pleistocene deposits:		
Sand and gravel. No water	25	25
Aquia formation:		
Water-bearing sand and mud	48	73
Rock	10	83
Water sand	12	95
Well AA-Df 39		
Pleistocene deposits		
Sand and gravel. No water	25	25
Aquia formation:		
Water-bearing sand and mud	50	75
Rock	10	85
Water sand	5	90
Well AA-Df 40		
Aquia formation:		
Sand. No water	5	5
Water-bearing sand and mud	46	51
Rock	9	60
Water-bearing sand	13	73
Well AA-Df 59		
Aquia, Monmouth and Matawan formations:		
Not reported	116	116
Yellow sandy clay	8	124
Soft clay	14	138
Firm clay	32	170
Clay	40	210
Magothy formation:		
Coarse gray sand and wood	44	254
Raritan and Patapsco formations:		
Clay with some sand streaks	120	374
Firm clay	42	416
Gray clay, soft in spots	105	521
Sand, gravel, and wood	12	533
Boulder or ledge	.5	533.5
Red and white clay, some sand	55.5	589
Fine sand	14	603
Clay and rock	28	631
Sandy rock	36	667
Hard gray clay, soft in spots	119	786
Tan clay	22	808
Hard red and gray clay with few soft spots	128	936

	Thickness (feet)	Depth (feet)
Sand and clay	9	945
Black clay	5	950
Gray, tan, and brown clay with wood	50	1000
Well AA-Ed 16		
Pleistocene deposits:		
Light clay and gravel	24	24
Calvert and Nanjemoy formations:		
Blue marl	79	103
Aquia formation:		
Fuller's earth, brown	17	120
Salt-and-pepper sand, water-bearing	70	190
Well AA-Ee 3		
Pleistocene deposits and Nanjemoy formation:		
Sand	25	25
Clay	14	39
Aquia formation:		
Water-bearing sand	71	110
Well AA-Ee 4		
Nanjemoy formation:		
Brown clay	28	28
Sand and gravel	5	33
Blue marl	15	48
Brown clay	25	73
Aquia formation:		
Green sandy marl	16	89
Rock	4	93
Blue marl	6	99
Rock	3	102
Black marl	9	111
Rock	3	114
Black marl	4	118
Rock	5	123
Marl	6	129
Rock	5	134
Water-bearing sand	6	140
Well AA-Ee 15		
Pleistocene deposits and Nanjemoy formation:		
Brown sandy top soil	4	4
Yellow sandy marl	18	22
Green sandy marl	25	47
Gray clay	9	56
Black marl	17	73
Aquia formation:		
Gray rock and shells	11	84

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Black sandy marl	13	97
Brown water-bearing sand	10	107
Well AA-Ee 21		
Pleistocene deposits and Nanjemoy formation:		
Soft clay and top soil	10	10
Marl	50	60
Aquia formation:		
Very fine black sand	10	70
Rock	1	71
Brown clay	4	75
Rock	2	77
Brown clay	6	83
Water-bearing sand	12	95
Well AA-Ee 34		
Pleistocene deposits:		
Clay	12	12
Calvert formation:		
Fine white sand	8	20
Nanjemoy formation:		
Marl	45	65
Sand with clay	30	95
Aquia formation:		
Fine sand	15	110
Sand	50	160
Well AA-Ee 35		
Pleistocene deposits and Calvert formation:		
White clay	13	13
Fine sand	7	20
Nanjemoy formation:		
Blue marl	50	70
Aquia formation:		
Sand and clay, rock layers	65	135
Salt-and-pepper sand	25	160
Well AA-Ee 36		
Pleistocene deposits, Calvert and Nanjemoy formations:		
Clay	8	8
Sandy clay	17	25
Marl	32	57
Sand	46	103
Aquia formation:		
Salt-and-pepper sand with rock layers	37	140
Well AA-Ee 38		
Calvert and Nanjemoy formations:		
Yellow clay	10	10

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Sandy clay	25	35
Blue marl	70	105
Aquia formation:		
Salt-and-pepper sand	75	180
Well AA-Ee 39		
Pleistocene deposits:		
Yellow clay	15	15
Nanjemoy formation:		
Blue marl	50	65
Aquia formation:		
Salt-and-pepper sand; lenses of rock	53	118
Salt-and-pepper sand with rock	42	160
Well AA-Fc 6		
Pleistocene deposits and Nanjemoy formation:		
Sand	42	42
Blue marl	28	70
Aquia formation:		
Water-bearing salt-and-pepper sand	35	105
Well AA-Fc 7		
Pleistocene deposits:		
Sand and gravel	5	5
Nanjemoy formation:	16	21
Blue marl	30	51
Aquia formation:		
Salt-and-pepper sand, water-bearing	74	125
Lens of rock		
Well AA-Fd 13		
Recent deposits:		
Brown sandy clay (fill)	10	10
Calvert formation:		
Blue marly clay with shell fragments	134	144
Nanjemoy formation:		
Black sandstone with dark glauconite	1	145
Dark green sandy clay with glauconite	75	220
Light gray clay with little sand	20	240
Dark green sandy clay with glauconite	5	245
Pink clay	20	265
Aquia formation:		
Green sandy clay with glauconite; some hard layers	15	280
Green sand in hard layers, slow drilling	45	325
Green glauconitic fine sand with clay	85	410
Monmouth and Matawan formations:		
Black or dark gray clay with some glauconite	95	505

TABLE 3—*Continued*

	Thickness (feet)	Depth (feet)
Magothy formation:		
Medium to light brown clay	29	534
Light gray coarse sand with some lignite	26	560
Raritan formation:		
Brown to red clay	25	585
Well AA-Fe 24		
Pleistocene deposits and Calvert formation:		
Clay and marl	126	126
Nanjemoy and Aquia Formation:		
Salt-and-pepper sand	84	210
Well AA-Fe 25		
Pleistocene deposits:		
Clay	10	10
Sandy clay	10	20
Calvert formation:		
Blue marl	50	70
Nanjemoy and Aquia formations:		
Salt-and-pepper sand	75	145
Salt-and-pepper sand with rock layers, 1 inch	55	200
Well AA-Fe 26		
Pleistocene deposits:		
Clay	12	12
Sand and clay	8	20
Calvert formation:		
Marl	50	70
Nanjemoy and Aquia formations:		
Sand and small amount of clay	75	145
Salt-and-pepper sand	35	180
Well AA-Fe 27		
Pleistocene deposits:		
White clay	12	12
Fine sand	8	20
Calvert formation:		
Blue marl, a little sand	105	125
Nanjcmoy and Aquia formations:		
Salt-and-pepper sand	45	170
Salt-and-pepper sand, some rock layers	40	210
Well AA-Fe 28		
Pleistocene deposits:		
Light clay	25	25
Calvert formation:		
Black sand and clay (no water)	35	60

TABLE 3—*Concluded*

	Thickness (feet)	Depth (feet)
Nanjemoy and Aquia formations:		
Sand	75	135
Good water-bearing sand	65	200
Well AA-Ge 2		
Pleistocene deposits:		
Yellow clay	20	20
Calvert formation:		
Marl	30	50
Nanjemoy and Aquia formations:		
Gray sandy clay	190	240
Brown clay	15	255
Fine black sand	20	275
Coarse sand, water-bearing	39	314
Well AA-Ge 4		
Pleistocene deposits:		
Very pale orange argillaceous fine sand	10.5	10.5
Weak yellowish orange argillaceous fine sand	10.5	21
Calvert formation:		
Pale brown argillaceous very fine sand. Pieces of blue marl	10.5	31.5
Weak yellow clay, a little very fine sand	10.5	42
Weak yellow slightly sandy clay, some brown clay lumps	10.5	52.5
Weak yellow diatomaceous clay, some lumps of brown clay.	21	73.5
Weak yellow diatomaceous clay, some lumps of brown clay; thick mud	10.5	84
Nanjemoy formation:		
Light olive gray diatomaceous earth, glauconite, shell fragments	10.5	94.5
Argillaceous green sand, black glauconite, shell fragments	10.5	105
Argillaceous green sand, black glauconite, fine mica	84	189
Argillaceous green sand, black glauconite, green-stained quartz	31.5	220.5
Argillaceous green sand and clay, pieces of pink clay	10.5	231
Clay, water of brownish tinge, pieces of pink clay	10.5	241.5
Aquia formation:		
Clay, some rock at bottom, yellow grains abundant	10.5	252
Not reported	6	258
Hard shell		258
Much hard shell, much less glauconite; yellow grains abundant	25.5	283.5
Yellowish green argillaceous green sand; yellow grains abundant	10.5	294
Yellowish green argillaceous green sand, little hard shell	21	315
Yellowish green argillaceous green sand; a few hard streaks—last 5 feet soft	10.5	325.5
Yellowish green argillaceous green sand, soft; glauconite abundant, chiefly yellow brown	28.5	354

TABLE 4

Logs of Wells in Anne Arundel County, from Which Well-cuttings Samples Were Obtained

Description	Thickness (feet)	Depth (feet)
Well Bd 23		
Patapsco formation:		
Clay, red to white; few rounded chert pebbles; some lignite	101	101
Sand, orange-pink, medium to coarse, arkosic, clean, slightly gravelly	11	112
Clay, white, sandy, plant fragments	1	113
Sand, orange-pink, clean, medium to coarse	12	125
Clay, red to white, slightly sandy	78	203
Sand, pink, medium-grained, some iron oxide	4	207
Clay, red to gray, slightly sandy, some plant fragments	71	278
Arundel formation:		
Clay, pink to red, slightly lignitic	133	411
Patuxent formation:		
Sand, clean, fine-grained, white, well sorted	56	467
Clay, red, sandy, plant fragments common	9	476
Sand, red to pink, medium to coarse, clean	20	496
Clay, red, slightly sandy, lignite and plant fragments	41	537
Sand, red, medium to coarse, lignite and hematite common	18	555
Clay, red, sandy	5	560
Sand, light gray, coarse, angular, clean, arkosic, some lignite present	47	607
Clay, red, sandy, lignitic	10	617
Samples do not indicate this well reached bedrock		
Well Cc 6		
Monmouth and Matawan formations:		
Sand, tan to buff, fine, micaceous, glauconitic. Base of oxidized zone at 20 feet	20	20
Sand, silty, very fine, clayey, micaceous, dark gray	30	50
Magothy formation:		
Sand, coarse, and silt, dark gray, lignitic, clayey	10	60
Clay, sandy, tan, finely micaceous, contains associated coarse quartz sand	10	70
Raritan (?) formation:		
Gravel and sand, angular and subangular, yellow; pebbles of iron oxide and hydroxide	20	90
Sand, coarse, gravelly, composed of clear translucent quartz, opaque white quartz, and tan chert; lignitic material present	20	110
Sand, medium to coarse, yellow-pink	10	120
Raritan formation:		
Clay, gray-pink, finely micaceous, sandy	10	130
Sand, pink-orange, medium, slightly clayey: contains plant fragments	30	160
Sand, coarse, clean, vitreous, slightly gravelly	11	171
Well Cd 5		
Magothy (?) formation:		
Sand, tan, some clay, medium to fine, contains some plant fragments and mica	25	25

TABLE 4—*Continued*

Description	Thickness (feet)	Depth (feet)
Well Cd 5—*Continued*		
Raritan and Patapsco formation:		
Clay, white to buff, silty in spots	35	60
Sand, fine, buff pink and white, some clay	15	75
Sand, coarse to medium, white to pink	35	110
Clay, white to red, sandy, silty	30	140
Sand, medium-grained, pink-white, dull, angular to subangular	2	142
Well Ce 6		
Matawan and Magothy formations:		
Sand, white, clean, medium-grained, slightly glauconitic	21	21
Sand, light gray, slightly feldspathic, glauconite rare, some lignite	20	41
Sand, chocolate brown, clayey, medium-grained, angular to subangular	4	45
Sand, fine, dark-gray, clayey, slightly micaceous, contains a few plant fragments; glauconite rare, limonite and pyrite common	16	61
Raritan and Patapsco (?) formations:		
Sand, light gray, medium to coarse, slightly limonitic; some pyrite and lignite	80	141
Sand, very fine, light-gray and pinkish, arkosic, liminitic	29	170
Well Ed 16		
Pleistocene deposits:		
Sand, gravel, tan, poorly sorted, clayey, contains some reworked glauconite	40	40
Calvert formation:		
Sand, gray, fine, silty, clayey	20	60
Nanjemoy formation:		
Sand, green, fine, glauconite abundant, quartz grains transparent, few phosphate fragments	20	80
Clay, pink-buff, with glauconite	20	100
Aquia formation:		
Sand, fine, clayey, green, botryoidal, glauconite; some pink clay balls present	30	130
Sand, fine, green, glauconite, slightly clayey sand somewhat coarser from 160 feet down	60	190
Well Fd 13		
Recent deposits:		
No sample	10	10
Calvert formation:		
Clay and silt, dark gray, diatomaceous, some shell fragments	110	120
Clay, gray, bleaches to white, many diatoms	25	145
Nanjemoy formation:		
Sand, green, glauconitic; some gray clay, some foraminifera and shell fragments	75	220
Clay, gray, some sand	20	240
Sand, green, glauconitic	5	245
Clay, pink, even-textured	20	265

TABLE 4—*Concluded*

Description	Thickness (feet)	Depth (feet)
Well Fd 13—*Continued*		
Aquia formation:		
Sand, fine, green, glauconitic, some foraminifera and shell fragments, some clay present	145	410
Monmouth and Matawan formations:		
Sandy clay, some glauconite, mica flakes, phosphate nodules, few foraminifera	90	500
Sand and silt, gray with shell fragments	10	510
Magothy formation:		
Clay, brown, some sand and lignite	25	535
Sand, coarse, clean, light gray, subangular to subrounded, lignite and pyrite present	43	578
Raritan formation:		
Clay, red and gray, contains many small siderite pellets	7	585
Well Ge 2		
Pleistocene deposits:		
Clay, tan, gray, sandy	20	20
Calvert formation:		
Clay, blue green, diatomaceous, silty	30	50
Nanjemoy formation:		
Silt, dark gray, sandy, contains fine mica flakes and some glauconite	20	70
Sand, clayey, dark gray, glauconitic, quartz rounded to subrounded, some foraminifera	110	180
Clay, sandy, pink-buff, some glauconite	40	220
Aquia formation:		
Sand, green, glauconitic, medium to coarse, shell and bryozoan fragments, some foraminifera. Glauconite changes to brown at 250 feet. Some fish teeth below 290 feet	100	320
Well Ge 4		
Pleistocene deposits:		
Sand, fine, tan, clayey, some plant fragments	21	21
Calvert formation:		
Clay, gray, diatomaceous, with a few shell fragments	63	84
Nanjemoy formation:		
Sand, green, with clay, gray, glauconitic, some foraminifera	136	220
Clay, pink-gray	20	240
Aquia formation:		
Sand, dark green, glauconitic, medium grained, with a small amount of clay, some mollusk and bryozoan fragments. Foraminifera common	64	304
Sand, brown, glauconitic, coarse, clean, large botryoidal grains	43	347
Sand, fine, brown, some clay	7	354

TABLE 5

Analyses of Ground Waters in Anne Arundel County

(Parts per million)

Well No. AA-	Owner	Depth (feet)	Date collected	Dissolved solids	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$	pH	Specific conductance (K × 10⁵ at 25°C.)	Analyst
Ac 8	C. E. Duckworth	128	Nov. 24, 1945	52	1.0	1.2	1.1	trace	—	—	—	—	4.0	—	0.0	20.0	6.0	—	E
Ad 1	County Sanitary Comm.	65	June 21, 1943	—	—	—	—	—	—	—	4.0	1.0	2.8	—	5.6	10.0	6.7	—	A
do	do	65	Apr. 1, 1946	25	6.3	0.28	1.6	0.8	2.1	0.5	2.0	1.0	2.9	0.0	6.0	7.3	5.2	3.1	A
Ad 2	do	95	July 30, 1941	—	0.7	0.04	1.2	0.3	—	—	—	—	—	—	0.0	2.0	5.1	—	B
do	do	95	June 21, 1943	—	—	—	—	—	—	—	4.0	1.0	3.5	—	8.6	16.0	6.0	4.0	A
Ad 3	do	62½	June 21, 1943	—	—	—	—	—	—	—	6.0	1.0	5.5	—	10.0	18.0	6.9	5.3	A
do	do	62½	Apr. 1, 1946	42	6.4	0.09	3.3	1.3	4.1	0.7	4.0	1.2	6.1	0.1	12.0	14.0	5.1	5.7	A
Ad 4	C. S. Walton Co.	94	Aug. 19, 1943	—	—	—	—	—	—	—	6.0	1.0	5.0	—	8.4	18.0	6.8	4.4	A
do	do	94	Apr. 6, 1945	34	—	—	—	—	—	—	—	—	28.4	—	—	7.2	4.5	—	F
Ad 5	do	127	Aug, 2, 1943	—	—	—	—	—	—	—	6.0	1.0	13.0	—	4.2	18.0	6.4	—	A
do	do	127	June 15, 1945	36	7.7	0.04	2.2	0.9	3.5	1.0	6.0	0.6	5.5	0.0	5.8	9.2	5.7	4.2	A
Ad 6	do	157	Aug. 19, 1943	—	—	0.35	—	—	—	—	5.0	1.0	5.0	—	6.1	18.0	6.4	4.0	A
do	do	157	Apr. 6, 1945	12	—	—	—	—	—	—	—	—	14.2	—	—	5.2	4.6	—	F
Ad 7	do	312	Aug. 19, 1943	—	—	0.57	—	—	—	—	1.0	7.0	2.0	—	0.0	12.0	5.1	2.7	A
do	do	312	June 15, 1945	23	9.3	0.04	1.3	0.5	1.8	0.7	2.0	6.5	1.4	0.0	0.0	5.3	5.0	2.7	A
Ad 17	E. Linthicum Heights	90	Mar. 31, 1914	—	—	—	—	—	—	—	—	—	9.4	—	—	6.0	—	—	B
Ad 20	Kavanaugh Products Co.	392	June 15, 1945	24	9.5	1.8	0.9	0.5	2.0	0.8	3.0	5.9	1.4	0.0	0.0	4.3	5.2	2.4	A
Ad 29	County Sanitary Comm	530	May 13, 1948	24	11.0	2.2	0.9	0.5	1.5	1.0	1.0	6.9	1.2	0.1	0.0	4.3	4.7	—	A
Ae 1	Armour Fertilizer Co.	350	Aug. 26, 1943	—	—	0.4	—	—	—	—	4.0	7.0	2.0	—	0.0	12.0	6.4	2.7	A
Ae 2	Cooperative Fertilizer Co.	23	Aug. 26, 1943	—	—	0.79	—	—	—	—	22.0	46.0	14.0	—	9.1	68.0	5.6	20.6	A
Ae 3	do	65	Aug. 26, 1943	—	—	0.2	—	—	—	—	35.0	70.0	17.0	—	0.1	87.0	6.3	26.9	A
Ae 4	U. S. Coast Guard	195	Jan. 31, 1944	—	—	—	—	—	—	—	—	16.0	4.0	—	0.5	10.0	4.3	6.4	A
Ae 22	Zamostny's Amoco Station	150	Jan. 14, 1946	329	4.4	0.46	48.0	7.1	37.0	5.4	68.0	70.0	40.0	0.0	59.0	149.0	6.8	50.6	A

Bb 8	Md. House of Correction	675	Aug. 17, 1927	176	—	0.1	—	—	—	—	—	4.6	—	—	0.0	56.0	—	—	B
Bc 1	National Plastic Products Co.	175	July 24, 1944	26	—	0.28	—	—	—	—	—	—	—	—	10.0	19.2	4.9	—	C
Bd 6	Rae	84	Mar. 28, 1946	19	8.0	0.08	1.1	0.5	1.2	0.3	2.0	4.6	1.5	0.1	0.1	4.8	5.0	2.1	A
Bd 7	Geo. B. Furman	80	May 20, 1946	—	—	—	—	—	—	—	0.0	3.0	3.0	—	0.1	6.0	4.5	2.9	A
Bd 23	County Sanitary Comm.	617	Aug. 23, 1948	50	23.0	3.0	0.9	0.05	—	—	—	—	—	—	0.04	—	5.4	—	B
Be 3	Board of Education	385	Sept. 17, 1935	56	—	6.0	—	—	—	—	—	—	4.2	—	0.0	16.0	5.8	—	B
Be 21	G. Bryce	150	Jan. 16, 1946	25	8.1	0.59	1.0	0.5	2.0	0.6	0.0	9.4	1.8	0.0	1.6	10.0	3.9	6.4	A
Be 32	W. Griebel	160(?)	Feb. 15, 1946	—	—	2.9	—	—	—	—	—	9.0	4.0	—	0.1	9.0	3.8	8.7	A
Be 33	G. H. Mank	180	Feb. 15, 1946	—	—	3.7	—	—	—	—	—	10.0	4.0	—	0.0	9.0	3.9	8.0	A
Be 36	Board of Education	120	Feb. 26, 1946	—	—	0.85	—	—	—	—	6.0	1.0	6.0	—	3.2	10.0	5.2	4.8	A
Be 42	W. R. Young	110(?)	Feb. 26, 1946	—	—	—	—	—	—	—	—	12.0	64.0	—	0.3	27.0	4.3	27.1	A
Be 45	H. Bunker	67	Apr. 16, 1946	75	2.8	0.35	6.2	2.3	6.1	1.4	2.0	14.0	7.0	0.2	21.0	25.0	4.7	11.4	A
Be 46	Appleton	24	Apr. 16, 1946	41	3.5	0.08	3.1	1.6	3.9	0.8	1.0	15.0	3.2	0.1	4.2	14.0	4.9	6.5	A
Bf 1	Fort Smallwood	377	Aug. 2, 1932	58	—	6.4	—	—	—	—	—	—	5.2	—	0.0	20.0	6.4	—	B
do	do	377	Aug. 3, 1943	—	—	18.0	—	—	—	—	20.0	2.0	3.0	—	0.0	16.0	6.1	7.1	A
Bf 2	do	378	Aug. 3, 1943	—	—	7.5	—	—	—	—	2.4	2.0	1.5	—	0.0	18.0	4.2	5.6	A
Bf 4	Rogers Townsend Boat Co.	140	Aug. 3, 1943	—	—	—	—	—	—	—	3.0	6.0	4.2	—	1.0	12.0	6.0	3.2	A
Cc 1	U. S. Naval Academy Dairy	245	Apr. 15, 1946	28	5.8	0.33	1.6	1.2	3.2	0.6	5.0	1.4	4.6	0.0	5.5	9.0	5.7	3.9	A
Cc 7	A. D. Riden Co.	300	Apr. 23, 1946	18	7.2	2.1	0.5	0.3	1.4	0.3	5.0	0.7	2.1	0.1	0.5	3.3	5.1	1.8	A
Cc 12	J. W. Wagner	92	May 1, 1946	—	—	0.15	—	—	—	—	32.0	1.0	2.0	—	1.8	22.0	6.3	6.2	A
Cc 15	J. Chowanetz	21	May 6, 1946	—	—	0.42	—	—	—	—	7.0	1.0	4.0	—	16.0	15.0	5.6	6.9	A
Cd 3	Board of Education	146	Feb. 10, 1930	52	—	0.0	—	—	—	—	—	—	3.4	—	0.4	48.0	—	—	B
do	do	146	Jan. 12, 1938	15	—	—	—	—	—	—	—	—	5.0	—	0.3	2.0	3.8	—	B
Cd 6	M. W. Schaul	153	Mar. 14, 1946	—	—	1.1	—	—	—	—	40.0	3.0	16.0	—	3.9	30.0	6.5	16.6	A
Cd 11	Crownsville State Hospital	232	Apr. 18, 1946	52	18.0	2.0	0.9	0.7	2.6	0.8	0.0	26.0	1.0	0.1	0.0	22.0	3.8	9.7	A
Cd 19	Mrs. R. Whithall	208	May 6, 1946	47	9.3	1.2	0.9	1.3	2.0	1.0	0.0	24.0	2.1	0.0	0.1	13.0	4.0	9.3	A
Cd 23	F. Kaczyrski	107	May 7, 1946	—	—	8.3	—	—	—	—	9.0	36.0	4.0	—	0.3	26.0	5.6	10.4	A
Ce 1	County Sanitary Comm.	213	Apr. 1, 1946	53	6.2	30.0	6.0	3.6	2.2	1.4	10.0	26.0	1.8	0.3	0.1	30.0	5.3	8.6	A
Ce 4	C. A. Ernest	106	Jan. 17, 1946	25	8.7	2.2	1.0	0.5	1.2	0.6	0.0	10.0	0.8	0.0	0.1	10.0	3.9	6.0	A

TABLE 5—*Continued*

Well No. AA-	Owner	Depth (feet)	Date collected	Dissolved solids	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$	pH	Specific conductance (K × 10^5 at 25°C.)	Analyst
Ce 10	J. H. Jacobs	150-200	Feb. 18, 1946	—	—	7.3	—	—	—	—	0.0	20.0	3.0	—	0.1	15.0	3.8	13.8	A
Ce 14	F. McKinsey	140	Apr. 1 1946	29	8.4	1.1	0.7	0.3	1.6	0.3	0.0	12.0	1.2	0.1	0.1	9.4	3.9	7.0	A
Ce 17	H. B. Little	220	Feb. 28, 1946	—	—	8.3	—	—	—	—	0.0	50.0	2.0	—	0.1	21.0	3.5	17.0	A
Ce 18	J. Heinstadt	90	Feb. 28, 1946	—	—	8.1	—	—	—	—	0.0	56.0	4.0	—	0.1	15.0	3.5	16.7	A
Ce 32	E. Clifford	512	Apr. 17, 1946	25	8.1	4.0	0.8	0.6	1.8	0.3	0.0	15.0	1.9	0.1	0.1	14.0	4.0	5.4	A
Ce 33	do	200	Apr. 17, 1946	28	11.0	2.8	0.4	0.3	1.1	0.3	0.0	12.0	0.8	0.1	0.1	12.0	3.9	6.2	A
Ce 34	County Sanitary Comm.	165	Apr. 1, 1946	36	9.5	2.9	1.2	0.5	1.8	0.5	0.0	16.0	1.8	0.1	0.1	12.0	3.9	8.2	A
Ce 36	L. S. Zimmerman	100	Apr. 26, 1946	—	—	0.4	—	—	—	—	0.0	15.0	2.5	—	0.0	9.0	—	7.2	A
Ce 37	E. Fulton	160	May 1, 1946	—	—	5.8	—	—	—	—	0.0	22.0	1.0	—	0.0	7.5	3.9	7.3	A
Ce 38	W. Mentzel	208	May 7, 1946	35	11.0	1.5	0.7	1.2	1.5	1.2	0.0	16.0	1.1	0.0	0.1	12.0	4.0	8.6	A
Ce 46	Epping Forest	96	May 8, 1946	62	13.0	11.0	7.8	3.5	2.1	2.7	21.0	20.0	2.0	0.3	0.0	34.0	5.6	9.5	A
Cf 1	Gibson Island Corp.	319	Apr. 11, 1946	36	6.7	9.4	1.4	1.2	1.6	0.7	0.0	19.0	0.9	0.1	0.1	17.0	3.8	10.5	A
Cf 4	L. V. Hare	205	Jan. 30, 1946	—	—	17.0	—	—	—	—	0.9	—	0.2	—	0.1	6.0	6.1	2.2	A
Cf 11	F. Dipaula	95	Apr. 16, 1946	55	9.1	21.0	6.2	2.5	1.8	1.8	5.0	25.0	1.5	0.3	0.0	26.0	4.9	8.3	A
Cf 13	L. Ruck	190	Apr. 16, 1946	56	7.4	30.0	5.8	3.1	1.8	1.3	0.0	31.0	0.8	0.2	0.0	30.0	4.3	9.7	A
Cf 15	W. H. Labrot	280	Apr. 17, 1946	75	7.8	29.0	8.7	4.4	2.9	1.6	0.0	42.0	1.8	0.2	0.1	42.0	4.4	12.5	A
Cg 1	State Roads Comm.	270	Sept. 29, 1943	—	—	15.0	33.0	4.0	—	—	—	34.0	1.0	—	—	37.0	5.4	—	D
Cg 2	do	138	Aug. 5, 1943	510	3.5	20.0	90.0	10.0	—	—	—	7.8	150.0	—	—	270.0	—	—	E
do	do	138	Sept. 3, 1943	—	—	32.0	—	41.0	—	—	—	6.0	146.0	—	—	255.0	6.6	—	D
Dd 12	K. Haver	45	June 6, 1946	—	—	0.3	—	—	—	—	5.0	1.0	8.0	—	4.6	9.0	5.3	5.8	A
De 3	Annapolis Water Co.	244	Apr. 25, 1932	66	16.0	26.0	9.9	4.2	2.3	2.6	44.0	11.0	2.0	—	0.0	42.0	—	—	A
do	do	244	Feb. 15, 1943	—	—	8.8	—	—	—	—	29.0	13.0	2.0	—	0.0	34.0	5.9	10.1	A
De 11	P. A. Donald	85	June 11, 1946	—	—	0.1	—	—	—	—	16.0	2.0	4.0	—	2.2	20.0	5.7	4.8	A
De 12	A. J. Daniels	65	June 11, 1946	—	—	0.9	—	—	—	—	14.0	1.0	3.0	—	9.4	15.0	6.1	5.3	A
De 20	W. M. Vickers	32	June 14, 1946	121	16.0	0.7	7.3	5.3	7.7	5.0	3.0	1.0	12.0	0.0	56.0	40.0	5.2	14.4	A
De 34	A. G. Fleet	60	June 25, 1946	—	—	0.44	—	—	—	—	12.0	1.0	8.0	—	24.0	28.0	5.5	10.4	A

De 35	G. C. Meeks	81	June 25, 1946	238	33.0	1.4	67.0	5.4	2.6	5.0	220.0	12.0	2.2	0.1	0.2	189.0	7.8	36.5	A
De 42	J. B. Semple, Jr.	230	July 19, 1946	—	—	14.0	—	—	—	—	78.0	28.0	2.0	—	0.1	82.0	6.3	18.1	A
De 43	P. Addison	48	Apr. 25, 1946	—	—	2.8	—	—	—	—	—	—	8.0	—	—	38.0	5.1	—	B
De 47	Annapolis Water Co.	258	Apr. 25, 1932	62	13.0	11.0	10.0	2.6	2.1	1.9	28.0	17.0	2.0	—	0.0	36.0	—	—	A
Df 9	U. S. Naval Academy	306	Mar. 20, 1945	104	9.5	20.0	16.0	5.5	1.9	2.6	37.0	38.0	1.6	0.5	0.0	63.0	5.8	—	A
Df 12	do	600	Mar. 20, 1945	66	7.6	19.0	7.9	3.8	1.5	1.7	9.0	32.0	1.2	0.2	0.0	35.0	5.2	—	A
Df 13	do	606	Mar. 20, 1945	74	7.9	20.0	6.2	3.6	1.5	1.7	2.0	34.0	0.9	0.2	0.0	30.0	4.6	—	A
Df 15	U.S. Navy Experiment Station	210	Mar. 20, 1945	106	8.6	26.0	15.0	5.7	1.8	2.4	32.0	45.0	1.4	0.5	0.0	61.0	5.8	—	A
Df 16	U. S. Navy Experiment Station	597	July 19, 1944	111	—	24.0	4.6	3.9								25.0			C
do	do	597	Mar. 20, 1945	80	8.5	18.0	5.7	3.6	1.8	1.9	26.0	36.0	0.9	0.1	0.0	29.0	5.8	—	A
Ed 8	F. Lankford, Jr.	265	June 28, 1946	209	17.0	1.2	50.0	7.7	4.2	7.2	190.0	15.0	2.5	0.1	1.5	156.0	7.2	34.2	A
Ed 15	T. C. Collinson	274	July 17, 1946	—	—	0.6	—	—	—	—	162.0	34.0	2.0	—	0.1	147.0	7.5	31.4	A
Ee 6	R. L. Forest	138	June 28, 1946	285	36.0	0.8	75.0	9.1	4.0	3.3	235.0	34.0	2.2	0.1	0.4	225.0	7.4	45.1	A
Ee 10	Y.M.C.A. Camp	72	June 29, 1946	271	45.0	2.4	76.0	3.1	4.2	3.9	247.0	6.1	3.9	0.0	0.1	202.0	7.2	40.8	A
Ee 12	H. R. Robey	104	June 29, 1946	—	—	1.6	—	—	—	—	189.0	9.0	2.0	—	0.0	153.0	7.9	31.7	A
Ee 22	Murray Estate	329	July 17, 1946	—	—	25.0	—	—	—	—	58.0	36.0	2.0	—	0.0	75.0	6.1	19.0	A
Ee 32	Hartges Boat Yard	150	July 29, 1946	244	20.0	0.7	58.0	9.9	5.0	3.8	162.0	61.0	1.6	0.2	0.2	185.0	7.6	37.4	A
Ef 2	E. L. Rudd	65	June 18, 1946	276	32.0	4.0	83.0	3.9	5.2	4.1	264.0	1.8	11.0	0.0	0.0	223.0	7.4	43.0	A
Ef 4	H. B. Stonebraker	—	Nov. 20, 1945	—	—	1.8	—	—	—	—	—	32.0	12.0	—	—	54.0	6.1	—	D
Ef 5	do	39	Nov. 20, 1945	—	—	1.3	—	—	—	—	—	27.0	18.0	—	—	88.0	7.0	—	D
Fc 4	F. C. Krauss	327	July 12, 1946	200	13.0	0.9	58.0	6.3	3.3	2.6	183.0	23.0	1.9	0.0	0.3	171.0	7.4	33.7	A
Fd 13	Board of Education	585	Dec. 28, 1948	197	10.0	13.0	55.0	6.2	—	—	—	63.9	3.2	—	—	164.0	6.7	—	C
Fe 8	F. Thomas	400(?)	July 27, 1946	—	—	15.0	—	—	—	—	80.0	50.0	2.0	—	0.0	100.0	6.6	24.6	A
Fe 14	R. T. Brooke	156	July 30, 1946	—	—	0.46	—	—	—	—	166.0	13.0	1.0	—	0.9	126.0	7.5	28.9	A
Ge 2	J. E. Rose	325	Mar. 9, 1949	166	14.0	0.37	33.0	11.0	5.6	2.0	166.0	8.9	3.5	0.2	0.9	128.0	7.6	—	A

Analyst: A, U. S. Geological Survey
B, Maryland State Health Department
C, Penniman & Browne, Inc.
D, Permutit Co.
E, Wiley & Co.
F, C. S. Walton Co.

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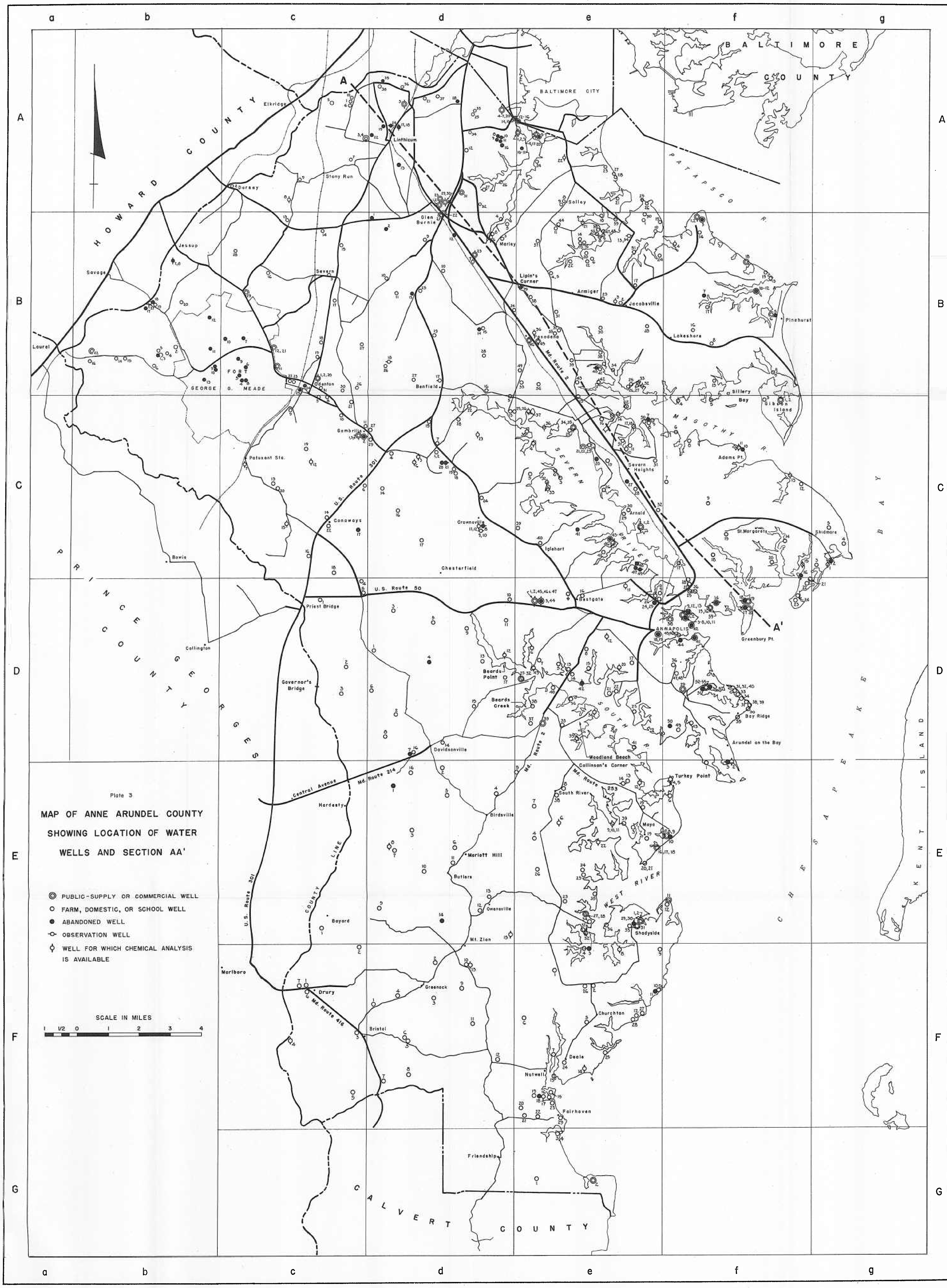
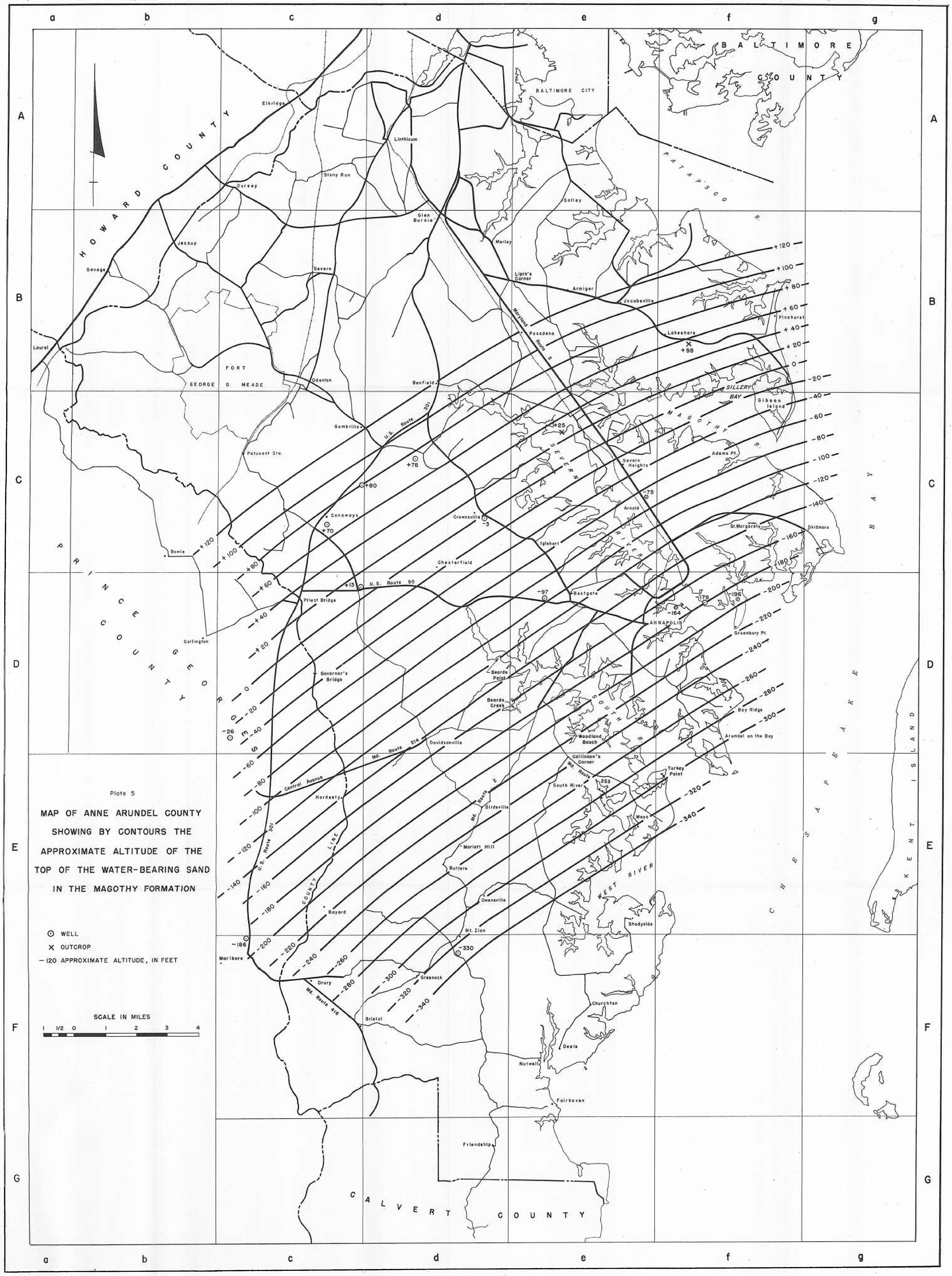


Plate 3
MAP OF ANNE ARUNDEL COUNTY
SHOWING LOCATION OF WATER
WELLS AND SECTION AA'
PUBLIC-SUPPLY OR COMMERCIAL WELL
FARM, DOMESTIC, OR SCHOOL WELL
ABANDONED WELL
OBSERVATION WELL
WELL FOR WHICH CHEMICAL ANALYSIS
IS AVAILABLE
SCALE IN MILES
1 1/2 0 1 2 3 4
BALTIMORE COUNTY
BALTIMORE CITY
HOWARD COUNTY
PRINCE GEORGES COUNTY
CALVERT COUNTY
CHESAPEAKE BAY
KENT ISLAND
PATAPSCO R.
MAGOTHY R.
SEVERN RIVER
SOUTH RIVER
WEST RIVER
U.S. Route 301
U.S. Route 50
Md. Route 2
Md. Route 214
Md. Route 416
Md. Route 253
Central Avenue
COUNTY LINE
Elkridge
Linthicum
Stony Run
Dorsey
Glen Burnie
Marley
Solley
Jessup
Savage
Severn
Lipin's Corner
Armiger
Jacobsville
Pinehurst
Lakeshore
Pasadena
Laurel
FORT GEORGE G. MEADE
Odenton
Benfield
Gambrills
Patuxent Sta.
Sillery Bay
Gibson Island
Severn Heights
Adams Pt.
Conaways
Crownsville
Arnold
Iglehart
St. Margarets
Skidmore
Bowie
Chesterfield
Priest Bridge
Westgate
ANNAPOLIS
Greenbury Pt.
Collington
Governor's Bridge
Beards Point
Beards Creek
Bay Ridge
Davidsonville
Arundel on the Bay
Woodland Beach
Collinson's Corner
Turkey Point
South River
Hardesty
Birdsville
Mayo
Mariott Hill
Butlers
Owensville
Bayard
Mt. Zion
Shadyside
Marlboro
Drury
Greenock
Churchton
Bristol
Deale
Nutwell
Fairhaven
Friendship
A
A'
a b c d e f g
A B C D E F G


BALTIMORE COUNTY
BALTIMORE CITY
HOWARD COUNTY
PRINCE GEORGES COUNTY
CALVERT COUNTY
FORT GEORGE G. MEADE
PATAPSCO R.
MAGOTHY R.
SEVERN RIVER
SOUTH R.
WEST RIVER
CHESAPEAKE BAY
KENT ISLAND
ANNAPOLIS
Plate 5
MAP OF ANNE ARUNDEL COUNTY SHOWING BY CONTOURS THE APPROXIMATE ALTITUDE OF THE TOP OF THE WATER-BEARING SAND IN THE MAGOTHY FORMATION
WELL
OUTCROP
—120 APPROXIMATE ALTITUDE, IN FEET
SCALE IN MILES
1 1/2 0 1 2 3 4

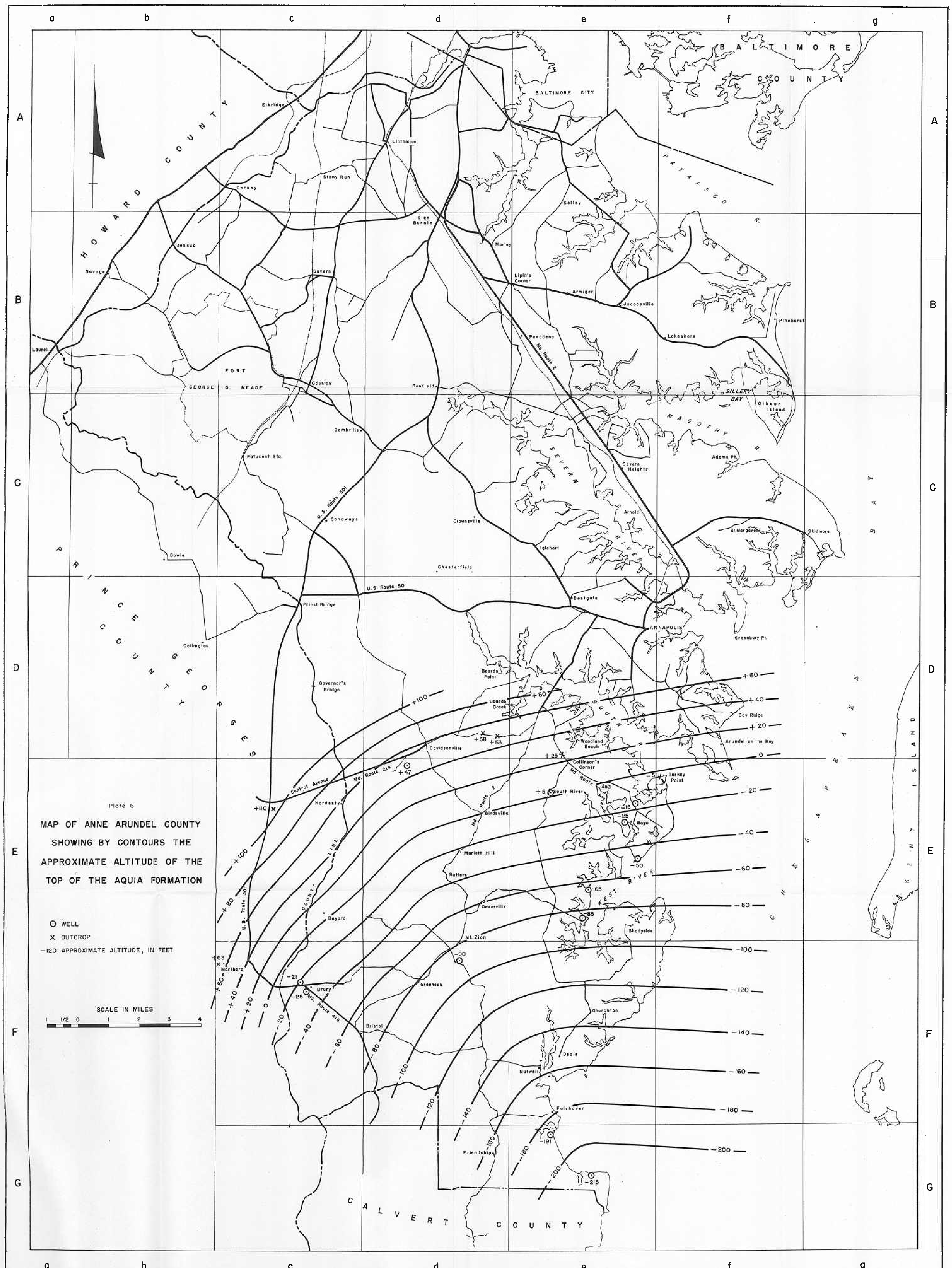


Plate 6
MAP OF ANNE ARUNDEL COUNTY SHOWING BY CONTOURS THE APPROXIMATE ALTITUDE OF THE TOP OF THE AQUIA FORMATION
WELL
OUTCROP
-120 APPROXIMATE ALTITUDE, IN FEET
SCALE IN MILES
1 1/2 0 1 2 3 4
BALTIMORE COUNTY
BALTIMORE CITY
HOWARD COUNTY
PRINCE GEORGES COUNTY
CALVERT COUNTY
KENT ISLAND
CHESAPEAKE BAY
PATAPSCO R.
MAGOTHY R.
SEVERN RIVER
SOUTH R.
WEST RIVER
SILLERY BAY
FORT GEORGE G. MEADE
ANNAPOLIS
Laurel
Savage
Jessup
Dorsey
Elkridge
Linthicum
Stony Run
Glen Burnie
Severn
Odenton
Marley
Solley
Lipin's Corner
Armiger
Jacobsville
Pinehurst
Lakeshore
Pasadena
Benfield
Gambrills
Patuxent Sta.
Conaways
Crownsville
Severn Heights
Arnold
Adams Pt.
Gibson Island
St. Margarets
Skidmore
Iglehart
Chesterfield
Bowie
Priest Bridge
Bestgate
Greenbury Pt.
Collington
Governor's Bridge
Beards Point
Beards Creek
Davidsonville
Woodland Beach
Collinson's Corner
Bay Ridge
Arundel on the Bay
Turkey Point
South River
Birdsville
Mayo
Hardesty
Mariott Hill
Butlers
Owensville
Mt. Zion
Shadyside
Bayard
Marlboro
Drury
Greenock
Bristol
Churchton
Deale
Nutwell
Fairhaven
Friendship
U.S. Route 301
U.S. Route 50
Md. Route 2
Md. Route 214
Md. Route 253
Md. Route 416
Central Avenue
COUNTY LINE
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
+110
+63
+58
+53
+47
+25
+5
-16
-25
-50
-65
-85
-90
-21
-25
-191
-215