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STATE OF NEW JERSEY

DEPARTMENT OF CONSERVATION

AND ECONOMIC DEVELOPMENT

Division of Water Policy and Supply

PUBLIC WATER SUPPLIES IN GLOUCESTER COUNTY, NEW JERSEY

WATER RESOURCES CIRCULAR No. 9

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PUBLIC WATER SUPPLIES IN GLOUCESTER COUNTY, N. J.

By

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U. S. Geological Survey

Prepared by the U. S. Geological Survey
in cooperation with the
State of New Jersey

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PUBLIC WATER SUPPLIES IN GLOUCESTER COUNTY, NEW JERSEY

By

William F. Hardt

ABSTRACT

Gloucester County is in the southwestern part of New Jersey, below Camden, and is a part of the Lower Delaware River Valley. This area is attracting new industry and has shown a population increase of about 47 percent from 1950 to 1960, mostly urban. With the economic growth of the county, the availability and quality of water become increasingly important.

The county is in the Coastal Plain of New Jersey. It is underlain by unconsolidated sands and clays of Quaternary, Tertiary, and Cretaceous age. The Raritan and Magothy Formations constitute the most important aquifers and yield more than 95 percent of the water pumped by the public water systems in the county. These formations are capable of yielding 1,400 gpm (gallons per minute) or more to large diameter wells. High yielding wells generally can be drilled anywhere in the county, although the formations are deeper toward the Atlantic Ocean. The Cohansey Sand, second most important aquifer, yields up to 800 gpm or more from large diameter wells. This aquifer is present only in the sparsely populated southeastern half of the county. The Wenonah Formation and Mount Laurel Sand are capable of yielding 100 to 200 gpm in certain areas.

The overall chemical quality of the naturally occurring ground water is good. The water generally meets the U.S. Public Health Service's (1962) suggested limit for dissolved solids; however, in some areas, the water carries objectionable amounts of iron and nitrate in solution and has a low pH. Contamination of ground water by salt-water encroachment or by pollution from industrial activity or organic waste in densely populated areas should be prevented. The quality rather than the quantity of water may be the important factor in future ground-water developments.

The 21 public water systems in Gloucester County pumped about 1.3 billion gallons of water during 1948 and some 2.7 billion gallons during 1959. This is slightly more than a hundred percent increase in pumpage in 12 years. The average per capita public water supply consumption in 1959 was approximately 75 gallons per day.

This report includes a summary of the history of the present installations, ground-water conditions, quality and availability of water, and potential future yield for the 21 public water systems in Gloucester County.

INTRODUCTION

Purpose and Scope of the Investigation

The future growth and economy of Gloucester County is largely dependent on the available water supply. At the present time moderate to large amounts of water can be pumped economically from the principal ground-water aquifers in the county. However, constant vigilance must be maintained to prevent contamination of this natural resource by salt-water encroachment or pollution from industrial activity or organic wastes in densely populated areas.

Under the provision of Chapter 375, Laws of 1957, the Division of Water Policy and Supply of the Department of Conservation and Economic Development, on December 1, 1957, delineated Gloucester County (except Monroe, Franklin and Newfield Townships) as a protected area, in which no person, corporation or agency of the public shall divert from subsurface sources in excess of 100,000 gpd (gallons per day) for any purpose without permit for such withdrawal.

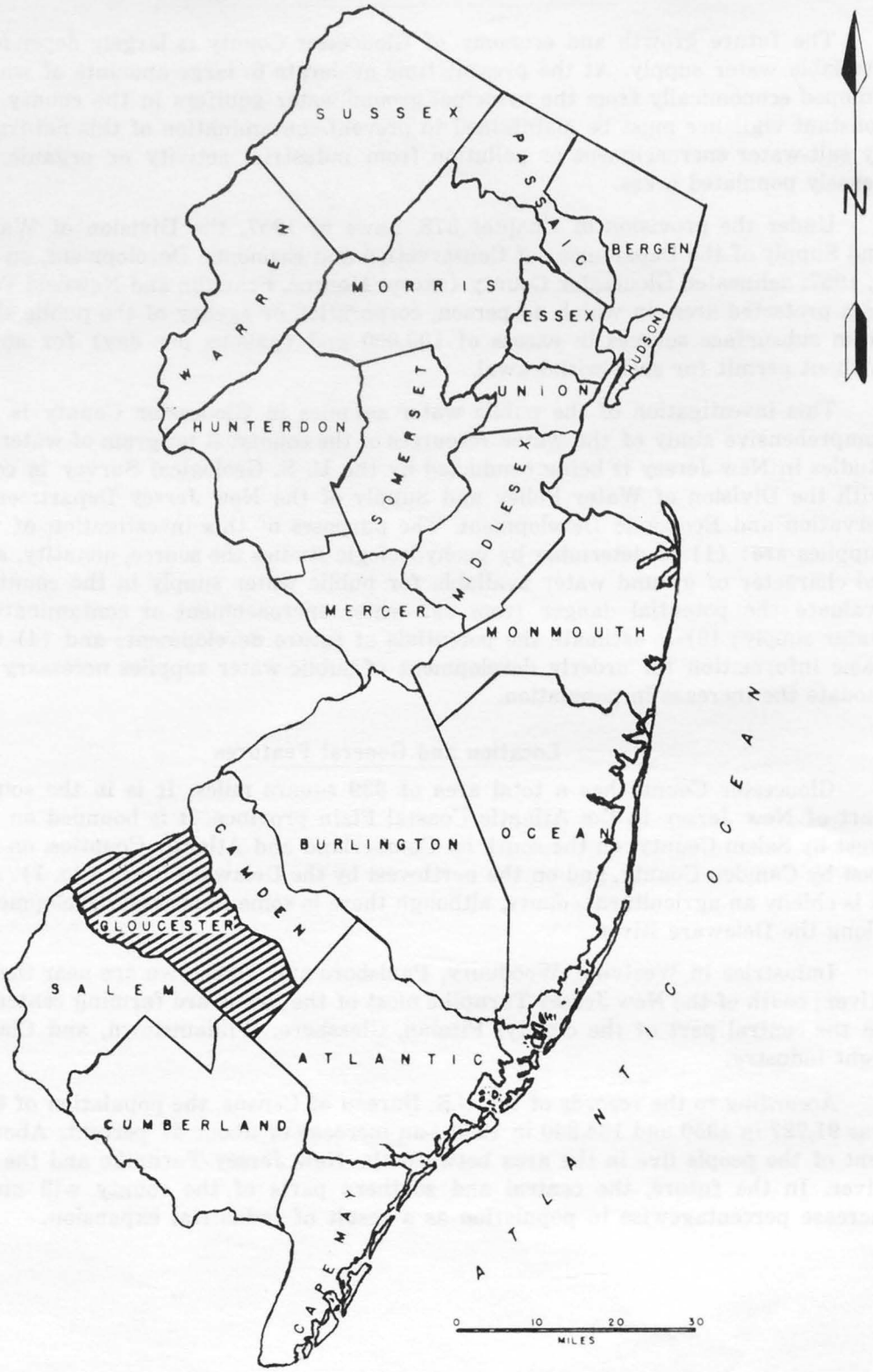
This investigation of the public water supplies in Gloucester County is part of a comprehensive study of the water resources of the county. A program of water-resources studies in New Jersey is being conducted by the U. S. Geological Survey in cooperation with the Division of Water Policy and Supply of the New Jersey Department of Conservation and Economic Development. The purposes of this investigation of the public supplies are: (1) to determine by geohydrologic studies the source, quantity, and chemical character of ground water available for public water supply in the county; (2) to evaluate the potential danger from salt-water encroachment or contamination of the water supply; (3) to estimate the potentials of future development; and (4) to provide basic information for orderly development of public water supplies necessary to accommodate the increase in population.

Location and General Features

Gloucester County has a total area of 339 square miles. It is in the southwestern part of New Jersey in the Atlantic Coastal Plain province. It is bounded on the southwest by Salem County, on the south by Cumberland and Atlantic Counties, on the northeast by Camden County, and on the northwest by the Delaware River (fig. 1). At present it is chiefly an agricultural county, although there is some industrial development, mostly along the Delaware River.

Industries in Westville, Woodbury, Paulsboro and Gibbstown are near the Delaware River; south of the New Jersey Turnpike most of the towns are farming centers (fig. 2). In the central part of the county, Pitman, Glassboro, Williamstown, and Clayton have light industry.

According to the records of the U.S. Bureau of Census, the population of the county was 91,727 in 1950 and 134,840 in 1960—an increase of about 47 percent. About 50 percent of the people live in the area between the New Jersey Turnpike and the Delaware River. In the future, the central and southern parts of the county will undoubtedly increase percentagewise in population as a result of industrial expansion.


SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
BURLINGTON
OCEAN
CAMDEN
GLOUCESTER
SALEM
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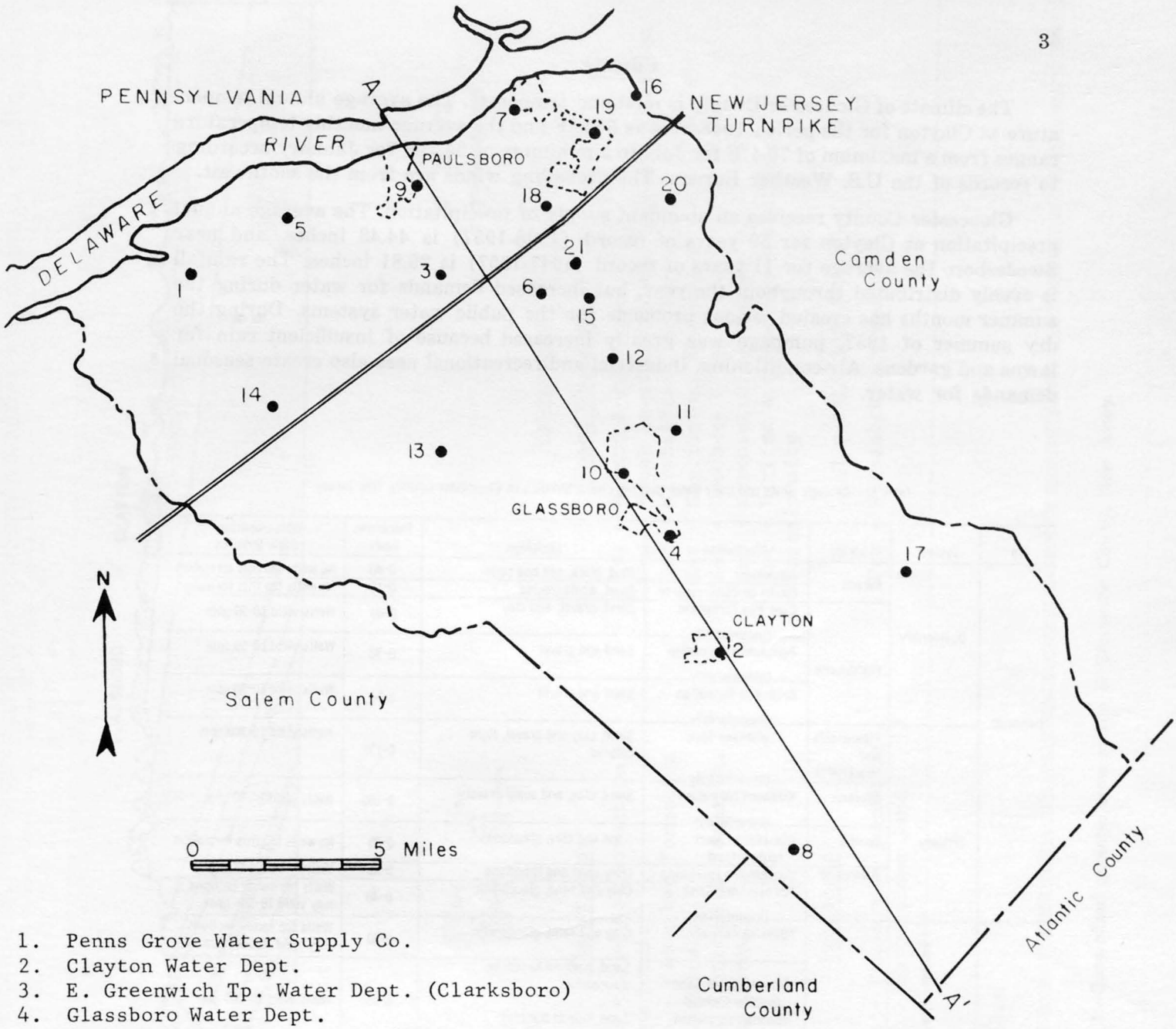


1. Penns Grove Water Supply Co.
2. Clayton Water Dept.
3. E. Greenwich Tp. Water Dept. (Clarksboro)
4. Glassboro Water Dept.
5. Greenwich Tp. Water Dept. (Gibbstown)
6. Mantua Water Co.
7. National Park Water Co.
8. Newfield Water Dept.
9. Paulsboro Water Dept.
10. Borough of Pitman Water Dept.
11. Lakeview Heights Water Co. (Pitman)
12. Sewell Water Co.
13. S. Jersey Water Supply Co. (Milluca Hill)
14. Swedesboro Water Dept.
15. Wenonah Water Dept.
16. Westville Water Dept.
17. Monroe Municipal Utilities Authority
18. Woodbury Water Dept.

Other water companies near Woodbury

19. West Deptford Tp. Water Dept.
20. Cooper Village Water Utility Co.
21. Oak Valley Water Co.

Figure 2.—Public water supplies in Gloucester County, New Jersey.

Climate

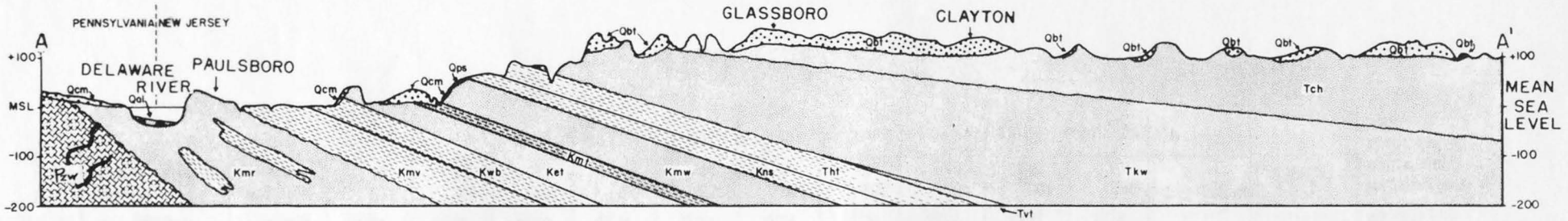
The climate of Gloucester County is mild and temperate. The average annual temperature at Clayton for the period 1948-57 was 54.9°F and the average monthly temperature ranges from a maximum of 76.4°F for July to a minimum of 34.7°F for January according to records of the U.S. Weather Bureau. The prevailing winds are from the southwest.

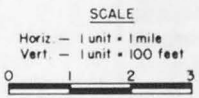
Gloucester County receives an abundant supply of precipitation. The average annual precipitation at Clayton for 50 years of record (1908-1957) is 44.43 inches, and near Swedesboro the average for 11 years of record (1947-1957) is 39.81 inches. The rainfall is evenly distributed throughout the year, but increased demands for water during the summer months has created serious problems for the public water systems. During the dry summer of 1957, pumpage was greatly increased because of insufficient rain for lawns and gardens. Air-conditioning, industrial and recreational uses also create seasonal demands for water.

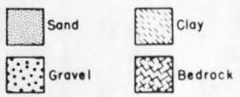
Table 1. --Geologic units and their water-bearing characteristics in Gloucester County, New Jersey

Era	System	Series	Formation	Lithology	Thickness (feet)	Water-bearing characteristics
Cenozoic	Quaternary	Recent	Alluvium	Mud, black, silt and sand	0-40	No wells tap this formation
			Eolian deposits--sparse	Sand, white frosted	0-10	No wells tap this formation
		Pleistocene	Cape May Formation	Sand, gravel, and clay	0-40	Wells yield 10-50 gpm
			——Unconformity——			
			Pensauken Formation	Sand and gravel	0-30	Wells yield 10-50 gpm
			——Unconformity——			
			Bridgeton Formation	Sand and gravel	0-50	Wells yield 10-50 gpm
			——Unconformity——			
	Tertiary	Pliocene(?) and Miocene(?)	Cohansey Sand	Sand, clay and gravel, light colored	0-130	Wells yield 10-800 gpm
			——Unconformity——			
		Miocene	Kirkwood Formation	Sand, clay, and some gravel	0-160	Wells yield 10-50 gpm
			——Unconformity——			
		Eocene	Manasquan Marl (subsurface)	Sand and clay, glauconitic	0-25	No wells tap this formation
		Paleocene	Vincentown Formation	Limy sand and limestone	0-55	Wells yield 10-150 gpm
			Hornerstown Sand	Clay and sand, glauconitic	0-40	Wells tap sandy sections may yield 10-50+ gpm
			——Unconformity——			
Mesozoic	Cretaceous	Upper Cretaceous	Navesink Formation	Clay and sand, glauconitic	0-40	Wells tap sandy sections may yield 10-50+ gpm
			Mount Laurel Sand undifferentiated Wenonah Formation	Sand, medium to coarse, glauconitic Sand, fine to medium, micaceous	0-95	Wells yield 10-200 gpm
			Marshalltown Formation	Clay, sandy in places, glauconitic	0-60	Wells yield at least 40 gpm in some areas (Englishtown formation included)
			Englishtown Formation	Sand, white and yellow, micaceous, slightly glauconitic	0-50	Wells yield 20-100 gpm
			Woodbury Clay	Clay, black, micaceous, nonglauconitic	0-80	No wells tap this formation
			Merchantville Formation	Clay, glauconitic, some sandy zones	0-70	Wells yield 15-100 gpm in some areas
			——Unconformity——			
			Magothy Formation undifferentiated Raritan Formation	Clay, dark colored and sand, light colored (alternating) Clay and Sand, variegated, alternating	150-500+	Wells yield 10-1,400 gpm
			——Unconformity——			
Paleozoic	Early Paleozoic(?)		Wissahickon Formation (subsurface)	Banded micaceous schist or gneiss	5,000-8,000	Wells yield little or no water

[1]The probable age of the Cohansey Sand--Miocene(?) and Pliocene(?) --is suggested by Owens and Minard (1960, p. 27)







QUATERNARY

Recent

Qal - Alluvium
Unconformity

Pleistocene

Qcm - Cape May Formation
Unconformity
Qps - Pensauken Formation
Unconformity
Qbt - Bridgeton Formation
Unconformity

TERTIARY

Pliocene(?) and Miocene(?)

Tch - Cohansey Sand
Unconformity

Paleocene

Tvt - Vincentown Formation
Tht - Hornerstown Sand
Unconformity

Miocene

Tkw - Kirkwood Formation
Unconformity

CRETACEOUS

Upper Cretaceous

Kns - Navesink Formation
Kmw - Mount Laurel Sand and Wenonah Formation
Kmt - Marshalltown Formation
Ket - Englishtown Formation
Kwb - Woodbury Clay
Kmv - Merchantville Formation
Kmr - Raritan and Magothy Formations
Unconformity

EARLY PALEOZOIC(?)

Pzw - Wissahickon Formation

Figure 3.—Generalized geologic cross section of Gloucester County, New Jersey.

Table 2. -- Use of ground water by public supplies in Gloucester County, New Jersey (1950-59)

Number	Name	Pumpage	1959	1958	1957	1956	1955	1954	1953	1952	1951	1950	Population served (1956)	Percentage of consumers metered (1956)	Aquifer
1	Bridgeport Water Co.	Avg. mgd	.034	.028	.035	.031	.032	.030	.024	.030	.046	.044	725	70	Raritan and Magothy Fms
		Total mg	12.39	10.41	12.74	11.20	11.53	11.15	8.73	10.92	16.68	16.26			
2	Clayton Water Co.	Avg. mgd	.188	.195	.253	.268	.242	.215	.159	.150	.120	.109	3,023	100	Cohansey Sand; Raritan and Magothy Fms
		Total mg	68.81	71.14	92.41	98.04	88.38	78.54	57.98	54.96	44.00	39.88			
3	E. Greenwich Tp. Water Dept.	Avg. mgd	.174	.138	.198	.130	.131	.152	.172	.120	.106	.085	1,640	100	Raritan and Magothy Fms
		Total mg	63.70	50.43	72.19	47.73	47.86	55.68	62.91	44.10	38.77	31.07			
4	Glassboro Water Co.	Avg. mgd	1.176	1.017	.917	.779	.750	.646	.588	.515	.495	.436	5,867	100	Raritan and Magothy Fms
		Total mg	429.43	371.36	334.53	284.98	273.77	235.62	214.50	188.39	180.54	159.05			
5	Greenwich Tp. Water Dept.	Avg. mgd	.655	.540	.524	.355	.512	.510	.366	.307	.264	.188	3,800	0	Raritan and Magothy Fms
		Total mg	239.05	197.10	191.14	129.79	186.76	186.34	133.41	112.42	96.49	68.80			
6	Mantua Water Co.	Avg. mgd	.063	.059	.065	.053	.050	.046	.042	.041	.039	.034	2,000	90	Raritan and Magothy Fms
		Total mg	22.86	21.69	23.56	19.33	18.16	16.92	15.47	15.11	14.29	12.48			
7	National Park Water Co.	Avg. mgd	.222	.192	.224	.167	.192	.282	.220	.272	.272	.274	3,212	3	Raritan and Magothy Fms
		Total mg	81.23	70.05	81.76	61.11	70.20	103.09	80.50	99.74	99.42	100.19			
8	Newfield Water Dept.	Avg. mgd	.125	.090	.095	.091	.087	.083	.081	.084	.072	.059	1,000	100	Cohansey Sand
		Total mg	45.79	33.03	34.81	33.37	31.71	30.26	29.50	30.70	26.10	21.45			
9	Paulsboro Water Co.	Avg. mgd	1.130	1.100	1.153	1.024	1.035	.996	1.040	.985	.797	.782	9,000	76	Raritan and Magothy Fms
		Total mg	412.61	401.70	421.02	374.64	377.83	363.55	379.81	360.75	290.96	285.33			
	Pitman Water Dept.	Avg. mgd	.483	.453	.485	.413	.440	.400	.365	.320	.324	.308	7,000	99	Raritan and Magothy Fms
		Total mg	176.24	165.41	177.20	151.20	160.81	146.16	133.10	117.18	118.35	112.42			
10	Pitman Grove Water System	Avg. mgd	.103	.100	.091	.082	.085	.078	.078	.078	.078	.076	5,600	100	Raritan and Magothy Fms
		Total mg	37.52	36.52	33.20	29.97	31.19	28.31	28.54	28.59	28.61	27.84			
11	Lakeview Heights Water Co.	Avg. mgd	.003	.003	.003	.003	.004	.004	.004	.004	.004	.004	56	0	Wenonah Formation and Mount Laurel Sand
		Total mg	1.18	1.14	1.23	1.23	1.44	1.39	1.46	1.63	1.65	1.65			

Table 2. -- Use of ground water by public supplies in Gloucester County, New Jersey (1950-59)--continued

Number	Name	Pumpage	1959	1958	1957	1956	1955	1954	1953	1952	1951	1950	(Population served (1956)	Percentage of consumers metered (1956)	Aquifer
12	Sewell Water Co.	Avg. mgd Total mg	.127 46.34	.125 45.71	.135 49.33	.088 32.11	.057 20.81	.047 17.31	.027 9.94	.025 9.10	.026 9.68	.026 9.60	1,300	100	Raritan and Magothy Fms
13	S. Jersey Water Supply Co.	Avg. mgd Total mg	.127 46.24	.113 41.33	.071 25.79	.048 17.78	.054 19.88	.080 29.15	.098 35.61	.101 37.07	.104 37.96	.084 30.74	700	90	Raritan and Magothy Fms
14	Swedesboro Water Dept.	Avg. mgd Total mg	.223 81.52	.188 68.79	.277 100.94	.220 80.45	.222 81.04	.212 77.32	.158 57.83	.199 72.97	.140 51.28	.120 43.76	1,200	100	Raritan and Magothy Fms
15	Wenonah Water Dept.	Avg. mgd Total mg	.192 70.28	.156 56.85	.162 58.98	.124 45.24	.128 46.91	.134 48.95	.107 39.17	.100 36.45	.103 37.63	.079 28.82	1,725	99	Raritan and Magothy Fms
16	Westville Water Dept.	Avg. mgd Total mg	.485 177.20	.455 165.98	.449 164.03	.422 154.53	.353 128.91	.261 95.28	.278 101.65	.266 97.46	.265 96.84	.272 99.41	5,000	100	Raritan and Magothy Fms
17	Monroe Tp. Water Co.	Avg. mgd Total mg	.213 77.61	.200 72.84	.197 71.77	.191 70.06	.209 76.20	.174 63.52	.157 57.31	.133 48.85	.140 50.93	.127 46.45	3,200	95	Cohansey Sand
18	Woodbury Water Dept.	Avg. mgd Total mg	1.567 571.94	1.370 500.22	1.703 621.65	1.370 501.36	1.418 517.42	1.290 471.02	1.161 423.74	1.053 385.33	.908 331.63	.845 308.49	21,950	100	Raritan and Magothy Fms
19	Colonial Manor Water Co.	Avg. mgd Total mg	.051 18.79	.044 16.21	.053 19.29	.043 15.62	.043 15.85	.044 16.05	.041 15.14	.043 15.65	.035 12.67	.029 10.45	700	0	Raritan and Magothy Fms
20	Cooper Village Water Utility Co.	Avg. mgd Total mg.	.078 28.29	.054 19.72	.048 17.50	[1].027 [1]10.02									Raritan and Magothy Fms
21	Oak Valley Water Co.	Avg. mgd Total mg	.237 86.43	.205 74.96	[2] .133 [2] 41.30										Raritan and Magothy Fms
	ANNUAL TOTAL	Avg. mgd Total mg	7.656 2,795.45	6.825 2,492.39	7.251 2,646.36	5.929 2,169.78	6.044 2,206.61	5.684 2,075.61	5.166 1,886.30	4.826 1,767.27	4.338 1,584.48	3.981 1,454.14	79,448		

[1]Started January 1956.
[2]Started January 1957.

GEOHYDROLOGY OF GLOUCESTER COUNTY

Gloucester County is underlain by unconsolidated sands and clays of Quaternary, Tertiary, and Cretaceous age. These sediments lie on a bedrock surface of metamorphic and igneous rocks of early Paleozoic age. The water-bearing characteristics of the formations are important in developing public water supplies. For example, the Raritan and Magothy Formations are the highest yielding aquifers in the county and the source of most of the public water supplies. The Cohansey Sand and possibly the Wenonah Formation and Mount Laurel Sand are other important aquifers capable of yielding large quantities of water. The other formations yield little or no water because they consist chiefly of clay and silt. Table 1 indicates the relative positions of the formations occurring in the county. These formations dip to the southeast and thicken oceanward so that each younger formation is more nearly horizontal than its predecessor. The older formations are at or near the surface along the Delaware River and are progressively deeper toward the ocean (fig. 3).

The Raritan and Magothy Formations can be tapped by wells anywhere in the county. Adjacent to the Delaware River, these formations are at the surface; hence water may be obtained from shallow wells. At Clayton the Raritan and Magothy Formations lie about 740 feet below the surface and at Newfield about 1,300 to 1,400 feet below the surface. Where these formations dip beneath the overlying younger formations the water is confined and under artesian pressure. Static water levels in wells would probably be less than 200 feet below the surface everywhere in the county and less than 50 feet in the northwestern part. The Cohansey Sand, which is largely a water-table aquifer, is at the surface in the southeastern part of the county. Wells less than 200 feet deep yield moderate to large amounts of water with static water levels usually less than 50 feet below the surface.

PUBLIC WATER SUPPLIES

Of the 21 public water-supply systems in Gloucester County, 19 use ground water from the Raritan and Magothy Formations, 2 use water from the Cohansey Sand, and 1 small company serving a part of Pitman uses water from the Wenonah Formation and Mount Laurel Sand. The Raritan and Magothy Formations constitute the most important aquifer and yield more than 95 percent of the public-supply water in the county. The largest public water system in the county is the Woodbury Water Department; others of notable size are those serving Paulsboro, Glassboro, Pitman, and Westville. The public water systems pumped on the average more than 7 mgd (million gallons per day) or as much as 2.7 billion gallons of water during 1959. In 1948 an average of only 3.6 mgd or a total of 1.3 billion gallons of water was pumped for public supplies. The 1959 rate represents an increase of slightly more than 100 percent in 12 years. There has been a steady increase in annual water consumption in the county, except for a slight decline in 1956 and 1958 (table 2). The number of people served by these systems is steadily increasing; approximately 55,000 people were served in 1952; 57,800 in 1954; and 85,800 in 1959. Undoubtedly, the population will continue to increase and the demand for additional water must be met by public water supply systems.

A tabulation of the monthly pumpage of public water systems during 1959 (table 3) shows that for nearly half of the public supplies the peak month of pumpage is May. This includes public supplies for industrial use. In about 30 percent of the municipalities, the peak months of pumpage are June or July. The average per capita consumption in the county in 1959 was about 75 gpd.

The basic data in tables 2 and 3 were obtained from the Division of Water Policy and Supply of the New Jersey Department of Conservation and Economic Development in Trenton.

The overall chemical quality of the ground water in Gloucester County is good. The water generally meets the U.S. Public Health Service's (1962) suggested limits for dissolved solids; however, in some areas the water carries objectionable amounts of iron and nitrate in solution (fig. 4) and has a low pH (table 5). The hardness of water, due chiefly to calcium and magnesium bicarbonate, is most commonly recognized by its effects when soap is used with water in washing. The classification of hardness of water as used in this report has been adopted from Lamar (1942).

Parts per million	*Description*
1 - 60	Soft
61 - 120	Moderately hard
121 - 200	Hard
201 and greater	Hard to very hard

The county has only a few quality-of-water problems now. However, increased ground-water consumption in the future may result in poor quality of water owing to contamination caused by a growing population and expanding industry. Serious problems may result unless proper management accompanies the ground-water development. Analyses of water from selected public-supply wells are shown in table 5. A brief description of each public water supply in the county includes the location, plant installations, ground-water conditions, quality and availability of water, and potential future yield. The well records and geohydrologic data for most of the public-supply wells in the county are presented in table 4.

Table 3. --Monthly use of ground water during 1959 for public supplies in Gloucester County, New Jersey

No.	Name	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total pumpage	Population served (1959)	Per capita consumption gpd per person
1	Penns Grove Water Supply Co.	.798	.711	.828	.924	1.160	1.130	1.017	.994	1.242	1.110	1.050	[1]1.426	12.390	725	46.8
2	Clayton Water Co.	5.799	4.951	4.443	4.661	7.049	[1]7.968	7.026	6.037	5.474	5.010	4.997	5.391	68.806	3,023	62.4
3	E. Greenwich Tp. Water Dept.	4.012	2.948	3.470	4.079	[1]8.954	8.108	5.964	5.321	5.024	4.180	8.070	3.574	63.704	3,000	58.2
4	Glassboro Water Co.	29.093	27.984	31.140	33.104	[1]41.937	39.677	41.020	39.149	39.521	33.894	34.654	38.256	[2]429.429	5,867	[2]200.5
5	Greenwich Tp. Water Dept.	16.984	15.754	18.608	19.155	[1]31.947	24.800	25.296	19.166	19.777	18.411	14.325	14.825	[2]239.048	4,000	[2]163.7
6	Mantua Water Co.	2.129	1.954	1.770	1.726	[1]2.202	2.127	1.995	1.923	1.832	1.766	1.708	1.727	22.859	2,000	[3]31.3
7	National Park Water Co.	4.413	3.671	5.044	5.742	11.394	[1]11.399	10.439	8.756	6.854	5.147	4.126	4.247	81.232	3,760	59.2
8	Newfield Water Dept.	3.132	3.817	4.443	5.313	[1]5.836	5.513	3.835	3.143	3.091	2.091	3.563	2.010	[2]45.787	1,000	[2]125.4
9	Paulsboro Water Co.	24.551	21.407	23.224	39.902	[1]61.757	48.925	41.574	44.302	33.768	27.272	20.407	25.518	[2]412.607	9,000	[2]125.6
10	Pitman Water Dept.	12.764	11.619	12.974	12.871	17.853	[1]18.117	15.221	15.190	17.512	16.157	12.771	13.194	176.243	7,000	69.0
	Pitman Grove Water System	2.425	2.154	2.714	3.063	3.712	[1]3.987	3.936	3.801	3.229	2.936	2.584	2.979	37,520	5,600	[3]18.4
11	Lakeview Heights Water Co.	.073	.081	.065	.083	.082	.070	[1].152	.152	.137	.119	.093	.076	1.183	56	57.8
12	Sewell Water Co.	3,702	3.306	4.001	4.124	4.016	4.229	[1]4.231	4.007	4.056	3.762	3.540	3.370	46.344	1,420	89.4
13	S. Jersey Water Supply Co.	2.671	2.517	2.824	4.328	4.196	5.025	5.056	[1]5.137	4.184	3.412	3.380	3.512	46.242	900	140.8
14	Swedesboro Water Dept.	5.283	5.012	6.253	6.136	7.613	[1]7.668	7.464	7.152	7.259	7.589	7.541	6.552	[2]81.522	2,500	[2]89.3
15	Wenonah Water Dept.	3.798	3.094	3.521	4.092	[1]10.469	10.103	7.857	8.557	6.950	4.910	3.521	3.403	70.275	1,780	108.2
16	Westville Water Dept.	14.526	12.945	13.877	13.768	17.710	17.740	[1]17.828	17.170	14.987	13.311	11.299	12.037	177.198	5,000	97.1
17	Monroe Tp. Water Co.	5.168	4.745	5.153	5.577	6.898	8.456	[1]8.457	7.848	6.632	6.469	6.006	6.115	77.614	4,000	53.2
18	Woodbury Water Dept.	40.298	35.949	39.904	46.528	[1]61.112	58.317	55.462	51.500	52.042	49.416	40.542	40.869	571.939	20,000	78.3
19	Colonial Manor Water Co.	1.242	1.143	1.258	1.416	[1]2.577	2.575	1.706	1.512	1.450	1.298	1.280	1.337	18.794	700	73.5
20	Cooper Village Water Co.	1.667	1.597	1.807	1.974	2.699	2.673	2.478	2.840	2.935	[1]2.999	2.542	2.081	28.292	1,300	59.6
21	Oak Valley	6.915	5.022	5.773	5.818	8.817	[1]9.542	6.460	8.831	7.874	7.502	6.403	7.473	86.430	3,200	74.0
	TOTAL													2,795.458	85,831	[4]75.2

[1]Peak month; [2]includes industrial usage; [3]low consumption figure; and [4]averages of 15 companies, normal consumption.

1. Penns Grove Water Supply Company (Bridgeport)
(Formerly Bridgeport Water Company)

Bridgeport is in the western part of the county adjacent to Raccoon Creek about a mile south of the Delaware River. The water company was formed in 1904 to supply water to this area. The present water plant was built in 1921, and in 1955 it became a division of the Penns Grove Water Supply Company. The pumping station, consisting of a pumphouse and a 50,000-gallon elevated storage tank, is at the south end of Railroad Avenue about 200 feet south of the Pennsylvania Railroad tracks.

Originally, water was pumped from six 4-inch wells about 40 feet deep near the present station. Four wells were taken out of service, and the two remaining wells yielded a total of about 130 gpm by direct suction. By 1930 these two wells had decreased appreciably in yield—probably because of precipitation of iron and manganese on the openings of the screen during the 26 years of pumping—and a 10-inch diameter well was drilled to a depth of 43 feet (well 1, table 4). This well, yielding 150 gpm, supplied the town with water adequately for 25 years. In 1955, another 10-inch well was drilled at the pumping station to a total depth of 127 feet, but was developed at 88 feet because of the presence of clays below this depth (well 2, table 4). The well was tested at 190 gpm with 11 feet of drawdown—a specific capacity of about 17 gpm per foot of drawdown or about 70 percent more than the older well. The 43-foot well has been disconnected from service and all pumping is now from the 88-foot well. The static water level in both wells was about 5 feet below land surface in 1957.

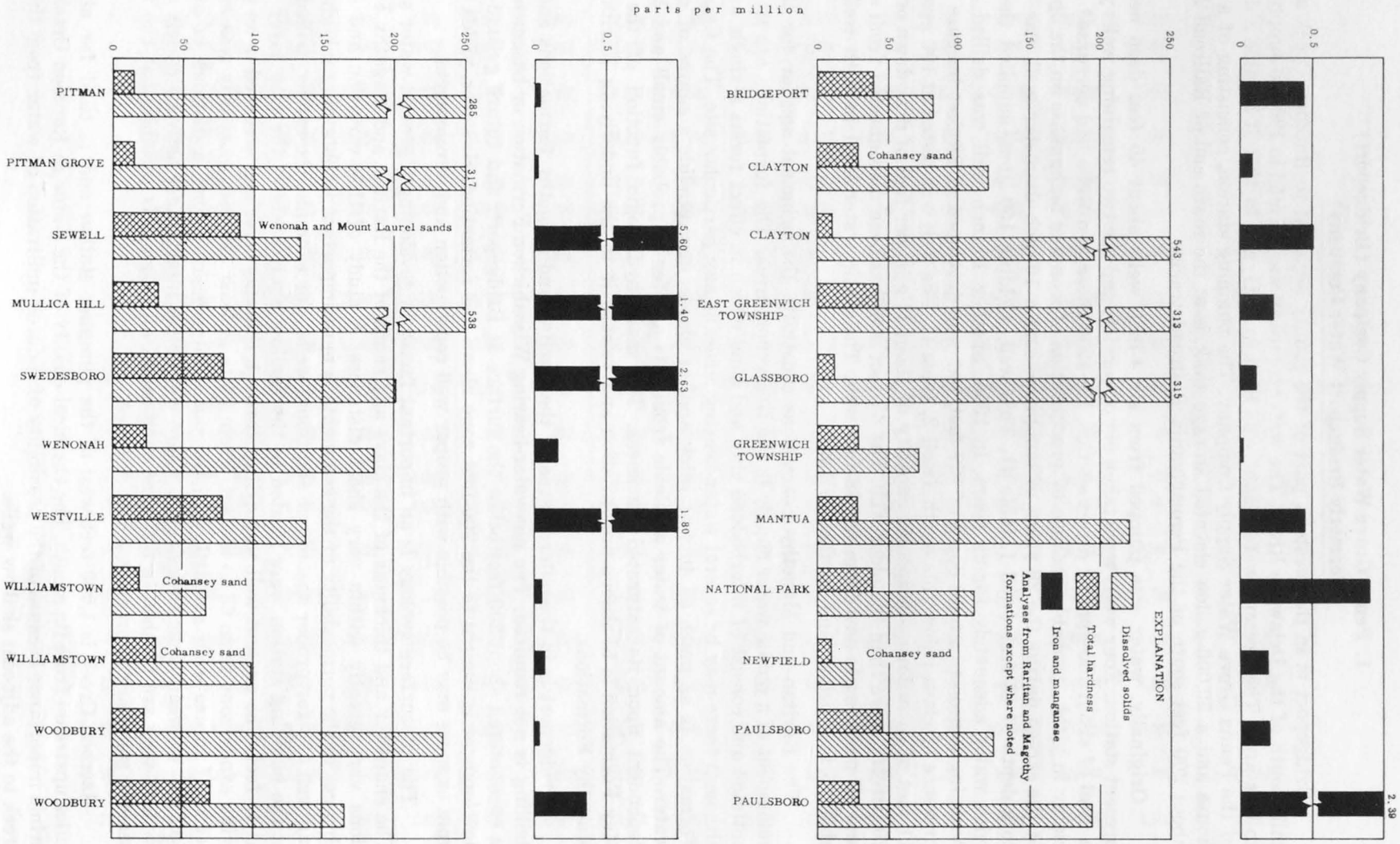
The Raritan and Magothy Formations constitute the principal aquifer for the development of a public water supply in the Bridgeport area. The formations are undifferentiated and consist of interbedded clay and sand which in effect forms a single aquifer, although there may be several water-bearing zones at any particular site. The Cape May Formation is as much as 40 feet thick and, at places, may provide a source of ground water. The amount of water available from this aquifer is probably small and largely dependent upon its saturated thickness. The main hydrologic function of the Cape May Formation is to absorb precipitation and release it to the underlying Raritan and Magothy Formations.

Bridgeport is in the outcrop area of the Raritan and Magothy Formations and deep drilling is not required. The nonwater-bearing Wissahickon Formation or basement rock is encountered about 200 feet below the surface at Bridgeport, and future ground-water development is limited to the 200-foot zone above this formation. However, yields of 500 gpm or more may be possible with proper well construction and development.

The subsurface geology is an important factor in developing a ground-water supply. The character and thickness of the clays and sands of the Raritan and Magothy Formations vary greatly within very short distances. A study of this variation and of the changes in the permeability of the sediments is most important in obtaining a high-yielding well and for proper spacing of additional wells. For example, the earlier drilled wells at the pumping station were located in the shallow aquifer above the clay layer found at 40 feet. The present well was drilled through this clay layer and screened in an underlying sandy zone from 65 to 85 feet. From 85 to at least 127 feet more clay was encountered. If future wells are drilled in the same water-bearing zone, a distance of at least 500 feet between wells is desirable. There will be less interference between closely spaced wells if they are finished in different sand zones, although it is possible that the water-bearing zones are interconnected at distance.

Raccoon Creek is 1,000 feet west of the pumping station and is tidal for about 8 miles upstream from its mouth. The chemical quality of the water in Raccoon Creek is of prime importance because of the possibility of induced infiltration of water from the tidal creek to the adjacent shallow wells.

Figure 4.—Concentrations of dissolved minerals in water from selected public supply wells in Gloucester County, New Jersey.



Water from the shallow abandoned well 1 (table 4) is of good chemical quality, except for iron and manganese contents. These two constituents are found in objectionable quantities in the water in the Bridgeport area and throughout much of the county. The nitrate content of the water from well 1 is 11 ppm (parts per million), whereas the chloride content is 9.5 ppm. The absence of intensive ground-water pumping near the borough may be a factor in maintaining the good quality of water.

The Penns Grove Water Supply Company pumped an average of about 35,000 gpd during 1957. There were no industrial wells or industrial users of water in the town as of June 1957, therefore, essentially all the water pumped was for domestic purposes.

2. The Borough of Clayton Water Department

Clayton is in the south-central part of the county. The pumping station of the Clayton Water Department is half a block east of Delsea Avenue (Route 47), on Chestnut Street in the southeastern part of the borough. Before 1928, both the boroughs of Glassboro and Clayton were supplied with water from this pumping station. Since then, Glassboro has developed its own water supply, but a service line connects the boroughs.

In 1926 an 8-inch well was drilled in the main building of the pumping station to a depth of 100 feet to replace 9 shallow wells. By 1941, the yield of this 8-inch well had decreased from 350 gpm to 150 gpm and the well was abandoned. The decrease in yield probably was caused by the clogging of the strainer by iron and manganese. In 1942 well 2, a 16-inch well, was drilled to a depth of 103 feet at a site about 75 feet west of the 8-inch well (well 3, table 4). The yield of this well was 450 gpm with 40 feet of drawdown. The water from this well was aerated in a receiving basin and then pumped into the mains with an elevated storage tank of 108,000 gallons capacity acting as an equalizer. The original static levels in the 8-inch and 16-inch wells were about 25 feet below the land surface and measurements in 1957 indicate that there has been no permanent lowering of the water table. Both these wells tap the Cohansey Sand which is slightly more than 100 feet thick at the pumping station.

Other wells in Clayton yield water which contains objectionable amounts of iron and manganese. Wide variations in these two constituents in water from the Cohansey Sand within short distances is common, and it is not possible to predict their concentration at any locality.

A pumping test of about 6 hours was conducted on well 2 in August 1957. When the well was pumped at a rate of 300 gpm, the water level lowered from 24 to 49 feet below the land surface in 15 minutes. For the remaining 5½ hours, the pumping level remained fairly constant. A slight decrease in pressure in the line was instantly reflected as recovery in the pumping level, owing to a decrease in the rate of pumping. The specific capacity of the well as determined by the test was 11 gpm per foot of drawdown, about the same as in 1942. The results of the 1957 test indicate that the Cohansey Sand is capable of yielding larger quantities of water. If properly constructed and developed, additional wells may yield 500 gpm or more. Wells yielding 300 gpm should be at least 250 feet apart and wells with higher yields preferably should be even farther apart.

In 1956, well 2 was abandoned and pumping from the Cohansey Sand ceased. A 12-inch well was drilled 300 feet southeast of well 2 to a depth of 1,010 feet to the Raritan and Magothy Formations (well 4, table 4). Because of the increasing amount of clay below 800 feet, the well was finished about this depth. It was screened in two sections, from 746 to 761 and 785 to 800 feet, and was tested at a rate of 708 gpm with 90 feet of drawdown. There is more clay and the saturated sands are thinner at this well site than at sites adjacent to the Delaware River. The driller's pumping test indicated a coefficient of transmissibility of about 30,000 gpd per foot, a coefficient of permeability between 500

and 1,000 gpd per square foot, and a specific capacity of 8 gpm per foot of drawdown. These results are lower than obtained from tests of the Raritan and Magothy Formations adjacent to the Delaware River. Inasmuch as Clayton is 16 miles downdip from the river there is some indication that the Raritan and Magothy Formations may yield less water farther downdip. The temperature of the water in the Raritan and Magothy Formations at this site is 74°F. Locally, wells tapping the Raritan and Magothy Formations yield water containing a greater concentration of dissolved solids than water from the wells tapping the Cohansey Sand. Also, water from the Raritan and Magothy Formations and water from the Cohansey Sand contain objectionable amounts of fluoride and nitrate, respectively.

The water in the Raritan and Magothy Formations rose nearly 600 feet under artesian pressure in the well at Clayton. The top of this aquifer is more than 700 feet below land surface in Clayton, and future development is possible anywhere in the borough. Yields of 500 gpm or more may be expected with proper well construction. Additional wells should be at least 500 feet apart. Future development in the deeper Raritan and Magothy Formations should be approached with caution in the Clayton area, because the static head in the aquifer was about 18 feet below sea level in November 1956. The fresh water-salt water interface probably is somewhere between Bridgeton (Cumberland County) and Clayton, and the relatively high chloride content of the water in the Clayton well may be an indication of the proximity of this interface. As of 1959, this is the closest well in the county to the salt-water interface and would be one of the first contaminated by saline water. There is little possibility of salt-water contamination in the Cohansey Sand at the present time in the Clayton area because the static level of the water table in the aquifer is more than 100 feet above sea level.

There is a possibility of obtaining small to medium amounts of water from the Wenonah Formation and Mount Laurel Sand, the Marshalltown Formation, and Englishtown Formation. These formations lie between 500 and 600 feet below the land surface. The water is under artesian pressure and would probably rise to within 100 feet of the land surface.

3. East Greenwich Township Water Department (Clarksboro)

The East Greenwich Township Water Department was started in 1931 to service the communities of Mickleton, Clarksboro, and Mount Royal. These three settlements are between Swedesboro and Woodbury and are about 5 miles south of the Delaware River.

The pumping station is at the northwest corner of Salem Avenue and Cohawkin Road in Clarksboro. At this site is also an elevated storage tank of 100,000 gallons capacity. In 1931 a 16-inch well was drilled to a total depth of 245 feet, but was finished at 205 feet owing to the presence of clays below this depth (well 5, table 4). The well was tested at 410 gpm with 33 feet of drawdown. Although this is adequate to supply the community's demand, in 1956 an additional 16-inch well was drilled to a depth of 218 feet at a site about 700 feet southwest of well 1 as a standby (well 6, table 4). Well 2 yielded 536 gpm with 20 feet of drawdown and has a specific capacity twice that of the older well owing to the coarser nature of the sediments encountered at this site. Distinct differences in the lithologic characteristics of the aquifer occurring within short distances is common in the Coastal Plain sediments.

The top of the Raritan and Magothy Formations is about 200 feet below land surface at Clarksboro, and drilling below 250 feet usually is not necessary because large quantities of water of good quality generally can be obtained from the upper zone. The chemical quality of the water in the upper zone is good and has not changed appreciably since 1931 in well 1 at Clarksboro. Data from wells in surrounding communities indicate

the presence of a lower aquifer which may be used in the case of overdevelopment or water-quality problems in the upper aquifer. Large amounts of water can be pumped from either zone. The nonwater-bearing Wissahickon Formation or basement rock is below the Raritan and Magothy Formations.

Future public water supplies can be obtained anywhere in East Greenwich Township only from the Raritan and Magothy Formations. Large-capacity wells yielding more than 500 gpm probably should not be spaced less than 500 feet apart. The thickness and location of the clay beds and the permeability of the sands and gravels in the Raritan and Magothy Formations are extremely important in the spacing of new wells. The static water levels in the town wells are at or below mean sea level. If the water levels remain below sea level, it may be possible over a period of years for surface water from the Delaware River to move downgradient. Therefore, it is very important to have good water in the river.

4. Borough of Glassboro Water Department

Glassboro, one of the larger municipalities in Gloucester County, is in the central part of the county about 3 miles north of Clayton and has the third largest water supply system in the county. Glassboro received water from Clayton until 1928 when the Borough of Glassboro formed its water department. The pumping station is on Main Street south of High Street, at the rear of the borough garage and police station.

The first well is 18 inches in diameter and drilled at the pumping station site in 1927 to a depth of 654 feet and yielded 363 gpm with 13 feet of drawdown (well 7, table 4). The second well is 18 inches in diameter and drilled in 1947 to a depth of 604 feet and yielded 584 gpm with 25 feet of drawdown (well 8, table 4). Well 2 is in a pumphouse below an elevated storage tank of 132,500 gallons capacity at the intersection of North Main Street and Delsea Drive, about 3,000 feet north of well 1. A third well, drilled in 1956 about 5,000 feet west of well 1 near the intersection of Deptford and Harvard Roads, is a 12-inch well 615 feet deep; it yielded 740 gpm with 30 feet of drawdown (well 9, table 4). The three wells pump from the Raritan and Magothy Formations, which lie deeper than 550 feet below the surface in the Glassboro area. The specific capacities of the wells are similar, averaging about 25 gpm per foot of drawdown. Geologic information from the three wells indicates that the formations are fairly uniform throughout the Glassboro area. The static water levels are from 145 to 165 feet below the surface. In 1959, the static water levels were a few feet below sea level and were slightly lower than when the first wells were constructed 30 years ago.

The chemical quality of the water is good. The water is very soft, and low in iron and dissolved solids. The fluoride content is in the proper range to be an asset in lowering the incidence of tooth decay in young children. Any steady increase in the dissolved-solids content of the water, particularly the chloride content, may indicate the advance of the salt-water interface from the south. The chloride content of water from the Raritan and Magothy Formations at Glassboro is 19 ppm which is about the same as that at Pitman and about six times less than at Clayton.

There is no measurable interference between the borough wells. The wells pump directly into the mains, and the elevated storage tank above well 2 and a 75,000 capacity standpipe north of town help to equalize the water pressure. Additional storage tanks may be needed in the future for the anticipated water needs caused by an increase in population and industrial development. An estimated 3 million gallons of water per month was supplied to private industry by the city in 1957. In 1956, an average of nearly 0.8 mgd was pumped. During the hot, dry month of June 1957, an average of 1 mgd was pumped for the first time in the history of the water department; the total amount

of water pumped—about 30 million gallons—exceeded any previous monthly record by 4 million gallons.

Future public water-supply wells can be drilled anywhere in the municipality to the Raritan and Magothy Formations with expected yields of 500 to 1,000 gpm or more depending on the subsurface geology.

Lesser amounts of ground water can be obtained from other aquifers in the Glassboro area. The Cohansey Sand and Kirkwood Formation will yield water to wells at depths less than 100 feet below land surface. About 300 feet below the surface, the Englishtown Formation, Wenonah Formation and Mount Laurel Sand yield small amounts of water.

5. Greenwich Township Water Department (Gibbstown)

Gibbstown is in an industrial area in the west-central part of the county near the Delaware River. The water department and pumping station are at Broad Street and Walnut Avenue in Gibbstown. An elevated storage tank of 100,000 gallons capacity is 4,000 feet east of the pumping station.

The first well was drilled in 1929 at the pumping station to a depth of 102 feet; it is now abandoned and capped. A second well was drilled in 1944 at the pumping station to a depth of 106 feet and originally yielded 524 gpm with 22 feet of drawdown (well 10, table 4). The third well was drilled in 1950 about a mile east of the pumping station on Harmony Road near Morse Avenue. It is a 16-inch well 100 feet deep and when first tested yielded 700 gpm with 50 feet of drawdown (well 11, table 4). The water department serves only the domestic and commercial needs of the town. The industries supply their own water from wells and the Delaware River.

In the Gibbstown area, the Raritan and Magothy Formations are at the surface and are underlain by basement rock at a depth of about 200 feet. An upper sand and gravel zone extends to a depth of about 100 feet. The static water level in this zone is about 20 feet below land surface. At the base of this upper aquifer is an extensive clay layer and below it a lower aquifer extends to the basement rock. Locally, there may be minor lenses of clay in the water-bearing sands.

The future water problem in Gibbstown and along the Delaware River in Gloucester County will be one of controlling the chemical quality of the water for public and industrial use. Whenever sands and gravels are exposed to industrial wastes or salt water, contamination can take place. Therefore, the quality of the water in the Delaware River and proper methods of waste disposal in the industrial areas are very important in preventing contamination of the aquifer. The water from the township well is of good chemical quality, although it has an acid pH of 4.4. The water in the lower aquifer generally is of poorer quality.

The most favorable area for future public-supply wells is in the southern part of Gibbstown away from possible sources of contamination, such as the river or wastes from industrial plants, and where wells need be less than 200 feet deep.

6. Mantua Water Company

Mantua is in the north-central part of the county about 3 miles south of Woodbury on the bank of Mantua Creek. Before 1928, the community was supplied with water from four small-diameter wells at the pumping station on Broadway Avenue about 200 feet south of Mantua Creek. Three of the wells were abandoned in 1928, owing to a decrease in yield caused by the accumulation of fine sand. From 1928 to 1940 the water supply for Mantua was obtained from the remaining 3-inch well, which was 205 feet deep and

yielded 90 gpm. In 1940 it was plugged and abandoned when the yield decreased. An 8-inch replacement well was drilled to 235 feet and yielded 460 gpm (well 12, table 4). It was adequate until 1953 when the yield had decreased to 100 gpm. Another well was drilled in 1954 about 2,800 feet south of the pumping station near the standpipe on South McCarthy Avenue. (The standpipe has a capacity of 67,000 gallons and helps to equalize the pressure in the mains.) This 8-inch well is 310 feet deep and when first tested yielded 287 gpm with 40 feet of drawdown (well 13, table 4).

The two wells obtain water from the Raritan and Magothy Formations, which are about 175 to 250 feet below land surface in the Mantua area. Some private wells in town obtain water from the sandy parts of the Merchantville Formation at depths of about 100 feet. Shallow wells, south of town, drilled to the Wenonah Formation and Mount Laurel Sand, yield water for domestic supplies. However, where a large permanent yield of water is necessary, wells should be drilled to the Raritan and Magothy Formations. Future wells probably can be located anywhere in the Township of Mantua, although wells drilled deeper than 600 to 700 feet will encounter basement rock. There are several water-bearing zones in the Raritan and Magothy Formations separated by clay lenses.

The quality of water in the Raritan and Magothy Formations at Mantua is good except for the objectionable amounts of iron. The decrease in yield of the older wells probably is due to clogging of the screens by precipitation of iron and the accumulation of fine sand around the screen.

7. National Park Water Company

National Park is about 6 miles south of Camden on the south bank of the Delaware River. The water company was started in 1952 when two 8-inch wells were drilled—one in the meadow opposite the end of Lincoln Avenue and one on Woodland Avenue. These wells were about 90 feet deep and each yielded 250 gpm. They supplied water to the town for 25 years until the combined yield decreased to 120 gpm because of sanding. In 1950 the wells were plugged and abandoned, and another well that originally yielded 500 gpm with 58½ feet of drawdown (well 14, table 4) was drilled to a depth of 87 feet at the pumping station on Woodland Avenue. In 1956, another well was drilled at Lakehurst and Grove Avenues near the 190,000-gallon-capacity standpipe. This well was drilled through the entire thickness of the Raritan and Magothy Formations and encountered bedrock 288 feet below land surface. The well was finished at a depth of 282 feet and yielded 636 gpm with 31 feet of drawdown (well 15, table 4).

In September 1957, an aquifer test was conducted at the Woodland Avenue Station. A well was pumped at a rate of 428 gpm for 24 hours and water levels were measured in an observation well 72 feet away. Results of the test indicate a coefficient of transmissibility of 52,000 gpd per foot, a storage coefficient of 0.003 (semiartesian conditions in the aquifer), and a coefficient of permeability of at least 1,000 gpd per square foot. Another aquifer test by the driller on the well at the standpipe (1,000 feet northeast of the original pumping station) indicated a coefficient of transmissibility of 42,000 gpd per foot and a permeability coefficient of 1,000 gpd per square foot. The two tests were in different water-bearing zones of the Raritan and Magothy Formations with the first test in an upper sandy zone and the second test in a deeper sandy zone. Results indicate similar hydrologic conditions in the water-bearing zones and that the various zones probably are hydraulically interconnected.

The Raritan and Magothy Formations constitute the only aquifer available for ground-water development in the National Park area and basement rock is about 275 to 300 feet below land surface. Additional wells can be drilled anywhere in the borough, but a favorable location probably would be at least 1,000 feet southeast of the standpipe.

This area is remote from the Delaware River and Woodbury Creek, which are possible sources of recharge water of poor quality.

8. The Borough of Newfield Water Department

Newfield Borough is in the extreme southern end of the county, adjacent to the Cumberland County line. The water department was started in 1936 with two 12-inch wells and an elevated storage tank of 100,000 gallons capacity at the corner of Church Street and Catawba Avenue. Both wells are 135 feet deep and yield water of excellent quality from the Cohansey Sand. Well 1 is east of the Municipal Building and originally yielded 500 gpm with 4½ feet of drawdown; well 2 is 75 feet east of well 1 and originally yielded 480 gpm with 8½ feet of drawdown (well 16, table 4). The wells are pumped alternately for 2-week periods.

The water demand in 1957 was about 70,000 gpd in the winter and 125,000 gpd in the summer or an average of 95,000 gpd, including an average of 10,000 gpd for industrial use. The water department should have no major water-supply problem, as additional wells can be drilled to the Cohansey Sand anywhere in the borough.

The Cohansey Sand is not uniform, as indicated by the difference in specific capacities of the two wells. A major factor that limits well yields is the change from coarser to finer material within short distances. However, yields of 500 to 800 gpm from wells less than 175 feet deep may be possible with proper well construction. Wells to be pumped simultaneously at rates of about 500 gpm probably should be at least 500 feet apart.

Geologic information is unavailable for deeper aquifers in the Newfield area, but small amounts of water might be obtained from the sandy sections of the Kirkwood Formation between 175 and 300 feet below land surface or from the Wenonah Formation and Mount Laurel Sand at about 800 feet. The Englishtown Formation would be encountered at about 1,000 feet, but might yield saline water. The chloride content of water in the Raritan and Magothy Formations probably exceeds 500 ppm at depths greater than 1,300 feet. The deeper aquifers are artesian, and the water will rise to within a few hundred feet of the surface—the water in the Raritan and Magothy Formations may rise more than 1,000 feet. In these deeper aquifers, the water temperature would be higher than in shallow aquifers, the chemical quality may be poor, and the static water level probably would be lower with each successively deeper aquifer.

9. The Borough of Paulsboro Water Department

Paulsboro is an industrial municipality about 12 miles south of Camden along the south bank of the Delaware River. The water department, currently the second largest in the county, was started in 1903 with 10 small-diameter wells, each approximately 100 feet deep, near Lincoln Avenue and North Delaware Street in the northern part of the borough. In 1927, a 24-inch test well was drilled about 3,500 feet north of the pumping station at Second Street and Billings Avenue to a depth of 100 feet; the yield was 700 gpm with 35 feet of drawdown, but the water was not potable and the well was plugged. In 1930, the original small-diameter wells were replaced by an 18-inch well 105 feet deep at the pumping station that yielded 780 gpm with 44 feet of drawdown (well 17, table 4). For 12 years this well was the main source of supply until it began to fail in 1942 and was replaced by a well 164 feet deep which yielded 640 gpm with 21 feet of drawdown (well 18, table 4). An elevated storage tank of 300,000 gallons capacity is adjacent to this well.

Because of the rapid growth in the southern part of the borough, a 12-inch well was drilled at Elizabeth and Summit Avenues in 1951, to a depth of 220 feet and yielded 1,000 gpm with 120 feet of drawdown (well 19, table 4). Another well was completed in 1957 at the rear of the Municipal Building on South Delaware near Broad Street; it yielded 900 gpm with 38 feet of drawdown (well 20, table 4).

The Raritan and Magothy Formations are the only sources of ground water for Paulsboro. These formations are underlain by basement rock at a depth of about 250 feet.

Paulsboro, like most areas in Gloucester County adjacent to the Delaware River, may have quality-of-water problems in the future. Improper disposal of industrial wastes and saline-water encroachment from the Delaware River are possible sources of contamination of the aquifer. The water from the three town wells is of good chemical quality, although iron and hydrogen sulphide are objectionable constituents. The southern part of the town farthest from the Delaware River and Mantua Creek probably is the most favorable location for future wells.

10. The Borough of Pitman Water Department

Pitman is in the center of the county about 15 miles south of Camden. Originally, water was supplied to the town from 11 small-yielding wells at the northern end of Alcyon Lake. The wells were drilled from 1921 to 1924 to depths of 150 feet to the Wenonah Formation and Mount Laurel Sand. Some of the wells flowed, but pumps were installed to increase the yields. These wells are the only known flowing wells in the county. Additional water was necessary, and in 1926 a 16-inch well was drilled to the Raritan and Magothy Formations at East Holly and North Summit Avenues near the 290,000-gallon standpipe. This well is 514 feet deep and yielded 651 gpm with 10 feet of drawdown (well 21, table 4). After the deep well was completed, the flowing wells were abandoned. In 1947 another well was drilled 800 feet north of well 1. It is 515 feet deep and yielded 500 gpm with 14 feet of drawdown (well 22, table 4).

The existing wells are adequately spaced and interference due to pumping is at a minimum. Both wells pump water of good quality from the Raritan and Magothy Formations which are encountered about 450 feet below land surface in the Pitman area. The chemical analysis of water from well 21 is given in table 5. Bedrock may be encountered about 1,200 to 1,300 feet below the surface. The static water levels are at or below sea level, but Pitman, because of its geographic location, is many miles from the industrial area along the Delaware River and the salt-water interface to the southeast. Future wells that may yield up to 1,000 gpm from the Raritan and Magothy Formations can be located anywhere in the borough. Wells drilled into the Wenonah Formation and Mount Laurel Sand at depths of from 150 to 250 feet may yield water of good quality at rates up to 200 gpm with proper development. The static head in the Wenonah Formation and Mount Laurel Sand is about 80 feet higher than the head in the Raritan and Magothy Formations.

The Pitman Grove pumping station at Wesley and Laurel Avenues in Pitman includes a 92,000-gallon standpipe. Originally, two wells 85 feet deep pumped water from the Kirkwood Formation. These were abandoned in 1937 or 1938 when a 12-inch well was drilled 527 feet to the Raritan and Magothy Formations and yielded 500 gpm (well 23, table 4). The chemical analysis of water from well 23 is given in table 5. The water supply is used principally in the summer when the population is eight to ten times the winter population. The ground-water conditions in the Grove area are similar to those in other parts of Pitman. Additional wells can be drilled anywhere but should be at least 500 feet away from an existing well.

11. Lakeview Heights Water Company (Pitman)

The Lakeview Heights Water Company, a privately owned plant at the eastern edge of Pitman adjacent to Kressey Lake, serves less than 100 people. A 4-inch well, 165 feet deep, yields 35 gpm from the Wenonah Formation and Mount Laurel Sand. Future wells tapping these formations with proper development should yield more than 35 gpm. Development in the deeper Raritan and Magothy Formations also is a possibility.

12. Sewell Water Company

Sewell is about 5 miles south of Woodbury in the north central part of the county in a section of Mantua Township. Before 1911 there was no public water company and water was obtained from individually owned wells. In 1911 a pumping station was established on the east bank of Chestnut Branch of Mantua Creek at the end of Morris Avenue. Three wells about 100 feet deep were drilled in the period 1911 to 1939 to the Wenonah Formation and Mount Laurel Sand (well 24, table 4). Reportedly, the three wells each flowed 40 gpm, and yielded up to 400 gpm when pumped.

In 1951 the pumping station and wells were abandoned because of the quality of the water. Although low in dissolved solids, the iron content and hardness of water were objectionable. Another well was drilled about 2,500 feet northeast of the abandoned pump station near a 59,000-gallon standpipe east of State Route 42 and Warren Avenue (well 25, table 4). This well is 352 feet deep and yielded water of much better quality at a rate of 600 gpm with 50 feet of drawdown fromthe Raritan and Magothy Formations.

Future wells for public supply can be drilled anywhere in the Sewell area, to obtain water from the Wenonah Formation and Mount Laurel Sand or the Raritan and Magothy Formations. Although it is possible that water of lower iron content might be obtained from the Wenonah Formation and Mount Laurel Sand less than 200 feet below the ground at other locations in the Sewell area, water from the Raritan and Magothy Formations in this area probably is of better quality. Sufficient water can be obtained from the Raritan and Magothy Formations at depths of about 400 feet in the Sewell area. It is estimated that bedrock is about 900 to 1,000 feet below the surface. The large thickness of sediments attributed to the Raritan and Magothy Formations in this area probably include sediments of the Patapsco Formation as found in Delaware and Maryland.

13. South Jersey Water Supply Company (Mullica Hill)

Mullica Hill is about 5 miles southeast of Swedesboro adjacent to Raccoon Creek. The water plant was established in 1901 under a franchise granted by Harrison Township to the Harrison Heights Improvement Association. In 1925, the water system was acquired by the South Jersey Water Supply Company.

The original water supply was from two 8-inch wells, 270 feet deep, that yielded 200 gpm each. It was reported that simultaneous pumping yielded no additional water because of the closeness of the wells. Another well was drilled in 1953 to a depth of 270 feet at the intersection of Routes 322 and 45 (well 26, table 4). This well originally yielded 400 gpm with 20 feet of drawdown and is now the main source of supply. All these wells pump from the Raritan and Magothy Formations and additional water can be obtained from these formations anywhere in the Mullica Hill area.

Drilling below 300 feet probably is not necessary to obtain large yields. Basement rock is estimated to be between 900 and 1,000 feet below land surface. The large thickness of sediments attributed to the Raritan and Magothy Formations probably include sediments of the Patapsco Formation as found in Delaware and Maryland. The Wenonah Formation and Mount Laurel Sand also might yield water to wells at rates of about 100 gpm in the Mullica Hill area. An old well, between 80 and 100 feet deep, tapping this formation, obtained flowing water (Woolman, 1902, p. 79).

The water from the Raritan and Magothy Formations is of good chemical quality although the chloride, bicarbonate, sodium, and dissolved solids are slightly high. Mullica Hill may be nearer to the salt-water interface than other towns farther to the south in the county. A pressure trough in the Raritan and Magothy Formations has allowed water of poorer quality to move northward through Mullica Hill and towards Clarksboro (Barksdale and others, 1958).

14. The Borough of Swedesboro Water Department

Swedesboro, a farming community and the canning center of the county, is in the western part of the county about 6 miles south of the Delaware River. Before 1933 the water supply came from seven 6-inch wells about 140 feet deep. The wells and pumping station were in the meadowland at the northern end of Lake Narraticon on the west side of Raccoon Creek. Frequent flooding of the area by high tides in Raccoon Creek allowed surface water to flow into the wells. In 1933 a new pumping station was built and a test hole was drilled to a depth of 439 feet at East and Park Avenues (1,200 feet south of the old water works). The geologic information from the test was favorable and a 12-inch well was drilled nearby to a depth of 224 feet (well 27, table 4). The well originally yielded 592 gpm with 16 feet of drawdown and is now operated automatically by the change in water level in the 105,000-gallon standpipe.

In 1940, a second well was drilled across the street to a depth of 244 feet and yielded 400 gpm with 5 feet of drawdown (well 28, table 4). The two wells are 500 feet apart and a few feet of drawdown occurs in one well whenever the other is pumping. Well 2 is pumped extensively and well 1 is used only occasionally; they are never pumped simultaneously.

These wells pump water from the Raritan and Magothy Formations, the only water-bearing formations in the Swedesboro area capable of yielding sufficient water for a public supply. The top of the formations is about 150 feet below land surface; basement rock occurs at about 500 feet. Additional large-capacity wells may be located anywhere in the borough; the depth to which wells should be drilled will depend on the yield required, and on the thickness of the permeable sands and gravels encountered. The water is of good chemical quality except for a high iron content which, according to the results of the 1933 test drilling, apparently increases with depth.

Swedesboro is adjacent to the tidal reach of Raccoon Creek but the aquifers tapped by the borough's wells are overlain by 100 feet of clay. The clay effectively prevents recharge to the aquifer from surface sources. The water levels in the borough's wells are below sea level, and intensive ground-water pumpage in the area between Swedesboro and the Delaware River could lower the piezometric surface sufficiently for river water to move downgradient toward Swedesboro.

15. The Borough of Wenonah Water Department

Wenonah is in the northeast part of the county about 3 miles south of Woodbury. The original pumping station and eight wells were near the southern end of Wenonah Lake at Ogden Road and Jefferson Avenue. Eight small-diameter wells, drilled about 1897, ranged in depth from 120 to 260 feet and obtained water from the Englishtown Formation and the sandy sections of the Merchantville Formation. In 1926, redevelopment of the wells resulted in a combined yield of 532 gpm. By 1942, the total yield had decreased to 245 gpm. The wells were again cleaned, resulting in individual yields ranging from 40 to 131 gpm.

Because of the uncertain condition of the old wells, a new well was drilled in 1944 to a depth of 320 feet to encounter the Raritan and Magothy Formations at a site 1,300 feet southeast of the old water works at the 132,000-gallon standpipe on Buttonwood Street and East Avenue. The well was originally tested at 500 gpm with 30 feet of drawdown (well 29, table 4). In 1951, a standby well was drilled 900 feet northwest of the standpipe near the railroad tracks on Ogden Road. It is 314 feet deep, originally yielded 1,200 gpm with 40 feet of drawdown, and is one of the highest-yielding wells in the county (well 30, table 4).

After the well was completed the drillers conducted a step-drawdown pumping test to determine the specific capacity at various pumping rates. The test indicated a well

efficiency of 93 percent at 851 gpm; and 80 percent at 1,000 gpm. If a decrease in well efficiency is observed after several years it might be attributed to the precipitation on the strainer of iron and other impurities from the water.

Additional ground-water supplies can be obtained anywhere in the Wenonah area from wells drilled to the Raritan and Magothy Formations. The top of the formations is about 250 feet below land surface and generally drilling wells deeper than 350 feet is not necessary. It is estimated that the depth to bedrock is about 700 feet. Generally, water from the Raritan and Magothy Formations is of good chemical quality, although locally the iron content may be high. The Englishtown Formation or the silty part of the Merchantville Formation ranges in thickness from 25 to 40 feet and may yield as much as 100 gpm.

Wenonah is on the southwestern bank of Mantua Creek near the head of the tidal reach of the creek. However, the Raritan and Magothy Formations are protected from infiltration of surface water by the Merchantville Formation and Woodbury Clay. The static water levels in the borough's wells are slightly below sea level, but pumping has not lowered appreciably the piezometric surface.

16. The Borough of Westville Water Department

The Borough of Westville is in the northern corner of the county 5 miles south of Camden at the confluence of the South Branch of Timber Creek and the Delaware River. The water department was established in 1898 with two wells each 112 feet deep on Crown Point Avenue at the rear of the borough hall. From 1898 to 1933, four additional wells were drilled and the two older wells were abandoned.

In 1933, Westville's water supply was from one well, 112 feet deep, drilled in 1930 which originally yielded 250 gpm with 22 feet of drawdown (well 31, table 4). In 1934, another well was drilled 118 feet deep about 100 feet west of the existing well; it yielded 335 gpm with 38 feet of drawdown (well 32, table 4). These two wells supplied water to the borough until 1945 when a well 140 feet deep adjacent to the 600,000-gallon elevated storage tank was drilled; the yield of this well was 500 gpm with 28 feet of drawdown (well 33, table 4). It was the main producer until 1958 when another well, 320 feet deep, was put into operation yielding 1,205 gpm with 95 feet of drawdown (well 34, table 4). All the borough wells and the elevated storage tank are in the rear of the borough hall.

The existing wells are too close together for simultaneous pumping and only one well is pumped at a time. The Raritan and Magothy Formations constitute the only aquifer available for ground-water development in the Westville area. The water is of good chemical quality.

The aquifer is made up of alternating layers of sand and clay with three or four water-bearing zones and is underlain by bedrock at a depth of about 325 feet. The old Westville wells tap a sandy zone between 40 and 140 feet below the surface and a recent town well taps another horizon about 300 feet below the surface. Westville is on the bank of the Delaware River and water levels in the wells are below sea level. Sand and gravel in the river bottom act as conduits for water to move from the river to the well field. Areas of clay or silt retard the movement of river water to the ground-water aquifer. Therefore, the extent and characteristics of sediments in the river bottom, particularly the clay beds, are very important.

The chemical quality of the river water is of vital interest to the borough. In some areas along the river, increased pumping from the aquifer has reversed the natural gradient and where geologic conditions are favorable there is the possibility that water is flowing inland.

High-yielding wells can be drilled anywhere in Westville, but in the future the quality of the water may be poorer because of contamination from industrial wastes and the encroachment of saline water from the Delaware River.

17. Monroe Municipal Utilities Authority (Williamstown)

Williamstown, in a section of Monroe Township, is a farming community in the southeastern part of the county about 20 miles south of Camden. All ground-water supplies are developed from shallow wells in the Cohansey Sand. The aquifer is at the surface in the Williamstown area and has a thickness of about 130 feet. Before 1935, the town was supplied with water from two wells. The first well, drilled in 1909 for a glass company at Blue Bell Road and Chestnut Street in the center of town, was 123 feet deep and had a yield of about 150 gpm. The second well, 1,600 feet northeast of well 1 on Washington Avenue near Route 322, was drilled in 1914 to a depth of 105 feet with a yield of 100 gpm. It was later abandoned and plugged, probably in the 1930's. In 1935, a 12-inch well was drilled 200 feet north of well 1 to a depth of 135 feet and yielded 350 gpm with 12 feet of drawdown (well 35, table 4). Between these two wells is an elevated storage tank of 150,000-gallon capacity. During 1951, a fourth well was drilled on Washington Avenue about 10 feet from abandoned well 2. It is a 12-inch well drilled through the entire thickness of the Cohansey Sand to a depth of 107 feet and originally yielded 805 gpm with 20 feet of drawdown (well 36, table 4). Data from a driller's pumping test indicates a coefficient of transmissibility of 62,000 gpd per foot and a coefficient of permeability of 1,000 gpd per square foot. Although the aquifer has 62 feet of saturated sand from 44 to 106 feet, the well was screened only in the lower 37 feet.

The combined yield of the three existing wells during 1957 was 900 gpm. Well 1 filled with sand to 95 feet and yields 67 gpm but is seldom used. Well 3 now yields 333 gpm and well 4 is mechanically set to pump 500 gpm.

The water is of good chemical quality except for the high nitrate content of 41 ppm (well 36, table 5). Water with more than 44 ppm of nitrate may result in infant methemoglobinemia and should not be used in feeding formulas (Faucett and Miller, 1946; Waring 1949, Maxcy, 1950). Excessive nitrates may be the result of improperly constructed septic tanks or the infiltration of animal wastes into the shallow water table. The water from well 4 has a slight swamp-gas odor which has been found in other wells in the Cohansey Sand in the Coastal Plain. There is a possibility the gas is coming from the black muddy clay at the bottom of the hole.

Additional wells 100 to 150 feet deep may be capable of yielding 400 to 800 gpm from the Cohansey Sand and can be located anywhere in the township. Wells should be at least 500 feet apart for simultaneous pumping. This aquifer has the highest hydraulic head in the county and there appears to be little danger of salt-water intrusion in the Williamstown area. Below the Cohansey Sand are two other aquifers that may yield small to moderate amounts of water. The Wenonah Formation and Mount Laurel Sand are about 500 feet below the surface. The water probably is low in dissolved solids and in nitrate content. Moderate amounts of water may be available from the Raritan and Magothy Formations about 850 to 900 feet below the surface. The water from these formations may be higher in dissolved solids, chlorides, and temperature than that from the Cohansey Sand, but should be adequate for domestic supplies.

18. The City of Woodbury Water Department

Woodbury, the county seat, is the largest city in the county. It is in the northwestern part of the county, 3 miles from the Delaware River and 8 miles south of Camden. The original water works was built 4 miles south of Woodbury in 1886 when water was taken from the East Branch of Mantua Creek. In 1913, test drilling northeast of the town

along Woodbury Creek showed that a ground-water supply at this location was insufficient. The first ground-water development for the city was in 1914 when ten 8-inch wells, ranging in depth from 287 to 296 feet, were drilled in the meadowland near the pumping station. The static water level in these wells was about 12 feet below the surface in 1914, and the water was of good chemical quality.

These wells were replaced in 1934 with two new wells. One well was drilled to a depth of 314 feet at a site 100 feet south of the pumping station and was equipped with a turbine pump. This well yielded 1,250 gpm with 42 feet of drawdown (well 37, table 4). A similar well is 400 feet north of the station. In 1959, these two wells were the main sources of water for the city. Only one well is pumped at a time because of the size of the distribution line from the pumping station to the storage reservoir.

For some time, a standby well was desired in the city because of the possibility of a flood or other catastrophe disrupting the supply line from the pumping station. Accordingly, in 1946 a well was drilled in the parking lot south of the city hall. This well was 188 feet deep and yielded 1,100 gpm with 54 feet of drawdown (well 38, table 4). The well is pumped only during peak demand for water. Another well was put into operation in 1954 at Oak and Tatum Streets to service the north part of the city. The well was drilled to a depth of 171 feet and yielded 1,056 gpm with 47 feet of drawdown (well 39, table 4). A test hole was drilled 440 feet to bedrock during 1952 at the intersection of Woodbury Creek and the railroad tracks northeast of the city (well 40, table 4). Two water-bearing strata were tested for yield and quality. Evidently, the results were unfavorable because the hole was abandoned and plugged.

All the wells in the city and at the pumping station 4 miles south of town pump into the mains and the excess water is pumped to a 1,250,000-gallon distribution reservoir. It is on a high hill two miles south of town at Woodbury Heights. The reservoir is 125 feet above sea level and Woodbury is less than 60 feet above sea level.

The Raritan and Magothy Formations constitute the only available aquifer in the Woodbury area. The formations are from 100 to 150 feet below the surface and are underlain by basement rock at about 400 to 450 feet. Yields of 500 to 1,000 gpm are possible from wells about 200 feet deep almost anywhere in the city. The area along Woodbury Creek seems to be poor for high-yielding wells. At the pumping station 4 miles south of town the aquifer is about 250 feet below the surface and wells less than 400 feet deep are sufficient. The characteristics of the subsurface materials, particularly the clay beds, affect the amount of water that may be pumped and influence the quality of the water. High-yielding wells usually can be obtained but water quality may be an important factor in Woodbury. At the present time (1959) water of good quality is available, although the iron content is different in every well. The water levels in the city wells are about at sea level and, owing to the proximity of the Delaware River and industrial areas, saline water or contamination may affect the city's supply in the future if there is hydraulic continuity between the two areas.

19. Township of West Deptford Water Department

The Township of West Deptford, north of Woodbury, has a well 134 feet deep and a storage tank at the intersection of Taft, Tatum, and Elberne Avenues. The well yields sufficient water from the Raritan and Magothy Formations to service nearly 1,000 people.

20. Cooper Village Water Utility Company

The Cooper Village Water Utility Company has a well drilled to the Raritan and Magothy Formations and a 200,000-gallon standpipe to serve a residential development east of Woodbury, in Deptford Township.

21. Oak Valley Water Company

Oak Valley Water Company south of Woodbury Heights pumps more than 100,000 gpd from a well drilled to the Raritan and Magothy Formations to serve a housing development, in Deptford Township.

REFERENCES CITED

Barksdale, H. C., Greenman, D. W., Lang, S. M., Hilton, G. S., and Outlaw, D. E., 1958, Ground-water resources in the tri-state region adjacent to the lower Delaware River: New Jersey Dept. of Conserv. and Econ. Develop., Div. of Water Policy and Supply Special Rept. 13, 190 p.

Faucett, R. L., and Miller, H. C., 1946, Methemoglobinemia occurring in infants fed milk diluted with well water of high nitrate content: Jour. Pediatrics, v. 29, p. 593.

Lamar, W. L., 1942, Industrial quality of public water supplies in Georgia: U.S. Geol. Survey Water-Supply Paper 912, 83 p.

Maxcy, Kenneth, F., 1950, Report on the relation of nitrate concentrations in well waters to the occurrence of methemoglobinemia: Natl. Research Council Bull., Sanitary Engineer, p. 265, App. D.

Owens, J. P., and Minard, J. P., 1960, The geology of north-central part of the New Jersey Coastal Plain: Am. Assoc. Petroleum Geologists, Guidebook 1, p. 1-45.

U.S. Public Health Service, 1962, Drinking water standards: Federal Register, Mar. 6, p. 2152-2155.

Waring, F. Holman, 1949, Significance of nitrates in water supplies: Jour. Am. Water Works Assoc., v. 72, no. 2.

Woolman, Lewis, 1902, Artesian wells, Part II, *in* Annual report of the state geologist for the year 1901: New Jersey Geol. Survey, p. 79.

Table 4.—Records of selected public supply wells in Gloucester County.

WELL 1

Owner: Penns Grove Water Supply Company.

Location: South end of Railroad Ave. at Penn. R.R. in Bridgeport; N. J. Grid No. 30.23.3.2.2.

Well data: Owner's No. 1; completed in June 1930 by Artesian Well Drilling Co.; depth, 43 feet; diameter, 10 inches; slotted pipe screen from 30.5 to 40.5 feet; Deming Triplex, direct-suction pump with capacity of 130 gpm.

Pumping-test data: Tested in June 1930: static water level, 5.2 feet below land surface; yield, 150 gpm with a drawdown of 15 feet after 36 hours pumping; specific capacity, 10 gpm/ft.

Remarks: Chemical analysis available (table 5). Well no longer used.

Driller's log
Surface altitude, 10 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Cape May Formation:		
Loam and soil	5	5
Upper Cretaceous:		
Raritan and Magothy Formations:		
Clay, white	18	23
Sand, white, and some gravel	12	35
Sand, coarse, white, and gravel	5½	40½
Clay	2½	43

WELL 2

Owner: Penns Grove Water Supply Company.

Location: South end of Railroad Ave. at Penn. R.R. tracks in Bridgeport; N. J. Grid No. 30.23.3.2.2.

Well data: Owner's No. 2; completed in January 1955 by Layne-New York Co.; depth, 127 feet, pulled back to 88.4 feet; diameter, 10 inches; screened from 65.4 to 85.4 feet; deep-well turbine pump and 10-horsepower automatic motor; pump set at 30 feet.

Pumping-test data: Tested in March 1955: Static water level, 6 feet below land surface; yield, 190 gpm with a drawdown of 11 feet after 4 hours pumping; specific capacity, 17.3 gpm/ft.

Remarks: Airline length, 38 feet.

Driller's log
Surface altitude, 10 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Cape May Formation:		
Topsoil	1	1
Sand, medium, yellow	6	7
Upper Cretaceous:		
Raritan and Magothy Formations:		
Clay, sandy, white, sand streaks	3	10

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 2—Continued

Upper Cretaceous:—Continued Raritan and Magothy Formations:—Continued	Thickness (feet)	Depth (feet)
Clay, tough, white	10	20
Clay, sandy, white	8	28
Sand, coarse, white, and gravel	15	43
Clay, sandy, white	2	45
Clay, red	15	60
Sand, coarse, and gravel	24	84
Clay, white	5	89
Sand, coarse, and gravel	16	105
Clay, sand and gravel	9	114
Clay, tough, red	13	127

WELL 3

Owner: Clayton Water Dept.

Location: Chestnut St. pumping station in Clayton; N. J. Grid No. 31.32.4.4.3.

Well data: Owner's No. 2; completed in August 1942 by John Rulon, Philadelphia, Pa.; depth, 103 feet; diameter, 16 and 10 inches; screened from 81.5 to 103 feet; deep-well turbine pump and 15-horsepower electric motor; pump setting at 73 feet.

Pumping-test data: Tested in August 1942; static water level, 26 feet below land surface; yield, 450 gpm with a drawdown of 40 feet after 9 hours pumping; specific capacity, 11.3 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log

Surface altitude, 133 feet

Pliocene(?) and Miocene(?): Cohansey Sand:	Thickness (feet)	Depth (feet)
Clay, and sand, yellow ochre color	12	12
Clay, stiff, yellow, with shells	12	24
Sand, fine, some yellow clay	19	43
Clay, stiff, yellow	5	48
Sand, medium, little yellow clay	22	70
Sand, medium, gray	8	78
Sand, fine, yellow	15	93
Clay and sand, light yellow	4	97
Sand, fine yellow, some clay	5	103
Miocene:		
Kirkwood Formation:		
Clay, gray (reported hard in places)	10	113

WELL 4

Owner: Clayton Water Dept.

Location: Chestnut St. pumping station in Clayton; N. J. Grid No. 31.32.4.5.1.

Well data: Owner's No. 3; completed in November 1956 by A. C. Schultes & Sons; depth, drilled 1,010 feet, pulled back to 800 feet; diameter, 12 and 8 inches; everdur screen with 0.030-inch openings from 746 to 761 feet and 785 to 800 feet; deep-well turbine and 100-horsepower electric motor.

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 4—Continued

Pumping-test data: Tested in November 1956: static water level, 151.5 feet below land surface; yield, 708 gpm with a drawdown of 89.5 feet after 8 hours pumping: specific capacity, 7.9 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log
Surface altitude, 133 feet

	Thickness (feet)	Depth (feet)
Pleistocene and Miocene(?):		
Undifferentiated:		
Sand, fine to coarse	90	90
Clay, hard, gray	20	110
Miocene:		
Kirkwood Formation:		
Clay, hard, gray	93	203
Marl	10	213
Clay, hard	48	261
Marl	29	290
Eocene and Upper Cretaceous:		
Undifferentiated:		
Marl	66	356
Sand	54	410
Upper Cretaceous:		
Wenonah Formation and Mount Laurel Sand:		
Sand	8	418
Clay(?), gray	77	495
Sand, gray	40	535
Clay, hard, gray	15	550
Marshalltown Formation:		
Clay, hard, gray	30	580
Englishtown Formation:		
Clay, hard, gray	20	600
Woodbury Clay:		
Clay, hard, gray	73	673
Merchantville Formation:		
Clay, gray	19	692
Sand, gray	3	695
Clay, gray	2	697
Sand, silty	11	708
Clay, gray	32	740
Raritan and Magothy Formations:		
Sand, fine, gray	30	770
Clay, silty	16	786
Sand, fine	16	802
Rock	2	804
Clay, gray	14	818
Sand, silty	24	842
Clay, gray	55	897
Sand, gray	16	913
Sand, silty, gray	14	927
Sand, fine, gray	26	953
Clay, gray; some red	57	1,010

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 5

Owner: East Greenwich Twp. Water Dept.

Location: Northwest corner of Salem Ave. and Cohawkin Rd. in Clarksboro; N. J. Grid No. 30.25.1.1.2.

Well data: Owner's No. 1; completed in August 1931 by Layne-New York Co.; depth, 205 feet; diameter, 16 and 10 inches; screened from 185 to 205 feet; deep-well turbine pump and 40-horsepower electric motor with a capacity of 400 gpm; pump setting, 115 feet.

Pumping-test data: Tested in August 1931; static water level, 65 feet below land surface; yield, 410 gpm with a drawdown of 33 feet after 8 hours pumping; specific capacity, 12.4 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log
Surface altitude, 65 feet

	Thickness (feet)	Depth (feet)
Recent:		
Topsoil	2	2
Pleistocene:		
Pensauken Formation:		
Sand, brown	11	13
Upper Cretaceous:		
Marshalltown Formation:		
Clay, blue	15	28
Englishtown Formation:		
Sand, yellow and brown	23	51
Woodbury Clay:		
Clay, blue	3	54
Clay, sandy	21	75
Merchantville Formation:		
Clay, hard	5	80
Clay, red	75	153
Clay, hard	20	173
Raritan and Magothy Formations:		
Sand and gravel, water bearing	32	205
Clay, hard	2	207
Sand	6	213
Sand and gravel	22	235
Clay, hard	3	238
Clay, soft	7	245

WELL 6

Owner: East Greenwich Twp. Water Dept.

Location: Eglinton Ave. and Salem Ave. in Clarksboro; N. J. Grid No. 30.25.1.1.3.

Well data: Owner's No. 2; completed in March 1956 by Layne-New York Co.,; depth, 218 feet; diameter, 16 inches; screened from 191 to 216 feet; deep-well turbine pump and 50-horsepower electric motor with a capacity of 500 gpm.

Pumping-test data: Tested in February 1956: static water level, 77 feet below land surface; yield, 536 gpm with a drawdown of 20 feet after 12 hours pumping; specific capacity, 26.8 gpm/ft.

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 6—Continued

Driller's log
Surface Altitude, 70 feet

	Thickness (feet)	Depth (feet)
Recent:		
Topsoil	1	1
Pleistocene:		
Pensauken Formation:		
Sand and clay, yellow	2	3
Sand, red	10	13
Upper Cretaceous:		
Marshalltown Formation:		
Clay, sandy, yellow and green	24	37
Englishtown Formation:		
Clay, sandy, blue and white, streaks of sand	24	61
Woodbury Clay:		
Clay, blue and white, hard sandy blue clay	24	85
Merchantville Formation:		
Clay, blue and white, hard sandy blue clay	22	107
Clay, sandy, hard, blue	76	183
Raritan and Magothy Formations:		
Sand and gravel, medium to coarse, white	22	205
Clay	1	206
Sand and gravel, coarse, white	17	223

WELL 7

Owner: Borough of Glassboro Water Department.

Location: Main and High St. rear of Public Works Bldg. in Glassboro; N. J. Grid No. 31.21.9.8.9.

Well data: Owner's No. 1; completed in November 1927 by Layne-New York Co.; depth, 654 feet; diameter, 18 and 13 inches; screen from 604 to 654 feet; deep-well turbine pump and 50-horsepower electric motor with capacity of 350 gpm; pump setting, 180 feet.

Pumping-test data: Tested in November 1927: static water level, 145 feet below land surface; yield, 363 gpm with a drawdown of 13 feet after 8 hours pumping; specific capacity of 27.9 gpm/ft.

Driller's log
Surface Altitude, 145 feet

	Thickness (feet)	Depth (feet)
Recent and Pleistocene:		
Undifferentiated:		
Cinders and gravel	22	22
Pliocene(?) and Miocene(?):		
Cohansey Sand:		
Sand, white	32	54
Miocene:		
Kirkwood Formation:		
Shells	12	66

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 7—Continued

	Thickness (feet)	Depth (feet)
Miocene:—Continued		
Kirkwood Formation:—Continued		
Clay, sandy	21	87
Sand, blue	38	125
Clay	12	137
Clay, sandy, blue	79	216
Eocene and Upper Cretaceous:		
Undifferentiated:		
Clay, sandy, blue	50	266
Clay	22	288
Upper Cretaceous:		
Undifferentiated:		
Sand, fine, gray	21	309
Sand, gray	54	363
Clay	10	373
Clay, sandy	91	464
Merchantville Formation and Woodbury Clay:		
Clay	42	506
Clay, sandy	22	528
Clay	21	549
Raritan and Magothy Formations:		
Sand and shells	30	579
Sand and gravel	75	654

WELL 8

Owner: Borough of Glassboro Water Department.

Location: Main St. and Delsea Dr. at storage tank in Glassboro; N. J. Grid No. 31.21.9.8.3.

Well data: Owner's No. 2; completed in August 1947 by Layne-New York Co.; depth, 604 feet; diameter, 18 and 12 inches; screened from 562 to 602 feet; deep-well turbine pump and 50-horsepower electric motor with a capacity of 550 gpm; pump setting, 206 feet.

Pumping-test data: Tested in August 1947: static water level, 154 feet below land surface; yield, 584 gpm with a drawdown of 25 feet after 8 hours pumping; specific capacity, 23.4 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log
Surface Altitude, 145 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Bridgeton Formation:		
Sand and gravel	25	25
Pliocene(?) and Miocene(?):		
Cohansey Sand:		
Sand, clay and streaks of gravel	32	57

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 8—Continued

	Thickness (feet)	Depth (feet)
Miocene:		
Kirkwood Formation:		
Clay, sand, dark	9	66
Sand and gravel	19	85
Clay, sandy, soft	48	133
Clay, hard	34	167
Clay, sandy, black and shells	26	193
Clay, sandy and hard streaks	35	228
Eocene and Upper Cretaceous:		
Undifferentiated:		
Clay	8	236
Sand, hard, black and silt	58	294
Upper Cretaceous:		
Undifferentiated:		
Clay, sandy	42	336
Clay	44	380
Clay, hard	10	390
Clay and hard streaks	60	450
Merchantville Formation and Woodbury Clay:		
Clay and hard streaks	44	494
Clay, hard	40	534
Sand, black	10	544
Raritan and Magothy Formations:		
Sand, coarse, gray, and fine gravel	64	608
Clay, tough	22	630

WELL 9

Owner: Borough of Glassboro Water Department.

Location: Deptford and Harvard Rds. in Glassboro; N. J. Grid No. 31.21.9.7.7.

Well data: Owner's No. 3; completed in January 1956 by Layne-New York Co.; depth, 615 feet; diameter, 12 inches; screened from 562 to 612 feet; deep-well turbine pump and 75-horsepower electric motor with a capacity of 700 gpm; pump setting, 227 feet.

Pumping-test data: Tested in December 1955: static water level, 166 feet below land surface; yield, 740 gpm with a drawdown of 30 feet after 1½ hours pumping; specific capacity, 24.7 gpm/ft.

Remarks: Well not in service.

Driller's log
Surface Altitude, 151 feet

	Thickness (feet)	Depth (feet)
Pliocene(?) and Miocene(?):		
Cohansey Sand:		
Topsoil and loam	5	5
Sand, gray	20	25
Miocene:		
Kirkwood Formation:		
Clay, brown and sand	15	40
Clay, blue	22	62

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 9—Continued

	Thickness (feet)	Depth (feet)
Miocene:—Continued		
Kirkwood Formation:—Continued		
Sand, mixed, blue and gray	22	84
Clay, mixed, blue and gray	83	167
Clay, with hard streaks	41	208
Eocene and Upper Cretaceous:		
Undifferentiated:		
Sand and clay	270	478
Upper Cretaceous:		
Merchantville Formation and Woodbury Clay:		
Clay, with streaks of sand	45	523
Clay, with hard streaks	30	553
Raritan and Magothy Formations:		
Sand, fine, hard-packed, pepper color	52	605
Clay, hard and soft streaks, mostly hard	27	632

WELL 10

Owner: Greenwich Twp. Water Dept.

Location: Gibbstown-Washington and Walnut Aves. at Municipal Bldg.; N. J. Grid No. 30.14.8.1.9.

Well data: Owner's No. 2; completed in February 1944 by Layne-New York Co.; depth, 100 feet (originally drilled to 106 feet); diameter, 24 and 16 inches; screened from 76 to 96 feet; deep-well turbine pump and 40-horsepower electric motor with capacity of 500 gpm.

Pumping-test data: Tested in February 1944: static water level, 22 feet below land surface; yield, 524 gpm with a drawdown of 22 feet after 8 hours pumping; specific capacity, 23.8 gpm/ft.

Driller's log

Surface Altitude, 10 feet

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Raritan and Magothy Formations:		
Top soil	17	17
Clay, yellow	10	27
Sand and gravel	20	47
Clay	4	51
Sand, coarse, hard-packed	10	61
Sand, coarse and gravel	8	69
Clay	1	70
Sand, coarse	4	74
Sand, coarse and gravel	24	98
Clay and sand	8	106

WELL 11

Owner: Greenwich Twp. Water Dept.

Location: Gibbstown-Harmony Rd. and Morse Ave. in Gibbstown; N. J. Grid No. 30.14.9.4.1.

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 11—Continued

Well data: Owner's No. 3; completed in May 1950 by A. C. Schultes & Sons; depth, 98 feet; diameter, 16 inches; screen with 0.040-inch openings from 69 to 98 feet; deep-well turbine pump and 60-horsepower electric motor with a capacity of 600 gpm.

Pumping-test data: Tested in May 1950: static water level, 20 feet below land surface; yield, 700 gpm with a drawdown of 50 feet after 8 hours pumping; specific capacity 14.0 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log

Surface Altitude, 12 feet

	Thickness (feet)	Depth (feet)
Pleistocene and Upper Cretaceous:		
Undifferentiated:		
Sand	12	12
Upper Cretaceous:		
Raritan and Magothy Formations:		
Sand and stones	3	15
Sand, dry, white	32	47
Sand, gray	11	58
Sand, coarse, white	2	60
Clay, gray	6	66
Sand and stones	3	69
Gravel, sand and stones	3	72
Gravel and stones	2	74
Sand, gravel and stones	23	97
Sand, fine	1	98
Clay, gray	2	100

WELL 12

Owner: Mantua Water Co.

Location: 200 feet south of Mantua Creek and west of Rt. 45 in Mantua; N. J. Grid No. 31.21.1.3.5.

Well data: Owner's No. 1; completed in August 1940 by A. C. Schultes & Sons; depth, 235 feet; diameter, 8 inches; screen from 214 to 235 feet; direct suction pump (air), 25-horsepower, with a capacity of 100 to 200 gpm.

Pumping-test data: Tested in August 1940: static water level 17 feet below land surface; yield, 460 gpm.

Remarks: Chemical analysis available (table 5).

Driller's log

Surface Altitude, 20 feet

	Thickness (feet)	Depth (feet)
Recent:		
"Marsh mud"	7	7
Pleistocene:		
Cape May Formation:		
Sand and gravel, yellow	29	36

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 12—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Undifferentiated:		
Clay, blue	9	45
Sand, black, and shells	9	54
Woodbury Clay:		
Clay, blue and sand, black	50	104
Sand, green and clay	9	113
Merchantville Formation:		
Hardpan	2	115
Sand, hard, gray	2	117
Clay, blue	50	167
Clay, clear, gray	19	186
Raritan and Magothy Formations:		
Sand and clay, blue	3	189
Clay and sand, gray	19	208
Clay, brown	4	212
Sand, gray, and stones	6	218
Sand, gray, and gravel	17	235
Sand, fine, gray	5	240

WELL 13

Owner: Mantua Water Co.

Location: 25 feet west of standpipe on South McCarthy Ave. in Mantua; N. J. Grid No. 31.21.1.6.3.

Well data: Owner's No. 2; completed in May 1954 by A. C. Schultes & Sons; depth, 316 feet; diameter, 8 inches; screen with 0.030-inch openings from 295 to 316 feet; deep-well turbine pump and 25-horsepower electric motor with a capacity of 250 gpm; pump set at 140 feet.

Pumping-test data: Tested in December 1953: static water level 90 feet below land surface; yield, 287 gpm with a drawdown of 40 feet after 4 hours pumping; specific capacity, 7.2 gpm/ft.

Remarks: No log available. Surface altitude, 75 feet.

WELL 14

Owner: National Park Water Co.

Location: 300 feet south of Grove Ave. on Woodlawn Ave. in National Park; N. J. Grid No. 31.11.4.2.6.

Well data: Owner's No. 1; completed in September 1950 by A. C. Schultes & Sons; depth, 85 feet; diameter, 8 inches; screen with 0.040-inch openings from 64 to 85 feet; deep-well turbine pump and 25-horsepower electric motor with a capacity of 300 gpm.

Pumping-test data: Tested in September 1950: static water level, 4.5 feet below land surface; yield, 500 gpm with a drawdown of 58.5 feet after 8 hours pumping; specific capacity, 8.5 gpm/ft.

Remarks: Chemical analysis available (table 5).

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 14—Continued

Driller's log
Surface Altitude, 10 feet

	Thickness (feet)	Depth (feet)
Recent:		
"Meadow mud"	6	6
Upper Cretaceous:		
Raritan and Magothy Formations:		
Sand, yellow, and stones	27	33
Gravel and stones	29	62
Sand, fine, gray	25	87

WELL 15

Owner: National Park Water Co.

Location: Lakehurst and Grove Ave. at Standpipe in National Park; N. J. Grid No. 31.11.4.2.2.

Well data: Owner's No. 2; completed in April 1956 by A. C. Schultes & Sons; depth, 282 feet; diameter 12 and 8 inches; screened from 241 to 282 feet; deep-well turbine pump and electric motor; pump setting, 125 feet.

Pumping-test data: Tested in April 1956: static water level, 52 feet below land surface; yield, 636 gpm with a drawdown of 31 feet after 8 hours pumping; specific capacity, 20.5 gpm/ft.

Driller's log
Surface Altitude, 30 feet

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Raritan and Magothy Formations:		
Fill dirt	10	10
Clay and sand layers	15	25
Sand and stone	5	30
Sand, medium, varicolored	5	35
Clay	2	37
Sand and gravel	63	100
Stones, large, and gravel	7	107
Clay	21	128
Sand, medium, varicolored	38	166
Clay, red	28	194
Sand, medium, brown and white	76	270
Sand and streaks of clay	18	288
Early Paleozoic(?):		
Wissahickon Formation:		
Weathered rock	19	307

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 16

Owner: The Borough of Newfield Water Dept.

Location: Catawba Ave. and Church St. in Newfield; N. J. Grid No. 31.42.6.4.9.

Well data: Owner's No. 2; completed in May 1936 by Artesian Well Drilling Co.; depth, 135 feet; diameter, 12 inches; screened from 102 to 134 feet; deep-well turbine pump and 20-horsepower electric motor with a capacity of 350 gpm.

Pumping-test data: Tested in May 1936: static water level, 27 feet below land surface; yield 480 gpm with a drawdown of 8.5 feet; specific capacity, 56.5 gpm/ft.

Remarks: Chemical analysis available (table 5). Well No. 1, 75 feet east of well No. 2; similar log, except screened material is very coarse sand.

Driller's log
Surface Altitude, 123 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Bridgeton Formation:		
Clay and sand	37	37
Sand and gravel	3	40
Pliocene (?) and Miocene (?):		
Cohansey Sand:		
Iron oxide	½	40½
Clay	5½	46
Sand, fine, yellow	54	100
Sand, coarse	20	120
Sand, coarse, yellow, and gravel	15	135

WELL 17

Owner: The Borough of Paulsboro Water Department.

Location: Lincoln Ave. and N. Delaware St. at storage tank in Paulsboro; N. J. Grid No. 30.14.6.8.6.

Well data: Owner's No. 2; completed in September 1930 by Layne-New York Co.; depth, 105 feet, diameter, 18 inches; screened from 70 to 100 feet; deep-well turbine pump and 50-horsepower electric motor with a capacity of 500 gpm.

Pumping-test data: Tested in September 1930: static water level, 19 feet below land surface; yield, 780 gpm with a drawdown of 44 feet after 8 hours pumping; specific capacity, 17.7 gpm/ft. Well redeveloped March 8, 1948: static water level, 13 feet below land surface; yield, 500 gpm with a drawdown of 59 feet; specific capacity, 8.5 gpm/ft. Redeveloped again May 10, 1950: static water level, 9.5 feet below land surface; yield, 465 gpm with a drawdown of 63.5 feet; specific capacity, 7.3 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log
Surface Altitude, 16 feet

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Raritan and Magothy Formations:		
Sand, fine	10	10
Sand, coarse, and gravel	40	50

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 17—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:—Continued		
Raritan and Magothy Formations:—Continued		
Clay	2	52
Sand, coarse, with gravel and boulders	18	70
Sand, coarse, and gravel	44	114
Clay		below 114

WELL 18

Owner: The Borough of Paulsboro Water Department.

Location: Lincoln Ave. and N. Delaware St. at storage tank in Paulsboro; N. J. Grid No. 30.14.6.8.6.

Well data: Owner's No. 3; completed in August 1942 by Layne-New York Co.; depth, 160 feet; diameter, 18 inches; screened from 115 to 140 feet; deep-well turbine pump and 60-horsepower electric motor with a capacity of 700 gpm.

Pumping-test data: Tested in July 1942: static water level, 19 feet below land surface; yield, 640 gpm with a drawdown of 21 feet after 8 hours pumping; specific capacity, 30.5 gpm/ft. Well redeveloped on May 15, 1950: static water level, 20 feet; yield, 800 gpm with a drawdown of 33 feet; specific capacity, 24.3 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log
Surface Altitude, 16 feet

	Thickness (feet)	Depth (feet)
Upper Cretaceous		
Raritan and Magothy Formations:		
Sand and gravel	83	83
Clay, tough	10	93
Sand and clay	10	103
Sand, coarse, and gravel	61	164

WELL 19

Owner: The Borough of Paulsboro Water Department.

Location: Intersection of Summit and Elizabeth Ave. in Paulsboro; N. J. Grid No. 30.14.9.2.9.

Well data: Owner's No. 1; completed in March 1951 by A. C. Schultes & Sons; depth, 220 feet; diameter, 12 inches; screen with 0.060-inch openings from 192 to 220 feet; deep-well turbine pump and 30-horsepower electric motor with a capacity of 600 gpm.

Pumping-test data: Tested in March 1951: static water level, 30 feet below land surface; yield, 1,000 gpm with a drawdown of 120 feet after 24 hours pumping; specific capacity, 8.3 gpm/ft.

Driller's log
Surface Altitude, 15 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Cape May(?) Formation:		
Sand, fine, yellow	16	16
Stones and sand	9	25

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 19—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Merchantville Formation:		
Clay, gray	3	28
"River mud"	11	39
Raritan and Magothy Formations:		
Sand, brown	4	43
Stones	4	47
Sand, brown	18	65
Sand, yellow	8	73
Sand and stones	12	85
Sand, gray	3	88
Gravel	9	97
Sand and stones	8	105
Gravel	5	110
Clay and stones	2	112
Clay and sand	18	130
Sand and stones	5	135
Gravel	5	140
Clay and stones	5	145
Clay, red	13	158
Clay, gray	7	165
Clay, sandy	6	171
Sand, fine	2	173
Clay, sand, white	2	175
Clay and sand	2	177
Stones and clay	5	182
Clay and sand	1	183
Clay, red	4	187
Clay	5	192
Sand, fine	3	195
Sand, clayey	2	197
Gravel	3	200
Clay and sand	3	203
Sand	5	208
Clay balls and gravel	2	210
Gravel	3	213
Clay and gravel	3	216
Stones and clay	3	219
Gravel	2	221
Clay, red		below 221

WELL 20

Owner: The Borough of Paulsboro Water Department.

Location: At rear of Borough Hall on South Delaware St. in Paulsboro; N. J. Grid No. 30.14.9.3.2.

Well data: Owner's No. 5; completed in September 1957 by Layne-New York; depth, 178 feet, originally drilled to 196 feet; diameter, 12 inches; screened from 135 to 175 feet; centrifugal pump and 40-horsepower electric motor.

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 20—Continued

Pumping-test data: Tested in September 1957: static water level, 15 feet below land surface; yield, 900 gpm with a drawdown of 38 feet after 8 hours pumping; specific capacity, 23.7 gpm/ft.

Driller's log
Surface Altitude, 10 feet

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Raritan and Magothy Formations:		
Sandy clay, yellow, and gravel	20	20
Sand and gravel, fine, streaks of clay	17	37
Sand, medium to coarse, and gravel	15	52
Sand, medium to coarse, gravel, wood and streaks of clay	21	73
Sand, medium to coarse, and gravel	12	85
Clay, blue and white	3	88
Sand, medium to coarse, and gravel	26	114
Clay, white, some gravel	10	124
Clay, white, tough, streaks of sand	11	135
Clay, sandy, white, streaks of sand	15	150
Sand, medium to coarse, and gravel, streaks of clay	10	160
Sand, medium to coarse, and gravel	36	196

WELL 21

Owner: The Borough of Pitman Water Dept.

Location: North Summit and East Holly Aves. at standpipe in Pitman; N. J. Grid No. 31.21.6.7.7.

Well data: Owner's No. P 1; completed in March 1926 by Layne-New York Co.; depth, 514 feet; diameter, 16 inches; bottom of screen at 514 feet; deep-well turbine pump and 50-horsepower electric motor with a capacity of 500 gpm.

Pumping-test data: Tested in March 1926: static water level, 140 feet below land surface; yield, 651 gpm with a drawdown of 10 feet after 9½ hours pumping; specific capacity, 65.1 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log
Surface Altitude, 140 feet

	Thickness (feet)	Depth (feet)
Pleistocene and Miocene(?):		
Undifferentiated:		
Sand, fine, blue	43	43
Miocene:		
Kirkwood Formation:		
Clay and sand	18	61
Clay, blue, and sand	21	82
Sand, fine, blue, and boulders	36	118
Eocene and Upper Cretaceous:		
Undifferentiated:		
Clay and boulders	14	132
Sand, fine, and boulders	11	143
Sand and clay	39	182

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 21—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Wenonah Formation and Mount Laurel sand:		
Sand, fine, blue, and clay	41	223
Clay, streaks, and gravel	19	242
Sand, blue, and clay	19	261
Englishtown and Marshalltown Formations:		
Clay, blue, soft	21	282
Clay, hard	9	291
Sand and boulders	2	293
Sand, blue	11	304
Clay, sandy	19	323
Clay, blue	47	370
Merchantville Formation and Woodbury Clay:		
Clay, blue	10	380
Clay, hard	80	460
Raritan and Magothy Formations:		
Gravel(?)	54	514

WELL 22

Owner: The Borough of Pitman Water Dept.

Location: Esplanade Ave. opposite High School in Pitman; N. J. Grid No. 31.21.6.7.4.

Well data: Owner's No. P 2; completed in August 1947 by Layne-New York Co.; depth, 515 feet; diameter, 20 and 12 inches; screened from 475 to 515 feet; deep-well turbine pump and 50-horsepower electric motor with capacity of 500 gpm.

Pumping-test data: Tested in June 1947: static water level, 144 feet below land surface; yield, 500 gpm with a drawdown of 14 feet after 8 hours pumping; specific capacity, 35.7 gpm/ft.

Driller's log
Surface Altitude, 130 feet

	Thickness (feet)	Depth (feet)
Pleistocene and Miocene(?):		
Undifferentiated:		
Sand, coarse, brown	45	45
Miocene:		
Kirkwood Formation:		
Sand, coarse, gravel, and sandy clay	39	84
Sand, coarse, gravel, and clay	15	99
No record	14	113
Eocene and Upper Cretaceous:		
Undifferentiated:		
Clay, gray, hard streaks	21	134
Sand, green	16	150
Sand, green, dark	16	166
Upper Cretaceous:		
Wenonah Formation and Mount Laurel Sand:		
Sand, coarse, a few shell fragments, some clay	45	211
Sand, dark, a few shell fragments, some clay	53	264

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 22—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:—Continued		
Englishtown and Marshalltown Formations:		
Clay, sandy, black	15	279
Clay, black, and sand	81	360
Merchantville Formation and Woodbury Clay:		
Clay, sandy, micaceous	90	450
Raritan and Magothy Formations:		
Sand, coarse, and gravel	8	458
Clay, black	4	462
Sand, coarse, and gravel	53	515
Clay, sandy, black, and shell fragments	10	525

WELL 23

Owner: The Borough of Pitman Water Department.

Location: Southwest corner of Laurel and Wesley Aves. at standpipe in Pitman; N. J. Grid No. 31.21.9.1.4.

Well data: Owner's No. PGI; completed in 1937 or 1938 by A. C. Schultes & Sons; depth, 527 feet; diameter, 12 and 10 inches; screened from 486 to 524 feet; deep-well turbine pump and 50-horsepower electric motor with capacity of 500 gpm.

Pumping-test data: Static water level, 135 feet below land surface; yield, 500 gpm; no additional data available.

Remarks: Chemical analysis available (table 5).

Driller's log
Surface Altitude, 140 feet

	Thickness (feet)	Depth (feet)
Pleistocene and Miocene(?):		
Undifferentiated:		
Sand, yellow and clay	46	46
Miocene:		
Kirkwood Formation:		
Clay, gray	26	72
Clay, black	22	94
Clay, gray	18	112
Eocene and Upper Cretaceous:		
Undifferentiated:		
Clay, gray, and sand, green	17	129
Hardpan, oyster and clam shells, greensand, baked together	41	170
Upper Cretaceous:		
Wenonah Formation and Mount Laurel Sand:		
Sand, green and white	48	218
Merchantville Formation, Woodbury Clay, Englishtown Formation and Marshalltown Formation (undifferentiated):		
Clay	265	483
Raritan and Magothy Formations:		
Sand, fine, white	7	491
Gravel, coarse, and sand, fine, white	14	505
Gravel, coarse, and sand, white, quartz	8	513
Sand, coarse, white	10	523
Clay, gray, hard	4	527

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 24

Owner: Sewell Water Company.

Location: East side of Chestnut Branch of Mantua Creek at pumping station in Sewell; N. J. Grid No. 31.21.5.2.3.

Well data: Owner's No. 1; completed in 1939; depth, 100 feet; diameter, 8 inches.

Pumping-test data: No data available.

Remarks: Chemical analysis available (table 5). Well abandoned.

Driller's log
Surface Altitude, 40 feet

	Thickness (feet)	Depth (feet)
Eocene and Upper Cretaceous:		
Undifferentiated:		
Clay	64	64
Upper Cretaceous:		
Wenonah Formation and Mount Laurel Sand:		
Sand, green	36	100

WELL 25

Owner: Sewell Water Company.

Location: East of Mantua-Sewell Rd. (Rt. 42) and Warren Ave. at standpipe in Sewell; N. J. Grid No. 31.21.2.9.8.

Well data: Owner's No. 4; completed in July 1951 by A. C. Schultes & Sons; depth, 377 feet; diameter, 10 inches; screened from 352 to 377 feet; deep-well turbine pump and 30-horsepower electric motor with a capacity of 300 gpm; pump setting, 150 feet.

Pumping-test data: Tested in July 1951: static water level, 95 feet below land surface; yield, 600 gpm with a drawdown of 50 feet after 24 hours pumping; specific capacity, 12.0 gpm/ft.

Driller's log
Surface Altitude, 80 feet

	Thickness (feet)	Depth (feet)
Miocene and Eocene:		
Undifferentiated:		
Sand, brown, and gravel	20	20
Upper Cretaceous:		
Navesink Formation:		
Marl, green	34	54
Wenonah Formation and Mount Laurel Sand:		
Sand, gray	93	147
Merchantville Formation, Woodbury Clay, Englishtown Formation and Marshalltown Formation (undifferentiated):		
Sand and clay	10	157
Clay, gray-blue	158	315
Hardpan	5	320

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 25—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:—Continued		
Raritan and Magothy Formations:		
Sand, white, and stones	15	335
Sand and stones	13	348
Sand, medium, gray-white	29	377
Clay	below 377	

WELL 26

Owner: South Jersey Water Supply Co.

Location: Glassboro Rd. at Raccoon Creek in Mullica Hill; N. J. Grid No. 39.25.4.7.9.

Well data: Owner's No. 3; completed in August 1953 by John Rulon, Philadelphia, Pa.; depth, 270 feet; diameter, 10 inches; screened from 234 to 265 feet; deep-well turbine pump and 20-horsepower electric motor with a capacity of 250 gpm.

Pumping-test data: Tested in August 1953: static water level, 35 feet below land surface; yield, 400 gpm with a drawdown of 20 feet after 8 hours pumping; specific capacity, 20.0 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log
Surface Altitude, 40 feet

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Wenonah Formation and Mount Laurel Sand:		
Marl	20	20
Gravel	5	25
Sand, dirty	5	30
Clay, sandy	10	40
Sand	10	50
Marl	30	80
Englishtown and Marshalltown Formations:		
Marl	40	120
Sand	10	130
Merchantville Formation and Woodbury Clay:		
Marl	80	210
Clay, hard	15	225
Raritan and Magothy Formations:		
Sand, gray, some small gravel	41	266
Clay, hard	4	270

WELL 27

Owner: The Borough of Swedesboro Water Dept.

Location: West side of Park Ave. at intersection of East Ave. in Swedesboro; N. J. Grid No. 30.24.4.9.1.

Well data: Owner's No. 1; completed in February 1933 by Artesian Well Drilling Co.; depth, 224 feet; screened from 175 to 220 feet; deep-well turbine pump and electric motor.

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 27—Continued

Pumping-test data: Tested in February 1933: static water level, 37 feet below land surface; yield, 592 gpm with a drawdown of 15.9 feet after 8 hours pumping; specific capacity, 37.2 gpm/ft.

Remarks: Chemical analysis available (table 5). Log is of test hole 8 feet from well; 50 feet west of well No. 2.

Driller's log
Surface Altitude, 35 feet

	Thickness (feet)	Depth (feet)
Recent:		
Topsoil and filled ground	8	8
Pleistocene:		
Cape May Formation:		
Sand, yellow, and gravel	7	15
Upper Cretaceous:		
Woodbury Clay:		
Clay, tough, blue	66	81
Merchantville Formation:		
Clay, tough, blue	40	121
Clay, sandy, blue	26	147
Raritan and Magothy Formations:		
Sand, coarse, gray, and gravel	22	169
Clay, sandy, blue	3	172
Sand, coarse, gray, and gravel	8	180
Clay, sandy, blue	5	185
Sand, coarse, white-gray, and gravel	38	223
Sand, white	11	234
Sand, coarse, white	15	249
Clay, sandy	9	258
Sand, coarse, white, and gravel	4	262
Clay, sandy	13	275
Clay, sandy, and gravel	8	283
Sand, coarse, white, and gravel	11	294
Sand, medium, gray, and gravel	29	323
Clay, soft, blue	4	327
Clay, tough, blue	11	338
Sand, coarse, gray, and gravel	35	373
Sand, coarse, gray, and gravel, with some red streaks of clay	21	394
Sand and gravel	4	398
Clay, sandy, red, and gravel	12	410
Sand, with some clay	14	424
Clay, hard, red	15	439
Sandrock		below 439

WELL 28

Owner: The Borough of Swedesboro Water Dept.

Location: East side of Park Ave. at intersection of East Ave. in Swedesboro; N. J. Grid No. 30.24.4.9.1.

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 28—Continued

Well data: Owner's No. 2; completed in June 1940 by Artesian Well Drilling Co.; depth, 244 feet; diameter, 10 inches; screened from 216 to 240 feet; deep-well turbine pump and 30-horsepower electric motor with a capacity of 350 gpm; pump setting, 50 feet.

Pumping-test data: Tested in June 1940: static water level, 33 feet below land surface; yield, 400 gpm with a drawdown of 5 feet after 10 hours pumping; specific capacity, 80.0 gpm/ft drawdown.

Remarks: Well is 50 feet east of well No. 1. See log well record 27. Surface altitude, 30 feet.

WELL 29

Owner: The Borough of Wenonah Water Dept.

Location: N. Clinton Ave. and Buttonwood St. at standpipe in Wenonah; N. J. Grid No. 31.21.2.2.5.

Well data: Owner's No. 1; completed in October 1944 by A. C. Schultes & Sons; depth, 320 feet; diameter, 12 inches, screened from 280 to 320 feet; deep-well turbine pump and 20-horsepower electric motor; pump setting, 136 feet.

Pumping-test data: Tested in May 1944: static water level, 90 feet below land surface; yield, 500 gpm with a drawdown of 30 feet after 24 hours pumping; specific capacity, 16.7 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log

Surface Altitude, 80 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Pensauken Formation:		
Sand, fine to medium, yellow	12	12
Upper Cretaceous:		
Wenonah Formation and Mount Laurel Sand:		
Sand, fine to medium, particles of limonite	38	50
Sand, fine, light yellow, loamy	5	55
Sand, fine, light brown, limonitic	10	65
Sand, micaceous, fine, light yellow	5	70
Marshalltown Formation:		
Sand, micaceous, loamy, green	10	80
Englishtown Formation:		
Sand, green, and clay; fragments of shells	10	90
Sand, loamy, fine, dark brown	15	105
Merchantville Formation and Woodbury Clay:		
Clay, sandy, micaceous, dark	65	170
Sand, fine, particles of limonite and fragments of shells	50	220
Sand, fine, micaceous, black	40	260
Raritan and Magothy Formations:		
Sand, fine, dark brown and pebbles and some clay	5	265
Sand, fine to coarse, gray	10	275
Sand, fine, brown, occasional coarse grains	10	285
Sand, fine, gray, and pebbles up to ½ inch	5	290
Sand, semicoarse to coarse, gray	5	295

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 29—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:—Continued		
Raritan and Magothy Formations:—Continued		
Pebbles, 3/8 inch, and coarse sand, white to gray	5	300
Sand, fine to coarse, gray	12	312
Sand, fine, brown	8	320
Sand, gray		below 320

WELL 30

Owner: The Borough of Wenonah Water Dept.

Location: Ogden Road and Penn. Reading R.R. in Wenonah; N. J. Grid No. 31.21.2.2.1.

Well data: Owner's No. 2; completed in February 1951 by A. C. Schultes & Sons; depth, 310 feet; diameter, 12 inches; screen with 0.040-inch openings from 270 to 310 feet; deep-well turbine pump and 15-horsepower electric motor with a capacity of 150 gpm.

Pumping-test data: Tested in February 1951: static water level, 67 feet below land surface; yield, 1,200 gpm with a drawdown of 40 feet after 8 hours of pumping; specific capacity, 30.0 gpm/ft.

Driller's log

Surface Altitude, 60 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Pensauken Formation:		
Topsoil	2	2
Mud and sand, brown	5	7
Upper Cretaceous:		
Wenonah Formation and Mount Laurel Sand:		
Sand, fine, brown	25	32
Marl, green	38	70
Merchantville Formation, Woodbury Clay, Englishtown Formation, and Marshalltown Formation (undifferentiated):		
Clay	10	80
Marl and clay	10	90
Marl, green	15	105
Clay, gray	32	137
Clay	3	140
Marl	40	180
Marl and clay	12	192
Clay	18	210
Marl and clay	10	220
Marl, green	5	225
Sand, salt and pepper	13	238
Sand, very fine	8	245
Clay, black	15	260
Raritan and Magothy Formations:		
Sand, coarse, and gravel	5	265
Sand, mixed, fine and coarse	10	275
Sand, coarse	5	280
Gravel and sand	6	286

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 30—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:—Continued		
Raritan and Magothy Formations:—Continued		
Stones, mixed	5	291
Stones and sand	5	296
Stones, big	14	310
Clay	4	314

WELL 31

Owner: The Borough of Westville Water Dept.

Location: Crown Point Ave. behind Borough Hall in Westville; N. J. Grid No. 31.11.3.7.5.

Well data: Owner's No. 1; completed in 1930; depth, 112 feet; diameter, 8 inches; screened from 69 to 112 feet; deep-well turbine pump and 20-horsepower electric motor with a capacity of 225 gpm; pump setting, 60 feet.

Pumping-test data: Tested in 1930: static water level, 16 feet below land surface; yield, 250 gpm with a drawdown of 22 feet; specific capacity, 11.4 gpm/ft.

Remarks: Chemical analysis available (table 5).
See well record 34. Surface Altitude, 16 feet.

WELL 32

Owner: The Borough of Westville Water Dept.

Location: Crown Point Ave. behind Borough Hall in Westville; N. J. Grid No. 31.11.3.7.5.

Well data: Owner's No. 2; completed in October 1934; depth 118 feet; diameter, 8 inches; screened from 78 to 118 feet; deep-well turbine pump and 20-horsepower electric motor with a capacity of 280 gpm.

Pumping-test data: Tested in October 1934: static water level, 18 feet below land surface; yield, 335 gpm with a drawdown of 38 feet after 36 hours pumping; specific capacity, 8.8 gpm/ft.

Remarks: 100 feet west of well 1. See well record 34.
Surface Altitude, 16 feet.

WELL 33

Owner: The Borough of Westville Water Dept.

Location: Crown Point Ave. and River Dr. in Westville; N. J. Grid No. 31.11.3.7.5.

Well data: Owner's No. 3; completed in July 1945 by Artesian Well Drilling Co.; depth, 140 feet; diameter, 10 inches; screened from 115 to 138 feet; deep-well turbine pump and electric motor.

Pumping-test data: Tested in June 1945: static water level, 24.5 feet below land surface; yield, 500 gpm with a drawdown of 28 feet after 2 hours pumping; specific capacity, 17.8 gpm/ft.

Remarks: 150 feet east of well 1. See well record 34.
Surface Altitude, 16 feet.

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 34

Owner: The Borough of Westville Water Dept.

Location: Crown Point Ave. behind Borough Hall in Westville; N. J. Grid No. 31.11.3.7.5.

Well data: Owner's No. 4; completed in December 1957 by A. C. Schultes & Sons; depth, 313 feet; diameter, 10 inches; screened from 286.5 to 313 feet; vertical turbine pump and 75-horsepower electric motor with a capacity of 750 gpm.

Pumping-test data: Tested in December 1957: static water level, 50.8 feet below land surface; yield, 1,205 gpm with a drawdown of 94.8 feet after 8 hours pumping; specific capacity, 12.7 gpm/ft.

Remarks: Well originally drilled to 320 feet.

Driller's log
Surface Altitude, 16 feet

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Raritan and Magothy Formations:		
Sand, fine, brown	23	23
Clay, gray	20	43
Sand, fine, gray	43	86
Clay, gray	2	88
Sand, fine, gray	55	143
Clay, gray	8	151
Sand, fine to medium, gray	12	163
Clay, red	23	186
Sand, fine, gray	5	191
Clay, red	2	193
Sand, fine, gray	9	202
Clay, red	14	216
Sand, fine, gray	15	231
Clay, red	24	255
Sand, fine to medium, gray	15	270
Clay, red	3	273
Sand, silty	5	278
Sand, fine to medium	37	315
Clay, red	1	316
Sand, fine to medium	4	320
Clay, red	below 320	

WELL 35

Owner: Monroe Municipal Utilities Authority.

Location: Blue Bell Rd. north of Chestnut St. in Williamstown; N. J. Grid No. 31.33.1.4.9.

Well data: Owner's No. 3; completed in 1935; depth, 130 feet; diameter, 12 inches; screened from 97 to 132 feet, estimated; deep-well turbine pump and 25-horsepower electric motor with a capacity of 333 gpm; pump setting, 75 feet.

Pumping-test data: Tested in 1935: static water level, 25 feet below land surface; yield, 350 gpm with a drawdown of 12 feet; specific capacity, 29.1 gpm/ft.

Remarks: Chemical analysis available (table 5).

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 35—Continued

Driller's log

Surface Altitude, 160 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Bridgeton(?) Formation:		
Top soil	2	2
Clay, brown	6	8
Pliocene(?) and Miocene(?):		
Cohansey Sand:		
Sand, fine, yellow and clay	12	20
Sand, finer, yellow and clay	4	24
Sand, fine, white and clay	5	29
Sand, fine, light yellow, and clay	11	40
Sand, medium, pink, and clay	3	43
Sand, medium, brown, trace of clay	7	50
Clay, yellow	2	52
Sand, fine, yellow, trace of clay	6	58
Clay, light brown	15	73
Clay, black	10	83
Sand, fine, black and clay	3	86
Sand, medium, brown, and clay	3	89
Clay, yellow	4	93
Sand, clayey, yellow	2	95
Sand, medium, fine	2	97
Sand, medium, yellow	5	102
Sand, coarse, yellow	7	109
Sand, medium, white	6	115
Sand, medium, coarse, white	5	120
Sand, medium fine, white	9	129
Sand, medium coarse, yellow	3	132
Sand, clayey, yellow	3	135

WELL 36

Owner: Monroe Mun. Util. Auth.

Location: Washington Ave., 200 feet west U.S. 322 in Williamstown; N. J. Grid No. 31.33.1.4.6.

Well data: Owner's No. 4; completed in November 1951 by A. C. Schultes & Sons; depth, 106 feet; diameter, 12 inches; screen with 0.030 and 0.060-inch openings from 69 to 106 feet; deep-well turbine pump and electric motor.

Pumping-test data: Tested in November 1951: static water level, 12.5 feet below land surface; yield, 805 gpm with a drawdown of 20 feet after 24 hours pumping; specific capacity, 40.3 gpm/ft.

Remarks: Chemical analysis available (table 5). Analysis is from abandoned well 2, 10 feet from well 4.

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 36—Continued

Driller's log

Surface Altitude, 140 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Bridgeton Formation:		
Fill	2	2
Sand, brown	4	6
Sand, brown, and stones	6	12
Gravel and stones	5	17
Sand, coarse, and gravel	11	28
Pliocene(?) and Miocene(?):		
Cohansey Sand:		
Sand, fine, and clay	5	33
Sand, coarse, yellow	2	35
Clay, yellow	9	44
Sand, coarse	12	56
Sand, fine, yellow	2	58
Sand, yellow	18	76
Sand and gravel	5	81
Sand, dark yellow, and gravel	15	96
Sand, dark yellow	8	104
Sand, dark brown, cemented	2	106
Miocene:		
Kirkwood Formation:		
Clay, black muddy	1	107

WELL 37

Owner: The City of Woodbury Water Dept.

Location: Sewell Pumping Station, bank of Mantua Creek, 4 miles south of Woodbury; N. J. Grid No. 31.21.2.9.2.

Well data: Owner's No. 1; completed in December 1934 by John Rulon, Philadelphia, Pa.; depth, 314 feet; diameter, 16 inches; screened from 271 to 314 feet; deep-well turbine pump and 30-horsepower electric motor with capacity of 1,050 gpm.

Pumping-test data: Tested in December 1934: static water level, 12.7 feet below land surface; yield, 1,250 gpm with a drawdown of 41.6 feet; specific capacity, 30.1 gpm/ft.

Remarks: Chemical analysis is from well 2 (table 5).

Driller's log

Surface Altitude, 20 feet

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Wenonah Formation and Mount Laurel Sand:		
Surface sod and fill	7	7
Sand and marl, dark green, muddy	53	60
Sand, black, and shells	15	75
Marshalltown Formation:		
Marl, bluish, plastic	33	108

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 37—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:—Continued		
Merchantville Formation, Woodbury Clay, and Englishtown Formation (undifferentiated):		
Clay, lead colored, plastic	118	226
Sand, coarse, white (water bearing)	2	228
Clay, lead colored, plastic	6	234
Gravel, coarse, and clay, gray, plastic	8	242
Clay, plastic, dark	5	247
Raritan and Magothy Formations:		
Hardpan, dark gray	3	250
Sand, coarse, gray (water bearing)	6	256
Sand, medium to coarse, gray, hard	5	261
Sand, fine to coarse, gray (water bearing)	31	292
Gravel, coarse, and stones (water bearing)	12	304
Clay, plastic, gray	2	306
Gravel, coarse, gray (water bearing)	9	315
Clay, plastic, with hardpan	2	317

WELL 38

Owner: The City of Woodbury Water Dept.

Location: W. Barber and Lupton Ave. in Woodbury; N. J. Grid No. 31.11.5.7.6.

Well data: Owner's No. 3; completed in April 1946 by A. C. Schultes & Sons; depth, 188 feet; diameter, 16 inches; screened from 148 to 188 feet; deep-well turbine pump and 50-horsepower electric motor with capacity of 700 gpm.

Pumping-test data: Tested in April 1946: static water level, 54 feet below land surface; yield, 1,100 gpm with a drawdown of 54 feet after 10 hours pumping; specific capacity, 20.4 gpm/ft.

Remarks: Chemical analysis available (table 5).

Driller's log
Surface Altitude, 60 feet

	Thickness (feet)	Depth (feet)
Upper Cretaceous:		
Englishtown Formation:		
Sand, fine, brown	14	14
Woodbury Clay:		
Clay, plastic	64	78
Merchantville Formation:		
Clay, dark	17	95
Clay, dark, and sand, fine	16	111
Clay, and sand, dark	8	119
Clay	15	134
Raritan and Magothy Formations:		
Sand, very coarse, and gravel (water)	5	139
Sand and gravel	6	145
Gravel, fine	3	148

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 38—Continued

	Thickness (feet)	Depth (feet)
Upper Cretaceous:—Continued		
Raritan and Magothy Formations:—Continued		
Sand, very coarse, and gravel	4	152
Sand, fine, and gravel	5	157
Sand, very coarse, and gravel	8	165
Sand, coarse, and gravel	9	174
Sand, very coarse, white, and gravel	14	188
Sand and gravel	below	188

WELL 39

Owner: The City of Woodbury Water Dept.

Location: Northeast corner of Oak and Tatum Sts. in Woodbury; N. J. Grid No. 31.11.5.8.1.

Well data: Owner's No. 4; completed in January 1953 by A. C. Schultes & Sons; depth, 167 feet; diameter, 16 inches; screen with 0.040- and 0.070-inch openings from 129 to 167 feet; deep-well turbine pump and electric motor.

Pumping-test data: Tested in January 1953: static water level, 28 feet below land surface; yield, 1,056 gpm with a drawdown of 47 feet after 8 hours pumping; specific capacity, 22.5 gpm/ft.

Driller's log
Surface Altitude, 20 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Pensauken Formation:		
Topsoil and clay, brown	4	4
Clay, heavy, yellow, and stones	8	12
Upper Cretaceous:		
Merchantville Formation and Woodbury Clay:		
Clay, thick, heavy, blue	93	105
Raritan and Magothy Formations:		
Sand, dirty, and gravel with clay	5	110
Sand, fine, dirty gray	5	115
Sand, coarse, and fine gravel	3	118
Sand, mixed, and coarse gravel	7	125
Sand, fine	3	128
Sand, fine to coarse	5	133
Sand, fine, some coarse gravel	11	144
Clay, hard, blue	4	148
Sand, mixed, and coarse gravel	2	150
Sand, fine to medium, white	4	154
Sand, medium to coarse	6	160
Sand, fine	11	171
Clay	below	171

Table 4.—Records of selected public supply wells in Gloucester County.—Continued

WELL 40

Owner: The City of Woodbury Water Dept.

Location: North bank of Woodbury Creek near Penn. Reading R.R. tracks; N. J. Grid No. 31.11.5.8.3.

Well data: Owner's No. Test Hole; completed in December 1952 by A. C. Schultes & Sons; depth, 440 feet; diameter, 8 inches; screened from 390 to 410 feet.

Pumping-test data: Tested in December 1952: static water level, 50 feet below land surface; yield, 100 gpm with a drawdown of 6 feet.

Remarks: Casing removed and hole plugged.

Driller's log
Surface Altitude, 10 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Cape May Formation:		
Sand, fine, yellow	25	25
Sand, brown	5	30
Upper Cretaceous:		
Merchantville Formation and Woodbury Clay:		
Clay	74	104
Raritan and Magothy Formations:		
Sand, fine	51	155
Sand, medium	10	165
Sand, coarse	12	177
Clay, red	24	201
Sand, fine, brown	29	230
Sand, medium	12	242
Sand, coarse	20	262
Gravel, small	14	276
Clay, red	73	349
Sand, fine	41	390
Gravel	20	410
Gravel, mixed with red clay	12	422
Early Paleozoic(?):		
Wissahickon Formation:		
Mica and weathered rock	18	440

Table 5.--Chemical analyses of water from selected public supply wells in Gloucester County, New Jersey

(Analytical results in parts per million except as indicated)

Well no.	Water-bearing unit	Date of collection	Temperature (^{0}F)	Silica (SiO_2)	Total iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Na + K		Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids		Hardness as $CaCO_3$		Specific conductance (micromhos at 25^{0}C)	pH	Source of analysis
								Sodium (Na)	Potassium (K)							Residue on evaporation at 180^{0}C	Sum	Calcium, magnesium	Noncarbonate			
1	Raritan and Magothy Formations	5-19-51	--	13	0.21	8.4	4.6	6.8	1.0	12	0	23	9.5	0.1	11	82	73	40	30	134	6.5	USGS
3	Cohansey Sand	4-23-51	56	7.9	.02	4.6	4.0	21	6.2	7	0	12	18	.1	50	121	128	28	22	174	5.2	Do.
4	Raritan and Magothy Formations	7-30-57	74	14	.50	2.6	1.3	216	7.5	382	0	0.0	120	2.0	.1	543	538	12	0	977	7.7	Do.
5	do.	5-7-51	57	9.8	.24	12	3.1	102	3.5	227	0	5.0	54	1.2	.9	313	304	43	0	523	7.8	Do.
8	do.	5-7-51	65	12	.11	3.0	1.0	118	4.6	292	0	6.2	19	1.6	.7	315	310	12	0	515	8.1	Do.
11	do.	9-21-51	59	8.3	.02	3.0	5.2	4.3	3.1	0	0	21	6.9	.0	17	72	69	29	29	121	4.4	Do.
12	do.	9-21-51	60	8.5	.45	8.0	2.0	71	5.2	191	0	4.0	19	1.5	.3	221	216	28	0	356	8.0	Do.
14	do.	4-25-51	57.8	7.4	.42	6.0	5.8	14	4.2	7	0	25	21	.0	20	111	107	39	33	175	5.8	Do.
16	Cohansey Sand	4-23-51	55	5.5	.01	1.2	.8	2.7	.4	5	0	1.0	4.2	.0	5.0	25	24	8	4	33.6	6.4	Do.
17	Raritan and Magothy Formations	4-11-51	57	7.6	.02	9.6	5.2	11	3.9	0	0	33	19	.1	20	124	110	45	45	196	4.5	DO.
18	do.	4-11-51	56	7.6	2.3	5.8	3.5	48	2.2	0	0	27	77	.1	5.2	194	177	29	29	342	4.5	Do.
21	do.	4-17-51	62	11	.03	4.2	.8	102	5.0	238	0	3.2	26	2.0	1.0	285	272	14	0	449	8.1	Do.
23	do.	5-7-51	62	12	.02	3.6	1.4	118	5.3	274	0	3.0	34	1.2	.8	317	312	15	--	523	8.2	Do.
24	Mount Laurel Formation and Wenonah Sand	8-15-50	--	18	5.6	34	1.2	2.2	2.8	83	0	20	5.9	.5	.2	133	126	90	22	208	7.6	Do.
26	Raritan and Magothy Formations	12-21-50	58	9.7	1.4	9.2	2.4	196	8.1	323	0	6.5	140	1.4	.8	538	536	33	0	967	8.2	Do.
27	do.	5-7-51	57	11	2.6	23	5.1	41	5.4	118	0	18	43	.3	.5	202	205	78	0	367	7.4	Do.
29	do.	4-17-51	--	10	.16	7.6	1.3	58	5.1	162	0	7.0	7.6	1.2	.3	186	179	24	0	288	7.6	Do.
31	do.	10-11-50	58	9.9	1.8	23	5.0	12	5.8	90	0	20	12	.4	1.4	137	134	78	4	246	7.6	Do.
35	Cohansey Sand	4-23-51	55	8.2	.03	2.6	3.1	6.2	1.5	1	0	.8	5.4	.0	32	66	60	19	18	89.2	4.8	Do.
36	do.	4-23-51	--	7.7	.03	3.6	5.1	9.8	2.7	4	0	1.0	13	.1	41	98	86	30	27	141	4.9	Do.
37	Raritan and Magothy Formations	4-25-51	59.6	10	.03	5.6	2.1	79	5.2	196	0	5.0	21	1.6	1.0	234	227	23	0	374	8.0	Do.
38	do.	5-7-51	--	8.9	.37	21	4.1	32	5.5	146	0	14	6.5	.7	.8	165	166	69	0	276	7.5	Do.