WATER-RESOURCES INVESTIGATIONS REPORT 03-4337

Ground water--SHEET 2 OF 5

Gordon, A.D., Hydrology of the unconfined Kirkwood-Cohansey aquifer system, Forked River and Cedar, Oyster, Mill, Westecunk, and Tuckerton Creek Basins and adjacent basins in the southern Ocean County area, New Jersey, 1998-99

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

HYDROLOGY OF THE UNCONFINED KIRKWOOD-COHANSEY AQUIFER SYSTEM, FORKED RIVER AND CEDAR, OYSTER, MILL, WESTECUNK, AND TUCKERTON CREEK BASINS AND ADJACENT BASINS IN THE SOUTHERN OCEAN COUNTY AREA, NEW JERSEY, 1998-99

By Alison D. Gordon

GROUND WATER

This sheet describes water levels in the unconfined aquifer system in the Atlantic Coastal study area. A water-level map prepared from water levels measured in May and June 1998 is presented. Hydrographs of water levels in two observation wells in the Kirkwood-Cohansey aquifer system are shown.

Water-Level Map

Ground water in the Kirkwood-Cohansey aquifer system in the study area occurs under either unconfined (water-table), semiconfined, or confined (artesian) conditions. Where the aquifer is unconfined, the static water level in a well is at or below the top of the aquifer. Semiconfined conditions may occur in areas where local clay or silt beds are present. Under artesian conditions, the aquifer is confined by units of lower hydraulic conductivity and the water level in a well is higher than the top of the aquifer. Artesian ("flowing") wells are found in coastal areas of Ocean, Barnegat, and Eagleswood Townships. The artesian wells and wells that are more than about 150 ft deep or that penetrate substantial thicknesses of silt or clay were not used in preparing the water-table map in order to avoid water levels that might represent artesian or semiconfined conditions.

The water-table contour map (fig. 2-1) is based on water-level measurements made in 56 wells (table 2-1) and at 126 stream sites (table 2-2) in May and June 1998. Construction details for all the wells shown in table 2-1 are from the Ground-Water Site Inventory (GWSI) database maintained by the USGS. Water levels were measured with respect to land surface at each measuring site; then the elevation of the land surface was used to determine the water-level altitudes with respect to NGVD 29. Where measurements in wells were not made, elevations of streams, lakes, and wetlands (which represent the water table at or above land surface) estimated from USGS 7-1/2-minute topographic maps provided supplementary water-table-altitude data. Measurements at some stream sites shown in figure 2-1 were made at culverts that cross intermittent streams; therefore, these sites may not be located directly on a stream on the map.

Under natural conditions, water in the unconfined Kirkwood-Cohansey aquifer system generally flows from topographically high land areas toward points of discharge in low-lying areas, such as wetlands, rivers, streams, and springs (fig. 2-2). In some areas where water is withdrawn from the underlying aquifers, water flows downward through the confining unit. The overall configuration of the water table tends to be a subdued replica of the land surface. Where a water-table contour crosses a stream channel, it is shaped like a "v" (fig. 2-1). For a gaining stream (a stream that receives ground-water flow along most of its length), the "v" points upstream, indicating that nearby ground water is at a higher elevation than the water in the stream channel; therefore, ground water flows into the stream. The streams in the study area principally are gaining streams where flow from the aquifer system to the stream increases with distance downstream, which is also referred to as ground-water discharge.

The altitude of the water levels ranged from NGVD 29 near the coast to 160 ft above NGVD 29 in the northwestern part of the study area. The slope of the water table is steeper in areas of higher elevation and gentler in areas where the elevation is lower, such as near the coast. Changes in the shape of the water table that result from local ground-water withdrawals or seasonal changes in withdrawals and local variations in the permeability of geologic materials in the aquifer system cannot be shown clearly at the 1:100,000 scale of the water-table map (fig. 2-1).

Water-Level Monitoring

Hydrographs of two observation wells screened in the Kirkwood-Cohansey aquifer system are shown in figure 2-3. Water levels in these wells were measured 1 to 13 times a year during 1962-99. The two wells are the Garden State Parkway water-table observation wells number 1 (29-513) and number 2 (29-514), which are next to each other in Ocean Township. Construction data for these wells are included in table 2-1. Well number 1 is screened from 18 to 21 ft below land surface; well number 2 is screened from 306 to 316 ft below land surface. Water levels fluctuated a total of 6.6 ft, from 41.3 to 34.7 ft above NGVD 29, at well number 1 during May 1962 to December 1999, and a total of 4.8 ft, from 38.1 to 33.3 ft above NGVD 29, at well number 2 during February 1962 to December 1999. Water levels in well number 2 typically are lower and fluctuate less than water levels in well number 1. For example, on April 15, 1998, the water level in well number 2 was 37.8 ft above NGVD 29, or 2.2 ft below the water level in well number 1, which was 40.0 ft above NGVD 29 (table 2-1). The difference between the water levels in these two wells indicates that a local confining unit may be present between the two screened intervals. The geologic log of well number 2 indicates that three clay layers with thicknesses of 15, 15, and 60 ft are present at depths of 40, 130, and 205 ft, respectively, below land surface.

Table 2-1. Well-construction data for, and water-level measurements in, wells in the Kirkwood-Cohansey aquifer system in the Atlantic Coastal study area, New Jersey, May-June 1998

[--, missing data]

U.S. Geological Survey well number	New Jersey permit number	Latitude[1]	Longitude[1]	Elevation of land surface[2] (feet above NGVD 29)	Depth of well (feet below land surface)	Screened interval (feet below land surface)		Date water level measured	Water level (feet below land surface)	Altitude of water level[3] (feet above NGVD 29)
						Top	Bottom			
					Barnegat Township					
29- 570	33-01189	394548	0741921	140	333	--	--	06-05-1998	44.85	99
29- 571	33-01195	394554	0741920	150	146	126	146	06-05-1998	57.76	92
29- 661	33-05799	394453	0741434	110	91	83	91	05-22-1998	46.85	63
29-1247	--	394334	0741323	7	7.55	--	--	06-22-1998	1.26	6
					Berkeley Township					
29- 021	33-01064	395414	0740921	20	168	158	168	05-21-1998	11.59	8
29- 662	33-02520	395332	0741157	35	67	57	67	05-21-1998	5.30	21
29- 747	33-04777	395430	0741049	40	117	107	117	05-19-1998	12.13	28
29- 800	33-05007	395219	0741028	10	50	40	50	05-19-1998	2.94	7
29-1249	33-10720	395414	0741333	54	34	14	34	05-29-1998	18.54	35
29-1250	33-16261-1	395414	0741333	54	97	--	--	05-29-1998	18.15	36
29-1251	33-10718	395424	0741327	54	34.5	14.5	34.5	05-29-1998	15.98	38
29-1252	33-16259-0	395424	0741327	53	82	--	--	05-29-1998	15.78	37
29-1253	33-10717	395448	0741352	51	25	5	25	05-29-1998	6.11	45
					Eagleswood Township					
29-1254	33-34893	393955	0741701	40	100	90	100	05-27-1995	18.33	22
29-1429	--	393945	0741848	29	29.1	--	--	06-17-1998	9.84	19
					Lacey Township					
29- 620	--	395323	0742255	128.3	18	--	--	05-27-1998	7.27	121.03
29- 702	33-00368	395046	0741147	20	75	67	75	05-20-1998	7.61	12
29- 716	33-07761	395134	0741132	40	140	120	140	05-21-1998	20.25	20
29- 724	33-07613	395204	0741154	30	150	130	150	05-05-1998	13.62	16
29- 789	32-08639	394949	0742029	200	69	59	69	06-05-1998	44.98	155
29- 790	32-08638	395107	0742255	155	51	41	51	06-05-1998	20.23	135
29- 795	33-04999	394939	0741208	10	85	75	85	05-19-1998	5.9	4
29- 797	33-05003	395014	0741141	15	45	35	45	05-19-1998	9	6
29-1110	33-18150	395022	0741259	25	139	119	139	05-20-1998	4.05	20
29-1192	33-17043	395021	0741028	11	110	100	110	05-20-1998	4.14	7
29-1255	33-26395	395200	0741013	8	130	110	130	05-21-1998	1.61	6
29-1411	33-36287	395145	0741023	20	23	8	23	05-20-1998	13.27	7
29-1424	33-05044	394843	0741152	8.51	70	--	--	05-20-1998	2.83	5.68
29-1428	--	395252	0741738	108	14	--	--	06-11-1998	13.08	95
29-1431	33-28572-1	395229	0741254	40	--	--	--	06-10-1998	8.15	32

					Little Egg Harbor Township					
29- 773	32-08458	393855	0742008	45	37	27	37	06-18-1998	15.56	29
29- 791	32-08640-2	394111	0742141	50	65	55	65	06-18-1998	8.59	41
29-1004	32-10582	393643	0742316	41	85	75	85	05-28-1998	4.87	36
29-1005	32-12963	393707	0742311	40	83	68	83	05-28-1998	1.94	38
29-1055	32-17360	393624	0742145	35	75	65	75	06-18-1998	14.68	20
29-1256	32-18369	393740	0741918	18	70	60	70	06-30-1998	2.52	15
29-1257	33-12057-2	393938	0741950	50	31	16	31	05-00-1998	16.3	34
29-1258	33-12058-3	393941	0741943	50	35	20	35	05-00-1998	14.67	35
29-1259	33-12056-1	393944	0741953	50	50	35	50	05-00-1998	20.1	30
29-1412	32-11539	393705	0742254	40	93	83	93	06-18-1998	7.41	33
29-1430	32-18879-A	393404	0742214	12	7	2	7	06-18-1998	2.47	9
					Ocean Gate Borough					
29- 508	33-00896	395528	0740826	10	153	133	153	05-21-1998	2.36	8
					Ocean Township					
[4]29- 513	--	394744	0741418	44.25	21	18	21	04-15-1998	4.25	40.01
[4]29- 514	--	394744	0741418	43.82	316	306	316	04-15-1998	6.01	[5]37.81
29- 641	33-01317	394658	0741802	105	90	84	90	05-28-1998	8.36	97
29-1260	33-20627-9	394737	0741807	129.60	22	12	22	06-18-1998	4.59	125.01
29-1261	33-37131	394742	0741408	45	101	91	101	05-21-1998	8.55	36
29-1408	33-32668	394736	0741803	140	24	9	24	06-05-1998	14.42	126
					Stafford Township					
29- 555	33-02866	394039	0741551	15	140	120	140	05-22-1998	1.13	14
29- 556	33-02867	394039	0741551	15	140	120	140	05-22-1998	1.05	14
29- 652	33-07847	394153	0741505	20	100	90	100	05-21-1998	1.15	19
29- 768	33-08241	394205	0741657	75	154	144	154	05-22-1998	45.36	30
29-1413	33-10398	394114	0741432	20	100	--	--	06-22-1998	6.43	14
29-1415	33-30994	394320	0741646	60	80	70	80	05-27-1998	15.67	44
29-1416	33-35431	394421	0741617	85	70	60	70	05-27-1998	28.91	56
29-1426	33-36500	394243	0741715	68	33.5	18.5	33.5	06-22-1998	21.16	47
					Tuckerton Borough					
29- 684	32-06602	393608	0742100	20	90	80	90	05-22-1998	13.19	7

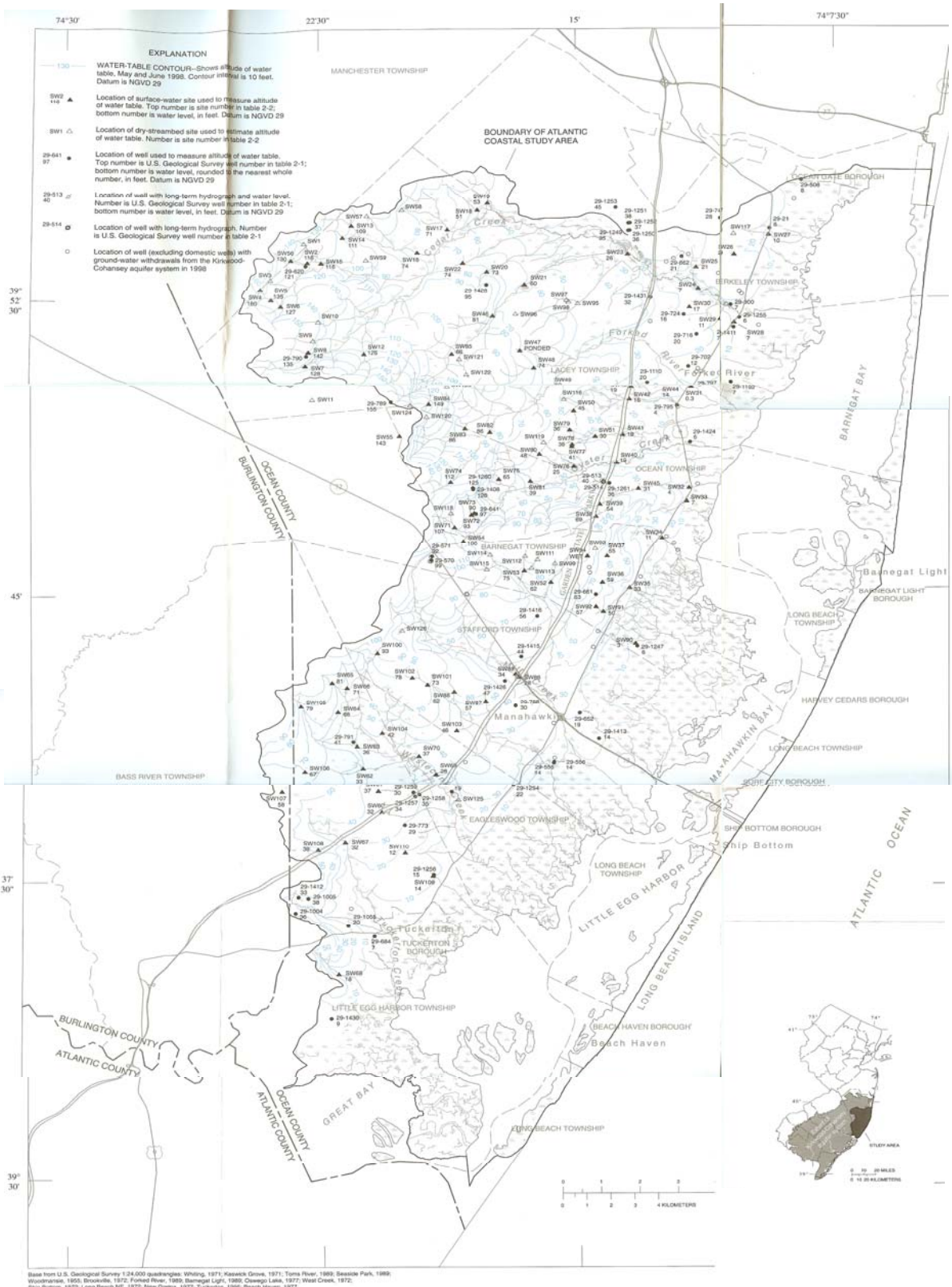
[1]Latitude and longitude are in degrees, minutes, and seconds and are referenced to the North American Datum of 1927.
[2]Values of elevation of land surface that are listed as whole numbers were determined by visual inspection of a 1:24,000 topographic map or by altimeter. Values listed to the tenth or hundredth place were determined from level measurements.
[3]Determined from elevation of land surface and rounded to nearest whole number, except when elevation of land surface was determined from level measurement (see footnote 2).
[4]Well used for long-term hydrograph (see fig. 2-3); water level measured in April 1998.
[5]Water level not included on water-table contour map (fig. 2-1).

Table 2-2. Elevations of water levels measured at stream sites in the Atlantic Coastal study area, New Jersey, June 1998

[Elevations of water levels are rounded to the nearest whole number; site locations are shown in fig. 2-1; <, less than]

Site number	Latitude[1]	Longitude[1]	Date measured	Elevation of water level (feet above NGVD 29)	Site number	Latitude[1]	Longitude[1]	Date measured	Elevation of water level (feet above NGVD 29)	Site number	Latitude[1]	Longitude[1]	Date measured	Elevation of water level (feet above NGVD 29)
SW1	395350	742259	6-8-1998	DRY	SW43	395001	741329	6-10-1998	19	SW85	395101	741841	6-19-1998	86
SW2	395321	742253	6-8-1998	116	SW44	395005	741229	6-10-1998	14	SW86	394242	741651	6-22-1998	28
SW3	395254	742358	6-8-1998	DRY	SW45	394726	741318	6-10-1998	31	SW87	394205	741750	6-22-1998	57
SW4	395239	742416	6-8-1998	160	SW46	395158	741729	6-11-1998	81	SW88	394220	741845	6-22-1998	62
SW5	395224	742357	6-8-1998	135	SW47	395105	741642	6-11-1998	PONDED	SW89	394246	741657	6-22-1998	34
SW6	395215	742340	6-8-1998	127	SW48	395039	741618	6-11-1998	74	SW90	394331	741327	6-22-1998	3
SW7	395045	742258	6-8-1998	128	SW49	395008	741549	6-11-1998	60	SW91	394420	741422	6-22-1998	50
SW8	395106	742252	6-8-1998	142	SW50	394926	741510	6-11-1998	45	SW92	394427	741435	6-22-1998	57
SW9	395123	742244	6-8-1998	DRY	SW51	394846	741433	6-11-1998	30	SW93	394556	741435	6-9-1998	DRY
SW10	395151	742234	6-8-1998	DRY	SW52	394505	741553	6-11-1998	62	SW94	394545	741449	6-9-1998	WET
SW11	394946	742248	6-8-1998	DRY	SW53	394523	741640	6-11-1998	75	SW95	395215	741500	6-9-1998	DRY
SW12	395102	742115	6-8-1998	125	SW54	394609	741825	6-11-1998	106	SW96	395200	741650	6-10-1998	DRY
SW13	395417	742135	6-9-1998	109	SW55	394850	742016	6-11-1998	143	SW97	395220	741520	6-10-1998	DRY
SW14	395358	742151	6-9-1998	111	SW56	395324	742322	6-8-1998	130	SW98	395218	741516	6-10-1998	DRY
SW15	395320	742229	6-9-1998	116	SW57	395431	742108	6-9-1998	DRY	SW99	394534	741546	6-10-1998	DRY
SW16	395335	741941	6-9-1998	74	SW58	395440	742007	6-9-1998	DRY	SW100	394320	742058	6-26-1998	93
SW17	395409	741848	6-9-1998	71	SW59	395324	742111	6-9-1998	DRY	SW101	394232	741931	6-26-1998	73
SW18	395439	741755	6-9-1998	51	SW60	393908	742048	6-17-1998	32	SW102	394242	741958	6-26-1998	78
SW19	395450	741737	6-9-1998	53	SW61	393939	742054	6-17-1998	37	SW103	394121	741841	6-26-1998	46
SW20	395305	741739	6-9-1998	73	SW62	394022	742125	6-17-1998	33	SW104	394118	742051	6-26-1998	42
SW21	395245	741633	6-9-1998	60	SW63	394057	742135	6-17-1998	36	SW105	394159	742313	6-26-1998	79
SW22	395318	741821	6-9-1998	74	SW64	394151	742208	6-17-1998	68	SW106	394018	742307	6-30-1998	67
SW23	395330	741332	6-9-1998	26	SW65	394236	742218	6-17-1998	81	SW107	393938	742340	6-30-1998	58
SW24	395236	741129	6-9-1998	7	SW66	394228	742152	6-17-1998	71	SW108	393810	742238	6-30-1998	38
SW25	395309	741133	6-9-1998	21	SW67	393822	742151	6-18-1998	32	SW109	393731	741920	6-30-1998	14
SW26	395328	741023	6-9-1998	29	SW68	393503	742202	6-18-1998	18	SW110	393806	742008	6-30-1998	12
SW27	395357	740923	6-9-1998	10	SW69	394013	741919	6-18-1998	28	SW111	394540	741617	6-10-1998	DRY
SW28	395145	741023	6-9-1998	7	SW70	394042	741948	6-18-1998	37	SW112	394545	741638	6-10-1998	DRY
SW29	395149	741051	6-9-1998	11	SW71	394631	741841	6-19-1998	107	SW113	394527	741627	6-10-1998	DRY
SW30	395208	741145	6-9-1998	17	SW72	394652	741806	6-19-1998	93	SW114	394548	741739	6-10-1998	DRY
SW31	395000	741144	6-10-1998	<1	SW73	394649	741811	6-19-1998	90	SW115	394526	741745	6-10-1998	DRY
SW32	394727	741149	6-10-1998	4	SW74	394739	741847	6-19-1998	112	SW116	394943	741527	6-10-1998	DRY
SW33	394707	741154	6-10-1998	7	SW75	394743	741722	6-19-1998	65	SW117	395359	741024	6-9-1998	DRY
SW34	394611	741238	6-10-1998	11	SW76	394801	741511	6-19-1998	25	SW118	394652	741847	6-19-1998	DRY
SW35	394456	741336	6-10-1998	33	SW77	394831	741514	6-19-1998	41	SW119	394838	741603	6-19-1998	DRY
SW36	394504	741423	6-10-1998	59	SW78	394835	741513	6-19-1998	35	SW120	394918	741928	6-19-1998	DRY
SW37	394545	741414	6-10-1998	55	SW79	394856	741517	6-19-1998	36	SW121	395054	741828	6-19-1998	DRY
SW38	394645	741433	6-10-1998	69	SW80	394820	741611	6-19-1998	48	SW122	395030	741816	6-19-1998	DRY
SW39	394703	741426	6-10-1998	54	SW81	394739	741627	6-19-1998	39	SW123	395005	741852	6-19-1998	DRY
SW40	394806	741356	6-10-1998	19	SW82	394854	741737	6-19-1998	86	SW124	394936	741956	6-19-1998	DRY
SW41	394849	741345	6-10-1998	19	SW83	394900	741820	6-19-1998	86	SW125	393926	741837	6-18-1998	DRY
SW42	394942	741333	6-10-1998	16	SW84	394938	741924	6-19-1998	149	SW126	394354	742015	6-26-1998	DRY

[1]Latitude and longitude are in degrees, minutes, and seconds and are referenced to the North American Datum of 1927.



Base from U.S. Geological Survey 1:24,000 quadrangles: Whiting, 1971; Keswick Grove, 1971; Toms River, 1989; Beeside Park, 1989; Woodmansie, 1955; Brookville, 1972; Forked River, 1989; Barnegat Light, 1989; Oswego Lake, 1977; West Creek, 1972; Ship Bottom, 1972; Long Beach NE, 1972; New Gretna, 1977; Tuckerton, 1995; Beach Haven, 1977

Figure 2-1. The Atlantic Coastal study area, New Jersey, showing well and stream-site locations, and altitude of the water table in the unconfined Kirkwood-Cohansey aquifer system, May and June 1998.

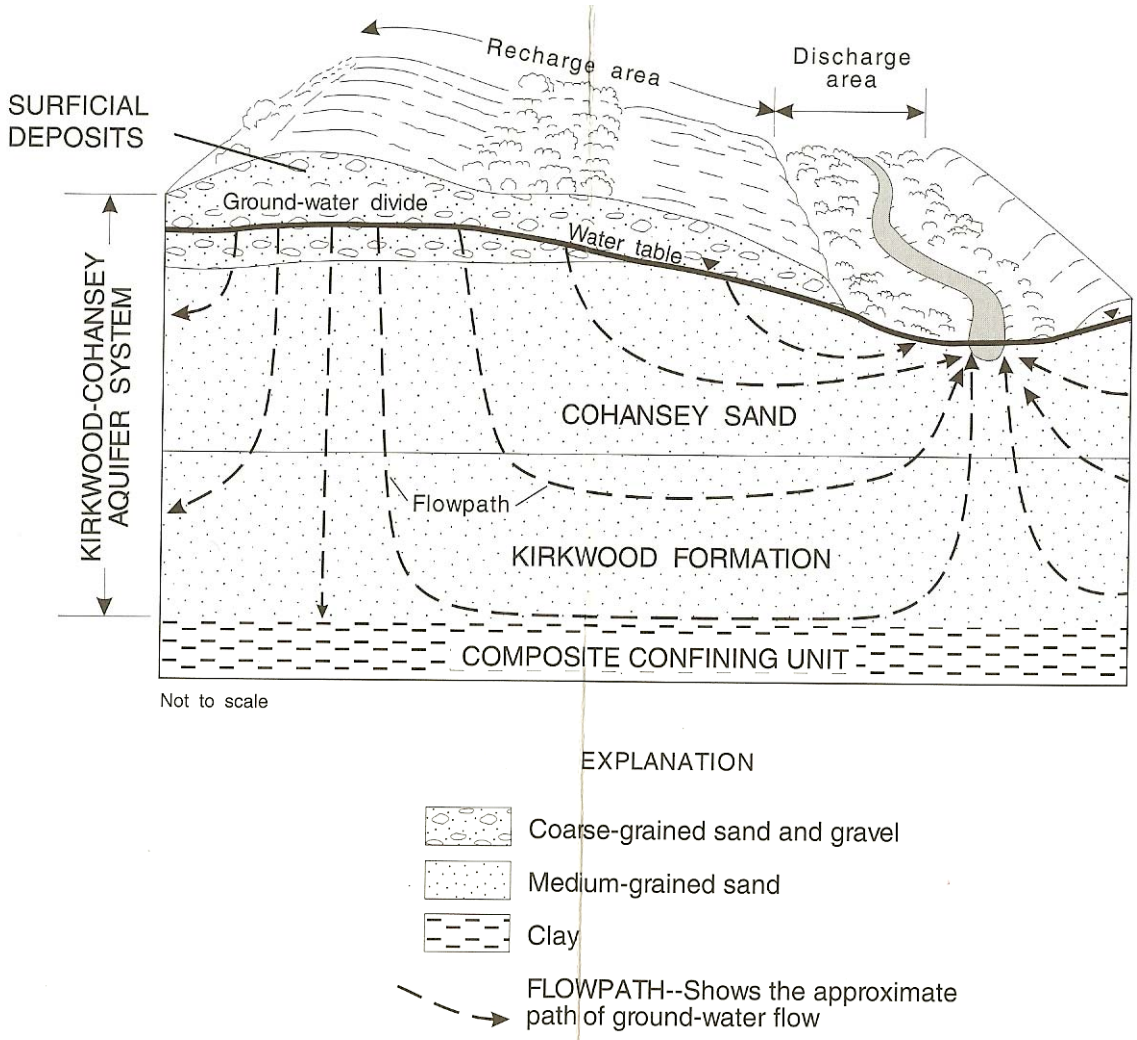


Figure 2-2. Generalized hydrogeologic section through the Kirkwood-Cohansey aquifer system and generalized ground-water-flow lines, southern Ocean County, New Jersey. (Modified from Kozinski and others, 1995, fig. 6)

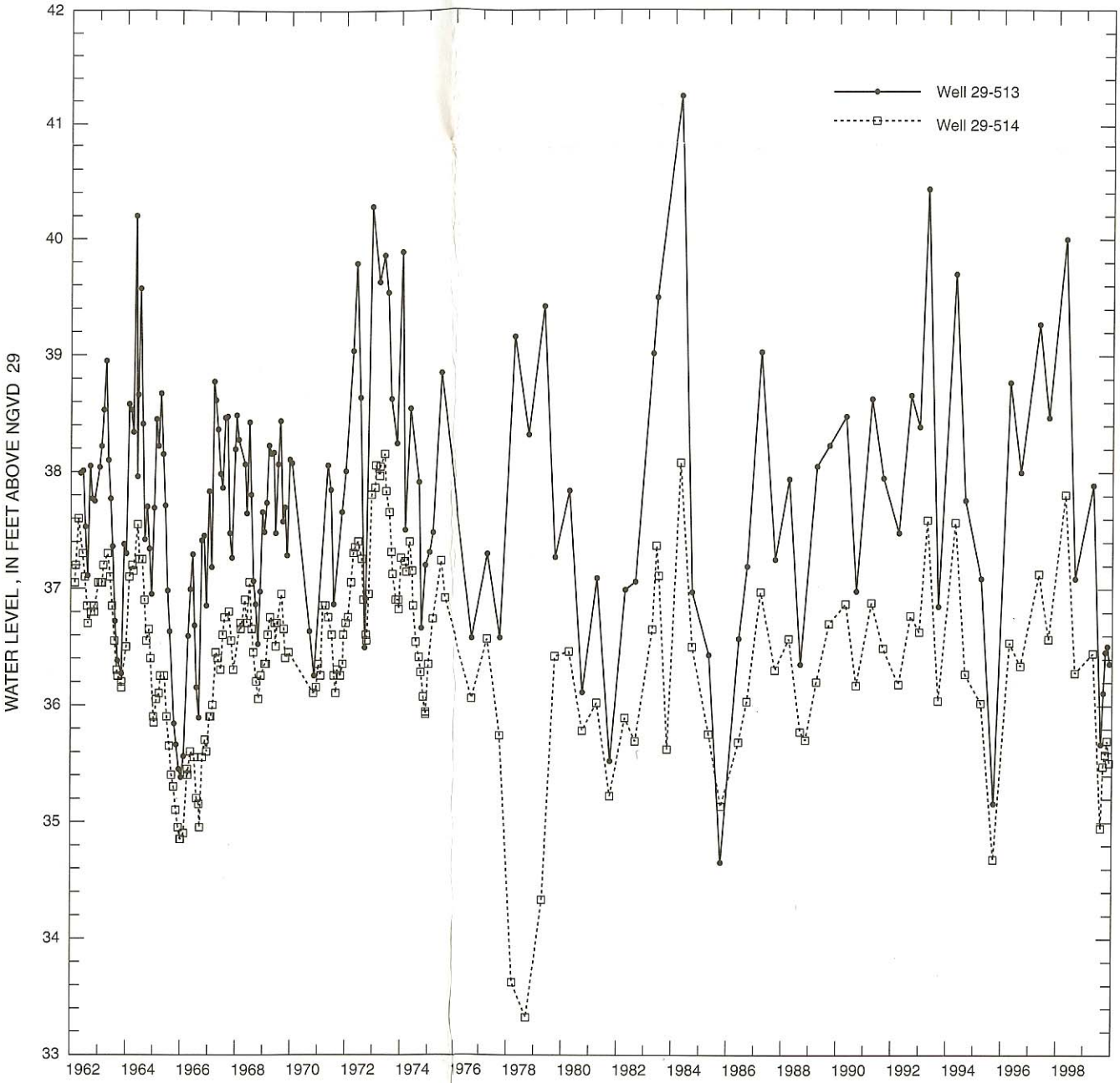


Figure 2-3. Hydrograph of water levels in Garden State Parkway Observation wells 1 and 2, Atlantic Coastal study area, New Jersey. (Well locations shown in fig. 2-1; construction data shown in table 2-1. Water levels reported as periodic measurements, May 1962 (well 29-513) and February 1962 (well 29-514) to December 1999)