DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF SCIENCE AND RESEARCH
NEW JERSEY GEOLOGICAL SURVEY

SURFICIAL GEOLOGY OF THE BOUND BROOK QUADRANGLE
SOMERSET AND MIDDLESEX COUNTIES, NEW JERSEY
OPEN FILE MAP NO. 4

DESCRIPTION OF MAP UNITS

af — **ARTIFICIAL FILL**—Excavated bedrock and surficial material, and discarded man-made material (construction debris, cinders, ash, and trash). As much as 40 feet thick. Many small areas of fill, particularly along streams in urban areas, are not mapped.

Deposits in Modern Valleys (Holocene and Pleistocene)—This suite of deposits occurs in floodplains, terraces, wetlands, and along the bases of slopes within modern valleys.

Qal — **ALLUVIUM**—Silt, sand, clay, and pebble-to-cobble gravel. Contains minor amounts of organic matter. Color of fine sediment is reddish brown in deposits derived from shale terrain; reddish brown, brown, and yellowish brown in deposits derived from basalt terrain; and reddish yellow in alluvium along Green and Ambrose Brooks derived from unit Qpf. Alluvium in the Middle Brook basin is chiefly basalt and mudstone gravel with minor overbank silt and clay. Alluvium in the Raritan and Millstone valleys is chiefly overbank silt and clay with minor channel deposits of pebble gravel and sand. The gravel here is chiefly shale and mudstone with lesser amounts of quartz, quartzite, and chert derived from the Bridgeton Formation, and gneiss, diabase, and basalt from bedrock formations. Alluvium along Green and Ambrose Brooks is chiefly sand with minor pebble gravel, both derived from unit Qpf. As much as 20 feet thick in the Raritan and Millstone valleys; as much as 10 feet thick in tributary valleys.

Qalb — **BASALT ALLUVIUM AND ALLUVIAL-LAGS**—Alluvium consisting of basalt gravel and minor brown to yellowish-brown silt and clay, and surface concentrations of subangular basalt cobbles (lag) formed by winnowing of weathered basalt. Alluvium is as much as 10 feet thick; lag concentrations as much as 3 feet thick.

Qs — **SWAMP DEPOSITS**—Organic silt and clay, gray to dark gray. As much as 6 feet thick (estimated). In two abandoned-channel swales on terraces west of Manville.

Qcb — **BASALT COLLUVIUM, BLOCKY PHASE**—Diamict sediment consisting of many subangular cobbles of basalt in a red to reddish-yellow clayey-silt to silt matrix. Includes angular chips and small flagstones of red shale derived from underlying shale bedrock on lower parts of some slopes. Forms steep aprons along base of cuesta slopes of First and Second Watchung Mountains. As much as 50 feet thick.

Qcbl — **BASALT COLLUVIUM, SILTY PHASE**—Diamict sediment consisting of red to reddish-yellow clayey silt with few subangular cobbles of basalt. Includes small areas of alluvial basalt-cobble lags. Forms gently-sloping aprons on dip slopes of First and Second Watchung Mountains. As much as 15 feet thick.

Qcs — **SHALE AND MUDSTONE COLLUVIUM**—Diamict sediment consisting of few to some angular chips and small flagstones of red shale and mudstone in a reddish-brown to yellowish-red silt matrix. Forms small, gently-sloping aprons along the East and West Branches of Middle Brook. As much as 10 feet thick.

Qe — **EOLIAN DEPOSITS**—Reddish-yellow to yellow fine sand and silt. Forms thin veneers on valley sides and, locally, on terrace deposits, in the Raritan and Millstone valleys. As much as 5 feet thick. Mapped only where generally continuous.

Qtls — **LOWER TRIBUTARY TERRACE DEPOSITS, SHALE AND MUDSTONE PHASE**—Silt, sand, clay, and pebble gravel. Fine sediment is reddish brown to reddish yellow. Gravel is chiefly shale and mudstone with some quartz, quartzite, and chert derived from the Bridgeton Formation. Forms terraces 5 to 15 feet above modern alluvial surfaces. As much as 15 feet thick.

Qtlb — **LOWER TRIBUTARY TERRACE DEPOSITS, BASALT PHASE**—Pebble-to-cobble gravel, minor silt, sand, and clay. Fine sediment is reddish yellow to yellow. Gravel is basalt with minor red shale and mudstone. The clasts are generally unweathered, but some basalt clasts have a thin weathering rind. Forms terraces 5 to 15 feet above modern alluvial surfaces. As much as 25 feet thick.

Qrtl — **LOWER RARITAN TERRACE DEPOSIT**—Sand, silt, pebble gravel, minor cobble gravel. Fine sediment is reddish brown to reddish yellow. Gravel is chiefly red shale and mudstone with some gneiss, quartzite, gray mudstone, and quartz. The gravel clasts are derived from bedrock formations and surficial deposits within the Raritan basin. The clasts are unweathered. Forms a terrace 10 to 15 feet above the modern Raritan alluvial surface. As much as 40 feet thick.

Qmt — **MILLSTONE TERRACE DEPOSIT**—Sand, silt, pebble gravel, minor cobble gravel. Fine sediment is reddish brown to reddish yellow. Gravel consists chiefly of gray mudstone and sandstone, some red shale and mudstone, and a little gneiss, quartz, chert, and quartzite. The clasts are unweathered. Forms a terrace 10 to 15 feet above the modern Millstone floodplain. As much as 30 feet thick. This deposit extends southward to Trenton, where it is continuous with the late Wisconsinan glaciofluvial gravel of the Delaware valley. Most of the gneiss and gray mudstone and sandstone in the deposit, and some of the quartzite and chert, is derived from bedrock formations in the Delaware valley. Most of the quartz, quartzite, and chert are derived from the Bridgeton Formation, and the red shale and mudstone are from the local bedrock.

Qpf — **PLAINFIELD OUTWASH**—Reddish-yellow sand and minor pebble gravel. Gravel includes chiefly red shale and mudstone with some quartz, gray mudstone and sandstone, gneiss, and quartzite. The clasts are unweathered. Forms a broad plain 15 to 20 feet above modern alluvial surfaces. As much as 50 feet thick. The Plainfield outwash is a late Wisconsinan glaciofluvial deposit which heads at the terminal moraine north and east of Plainfield.

Qtus — **UPPER TRIBUTARY TERRACE DEPOSITS, SHALE AND MUDSTONE PHASE**—Silt, sand, pebble gravel, and clay. Fine sediment is reddish brown. Gravel consists chiefly of quartz, quartzite, and chert derived from the Bridgeton Formation, and red shale, with minor basalt. Shale and basalt clasts are weathered at some locations. Forms terraces 10 to 20 feet above modern alluvial surfaces. As much as 20 feet thick. The deposit along Peters Brook in Somerville includes 5- to 10-foot-thick clay beds (described by Salisbury, 1892, p. 122-123) that may be lacustrine deposits formed when deposition of unit Qrtu in the main valley ponded drainage in tributary valleys.

Qtub — **UPPER TRIBUTARY TERRACE DEPOSITS, BASALT PHASE**—Pebble-to-cobble gravel, silt, clay, and minor sand. Fine sediment is reddish brown to reddish yellow. Gravel consists chiefly of basalt with lesser amounts of quartz and quartzite derived from the Bridgeton Formation, and red to gray mudstone. Basalt clasts have thin weathering rinds. Forms terraces 15 to 20 feet above modern alluvial surface along Middle Brook south of Chimney Rock. As much as 15 feet thick.

Qrtu — **UPPER RARITAN TERRACE DEPOSIT**—Sand and pebble gravel, minor cobble gravel, silt, and clay. Fine sediment is reddish yellow. Gravel consists of gneiss, quartz, quartzite, red and gray mudstone and sandstone, and chert. These clasts are derived from bedrock formations and surficial deposits within the Raritan basin. Gneiss clasts have thick weathering rinds. Forms a terrace 20 to 30 feet above the modern Raritan alluvial surface. As much as 50 feet thick.

Deposits on Surfaces that Predate Modern Valleys (late Miocene?-early Pleistocene)—These deposits rest on erosional surfaces that are 80 to 140 feet above the valley bottoms of the modern Raritan and Millstone Rivers. They cap hilltops and divides and are unrelated to the modern drainage network.

Qjt — **JERSEYAN TILL**—Diamict sediment consisting of reddish-yellow, reddish-brown, and yellow clayey silt to sandy silt with some subrounded to subangular pebbles and cobbles and few subrounded boulders. Gravel consists of gneiss, quartzite, and red mudstone and sandstone, with some quartz, chert, basalt, and gray mudstone and sandstone. Boulders are chiefly gneiss and quartzite. Gneiss and basalt clasts, and some mudstone clasts, have thick weathering rinds or are fully decomposed; most quartzite clasts have a surface iron oxide stain. As much as 25 feet thick. The Jerseyan till is much more eroded and weathered than glacial deposits of probable Illinoian age to the north of the Bound Brook quadrangle. Thus, the Jerseyan till was deposited by a pre-Illinoian glacier. The term "Jerseyan" was introduced by Bayley and others (1914) to refer to all pre-late Wisconsinan glacial deposits in New Jersey. The term here is restricted to pre-Illinoian glacial deposits.

TQb — **BRIDGETON FORMATION**—Reddish-yellow sand, pebble gravel, minor cobble gravel. Gravel consists of quartz, quartzite, and chert, with some red and gray mudstone and gneiss. Gneiss and mudstone clasts, and some chert clasts, are fully decomposed. Many quartz clasts have a surface iron oxide stain. As much as 15 feet thick. Occurs as small, scattered hilltop remnants of a once-continuous fluvial gravel with a base between 140 and 160 feet above sea level. This deposit covered the entire portion of the quadrangle south of First Watchung Mountain; pebbles and cobbles derived from the Bridgeton Formation are scattered on all weathered bedrock surfaces and in all surficial deposits in this area. Bayley and others (1914) assigned this gravel to the Pensauken Formation and considered it to be of Quaternary age; Owens and Minard (1979) reassigned it to the Bridgeton based on projection of the base of the gravel from its type location in southern New Jersey. They considered it to be of late Miocene age by correlation to gravels in the Delmarva Peninsula. The Bridgeton is not dated in its type area and its age is therefore uncertain.

Weathered Bedrock Material (Tertiary?-Quaternary)

Qsw — **WEATHERED SHALE AND MUDSTONE**—Diamict material consisting of some to many angular chips of red shale in reddish-brown, red, and reddish-yellow silty clay to clayey silt. As much as 10 feet thick on remnants of pre-Bridgeton erosion surfaces (subjacent and adjacent to unit TQb), where it may locally be of Tertiary age; generally less than 3 feet thick elsewhere. Unit not shown on sections because it is either too thin or depth of lower contact is too variable.

Qbw — **WEATHERED BASALT**—Diamict material consisting of few to many angular and subangular pebbles and cobbles of basalt in reddish-yellow, yellow, brown, and brownish-yellow silty clay to sandy clayey silt. Lower contact is uneven and grades into unweathered bedrock. Depth to unweathered bedrock may be as much as 40 feet but is generally less than 15 feet. Unit not shown on sections because depth of lower contact is too variable.

TQbw — **WEATHERED BASALT, RED CLAY PHASE**—Diamict material consisting of few to some subangular to subrounded pebbles and cobbles of basalt in red to yellowish-red silty clay. Lower contact and thickness similar to unit Qbw. Distinctly more clayey and redder than unit Qbw. Occurs on broad, flat summit area north of Mount Horeb, which may be a remnant of a Tertiary erosion surface.

MAP SYMBOLS

Contact–Dashed where approximately located, short-dashed where gradational or feathering, dotted where excavated or concealed by fill or artificial lakes.

Erosional scarp—Line at top of scarp, ticks on slope.

Artificial excavation scarp—Line at top of scarp, ticks on slope. Shows extent of quarries and major road and railroad cuts. Drawn from 1979 aerial photographs.

Crest of low bedrock ridge–Line at crest of low (generally less than 6 feet high) bedrock-controlled ridge, parallel to strike of beds. Drawn from aerial photographs; includes some lines defined by adjacent beds differing in color.

⊕ 17 — **Location of well with log in table 1.**

af/Qal, Qe/Qsw — **Map unit to left of slash overlies unit to right of slash**–Shows extent of natural material beneath large areas of artificial fill (based in part on the mapping of Salisbury, 1895, and Bayley and others, 1914), and units beneath thin veneers of eolian sand and silt.

(TQb) — **Surface lag of gravel clasts derived from Bridgeton Formation**–Concentration of clasts from unit TQb on surface of unit Qsw.

(Qrtu) — **Surface lag of gravel clasts derived from Upper Raritan Terrace Deposit**–Scattering of clasts from unit Qrtu on surface of unit Qsw.

Thin, discontinuous surficial material–Steep slopes with small bedrock outcrops and fractured bedrock rubble where surficial deposits and weathered bedrock material are discontinuous and generally less than 8 feet thick. Includes areas of no surficial material in basalt quarries.

Large bedrock outcrop–Numerous small outcrops in streambanks and road and railroad cuts not mapped.

Basalt quarry or shale pit

REFERENCES

Bayley, W. S., Salisbury, R. D., Kummel, H. B., 1914, Description of the Raritan quadrangle [New Jersey]: U. S. Geological Survey Geologic Atlas, Folio 191, 32 p., 5 map sheets, scale 1:125,000.

Owens, J. P., and Minard, J. P., 1979, Upper Cenozoic sediments of the lower Delaware Valley and the northern Delmarva Peninsula, New Jersey, Pennsylvania, Delaware, and Maryland: U. S. Geological Survey Professional Paper 1067-D, 47 p.

Salisbury, R. D., 1892, A preliminary paper on drift or Pleistocene formations of New Jersey: New Jersey Geological Survey Annual Report for 1891, p. 35-108.

Salisbury, R. D., 1895, Surface geology: report of progress: New Jersey Geological Survey Annual Report for 1894, p. 1-149.

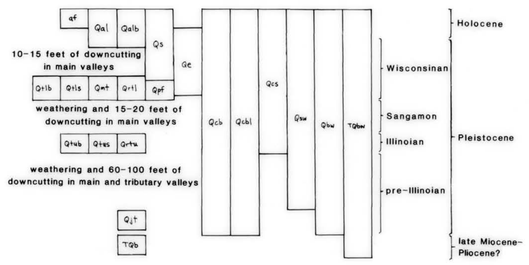
Table 1.–Selected Well Logs

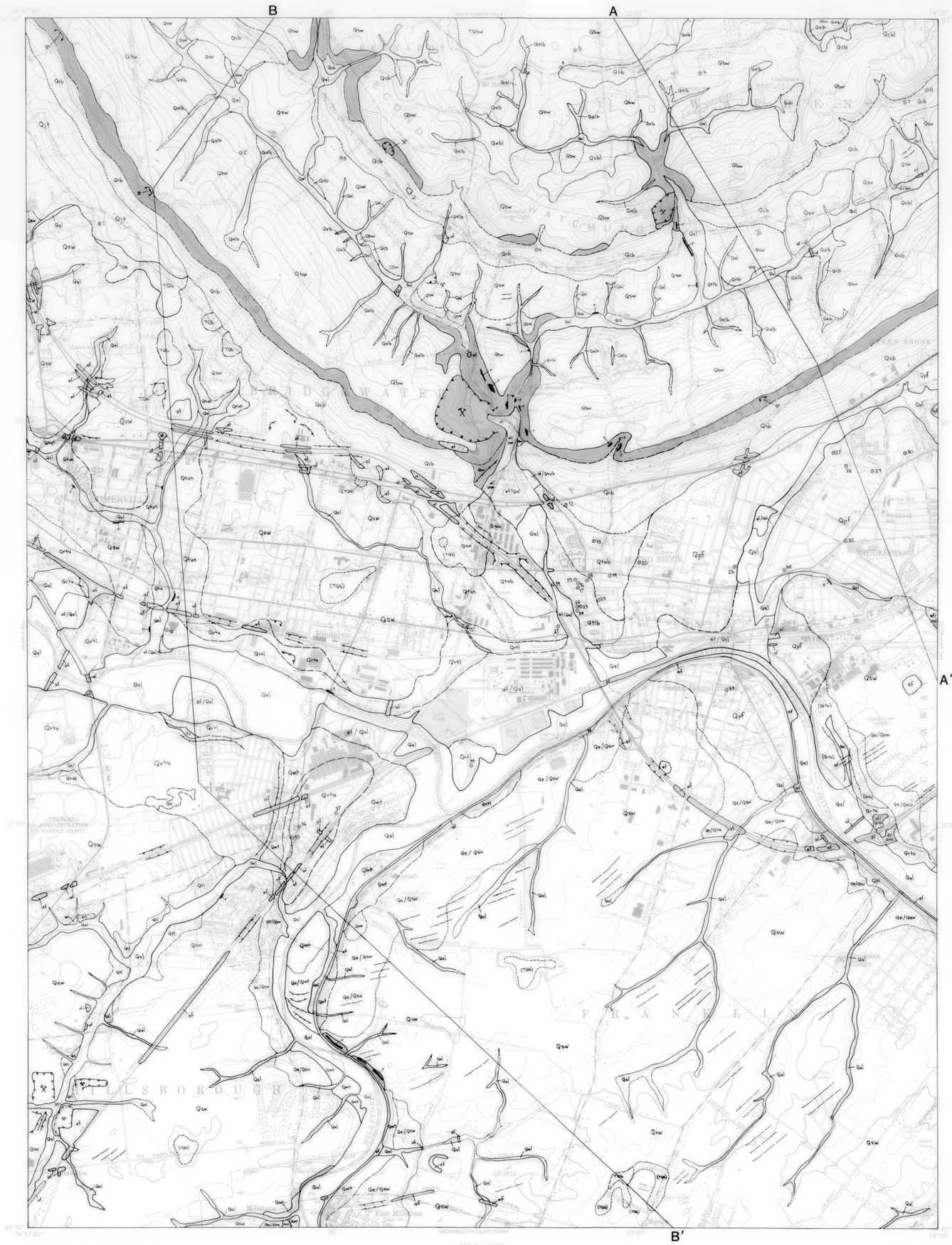
Well No.	Permit No. (1)	Depth (feet)	Driller's Log Description (2)
1	25-20590	0-20	brown clay, silt, stones (Qjt)
		20-35	yellow sand, gravel, silt (TQb)
		35-150	red shale
2	25-15763	0-20	overburden (Qbw)
		20-50	blue rock (basalt)
		50-70	like gravel (weathered basalt)
		70-300	blue rock, red rock (basalt, shale)
3	25-5786	0-25	clay (Qbw)
		25-100	red shale
4	25-9167	0-38	clay and stone (Qbw)
		38-78	blue rock (basalt)
5	25-10639	0-35	clay and stone (Qbw)
		35-120	rock (basalt)
6	on file at N. J. Geological Survey	0-12	yellow clay (Qbw)
		12-50	red shale
		50-100	trap rock (basalt)
7	25-1931	0-48	red clay with loose mountain stones (Qcb)
		48-92	red shale
8	25-8782	0-45	stone and dirt (Qcb)
		45-147	shale
9	25-350	0-20	clay (Qcb)
		20-125	red shale
		125-188	sandstone
10	25-12614	0-40	red clay, dirt, gravel (Qrtl)
		40-500	red shale
11	25-30749	0-3	red brown clay loam
		3-4	light gray silty clay
		4-13	reddish brown clay (Qrtl)
12	25-23566	0-40	overburden (Qcb)
		40-125	shale
13	25-8620	0-36	sand (Qtub)
		36-143	shale
14	25-32627	0-12	coarse to fine gravel (Qal)
		12-68	shale
15	25-1300	0-23	sand and large gravel (Qtlb)
		23-80	red shale
16	25-20973	0-25	sand and gravel (Qtlb)
		25-175	shale
17	25-20900	0-40	sand (Qtlb)
		40-150	red shale
18	25-20901	0-40	sand (Qtlb)
		40-150	red shale
19	25-170	0-25	sand mixed with gravel (Qtub)
		25-65	red clay (Qtub, Qsw)
		65-131	red shale
20	25-13178	0-30	sand, gravel, clay (Qpf)
		30-100	red shale
21	25-8217	0-11	earth and clay (Qtlb)
		11-25	soft red shale rock (Qsw)
		25-403	red shale
22	25-7724	0-26	sand and gravel (Qtlb)
		26-100	red shale
23	25-1299	0-25	sand and gravel (Qtlb)
		25-95	red shale
24	25-8201	0-20	sand (Qtlb)
		20-100	shale
25	25-7588	0-18	sand and gravel (Qtub)
		18-100	red shale
26	25-30289	0-40	red sand and gravel (Qpf)
		40-185	shale
27	25-20868	0-30	sand (Qpf)
		30-130	shale
28	25-7314	0-52	sand and gravel (Qpf)
		52-112	red shale
29	25-1094	0-40	sand and gravel (Qpf)
		40-65	red clay (probable Qsw or shale)
		65-100	red shale
30	25-11544	0-38	sand (Qpf)
		38-98	shale
31	25-26216	0-19	sand, some fine gravel (Qpf)
		19-21	shale
32	25-6688	0-12	sand (Qpf)
		12-102	red shale
33	25-20549	0-15	clay and sand (Qpf)
		15-28	sand, gravel (Qpf)
		28-175	shale
34	on file at N. J. Geological Survey	0-38	sand and gravel (Qrtl)
		38-?	shale (total depth not reported)
35	25-11282	0-65	sand (Qrtu, thickness questionable)
		65-110	shale
36	25-3853	0-30	sand (Qrtu)
		30-201	shale
37	on file at N. J. Geological Survey	0-42	gravel and sand (Qrtu)
		42-?	shale (total depth not reported)

(1.) Well permit number issued by the New Jersey Department of Environmental Protection and Energy, Bureau of Water Allocation.

(2.) Inferred map units and comments in parentheses.

Correlation of Map Units



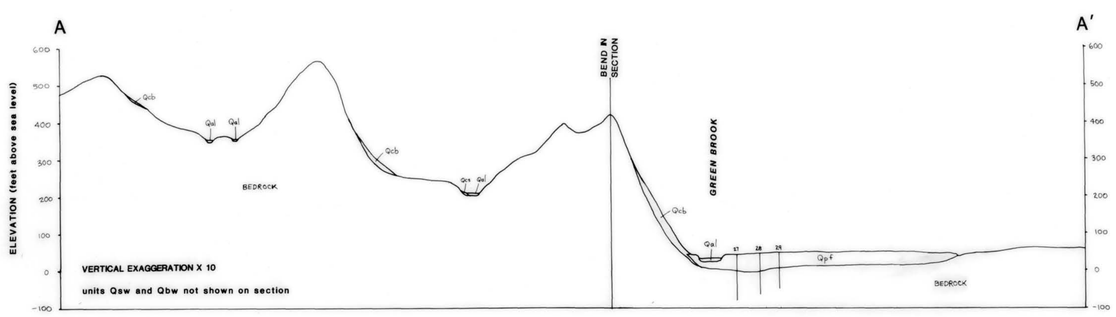


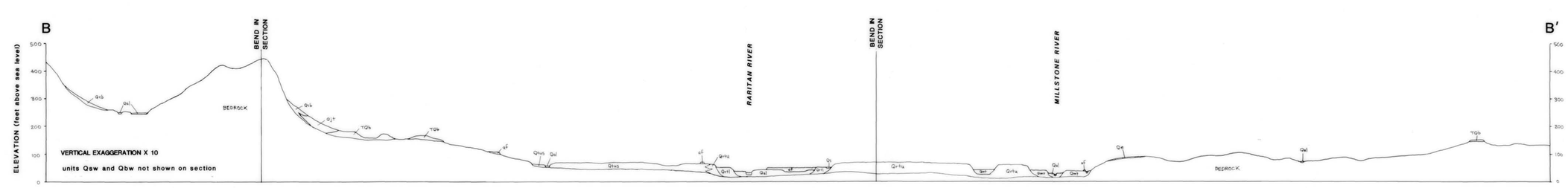
Base from U.S. Geological Survey, 1955

Photorevised 1970

Geology mapped in 1988, 1990–91

The interpretations presented here are provisional pending peer review. There may be revisions prior to publication.





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by
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1992