DEPARTMENT OF ENVIRONMENTAL PROTECTION
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INTRODUCTION

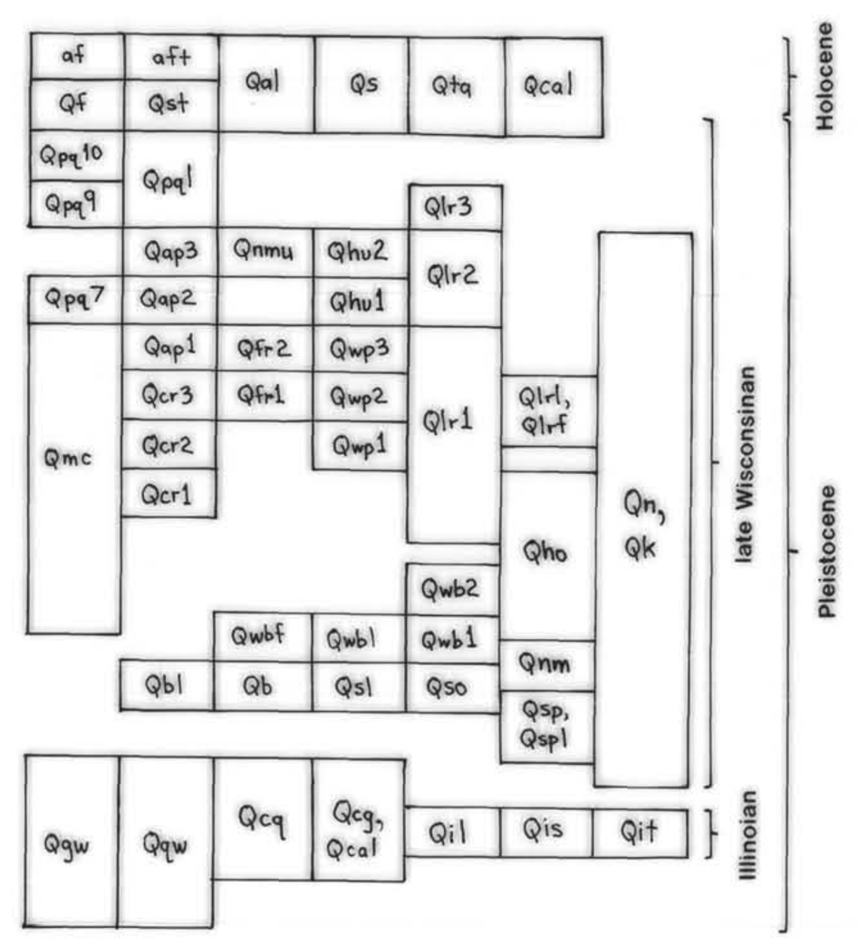
Surficial materials in the Stanhope quadrangle consist of glacial, stream, wetland, hillslope, and weathered bedrock sediments. The glacial sediments were deposited by two glaciations. They include sand, gravel, silt, and clay laid down by meltwater in glacial lakes and river plains; and till laid down by glacial ice as a discontinuous sheet on bedrock, in moraines, and in drumlins. The sand, gravel, silt, and clay, known collectively as stratified drift, are as much as 300 feet thick. Till is as much as 150 feet thick. The stream sediments include sand, gravel, and silt deposited in floodplains, stream terraces, and alluvial fans. The wetland sediments include peat and organic silt and clay deposited in marshes and swamps. Hillslope sediments include colluvium deposited in aprons along the base of hillslopes, and talus deposited at the base of cliffs. The stream, wetland, and hillslope deposits are generally less than 20 feet thick. The weathered bedrock generally consists of blocky, sandy silt to silty sand formed by chemical and mechanical decomposition of bedrock. It is irregularly distributed along zones of faulting or compositional layering in the bedrock, and may be as much as 200 feet thick.

The accompanying map and sections show the surface extent and subsurface relations of these deposits. A brief summary of their resource and environmental characteristics is provided below. Table 1 lists water-well and test-boring logs used to plot bedrock-surface topography and to infer the subsurface distribution of deposits. Table 2 lists the composition of pebbles in the glacial deposits. The correlation chart shows the temporal relationships of the deposits. Figure 1 shows recessional ice margins and their associated deposits. The bedrock geology was mapped by Volkert and others (1989) and Herman and Mitchell (1991).

The stratified drift is divided into units that represent the individual glacial-lake basin or glacial-stream valley in which it was deposited. Numbers on the map units indicate successively lower lakes or lake stages that formed as the ice front retreated (for example, Qap1, Qap2, Qap3). For glacial-stream deposits, the numbers indicate sediments laid down from successively younger ice-margin positions (for example, Qlr1, Qlr2, Qlr3). Some of the glacial-lake deposits, such as lake-bottom and lacustrine-fan sediments and some small deltaic units, lack features that record lake levels and so cannot be assigned to specific lake stages. Likewise, some of the glacial-stream deposits cannot be correlated to specific ice-margin positions, and so are not numbered. The descriptions provide basic texture and thickness information for each stratified drift unit. Bedding, color, and sand and gravel composition are similar for all the stratified drift units. Thus, these are described in the general headings for glacial-lake and glacial-stream deposits rather than in each unit description.

Till is subdivided into three units based on age, color, grain-size, and gravel-clast composition. Moraines are mapped as morphologic varieties of these units.

CORRELATION OF MAP UNITS



RESOURCES AND ENVIRONMENTAL CHARACTERISTICS

Surficial deposits in the quadrangle supply ground water to wells; influence the movement of water and pollutants from the land surface into lakes, streams, and underlying bedrock and glacial aquifers; provide sand and gravel for construction uses; and produce peat for use as a soil conditioner. Glacial sediments yield ground water to domestic and public-supply wells at several places. Yields and screened intervals for these wells are provided in table 1. Many wells at the north end of Budd Lake draw water from Illinoian and late Wisconsinan glaciolacustrine sand and gravel (units Qis or Qb). Some wells also draw from glaciolacustrine sediment along the east side of Cranberry Lake (Qcr), at Lake Lackawanna (Qlrf and Qlr1) and at Andover (Qap3). Sandy till of the terminal moraine (Qnm) also supplies a few domestic wells and several public-supply wells in the Netcong wellfield (wells 70-76 in table 1). Glaciolacustrine deposits in the Ledgewood-Landing-Stanhope valley fill (Qsp, section BB') and in the Kenvil valley fill (Qso and Qis) also supply some domestic wells. The valley-fill sediments also provide storage and recharge for the underlying bedrock aquifers, for example, the gneiss and carbonate rock tapped by the Stanhope and Netcong well fields (wells 89-95).

Sand and gravel deposits are highly permeable (estimated hydraulic conductivity between about 100 and 1300 feet per day [ft/d]). Their outcrops may be recharge areas for glacial or bedrock aquifers. Sandy till is also permeable (estimated hydraulic conductivity between 0.1 and 100 ft/d). Sandy silt till, weathered gneiss bedrock, and colluvium, are moderately permeable (estimated hydraulic conductivity between 10^{-3} to 10^{-1} ft/d). Lake-bottom sediment and weathered carbonate bedrock are of low permeability and will retard ground-water flow, particularly if clay is abundant (estimated vertical hydraulic conductivity of silty-clayey material is 10^{-5} to 10^{-3} ft/d; silty-sandy material is generally 10^{-3} to 10^{-1} ft/d). The estimated hydraulic conductivities cited above are based on glacial aquifer-test and laboratory permeability data from New Jersey on file at the N. J. Geological Survey (R. Canace, written communication), and published data summarized by Stanford and Witte (in press).

Sand and gravel have been extensively mined from the Wills Brook, Andover Pond, and Lake Succasunna deposits, and, to a lesser extent, from the Lubbers Run deposits and sandy till of the terminal moraine. The location and extent of these mining operations are shown by pit and excavation-scarp symbols on the map. None of them are currently active, although in most, extractible resources remain. Locally, carbonate cement in the gravel (observed in the Andover Pond deposits) and high water tables (particularly in the Lubbers Run and Lake Succasunna deposits) may hinder extraction. Peat is extracted from a swamp north of Lake Musconetcong, and was formerly mined from a small bog near Ledgewood. Numerous other swamps in the quadrangle are also potential peat sources.

Peat and poorly-consolidated, organic-rich silt and clay in units Qs and Qal are of low strength and therefore generally unsuitable supports for structures. They are also subject to frequent flooding and high water tables. Areas of bedrock outcrop (unit "r") and thin till (Qnt and Qkt) have little or no soil cover overlying fresh bedrock. The use of septic systems may be severely limited in these areas. Bedrock may also be close to the surface in units Qgwt and Qqwt.

DESCRIPTION OF MAP UNITS

Postglacial Deposits--Artificial fill and natural sediment deposited along streams, in wetlands, and at the base of cliffs. These deposits have been accumulating since retreat of the late Wisconsinan glacier.

af — ARTIFICIAL FILL--Excavated till, sand, gravel, and rock; also, construction debris, cinders, and slag. In highway and railroad embankments, dams, and filled land. As much as 80 feet thick in large railroad embankments but generally less than 20 feet thick. Small areas of fill in urban areas are not mapped.

aft — TRASH FILL--Trash mixed and covered with sand, silt, clay, gravel and excavated rock. As much as 50 feet thick.

Qal — ALLUVIUM--Silt, sand, clay, and pebble-to-cobble gravel. Contains variable amounts of organic matter. Color of matrix sediment is gray, brown, and yellowish brown. As much as 15 feet thick. Silt, sand, and clay are deposited as overbank material on floodplains and are most abundant along low-gradient stream reaches. Gravel and sand are deposited in stream channels and are most abundant in higher-gradient stream reaches. Gravel and sand composition is similar to that of surficial deposits in the drainage basin.

Qst — STREAM TERRACE DEPOSITS--Sand, yellowish-brown, and pebble gravel in a low terrace along a tributary stream north of Andover. As much as 10 feet thick (estimated).

Qf — ALLUVIAL FAN DEPOSIT--Cobble-to-boulder gravel and yellowish brown sand at the mouth of a steep tributary about 0.75 mile southwest of Lake Lackawanna. As much as 20 feet thick (estimated). May have been deposited, in part, by glacial meltwater.

Qs — SWAMP DEPOSITS--Gray silt and clay with organic matter, overlain by dark-brown to black peat. May be overlain or replaced by fine-grained alluvium in places along larger streams (for example, along Lubbers Run). As much as 40 feet thick (Waksman and others, 1943, p. 172; Harmon, 1968). Glacial lake-bottom deposits of silt, clay, and fine sand may underlie the swamp deposits in places, particularly in large swamps. Diatomaceous earth occurs beneath peat in swamps north of Lake Musconetcong and near Ledgewood, where it was mined (N. J. Geological Survey permanent notes 25-1-317 and 25-2-457, on file at the N. J. Geological Survey). It probably occurs elsewhere.

Qta — TALUS--Angular boulders and blocks of gray gneiss, with little to no matrix material, forming steep aprons at the base of cliffs. Maximum thickness 20 feet (estimated). Many small talus deposits are not mapped.

Glacial Deposits--These include stratified glacial-lake and glacial-stream deposits, and till. They were laid down during the Illinoian and late Wisconsinan glaciations. Illinoian ice advanced to a terminal position about 3 miles south of the south edge of the quadrangle. It reached its maximum extent about 150,000 years ago, based on correlation to the marine oxygen-isotope record (oxygen isotope stage 6). This correlation is based on comparison of glacial ice volumes and oxygen-isotope values, and has not been confirmed by dates from the deposits. Late Wisconsinan ice advanced to a terminal position along the southern edge of the quadrangle, marked by a prominent terminal moraine (fig. 1; unit Qnm). It began to melt back from this position about 20,000 radiocarbon years ago, based on radiocarbon dating of organic material in the bottom of postglacial bogs at several locations in northwestern New Jersey and adjacent Pennsylvania (Cotter and others, 1986).

Harmon (1968) analyzed pollen and obtained two radiocarbon dates from a 60-foot core recovered from the floating bog along the west shore of Budd Lake. A date of 12,290+/-570 (reference number GXO 330) was obtained on organic clay at a depth of 27 feet, at the transition from pine-spruce to oak-hemlock forest, and a date of 22,870+/-720 (reference number I-2845) was obtained from an organic clay at a depth of 37 feet, within a predominantly spruce-pine interval about 5 feet below the level of maximum cold marked by spruce and sedge pollen. Harmon (1968) rejected both dates as too old, based on correlation of the pollen zones to other deglaciation pollen records in the northeast. She attributed the seemingly spurious ages to contamination by ancient carbon derived from local limestone bedrock, although carbonate rock constitutes less than 1 to 2 percent of the gravel fraction of the glacial sediment in the area (see data for pebble-count sites 1, 5-9 in table 2).

The stratigraphy of the deposits in the buried valley north of Budd Lake suggests an alternative interpretation. As shown on sections CC' and DD', Illinoian deposits (Qis) fill the valley to elevations up to about 900 feet. Because this valley was north-draining, and the divide to the south is at 940 feet, these deposits may have dammed a lake at about 900 feet in elevation that would have persisted from the Illinoian deglaciation to the late Wisconsinan advance. The thick lake-bottom deposits beneath the lake (see logs for wells 48 and 49 in table 1) indicate a long period of deposition and support this interpretation. The lower date in the core is at about 900 feet in elevation and so may date organic deposition in this lake before arrival of late Wisconsinan ice. This is supported by the pollen record in the core, which indicates maximum cold at 5 feet above the lower date. Thus, the lower date may be a maximum age for the arrival of late Wisconsinan ice at the terminal moraine.

Illinoian deposits include till (Qit) and probable glaciolacustrine sediment (Qis, Qil). The till mantles gently-sloping terrain south of the late Wisconsinan terminal moraine. MacClintock (1940) informally termed this till the "Budd Lake drift" and, based on the degree of clast weathering, suggested it was of early Wisconsinan age. Evidence for early Wisconsin glaciation in the New Jersey-eastern Pennsylvania region has been questioned (Ridge and others, 1990) and an Illinoian age is more likely. Well logs indicate that Illinoian till also occurs in the subsurface beneath the moraine in places. In the pit on the west edge of the quarry in the 1160-foot hill half a mile west of U. S. 206 at the south edge of the map, 20 to 30 feet of weathered Illinoian till underlies, and is in sharp contact with, 10 to 15 feet of unweathered late Wisconsinan till. The glaciolacustrine sediment occurs in valley fills beneath late Wisconsinan sediment northeast of Budd Lake (sections CC', DD') and around Kenvil (sections AA', BB'), as inferred from well logs. These sediments indicate that glacial lakes resembling late Wisconsinan lakes Budd and Succasunna were present during Illinoian glaciation. The direction of Illinoian ice flow was probably similar to late Wisconsinan ice flow because gravel in Illinoian till is similar to that in late Wisconsinan till, and the terminal positions of the two glaciations are parallel.

The orientation of striations and the distribution of erratics indicate that the late Wisconsinan glacier advanced generally southward across the quadrangle, with a slight easterly component in the eastern half. Some topographic channeling of ice is indicated by the slightly southwest orientation of striations in the Lubbers Run and Andover Valleys. Gravel clasts in till consist chiefly of locally derived gneiss, but the pebble fraction includes as much as 20 percent gray sandstone and mudstone, and as much as 5 percent carbonate rock (table 2). The sandstone, mudstone, and carbonate rock were transported southward from outcrop belts of Paleozoic sedimentary rock in Kittatinny Valley to the north. Some of these clasts also come from small outcrop belts of Paleozoic rock within the quadrangle in the Musconetcong, Lubbers Run, and Wright Pond Valleys (Volkert and others, 1989). Erratic boulders of carbonate rock (shown by a diamond symbol on the map) are common in the northwest part of the quadrangle but rare to the southeast, again indicating southerly to southeasterly transport.

The glacier deposited till (Qk, Qn) in continuous sheets on hillslopes and valley walls facing the advancing ice (north- or north-west-facing slopes). Locally, till was deposited on overridden zones of weathered bedrock (exposures indicated by triangle symbol on map; see also well logs 228, 268, 275, 276, 281, 287, 288, 299, 306, 312, 322, and 331-336). Till deposition was more continuous in a 2- to 3-mile-wide belt north of the late Wisconsinan limit. Here, till blankets most slopes. In the Musconetcong Valley between Stanhope and Landing, and in the valley between Landing and Ledgewood, till covers glaciolacustrine deposits (Qsp, Qspl) laid down in lakes ponded in front of the advancing ice (section BB'). Similarly, in the buried valley between Budd Lake and Stanhope, advancing ice overrode glacial Lake Budd deposits (Qb, Qbl) laid down on top of Illinoian glaciolacustrine sediments in a rising ice-dammed lake.

In other areas till deposition was discontinuous and the glacier eroded bedrock. Large erosional features, indicated by bedrock-surface contours on the map, include scoured basins in weathered carbonate rock beneath the Musconetcong Valley west of Stanhope (below the 600-foot contour) and in gneiss beneath Lake Lackawanna (below the 650-foot contour). Numerous smaller scoured or plucked basins also occur in gneiss bedrock on uplands; many of these now contain swamps. On northwest- or north-facing slopes that faced advancing ice, glacial abrasion formed gently-sloping ledges. On southeast- or south-facing slopes that faced away from advancing ice, glacial quarrying formed cliffs. Slopes with oblique orientations to ice flow were alternately abraded and quarried, and thus display both ledge and cliff outcrops. The broad uplands west of the Lubbers Run Valley are good examples of these ledge and cliff forms. Large cliffed outcrops occur on the southeast-facing slopes of these uplands; ledges and till ramps dominate on the northwest-facing slopes, and outcrops on east-west trending slopes combine both elements. Ridge-and-trough erosional forms occur on steeply-dipping layered gneiss, as in the upland area between Lake Hopatcong and Lake Lackawanna, and between Cranberry Lake and Jefferson Lake.

The terminal moraine (Qnm) is a belt of till with ridge-and-basin topography deposited as the ice margin stood at and receded from its southernmost position. The major landform features of the moraine, shown by special symbols on the map, are ridges, knolls, basins, and plateaus. Many of the basins are swales between ridged landforms rather than dead-ice features. The ridges include flowtill aprons with steep ice-contact north slopes and gentler apron-like south slopes. These ridges form the front of the moraine along much of its south edge. Asymmetric ridges with gentle north slopes and steeper south slopes occur within the moraine, either singly or as several parallel ridges. They may represent push or overriding of till by active ice. Also common are roughly symmetrical ridges with parallel or, in places, polygonal map patterns that may represent ice-channel or subglacial ice-cavity fills. The plateaus and knolls may represent deposition in ice-walled basins or subglacial cavities.

Nonmorainic till extends as much as half a mile south of the moraine in several places. These are on slopes that decline away from the ice margin. Ice was likely thinner and more short-lived in these settings, limiting till deposition and the formation of morainic landforms. Moraine topography is also absent on till covering some steep bedrock hills within the moraine belt.

Deposition of stratified drift in glacial Lakes Budd (Qb, Qbl) and Succasunna (Qso, Qsl) occurred concurrently with deposition of the moraine. As the ice front retreated northward from the moraine, glacial lakes formed in valleys that sloped toward the glacier, and so were dammed; or in valleys that sloped away from the glacier but were dammed by previously-deposited sediment. Unobstructed valleys conducted streams of meltwater. The ice-contact slopes of stratified deposits, and the position of the ice margins required to maintain or drain known glacial-lake levels, permit an approximate reconstruction of recessional ice margins. In the quadrangle these margins (fig. 1) trend generally east-west. However, the absence of recessional deposits on uplands makes correlation of margins from valley to valley difficult. Lobation of the ice front around prominent hills and uplands was likely locally significant, particularly in the narrow valleys in the northern half of the quadrangle. Details of glacial-lake levels and spillways, and glacial-stream drainage, are provided in the map unit descriptions.

Glacial-Lake Deposits--These are stratified and generally well-sorted. They include sand and gravel laid down in deltas and lacustrine fans, and clay, silt, and fine sand laid down on lake-bottom plains and in the lower parts of deltas. Bedding in the deltas includes inclined foreset beds of sand, pebbly sand, and minor pebble-to-cobble gravel, overlain at the surface of some deltas by thin, horizontal topset beds of sand and pebble-to-cobble gravel. Lacustrine fans contain gently dipping beds of sand, pebble gravel, and cobble gravel. Bedding in both deltas and lacustrine fans may be deformed locally by collapse, slumping, or pushing by glacial ice. Bedding in lake-bottom deposits is generally horizontal, laminated to thin-bedded, and undeformed. Nongravel sediment is very pale brown to light gray. Sand composition is chiefly quartz, feldspar, and fragments of gneiss, sandstone, mudstone, carbonate rock, and quartzite, with variable but minor mica and heavy minerals. Gravel consists chiefly of clasts of local bedrock or clasts eroded from the local till. Gravel in the Andover Pond deposits consists chiefly of gray carbonate rock and gray mudstone and sandstone, with lesser gneiss and white-to-gray quartzite. Gravel in the other glacial-lake deposits consists chiefly of gneiss; with minor gray mudstone and sandstone; white, gray, red, and purple quartzite; and gray carbonate rock.

UPPER PEQUEST VALLEY DEPOSITS--Deltaic (Qpq7, Qpq9, Qpq10) and lake-bottom (Qpql) sediment deposited in several lakes in the upper Pequest Valley. These lakes were dammed by earlier deposits blocking the valley to the south. Qpq1-6 and Qpq8 are south and west of the Stanhope quadrangle (Witte, 1991). Relationship to recessional ice margins and other deposits in the Pequest Valley is shown by Witte (1991).

Qpq10 — **Sand and pebbly sand**--As much as 40 feet thick (estimated).

Qpq9 — **Sand and pebble-to-cobble gravel**--As much as 40 feet thick (estimated).

Qpq7 — **Sand and pebble-to-cobble gravel**--As much as 20 feet thick (estimated).

Qpql — **Silt, fine sand, clay**--As much as 40 feet thick (estimated).

ANDOVER POND DEPOSITS--Deltaic sediment (Qap3, Qap2, Qap1) deposited in three glacial lakes in the north-draining valley near Andover.

Qap3 — **Sand and pebble-to-cobble gravel**--As much as 60 feet thick (estimated). Spillway drained westward into the Pequest Valley at an elevation of about 650 feet.

Qap2 — **Sand and pebble-to-cobble gravel**--Includes some boulder gravel and bouldery diamicton in collapsed ice-contact area around Andover Pond. As much as 60 feet thick (estimated). Spillway drained southwestward into the Pequest Valley at an elevation of about 710 feet.

Qap1 — **Sand and pebble-to-cobble gravel**--As much as 40 feet thick. Spillway drained westward into the Pequest Valley at an elevation of about 790 feet.

HUGHS POND DEPOSITS--Deltaic sediment (Qhu2, Qhu1) deposited in two small glacial lakes in the north-draining valley around Hughs Pond.

Qhu2 — **Sand, pebbly sand, and pebble-to-cobble gravel**--As much as 30 feet thick. Spillway drained westward into the Wright Pond Valley at an elevation of about 980 feet. More northerly parts of the unit may have been deposited as the spillway lowered along the hillslope north of the 980-foot outlet.

Qhu1 — **Sand and pebble-to-cobble gravel**--As much as 20 feet thick. Spillway drained southward into the Wright Pond Valley at an elevation of about 1070 feet.

FOREST LAKE DEPOSITS--Deltaic sediment (Qfr2, Qfr1) deposited in two glacial lakes occupying the north-draining valley east of Forest Lake. Lake-bottom silt and fine sand may underlie swamp deposits north and south of Qfr2.

Qfr2 — **Sand and pebble-to-cobble gravel**--As much as 20 feet thick (estimated). Spillway drained westward into the Andover Pond Valley at an elevation of about 760 feet.

Qfr1 — **Sand and pebble-to-cobble gravel**--As much as 40 feet thick (estimated). Spillway drained southeastward into the Wright Pond Valley at an elevation of about 950 feet.

CRANBERRY LAKE DEPOSITS--Deltaic sediment (Qcr3, Qcr2, Qcr1) deposited in three glacial lakes near Cranberry Lake. Lake-bottom silt and fine sand likely underlie Cranberry and Panther Lakes and swamp deposits adjacent to unit Qcr1.

Qcr3 — **Sand and pebble-to-cobble gravel**--As much as 50 feet thick (estimated). Spillway drained southward into the Cranberry Lake basin at an elevation of about 780 feet.

Qcr2 — **Cobble gravel and sand**--As much as 20 feet thick (estimated). Spillway drained southward into the Cranberry Lake basin at an elevation of about 780 feet.

Qcr1 — **Sand and pebble-to-cobble gravel**--As much as 70 feet thick. Spillway drained southward into the Musconetcong Valley at an elevation of about 760 feet.

WRIGHT POND DEPOSITS--Fluvial-deltaic (Qwp3) and deltaic (Qwp2, Qwp1) sediment deposited in several glacial lakes in the Wright Pond Valley. Associated lake-bottom silt and fine sand likely underlies Wright Pond, Wolf Lake, and parts of unit Qwp3.

Qwp3 — **Sand, pebbly sand, and pebble-to-cobble gravel**--Chiefly sand and pebbly sand east of Wright Pond; chiefly pebble-to-cobble gravel and sand to the north. As much as 50 feet thick (estimated). The upper part is a fluvial deposit grading from an ice margin position at its north end to a baselevel at the erosionally lowered Qwp2 spillway near Roseville. Deltaic sand may underlie the fluvial sand and gravel in places.

Qwp2 — **Sand and pebble-to-cobble gravel**--Includes minor boulder gravel in places. As much as 50 feet thick (estimated). Spillway, now eroded, drained southward into the Lubbers Run Valley at an elevation of about 760 feet. Parts of this unit at and north of Wright Pond may have been deposited in slightly higher lakes dammed by the ice margin or stagnant ice blocks.

Qwp1 — **Cobble-to-boulder gravel and sand**--As much as 40 feet thick (estimated). Spillway drained eastward into the Wolf Lake basin at an elevation of about 790 feet.

WILLS BROOK DEPOSITS--Deltaic (Qwb2, Qwb1), lake-bottom (Qwbl), and possible lacustrine-fan (Qwbf) sediment deposited in two stages of a glacial lake occupying the Wills Brook Valley.

Qwb2 — **Sand, pebbly sand, and pebble-to-cobble gravel**--As much as 80 feet thick. Spillway drained westward into the Musconetcong Valley at an elevation of about 780 feet.

Qwb1 — **Sand, pebbly sand, and pebble-to-cobble gravel**--As much as 120 feet thick. Spillway drained westward into the Musconetcong Valley at an elevation of about 890 feet.

Qwbl — **Silt, fine sand, and clay**--As much as 60 feet thick. Deposited in higher stage of lake (Qwb1). In subsurface only (section DD').

Qwbf — **Sand and gravel**--As much as 30 feet thick. Inferred from well logs (wells 16, 17), but may be unit Qn. In subsurface only.

GLACIAL LAKE HOPATCONG DEPOSITS--Deltaic sediment (Qho) deposited in glacial Lake Hopatcong. This lake was dammed on the south by the terminal moraine and filled the upper Musconetcong Valley. It was about 10 feet higher than present Lake Hopatcong. Lake-bottom silt, clay, and fine sand and, possibly, lacustrine-fan sand and gravel likely underlie Lake Hopatcong.

Qho — **Sand, pebbly sand, some pebble-to-cobble gravel**--As much as 160 feet thick. Spillway drained southwestward into the Musconetcong Valley at an elevation of about 930 feet.

GLACIAL LAKE BUDD DEPOSITS--Deltaic (Qb) and lake-bottom (Qbl) sediment deposited in glacial Lake Budd. This lake occupied a north-draining valley extending from the present-day Budd Lake to the Musconetcong Valley. Deposition of the glacial Lake Budd sediments, till of the moraine, and earlier Illinoian glaciolacustrine sediments, completely filled this valley. Drainage is now southward into the Raritan basin over the former spillway at the south end of Budd Lake.

Qb — **Sand and pebble-to-cobble gravel**--As much as 80 feet thick. Crops out along northern shore of Budd Lake and extends beneath till of the terminal moraine in the buried valley to the north (sections DD', CC'). Spillway drained southward into the Raritan Valley at south end of Budd Lake (about 1 mile south of the corner of the quadrangle) at an elevation of about 940 feet.

Qbl — **Silt, fine sand, clay**--As much as 180 feet thick. In subsurface only (sections CC', DD').

GLACIAL LAKE SUCCASUNNA DEPOSITS-- Fluvial-deltaic (Qso) and lake-bottom (Qsl) sediment deposited in glacial Lake Succasunna. This lake occupied a north-draining valley system extending from near Chester (about 8 miles southwest of Kenvil) to the Rockaway Valley near Wharton (about 2 miles northeast of Kenvil). Deposition of the glacial Lake Succasunna sediments, till of the terminal moraine, and earlier Illinoian glaciolacustrine sediments, completely filled the valley (Stanford, 1989). Drainage is now southward into the Raritan basin over the former spillway near Chester.

Qso — **Sand; pebbly sand; some pebble, cobble, and boulder gravel**--Unit includes sand and pebbly sand in delta foreset beds as much as 70 feet thick in the subsurface in the plains around Kenvil, pebbly sand and pebble-to-cobble gravel in delta topset beds as much as 30 feet thick forming the surface of the Kenvil plain, and pebble, cobble, and boulder gravel in fluvial beds as much as 40 feet thick forming the narrow fluvial plains north of Ledgewood and northeast of Duck Pond. Spillway drained southward into the Raritan basin near Chester (about 8 miles southwest of Kenvil) at an elevation of about 680 feet.

Qsl — **Silt, clay, fine sand**--As much as 120 feet thick. In subsurface only (sections AA', BB').

Qsu — UNCORRELATED DELTAIC DEPOSITS--**Sand, pebbly sand, pebble-to-cobble gravel.** As much as 40 feet thick (estimated). Laid down in small ice-dammed ponds in upland valleys. Possible relations of these deposits to recessional ice margins are shown in figure 1.

PRE-ADVANCE GLACIAL-LAKE DEPOSITS--Deltaic and lacustrine-fan sediment (Qsp) and lake-bottom sediment (Qspl) deposited in glacial lakes in front of the advancing late Wisconsinan glacier. May include some Illinoian sediment, and unit Qsp may include some fluvial deposits. In subsurface only, beneath units Qnm and Qn in the valley fill between Ledgewood, Landing, and Stanhope. Origin is uncertain but lakes may have been formed by ice-damming of the Musconetcong Valley west of Stanhope and Landing-Ledgewood valley west of Duck Pond before ice entered the Ledgewood-Landing-Stanhope area.

Qsp — **Sand and gravel**--As much as 120 feet thick. In subsurface only (section BB').

Qspl — **Silt, fine sand, clay**--As much as 140 feet thick. May include some silt and clay carbonate-rock residuum in the Stanhope area (well 89). In subsurface only (sections BB', DD').

ILLINOIAN GLACIAL-LAKE DEPOSITS--Deltaic and lacustrine-fan sand and gravel (Qis) and lake-bottom sediment (Qil) deposited in Illinoian equivalents to glacial lakes Budd and Succasunna. Spillway locations and elevations are similar to those of the late Wisconsinan lakes. In subsurface only, beneath late Wisconsinan deposits in the Budd Lake and Kenvil valley fills (sections AA', BB', CC', DD').

Qis — **Sand and gravel**--May include some till (unit Qit). As much as 250 feet thick (estimated).

Qil — **Silt, clay, fine sand**--As much as 100 feet thick (estimated).

Glacial-Stream Deposits--Stratified, generally well-sorted gravel and sand forming valley-bottom plains and terraces in valleys not occupied by glacial lakes. Bedding is generally horizontal; varying from massive, thick beds in cobble-to-boulder gravel; to cross-beds and thin horizontal beds in sand to pebbly sand. Nongravel sediment is very pale brown, brown, and light gray. Sand is chiefly quartz, feldspar, and fragments of gneiss, mudstone, sandstone, and quartzite, with minor mica and heavy minerals. Gravel is chiefly gneiss; with some gray to brown mudstone and sandstone, gray carbonate rock, and gray to white quartzite.

LUBBERS RUN DEPOSITS--Fluvial and deltaic (Qlr1, Qlr2, Qlr3), lake-bottom (Qlrl) and lacustrine-fan (Qlrf) sediment deposited from at least 3 ice-margin positions in the Lubbers Run Valley. Deltaic, lake-bottom, and lacustrine-fan deposits occur in a scoured bedrock basin at Lake Lackawanna; elsewhere the deposits are chiefly fluvial.

Qlr3 — **Sand, pebbly sand, and cobble-to-boulder gravel**--Cobble-to-boulder gravel occurs north of Tomahawk Lake; pebbly sand dominates to south. As much as 50 feet thick (estimated).

Qlr2 — **Sand and pebble-to-cobble gravel**--Some boulder gravel and boulder diamicton in ice-contact deposits in northernmost parts of unit. As much as 40 feet thick (estimated).

Qlr1 — **Sand, pebbly sand, and pebble-to-cobble gravel**--Deltaic part of unit at Lake Lackawanna is as much as 100 feet thick; fluvial part of unit elsewhere is as much as 50 feet thick. Probably deposited from several ice-margin positions, although only the northernmost part of the unit shows ice-contact landform.

Qlrl — **Silt, fine sand, clay**--As much as 30 feet thick. In subsurface only, in the Lake Lackawanna area (section DD'). May also underlie larger swamp deposits elsewhere along Lubbers Run.

Qlrf — **Sand and gravel**--As much as 20 feet thick. In subsurface only, in the Lake Lackawanna area (section DD').

Qmo — MUSCONETCONG DEPOSIT--**Sand and pebble, cobble, and boulder gravel.** Includes boulder lag deposits, particularly north of Lake Musconetcong. As much as 80 feet thick near Waterloo and Jefferson Lakes, where it includes deltaic sand; elsewhere, generally less than 20 feet thick (estimated). Deposited primarily by meltwater from glacial Lake Hopatcong descending the Musconetcong Valley and reworking sediment in the terminal moraine and Wills Brook deposits.

Till and Related Deposits--Poorly-sorted, nonstratified sediment deposited by glacial ice or by flow of sediment from the glacier surface. Occur in drumlins and moraines, and as a discontinuous layer on the bedrock surface.

Qn, Qnt — NETCONG TILL--Yellow, yellowish-brown, very pale (oxidized) to light-gray and brownish-gray (unoxidized) silty sand to sand with many (10 to 40 percent by volume) subrounded to subangular pebbles and cobbles, and some (5 to 10 percent by volume) to many subrounded boulders. Depth of oxidation ranges from 5 to 30 feet. Till matrix is generally compact, nonplastic, nonsticky, non-jointed, but may have a weak to moderate subhorizontal fissility. Gravel is chiefly gneiss, some gray mudstone and sandstone, and a trace of both gray carbonate rock and white-to-gray quartzite. Purple quartzite-conglomerate from the Green Pond Formation is abundant in the small till deposit adjacent to the Green Pond outcrops west of Duck Pond. Boulders are chiefly gneiss, with some scattered carbonate rock and quartzite. The carbonate and quartzite become increasingly scarce to the southeast. Unit Qn is as much as 100 feet thick in till sheets but is generally less than 40 feet thick elsewhere. Unit Qnt delineates areas of scattered bedrock outcrop where the till is discontinuous and generally less than 20 feet thick. Contacts with units Qk and Qkt are gradational.

Qnm — TILL OF THE TERMINAL MORAINE--Netcong till, as in Qn, forming ridge-and-swale and knoll-and-basin topography. Includes minor interbeds and small deposits of sorted, stratified sand and pebble-to-cobble gravel in places. As much as 120 feet thick.

Qnmu — UNCORRELATED MORAINIC DEPOSIT--Netcong till, as in Qn, forming low knoll and swale topography north of Rocker Pond. As much as 20 feet thick (estimated).

Qk, Qkt — KITTATINNY TILL--Very pale-brown and yellowish-brown (oxidized) to grayish-brown and light olive-brown (unoxidized) sandy silt to silt with some to many subrounded to subangular pebbles and cobbles and a few (0 to 5 percent by volume) to some subrounded boulders. Depth of oxidation ranges from 5 to 15 feet. Till matrix is generally compact, slightly plastic, slightly sticky, non-jointed, with moderately-developed subhorizontal fissility. Gravel includes chiefly gray-to-white carbonate rock and gray mudstone and sandstone, with some white-to-gray quartzite. Boulders are chiefly carbonate rock, with some quartzite. Unit Qk is as much as 100 feet thick (estimated) in the drumlin at Andover but is generally less than 40 feet thick elsewhere. Unit Qkt delineates areas of scattered bedrock outcrop where till is discontinuous and generally less than 20 feet thick. Contacts with units Qn and Qnt are gradational.

Qit — ILLINOIAN TILL--Brown, brownish-yellow, and very pale-brown silty sand to sandy silt with some to many subrounded to subangular pebbles and cobbles and few to some subrounded boulders. Till matrix is generally compact, nonplastic, nonsticky, nonjointed, but may have a weak to moderate subhorizontal fissility. Gravel is chiefly gneiss, and a little gray mudstone, sandstone, chert, carbonate rock, and white-to-gray quartzite. Boulders are chiefly gneiss, with few to some white-to-gray quartzite. Carbonate clasts are fully decomposed to depths of more than 20 feet; gneiss clasts have weathered rinds generally greater than 0.25 inch thick. Some mudstone clasts are also deeply weathered or decomposed. As much as 40 feet thick. Crops out south of the terminal moraine, and underlies late Wisconsinan deposits in places in the Ledgewood-Landing-Stanhope valley fill (section BB').

Hillslope Deposits and Weathered Bedrock Material--Poorly stratified and poorly sorted sediment formed by downslope movement of material on hillslopes and by mechanical and chemical decomposition of bedrock.

Qcg — GNEISS COLLUVIUM--Yellowish-brown to reddish-brown silty sand to sandy silt with many angular pebbles and cobbles of gneiss; in places, underlain by or interbedded with thinly-layered reddish-yellow to pinkish-white clayey sand and sandy clay with few angular pebbles and cobbles. Upper blocky colluvium is derived from downslope movement of fractured, weathered bedrock; lower, layered colluvium is derived from downslope movement of saprolite. Total thickness as much as 40 feet (estimated). Forms aprons along the base of hillslopes south of the terminal moraine, and may underlie or interfinger with glacial sediment in valley fills adjacent to valley walls in the Kenvil-Ledgewood area (sections AA', BB').

Qcq — QUARTZITE COLLUVIUM--Reddish-brown to reddish-yellow silty sand with many angular pebbles and cobbles of reddish-purple quartzite conglomerate. As much as 30 feet thick (estimated). Distribution similar to unit Qcg.

Qcal — COLLUVIUM AND ALLUVIUM, UNDIVIDED--Interbedded colluvium as in unit Qcg and dark-brown to yellowish-brown silty sand and pebble-to-cobble gravel alluvium forming valley-bottom fills on uplands south of the terminal moraine. As much as 20 feet thick (estimated).

Qgw, Qgwt — WEATHERED GNEISS--Yellow, very pale-brown, white, pink, clayey sand to gravelly sand with some to many angular pebbles and cobbles of gneiss. Texture and structure vary from massive, blocky fractured-rock rubble to saprolite that preserves rock structure. Most material is a mix of rock rubble and saprolite-derived massive clayey, silty sand. As much as 100 feet thick, but thickness varies greatly within short distances. Includes some patchy gneiss colluvium genrally less than 10 feet thick. Qgwt indicates areas where weathered gneiss is generally less than 10 feet thick.

Qqw, Qqwt — WEATHERED QUARTZITE--Reddish-brown to reddish-yellow silty sand with many angular pebbles and cobbles of reddish purple quartzite conglomerate. As much as 20 feet thick. Includes some patchy quartzite colluvium less than 10 feet thick. Qqwt indicates areas where weathered quartzite is generally less than 10 feet thick.

MAP SYMBOLS

Contact--Dotted where concealed by fill or water, or exposed by excavation. Contacts of postglacial deposits, stratified glacial deposits, and moraines generally are sharp and well-defined by landforms. Contacts between units Qn, Qnt, Qk, Qkt, Qit, Qgw, Qcg, Qqw, Qcq, and bedrock outcrop area ("r") generally are gradational or featheredged.

Area of extensive bedrock outcrop--Surficial material generally absent.

Striation--Observation at dot. Arrow shows inferred direction of ice flow.

Drumlin--Line along crest, symbol at summit.

Till ridge--Line along crest, barbs on ice-contact slope. Formed along a recessional ice margin near Tomahawk Lake.

Meltwater channel--Line in channel bottom, arrow shows inferred direction of meltwater flow.

Qcr1 — **Spillway for glacial lake**--Symbol in spillway area. Arrow shows drainage direction. Lettering indicates associated deposit.

Scarp cut by postglacial streams--Line at top of scarp, symbols on slope.

Scarp cut by meltwater--Line at top of scarp, ticks on slope.

Man-made-excavation scarp--Line at top of scarp, ticks on slope.

Sand and gravel pit--Inactive in 1995.

Peat pit--Active in 1995.

Quarry--Active in 1995.

Surface accumulation of boulders--Till, surfaces washed by meltwater.

(Qal) — **Thin unit**--Alluvium is thin, patchy, and overlies boulder lag formed on underlying till.

Qgw — **Exposure of weathered gneiss beneath late Wisconsinan till**--Observed in 1995.

47 — **Well or boring with log in table 1**--Location accurate to within 100 feet.

74 — **Well or boring with log in table 1**--Location accurate to within 500 feet.

× — **Well or boring with thin surficial material**--Driller's log reports less than 30 feet of surficial material. Logs on file at the N. J. Geological Survey.

47 — **Site of pebble lithology count**--Data in table 2.

Erratic boulder of carbonate rock--Indicates southerly glacial transport from carbonate-rock outcrop areas. Not all occurrences shown.

500 — **Elevation of bedrock surface**--Contour interval 100 feet, 50 feet in places.

Topographic features of the terminal moraine:

Asymmetric ridge--Line at crest, barbs on gentle slope. Includes both flowtill aprons and push ridges.

Narrow ridge--Line at crest.

Broad ridge--Line at crest.

Scarp--Line at top, balls on slope.

Hill--Symbol on summit, line around base.

Plateau--Line along rim (raised in places), ruling on summit.

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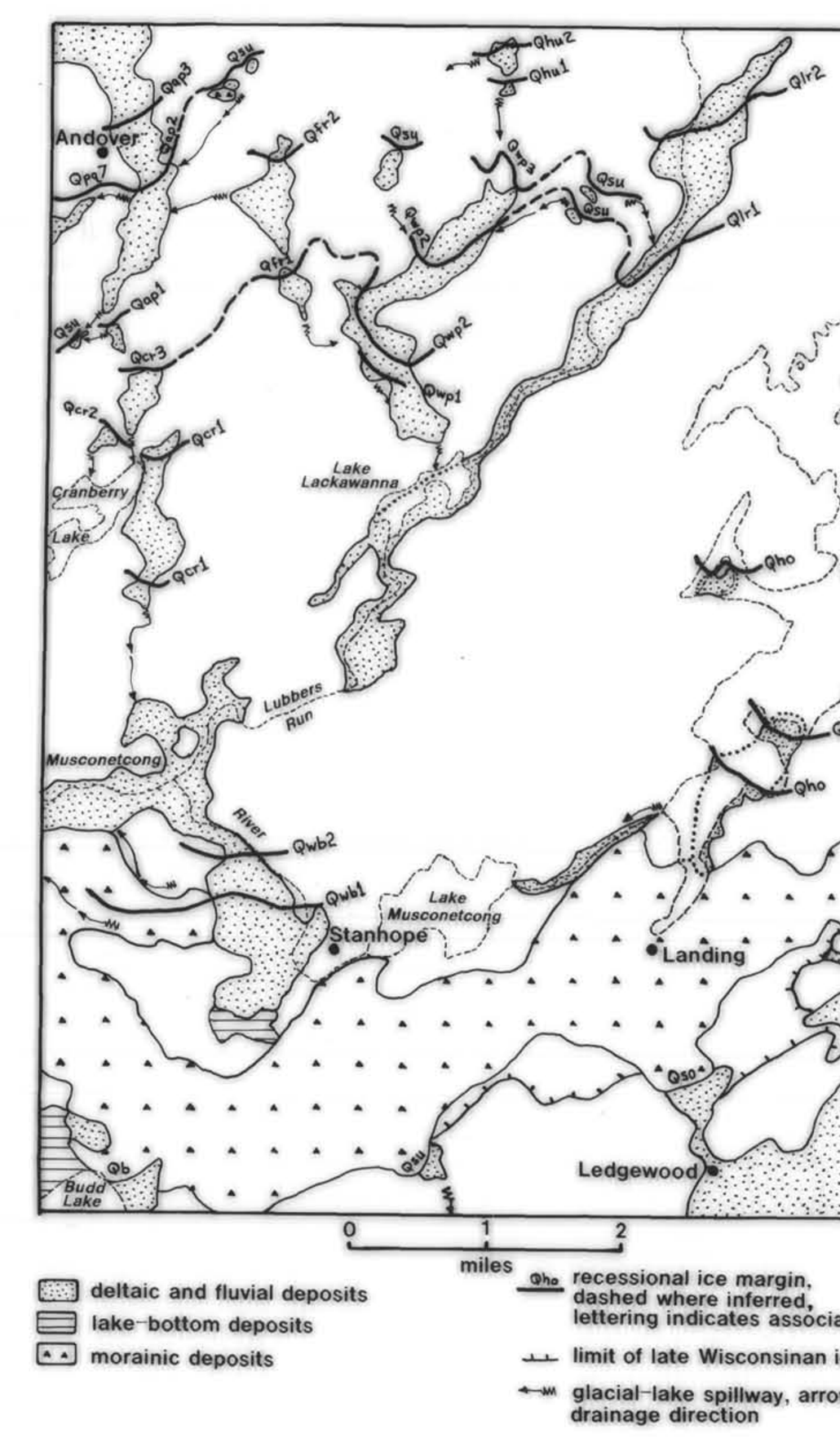
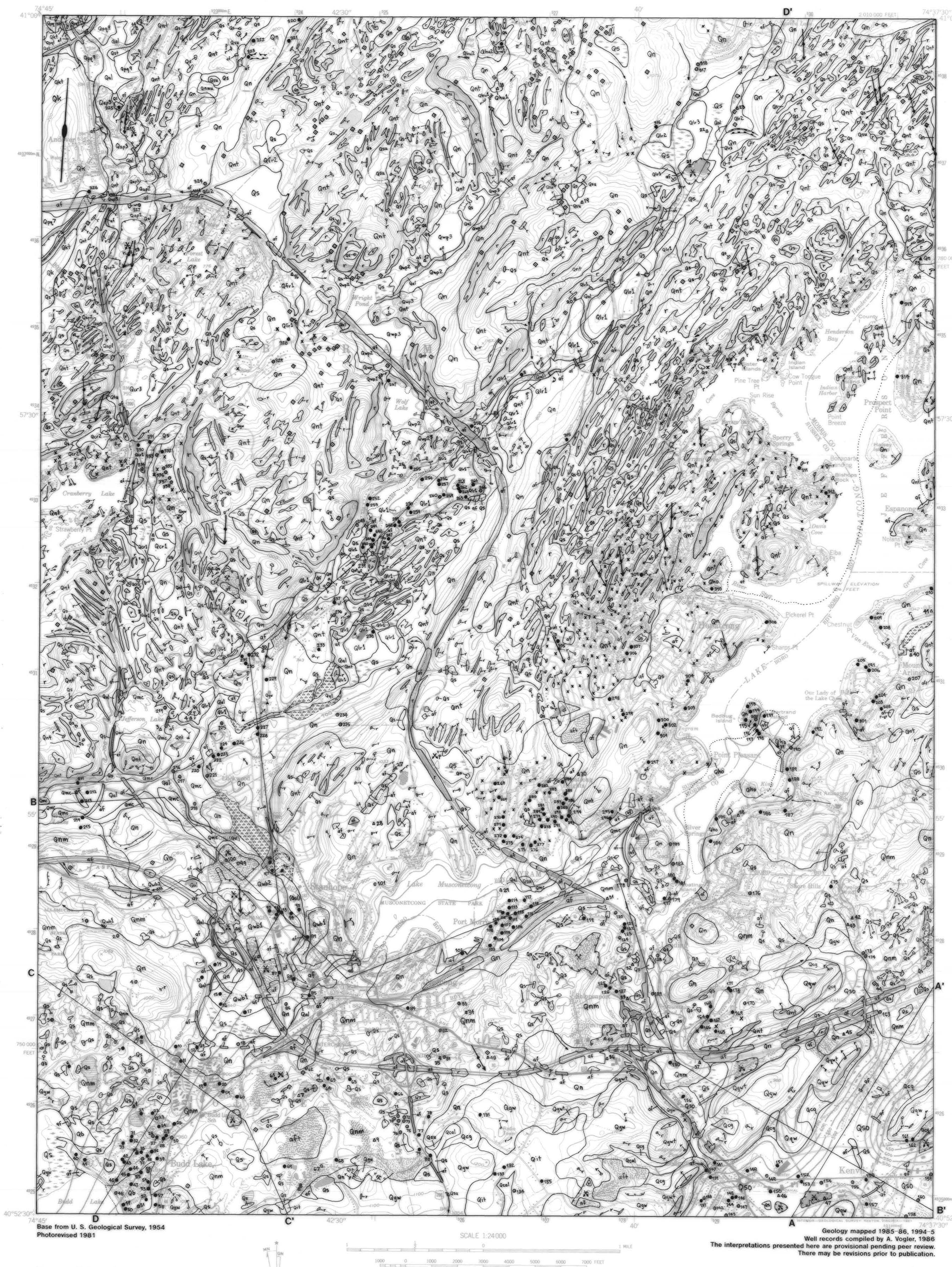
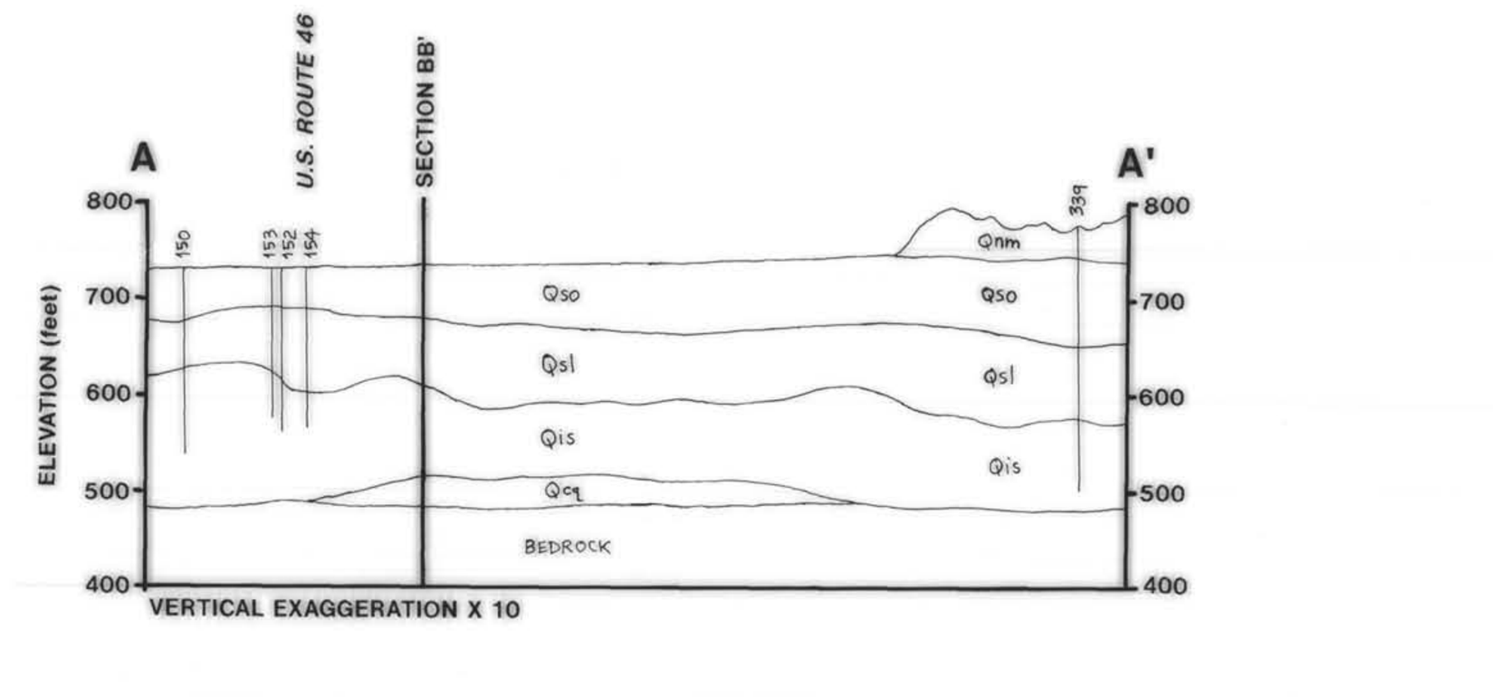


Figure 1.--Terminal moraine, stratified deposits, glacial-lake spillways, and recessional ice margins in the Stanhope quadrangle.

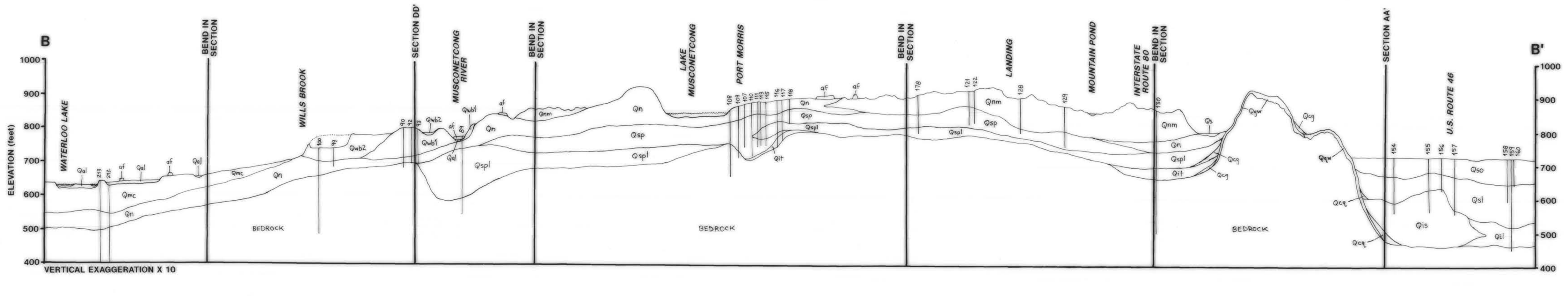


Base from U. S. Geological Survey, 1954
Photorevised 1981

Geology mapped 1985-86, 1994-5
Well records compiled by A. Vogler, 1986
The interpretations presented here are provisional pending peer review. There may be revisions prior to publication.



VERTICAL EXAGGERATION X 10



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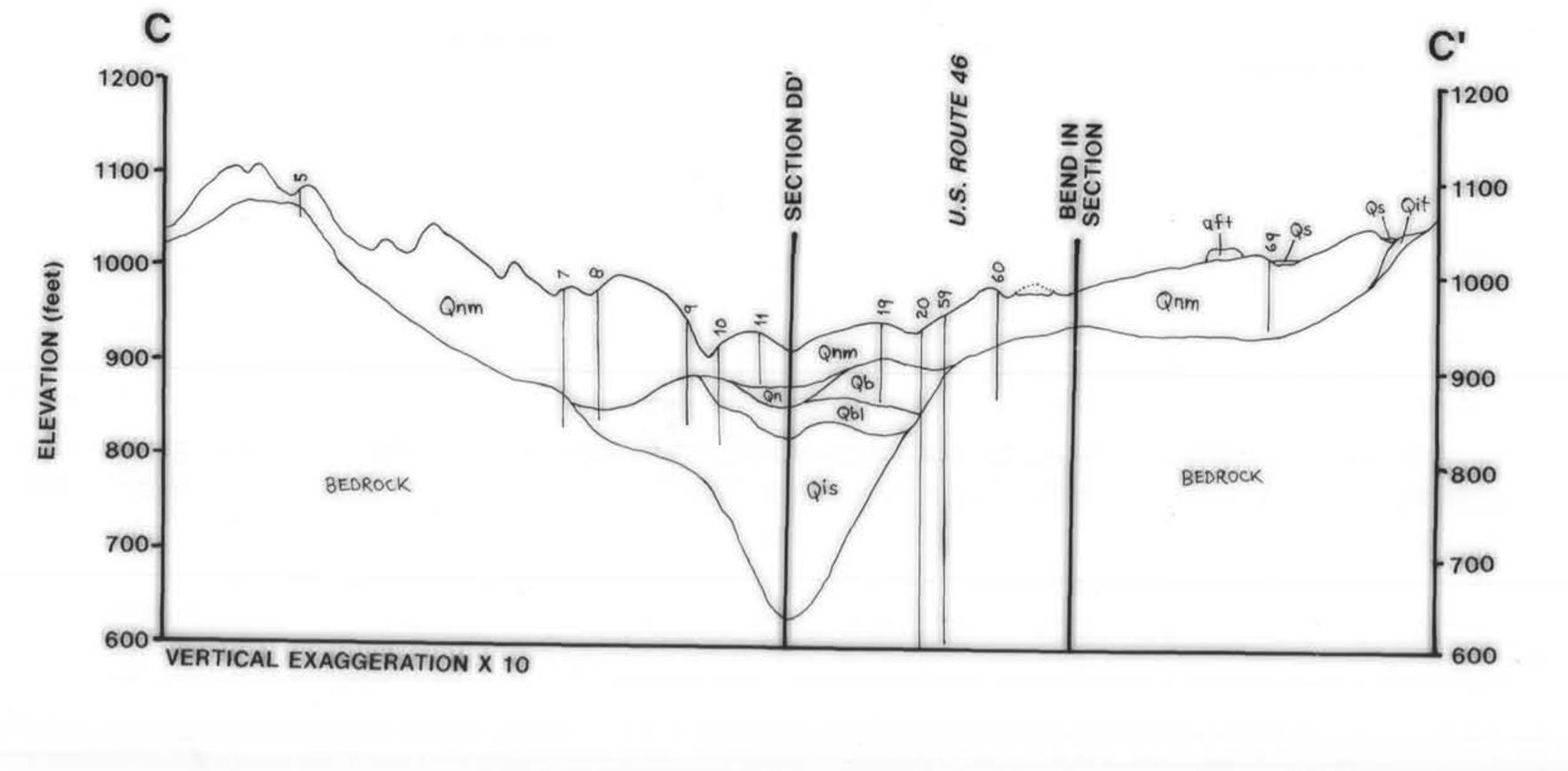

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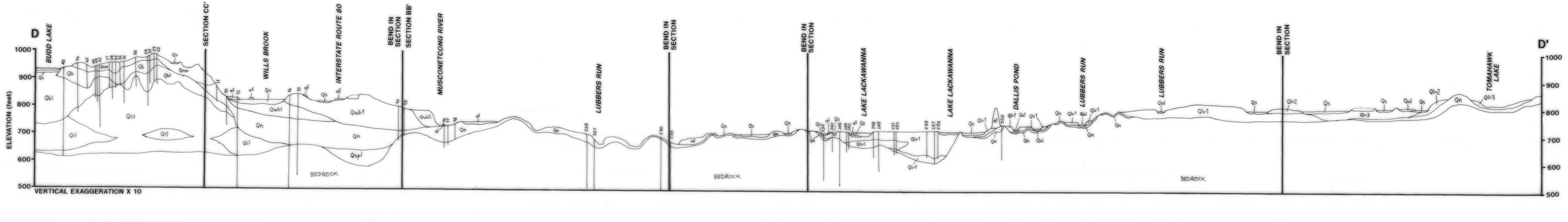

VERTICAL EXAGGERATION X 10

SURFICIAL GEOLOGY OF THE STANHOPE QUADRANGLE, SUSSEX AND MORRIS COUNTIES, NEW JERSEY

by

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1996

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

Table 1.--Selected Well Logs

Well no.	Identifier[1]	Geologic log[2]: Depth[3]	Description
1	25-23273	0-22	brown medium-to-fine sand and gravel with some
	boring		silt and cobbles and trace of boulders (Qnm)
	5-2-2	22-30	decomposed rock (Qgw)
	30-35	rock	
2	25-23273	0-13	brown medium-to-fine sand and gravel with some
	boring		cobbles, trace boulders, trace silt (Qn)
	5-2-3	13-18	decomposed rock (Qgw)
		18-25	rock
3	22-17509	0-48	sand, silt, gravel (Qlr1)
		48-198	granite
4	25-23273	0-14	till--sand, silt, gravel, cobbles, boulder (Qn)
	boring	14-30	rock
	5-2-5		
5	25-23273	0-15	brown till (Qnm)
	boring	15-25	decomposed rock (Qgw)
	5-2-6		
6	25-20732	0-88	sand, gravel, clay, boulders (Qnm)
		88-197	granite
7	25-19828	0-117	sand and large gravel (Qnm)
		117-148	gray granite
8	25-23326	0-140	sand, gravel (Qnm), yield 15 gpm
9	25-19698	0-5	boulders (Qnm)
		5-10	big gravel (Qnm)
		10-95	sand, gravel (Qnm, possibly over Qb)
		95-105	big gravel (Qnm or Qis)
			screened 95-105, yield 10 gpm
10	25-18054	0-19	boulders, mud, and silt (Qn)
		19-55	limestone sand, silt, small gravel (Qbl)
		55-65	coarse sand, small gravel, with silt (Qis)
		65-71	coarse gravel, some sand and silt (Qis)
		71-78	cobbles and coarse gravel (Qis)
		78-80	streaks of gray limestone (clasts in Qis?)
		80-100	cobbles and sand (Qis)
			screened 78-88, yield 201 gpm
11	25-17318	0-2	fill
		2-10	coarse brown sand, gravel, boulders (Qnm)
		10-15	coarse brown sand, gravel, boulders, trace clay (Qnm)
		15-20	medium-to-coarse brown sand, boulders (Qnm or Qis)
		20-40	medium-to-coarse brown sand mixed with boulders (Qnm or Qis)
		40-50	coarse brown sand and boulders (Qis or Qnm)
			screened 39-49, yield 108 gpm
12	Village		log by W. C. Koster; Doncar, Inc.
	Green	0-40	grayish green to gray, soft clayey silt
	well 5		and silt (Qs over Qwbl)
	(Koster,	40-120	boulders (Qn)
	1993)	120-230	light brown clayey sand (Qbl, Qil, or weathered sandstone)
		230-476	brown to gray feldspathic sandstone
		476-536	gray to brown shale, some sandstone
13	Foreign	0-35	brown sand, gravel, silt intermixed--till (Qn)
	Trade Zone	35-55	brown sand and gravel, some silt (Qb or Qn)
	well BR-1	55-75	brown sandy silt (Qbl)
		75-80	brown silty sand (Qbl or Qis)
		80-91	brown-gray sand and gravel (Qis)
		91-92	brown sandy silt (Qis)
		92-96	brown sand and gravel (Qis or Qit)
		96-105	weathered bedrock (Qgw)
		105-350	bedrock, gneiss
14	25-23846	0-2	boulder (Qn)
	Foreign	2-45	brown sand, gravel, silt--till (Qn)
	Trade Zone	45-50	grading to more gravelly till (Qn or Qb)
	well BR-2	50-58	gravelly till (Qn or Qb)
		58-350	gneiss and amphibolite
15	25-37311	0-26	rocks; greenish, blue, brown (Qwb1)
	Foreign	26-42	sand and coarse gravel; blue, green, brown (Qwb1)
	Trade Zone		
	well BR-4	42-50	fine sand; white, gray (Qwb1)
		50-58	streaks of clay and sand; gray, green (Qwbl)
		58-82	clay; gray, green (Qwbl)
		82-91	clay, turning more brown and gray (Qwbl)
		91-94	sand and clay (Qwbl)
		94-95	clay, brown (Qwbl)
		95-98	clay and sand; brown, gray (Qwbl)
		98-101	gravel and rocks (Qn)
		101-115	rocks, gravel; black, brown (Qn)
		115-125	brown gravel, less rocks (Qn)
		125-130	clay, brown, with some gravel (Qn)
		130-157	brown clay (weathered limestone or Qil)
		157-298	alternating hard and soft limestone and brown clay (weathered limestone)
16	25-23865	0-7	brown sandy fill
	Foreign	7-25	brown, gray sand and gravel, saturated (Qwb1)
	Trade Zone	25-62	gray fine-to-medium sand, some silt (Qwb1)
	well BR-3	62-77	gray sandy silt (Qwbl)
		77-78	brown, gray clay (Qwbl)
		78-98	brown sand, gravel, cobbles, some silt (Qwbf or Qn)
		98-107	brown silty sand and gravel--till (Qn)
		107-128	gray, brown silty sand and gravel--till (Qn)
		128-180	brown silty sand and gravel--till (Qn)
		180-553	gray to brown shale
17	25-37526	0-44	rocks and cobbles (Qwb1)
		44-50	sand and rocks (Qwb1)
		50-81	rocks and cobbles (Qn or Qwbf)
		81-131	granite
18	25-9101	0-4	gravel and boulders (Qn)
		4-6	sand (Qn)
		6-8	sandy clay (Qn)
		8-15	gravel and sand (Qn)
		15-18	sand and gravel (Qn)
		18-26	gravel and sand and trace clay streaks (Qn)
		26-41	clay and gravel (Qn)
		41-43	rock, very hard
19	25-16087	0-20	brown sandy clay and boulders (Qnm)
	Village	20-35	fine-to-medium gray sand and gravel (Qb)
	Green	35-60	fine-to-coarse gray sand with some small boulders (Qb)
	well 2	60-81	fine-to-medium brown sand (Qb)
			screened 71-81, yield 98.9 gpm
20	25-15906	0-94	sand, gravel, boulders, etc. (Qnm over Qb?)
	Village	94-344	granite
	Green		
	well 1		
21	25-13558	0-13	overburden (Qnm)
		13-24	boulders (Qnm)
		24-42	sand, gravel (Qb)
		42-46	boulder (Qb)
		46-70	sand (Qb)
		70-91	sand, gravel (Qb)
		91-100	sand (Qb)
		100-107	sand, gravel (Qb), yield 15-20 gpm
22	25-22262	0-80	boulders, gravel (Qn over Qb)
		80-85	sand (Qb)
		85-100	sand and gravel (Qb), yield 4 gpm
23	25-15743	0-15	sand and gravel (Qnm)
		15-65	gray clay and sand (Qbl)
		65-90	gray clay, sand, ground water (Qbl)
		90-95	brown sand and some gravel (Qis)
		65-99	brown sand and medium gravel (Qis), yield >20 gpm
24	25-10523	0-60	clay, sand, gravel (Qn over Qb)
		60-148	blue clay, very sticky (Qbl)
		148-168	clay and hardpan (Qbl or Qit?)
		168-178	coarse gravel (Qis), yield 15 gpm
25	25-21920	0-10	sand, gravel, boulders (Qnm)
		10-40	sand, gravel (Qnm or Qb)
		40-42	boulder (Qnm or Qb)
		42-44	sand, gravel (Qnm or Qb)
		44-46	boulder (Qnm or Qb)
		46-72	sand, gravel (Qb)
		72-76	boulder (Qb or Qis)
		76-94	sand, gravel (Qis)
		94-95	heavy gravel (Qis or Qit), yield 15 gpm
26	25-12432	0-7	overburden and boulders (Qnm)
		7-49	fine sand (Qb)
		49-95	coarse sand (Qis)
		95-103	coarse sand, gravel, lots of water (Qis), yield 30 gpm
27	25-17339	0-20	gravel (Qnm)
		20-40	sand, gravel (Qb)
		40-100	gray silt (Qbl)
		100-115	gravel and sand, water (Qis), yield 10 gpm
28	25-12431	0-40	overburden and boulders (Qnm)
		40-65	coarse sand (Qb)
		65-66	sand, gravel, water (Qis?), yield 15 gpm
29	25-16676	0-30	boulders and clay (Qnm)
		30-70	boulder, gravel, sand (Qb)
		70-135	clay and sand (Qbl)
		135-140	gravel (Qis)
			screened 130-140, yield >50 gpm
30	N 25-1-547	0-208	sand, clay, boulders (Qnm over Qb, Qbl, Qis?)
		at 208	granite gneiss
31	25-18348	0-60	heavy gravel, overburden, etc. (Qnm)
		60-80	boulders, gravel, overburden (Qnm)
		80-100	gravel, clay (Qb and Qbl?)
		100-129	sand, gravel, clay (Qb and Qbl?)
		129-154	gravel, sand, water (Qis), yield 5 gpm
32	25-17663	0-20	boulders (Qnm)
		20-30	sand (Qb)
		30-84	gray sand and gravel (Qb)
		at 84	heavy gravel and water (Qis), yield 20 gpm
33	25-20086	0-6	overburden (Qnm)
		6-65	sand and clay (Qbl)
		65-75	water (probable sand in Qis)
		75-87	gravel, sand, water (Qis)
		87-90	gravel, water (Qis)
			screened 87-90, yield >20 gpm
34	25-12567	0-43	sand, boulders (Qnm)
		43-81	sand, gravel (Qb)
		81-90	fine brown sand (Qb, grading to Qbl)
		90-123	fine sand, gray clay (Qbl)
		123-128	large gravel, sand, clay (Qis)
		128-130	gravel bed, yield 18 gpm
35	25-22848	0-80	layers of gray clay and silty sand (thin Qnm over Qbl)
		80-95	fine sand, water (Qis), yield 10 gpm
36	25-18861	0-20	brown sand (Qnm)
		20-104	gray silt (Qbl)
		104-107	gravel bed and water (Qis), yield 10 gpm
37	25-3331	0-28	clay and boulders (Qnm)
		28-40	fine silty sand (Qbl)
		40-80	gray and blue sticky clay (Qbl)
		80-88	coarse gravel (Qis), yield 12 gpm
38	25-21062	0-2	overburden (Qnm)
		2-100	sand and gravel (Qnm over Qb), yield >15 gpm
39	25-17488	0-100	sand (Qnm over Qb)
		100-102	gravel (Qis), yield 6 gpm
40	25-17643	0-5	overburden (Qnm)
		5-70	sand, gravel, clay (Qnm over Qb)
		70-83	sand (Qb)
		83-85	sand and gravel (Qis), yield >50 gpm
41	25-19325	0-100	sand, gravel, boulders (Qnm over Qb)
		100-162	silt and clay (Qbl)
		162-164	gravel (Qis?)
		164-172	silt (Qis?)
			screened 167-172, yield 12 gpm
42	25-21453	0-25	brown sand and gravel, water (Qnm)
		25-120	gray silt (Qbl)
		120-140	sand and gravel (Qis)
		140-230	sand (Qis), yield 3 gpm
43	25-17128	0-15	overburden (Qnm)
		15-120	sand and clay (Qbl)
		120-125	gravel (Qis)
44	25-23847	0-2	overburden (Qnm)
		2-40	sand and gravel (Qnm over Qb)
		40-100	gray clay (Qbl)
		100-104	sand and gravel (Qis)
45	25-15269	0-20	overburden with big gravel (Qnm)
		20-68	sand (Qb)
		68-70	gravel, clay (Qb)
		70-78	sand (Qb)
		78-80	sand, gravel (Qb or Qis)
			screened 78-80, yield 10-15 gpm
46	25-21410	0-3	overburden (Qnm)
		3-6	clay and gravel (Qnm)
		6-10	sand (Qnm)
		10-15	sand and boulders (Qnm)
		15-85	sand and gravel (Qb)
		85-160	clay (Qbl)
		160-162	sand and gravel (Qis)
		162-170	clay and gravel (Qis or Qit)
		170-173	sand and gravel (Qis or Qit), yield 40-50 gpm
47	25-17734	0-25	sand and water (Qb)
		25-121	gray clay (Qbl)
		121-122	gravel bed, water (Qis), yield 15 gpm
48	N 25-1-249	0-316	upper part of overburden was sand and gravel (Qb) then came a great thickness of blue clay (Qbl) and at the bottom a little yellow clayey sand (Qis or Qit or Qgw)
		at 316	granite-gneiss rock
49	25-18954	0-30	water, sand, gravel (Qb)
		30-50	sand, gravel (Qb)
		50-94	yellow clay (Qbl)
		94-130	clay and gravel mixed (Qbl)
		130-140	lard (sic) clay (Qbl)
		140-150	clay (Qbl)
		150-157	clay and gravel (Qit?)
		157-160	sandstone, water
50	25-20100	0-135	sand and clay (Qb over Qbl)
		135-155	rotten granite (Qgw)
		155-223	granite
51	25-19940	0-45	sand and water (Qb)
		45-79	clay (Qbl)
		79-85	gravel and water (Qis), yield 20 gpm
52	25-15908	0-80	gravel, etc. (Qb)
		80-85	gravel and water (Qb or Qis), yield 20 gpm
53	25-15620	0-57	sand and silt, gravel (Qb over Qbl)
		57-146	gray granite
54	25-20279	0-80	sand, gravel (Qb)
		80-152	clay and big gravel (Qbl over Qis or Qit)
		152-160	granite
55	25-22132	0-5	overburden (Qb)
		5-10	sand and gravel (Qb)
		10-70	sand (Qb)
		70-82	sand and gravel (Qis), yield 20 gpm
56	25-16674	0-25	overburden (Qb)
		25-70	sand, clay, water (Qbl)
		70-76	gravel and water (Qis)
57	25-12642	0-21	sand, clay, boulders (Qgw)
		21-172	granite
58	25-23850	0-75	overburden (Qgw)
		75-150	granite
59	25-21875	0-60	boulder, sand, gravel, etc. (Qnm)
		60-348	granite
60	25-21421	0-48	sand, gravel, boulders (Qnm)
		48-110	granite
61	25-8938		log by D. G. Parrillo, NJGS, abbreviated here
		0-16	buff coarse very clayey sand with gravel (Qnm)
		16-40	coarse sand and gravel (Qnm)
		40-68	light gray to light brown clayey sand with scattered gravel (Qnm)
		68-74	medium to very coarse sand with gravel (Qnm)
62	25-9181	0-7	sand and gravel (Qnm)
		7-11	muddy sand and gravel (Qnm)
		11-17	coarse sand (Qnm)
		17-21	gravel and sand (Qnm)
		21-25	boulders, sand, gravel, clay streaks (Qnm)
		25-32	soft rock and clay streaks (Qgw)
		32-33	harder rock
63	25-8242	0-7	overburden (Qnm)
		7-11	clay (Qnm)
		11-23	hardpan (Qnm)
		23-77	sand, stone (Qnm or Qgw)
		77-102	sand and clay (Qsu or Qgw)
		102-173	sand and stone (Qit or Qgw)
64	25-11389	0-11	overburden, boulder (Qnm)
		11-40	sand and gravel (Qnm)
		40-54	boulder (Qnm or bedrock)
		54-60	sand (Qsu or Qgw)
		60-80	heavy gravel, fine sand, water (Qit, Qis or Qgw)
		80-84	gravel and water (Qis, Qit, or Qgw)
65	25-21793	0-54	sand, gravel, boulders (Qnm)
		54-97	granite
66	25-14044	0-55	overburden with boulders (Qnm)
		55-63	big gravel (Qnm)
		63-123	sand, clay (Qsu or Qgw)
		123-148	granite
67	25-15896	0-46	large gravel and gray sand, etc. (Qnm)
		46-152	granite and water
68	25-16585	0-24	overburden with gravel (Qnm)
		24-245	granite
69	25-16496	0-71	sand, gravel, etc. (Qnm)
		71-75	gravel with water (Qnm)
70	NJGS files	0-70	sand, gravel, boulders (Qnm)
	Netcong	70-74	yellow clay (Qnm)
	well field	74-96	sand, gravel, boulders (Qnm)
		96-98	yellow clay (Qnm)
		98-108	sand and gravel (Qnm)
		108-115	sandstone (probably gneiss)
71	25-21081	0-100	brown, yellow, gray sand, clay, and silt (Qnm)
		100-104	burnt orange broken rock
		104-105	rock
72	NJGS files	0-88	overburden (Qnm)
	Netcong		
	well field		
73	N 25-1-256	0-6	soft muck (Qs now filled?)
		6-28	soft blue clay (Qs now filled?)
		28-68	clay, sand, boulders (Qnm)
		68-73	yellow clay (Qnm)
		73-81	sand and gravel (Qnm)
		81-94	boulders (Qnm)
		94-96	ledge rock
74	N 25-1-566	0-5	blue clay (Qnm)
		5-30	broken rock, boulders (Qnm)
		30-60	brown and gray sand and some broken rock (Qnm)
		60-70	coarse sand and rock chips (Qnm)
		70-74	yellow sandy clay (Qnm)
		74-80	coarse gray sand (Qnm)
		80-88	broken rock and coarse gray sand (Qnm)
		88-96	medium grained gray to brown sand (Qnm)
		96-98	sandy clay (Qnm)
		98-108	coarse gray and brown sand (Qnm)
		108-115	rock fragments (bedrock or Qnm)
75	25-14788	0-31	brown sandy clay and boulders (Qnm)
		31-37	hardpan (Qnm)
		37-42	sand and gravel, streaks of dry clay (Qnm)
		42-62	brown sand and gravel, boulders (Qnm)
		62-72	brown sand and gravel (Qnm)
		72-77	brown clay and gravel (Qnm)
		77-82	brown sand, clay streaks (Qnm)
		82-84	packed clay and gravel (Qnm)
			screened 69-84, yield 250 gpm
76	25-14208	0-5	brown clay and boulders (Qnm)
		5-18	green sandy clay and boulders (Qnm)
		18-70	sandy clay and boulders (Qnm)
		70-78	hard packed clay and gravel (Qnm)
		78-81	brown sand (Qnm)
		81-88	brown clay and gravel--hard packed (Qnm)
		88-93	muddy brown sand (Qnm)
		93-98	brown clay and gravel (Qnm)
		98-105	green clay (Qsp or Qgw)
		105-107	sand and broken rock (Qsp or Qgw)
		107-117	green silty clay (Qsp or Qgw)
		117-120	sand, gravel, boulders (Qsp or Qgw)
		120-122	brown sand and gravel, clay (Qsp or Qgw)
		122-123	hard rock
77	25-22227	0-30	overburden with boulders (Qnm)
		30-197	granite
78	25-16844	0-38	boulders and clay (Qnm)
		38-198	granite
79	22-22230	0-60	silt, gray clay, gravel (Qnm)
		60-77	hardpan and sandstone (Qnm or Qgw)
		77-122	granite
80	25-7900	0-9	swamp muck (Qs)
		9-20	gray clay (Qs over Qsu)
		20-40	brown sandstone with streaks of clay and hard rock (Qgw?)
		40-68	granite
81	25-19464		abbreviated log
		0-95	yellow to gray sand, clay, gravel, some boulders (Qnm)
		95-100	broken rock, fine sand (Qgw or Qnm)
		100-105	hard rock
82	25-18208	0-60	clay (Qnm)
		60-124	hardpan (Qnm)
		124-145	rotten rock (Qgw)
		145-155	granite gneiss
83	25-20885		abbreviated log
		0-3	fill
		3-15	black mud (Qs covered with fill?)
		15-80	brown clay, sand, silt, gravel, boulders (Qnm)
		80-90	weathered rock, fractured (Qgw)
		90-104	clay, broken rock (Qgw)
		104-245	bedrock
84	25-23398	0-83	layers of hardpan with silty sand (Qnm)
		83-150	granite
85	25-22911		abbreviated log
		0-5	black cinders (af)
		5-88	brown sand, some gravel, trace clay and silt, (Qnm)
		88-89	weathered rock (Qgw)
		89-300	syenite gneiss
86	25-20720	0-20	sand, gravel, boulders (Qn)
		20-48	sand and clay (Qbl or Qgw)
		48-50	rotten granite (Qgw)
		50-98	very rotten granite (Qgw)
87	25-7648	0-43	dirty sand, gravel, boulders (Qwb1)
		43-47	sand and gravel, dirty (Qwb1)
		47-54	gray clay mixed with gravel (Qn)
		54-60	coarse brown sand (Qn)
		60-69	clay, sand, gravel--hard packed (Qn)
		69-78	brown sandy clay and some gravel (Qn)
		78-90	brown sandy clay and cobblestones (Qn)
		90-93	dark brown sand--hardpan (Qn)
		93-137	sandy clay, red sand, crushed stone (Qbl? over weathered shale and sandstone)
		137-142	red rock
88	25-8793	0-3	fill iron, slag (af)
		3-9	clay and gravel (Qn)
		9-13	boulders and clay (Qn)
		13-18	gravel, sand, clay (Qn)
		18-27	clay and gravel (Qn)
		27-43	quartz, mica rock and clay streaks with gravel and sand (Qn)
89	25-21153	0-5	boulders, stones, gray muck (Qal)
		5-10	boulders, clay, river muck (Qal)
		10-15	boulders, gray clay, brown sharp sand (Qn)
		15-20	boulders, sand, sharp small gravel (Qn)
		20-25	yellow clay, gravel, sand, silt (Qn)
		25-30	coarse gravel, yellow clay, brown sand (Qn)
		30-50	yellow clay, sand, silt (Qspl)
		50-55	boulders, yellow clay, sand, silt, small sharp gravel (coarse bed in Qspl?)
		55-75	yellow clay, fine-to-medium sand (Qspl)
		75-80	sharp gravel, fine-to-medium sand, silt, yellow clay (coarse bed in Qspl?)
		80-120	yellow clay and silt (Qspl)
		120-145	clay, silt, fine sand (Qspl)
		145-160	clay, sand, small sharp gravel (Qspl)
		160-170	brown sharp sand, silt, medium sharp limestone gravel (Qspl over bedrock)
		170-225	limestone
			note: interval from 30-170 may include some weathered carbonate rock with some collapsed glacial sediment
90	N 25-1-285	0-15	clean fine-to-coarse sand (Qwb1)
		15-35	gray silt (Qwb1)
		35-65	clean medium-to-coarse sand and fine gravel (Qwb1)
		65-72	clean, medium-grained sand (Qwb1)
		72-90	clean fine-to-coarse sand (Qwb1)
		90-105	yellow fine-to-coarse clayey sand (Qn)
		105-115	granite gneiss
91	25-24017	0-12	sand and boulders (af over Qwb1)
		12-50	medium-to-fine sand, some gravel, boulders (Qwb1)
92	NJGS files	0-25	yellow clay, boulders (Qwb1)
	Stanhope	25-55	sandy clay (Qwb1)
	well field	55-90	gravel and boulders (Qwb1)
		90-92	yellow clay (Qwb1)
		92-115	sand and gravel (Qwb1)
		115-119	hardpan (Qn)
93	25-11618	0-10	clay and boulders (Qwb1)
		10-18	sand and boulders (Qwb1)
		18-30	sand, clay, boulders (Qwb1)
		30-57	sand, boulders, clay (Qwb1)
		57-73	sand and gravel (Qwb1)
		73-75	gray clay (Qwb1)
		75-91	fine sand and boulders (Qn or Qwb1)
		91-95	gray clay (Qspl or Qn)
		95-102	sand and gravel (Qsp or Qn)
		102-103	rock
94	N 25-1-285	0-58	clay and boulders (thin Qal on Qn)
	well 1	58-65	fine sand (Qn or Qsp)
		65-102	granite gneiss
95	N 25-1-285	0-55	(material as in well 94, thin Qal on Qn)
		at 55	bedrock
96	25-18608	0-72	sand, gravel, hardpan, boulders (Qn)
		72-76	gneiss
97	25-7493	0-5	fill
		5-8	topsoil
		8-17	sandy clay, gravel, boulders (Qn)
		17-41	sand, gravel, streaks of clay, boulders (Qn)
		41-53	gray clay, large gravel (Qn)
		53-55	sand and gravel, streaks of clay (Qn)
		55-59	sand and gravel (Qn)
		59-61	brown clay (Qn or Qgw)
		61-77	rock
			screened 54-59, yield 70 gpm
98	25-18607		abbreviated log
		0-5	swamp mud and stones (thin Qal)
		5-47	brown sand, some clay, stones, boulders (Qn)
		47-48	granite
99	N 25-1-273		former pit exposed:
		0-30	chiefly sand (Qwb2)
		30-40	gravel with sand (Qwb2)
		40-50	many large boulders (Qn)
100	25-14911		well drilled in base of former pit
		0-15	fine sand (Qwb2)
		15-40	cobbles and boulders (Qwb2 over Qn)
		40-46	large gravel, sand, silt (Qn)
		46-78	boulders, large gravel, some fine sand and and clay (Qn)
		78-247	granite
101	NJGS files	0-41	glacial drift (Qn)
	Stanhope	41-150	gneiss
	well		
102	25-22910	0-20	light brown silty sand, some gravel and boulders, trace clay (af over Qn)
		20-45	brown silty sand, trace gravel, clay, occasional boulders (Qn or Qsp)
		45-353	gneiss
103	25-12251	0-17	overburden with boulders (Qn)
		17-39	fine sand, brown (Qsp)
		39-52	red clay (Qspl)
		52-70	brown clay with gravel (Qsp)
		70-129	brown clay with gravel and sand (Qsp)
		129-170	granite
104	25-20842	0-30	sand, clay, gravel (Qn over Qsp)
		30-60	clay (Qspl)
		60-80	clay, gravel, mixed (Qsp)
		80-120	gravel (Qsp)
			screened 113-120, yield 30 gpm
105	25-17635	0-4	overburden (Qn)
		4-40	sand (Qn over Qsp)
		40-80	sand and gravel, no water (Qsp)
		80-142	fine sand, gravel (Qsp)
		142-143	coarse sand, gravel, water, yield >20 gpm
106	25-20228	0-50	boulders, sand (Qn)
		50-60	gravel, boulders (Qn or Qsp)
		60-100	sand, boulders (Qsp or Qn)
		100-123	gravel (Qsp)
			screened 120-123, yield 8-10 gpm
107	25-17689	0-50	clay and sand (Qn over Qsp)
		50-100	clay and sand (Qspl)
		100-140	clay (Qspl)
		140-142	sand and gravel (Qsp)
			screened 140-142, yield 20 gpm
108	25-20271	0-93	sand, clay, gravel (Qn over Qsp)
		93-198	granite
109	25-17662	0-30	sand (Qn over Qsp)
		30-136	sand and gravel (Qsp)
		136-147	brown granite
110	25-22473	0-22	gravel and sand (Qn)
		22-80	boulder, gravel, sand (Qn over Qsp)
		80-85	fine sand (Qsp)
		85-160	sand, gravel, water, clay (Qsp)
111	25-21798	0-25	sand and large gravel (Qn)
		25-50	sand (Qsp)
		50-83	gravel, sand, clay (Qsp)
		83-100	clay (Qspl)
		100-125	sand, clay (Qspl)
		125-130	sand (Qsp)
		130-140	sand, gravel (Qsp)
		140-145	gravel, water (Qsp)
			screened 140-145, yield 15 gpm
112	25-21015	0-148	sand and gravel (Qn over Qsp)
			screened 137-148, yield 7 gpm
113	25-21797	0-2	overburden (Qn)
		2-25	sand and gravel (Qn)
		25-29	boulder (Qn)
		29-80	fine sand (Qsp)
		80-133	fine sand and clay (Qspl)
		133-135	sand and gravel (Qsp)
			screened 133-135, yield 50 gpm
114	25-18017	0-30	silt (Qn over Qsp)
		30-60	sand (Qsp)
		60-80	gray clay (Qspl)
		80-90	gravel and clay (Qspl)
		90-105	silt and clay (Qspl)
		105-110	clay (Qspl)
		110-112	gravel and water (Qsp), yield >20 gpm
115	25-15309	0-40	overburden with boulders (Qn)
		40-60	sand (Qsp)
		60-75	clay (Qspl)
		75-119	gravel, sand, clay (Qsp)
		119-125	sand, gravel (Qsp)
			screened 120-125, yield 12 gpm
116	25-22225	0-135	sand, clay, gravel (Qn over Qsp), yield 30 gpm
117	25-12672	0-18	overburden (Qn)
		18-24	boulder (Qn)
		24-50	sand and gravel (Qsp)
		50-65	gravel (Qsp)
		65-90	gray clay (Qspl)
		90-105	sand, gravel (Qsp)
		105-118	brown clay with gravel (Qit?)
		118-120	brown granite
118	25-19952	0-11	overburden (Qn)
		11-19	boulder (Qn)
		19-50	sand (Qsp)
		50-70	gravel, water (Qsp), yield 20 gpm
119	25-12871	0-53	sand, gravel, boulders (Qnm)
		53-123	gray granite
120	25-9409		abbreviated log
		0-70	medium-to-coarse sand, some gravel, trace clay (Qnm, possibly over Qsp)
121	24-5671	0-15	overburden (Qnm)
		15-37	boulders (Qnm)
		37-50	gravel (Qnm or Qsp)
		50-100	sand and gravel (Qsp)
122	25-16725	0-20	overburden with boulders (Qnm)
		20-50	sand and boulders (Qnm)
		50-52	boulders (Qnm)
		52-90	gravel with fine sand (Qsp)
		90-95	sand, gravel (Qsp), yield 15-20 gpm
123	25-13447	0-38	sand, gravel, boulders (Qnm)
		38-80	sand, clay, gravel (Qsp)
		80-92	clay, some sand and gravel (Qspl)
		92-96	brown clay (Qspl or Qgw)
		96-118	brown granite
		118-147	light gray granite
124	25-12226	0-74	clay, boulders, gravel, silt, sand (Qnm over Qsp and Qspl)
		74-80	rotten granite, clayey (Qgw)
125	25-19391	0-20	overburden with boulders (Qnm)
		20-60	gravel, clay, boulders (Qnm)
		60-70	sand (Qsp or Qgw)
		70-88	brown granite
		88-147	granite
126	25-14010	0-8	overburden (Qnm)
		8-40	gravel (Qnm)
		40-55	sand, gravel (Qnm)
		55-61	big gravel (Qnm)
		61-101	sand, gravel (Qsp), yield 50 gpm
127	25-13993	0-40	overburden, big gravel (Qnm)
		40-44	boulder (Qnm)
		44-100	gravel (Qsp)
			screened 75-100, yield 10 gpm
128	25-13912	0-90	overburden with boulders, sand, gravel (Qnm)
		90-100	sand and gravel (Qsp), yield 10.5 gpm
129	25-20818	0-10	sand, small gravel (Qnm)
		10-45	sand, large and small gravel (Qnm)
		45-73	large gravel (Qnm)
		73-118	gravel, sand (Qsp), yield 390 gpm
130	25-16166	0-133	hardpan, boulders (Qnm)
		133-165	clay (Qspl)
		165-207	boulders (Qit?)
		207-360	granite
131	25-21391	0-14	overburden (Qgw)
		14-200	granite
132	25-14307	0-33	clay, sand, stones, overburden (Qit)
		33-51	rotten fractured soft sandstone (Qgw)
		51-97	light gray granite
133	25-15633	0-30	overburden (Qit over Qgw)
		30-73	granite
134	45-289	0-12	sand, clay, dirt (Qit)
		12-70	rotted brown white sandstone (Qgw)
		70-90	sandstone (probable gneiss)
135	25-16809	0-45	overburden (Qit over Qgw)
		45-123	granite
136	25-22597	0-42	gravel (Qso)
		42-138	sand, clay, gravel (Qsl over Qit)
		138-149	brown granite
137	25-20817	0-20	sand and gravel (Qso)
		20-50	big gravel (Qso)
		50-75	sand (Qso over Qsl)
		75-131	sand, clay (Qsl)
138	25-15127	0-2	overburden, boulders (Qso)
		2-40	boulders and gravel (Qso)
		40-51	sand and gravel (Qso)
139	25-22439	0-40	sand and big gravel (Qso)
		40-100	fine sand (Qsl)
		100-103	fine sand and gravel (Qis)
		103-138	sand (Qis)
		138-141	sand and gravel (Qis)
140	25-18238	0-45	gravel, boulders (Qso over Qgw)
		45-93	granite
141	25-21918	0-15	sand, gravel, boulders (Qso)
		15-45	sand and gravel (Qso)
		45-125	granite
142	25-15236	0-25	overburden with boulders (Qso)
		25-50	gravel (Qso)
143	25-14029	0-15	sand and gravel (Qso)
		15-20	sand (Qso)
		25-38	big gravel (Qso)
		38-46	sand and gravel (Qso)
		46-104	fine sand (Qsl)
		104-134	sand and gravel (Qis)
		134-144	sand (Qis)
		144-150	sand and gravel (Qis), yield 15 gpm
144	25-14949	0-42	gravel (Qso)
		42-70	sand (Qso over Qsl)
		70-96	fine sand (Qsl)
		96-98	sand, gravel (Qis)
145	NJGS files	0-50	sand and gravel (Qso)
			screened 44-50, yield >24 gpm
146	25-16440	0-40	clay and gravel (Qso)
		40-105	sand (Qso over Qsl)
		105-107	gravel, yield >50 gpm (Qis)
147	25-15745	0-155	gravel and water, yield 10 gpm (Qso over Qsl over Qis)
148	25-7766	0-40	sand and gravel (Qso)
		40-50	fine sand (Qsl)
		50-85	fine mucky sand (Qsl)
		85-102	gray clay (Qls)
		102-130	yellow hardpan (Qil or Qit?)
		130-140	red hardpan (Qit?)
		140-160	red sandstone
149	25-23718	0-40	sand and gravel (Qso)
		40-80	fine sand (Qsl)
		80-140	clay (Qsl)
		140-142	boulder (Qit?)
		142-150	red rock, soft
			screened 140-150, yield 20 gpm
150	25-8891		log by D. G. Parrillo, NJGS, abbreviated here
		0-50	yellowish brown to grayish brown fine-to-coarse sand composed of quartz and gneiss fragments (Qso)
		50-80	yellowish brown silty fine-to-medium sand (Qsl)
		80-90	yellowish brown slightly sandy silt (Qsl)
		90-100	yellowish brown slightly clayey silt (Qsl)
		100-160	silty fine-to-medium sand, some coarse sand composed mostly of gneiss (Qis)
		160-195	medium-to-very-coarse sand, some gravel, slightly silty (Qis)
			screened 192-196, yield 30 gpm
151	25-20816	0-20	sand and large gravel (Qso)
		20-25	water, sand, large gravel (Qso)
		25-70	coarse brown sand (Qso)
		70-80	fine sand (Qsl)
		80-92	sand (Qsl)
		92-160	red sandstone
152	25-12043	0-50	coarse sand, little water (Qso)
		50-150	gray clay, no water (Qsl)
		150-160	fine sand, no water (Qis)
		160-170	sand and gravel with water (Qis)
			screened 168-170, yield 30 gpm
153	25-17081	0-30	gravel and clay (Qso)
		30-100	gray clay (Qsl)
		100-150	sand (Qis)
		150-157	gravel (Qis)
			screened 155-157, yield 25 gpm
154	25-12640	0-110	sand (Qso over Qsl)
		110-130	clay (Qsl)
		130-145	sand and gravel (Qis)
		145-153	hardpan (Qit?)
		153-157	sand and gravel (Qis), yield 27 gpm
155	25-18885	0-20	sand (Qso)
		20-35	sand and gravel (Qso)
		35-90	clay (Qsl)
		90-156	sand (Qis)
		156-158	sand, gravel (Qis), yield 20 gpm
156	25-16919	0-50	sand and boulders (Qso)
		50-70	red clay (Qsl)
		70-92	sand and red clay (Qsl)
		92-95	gravel (Qis)
			screened 92-95, yield >25 gpm
157	25-19417	0-135	sand (Qso over Qsl)
		135-148	clay (Qsl)
		148-152	gravel (Qis), yield 10 gpm
158	NJGS files	0-5	fill
		5-15	yellow sandy clay (Qso)
		15-25	coarse sand, medium gravel (Qso)
		25-30	medium sand, little gravel (Qso)
		30-35	medium sand, gravel (Qso)
		35-75	medium-to-fine sand (Qso)
		75-80	medium sand, 5/8" gravel (Qso)
		80-85	medium-to-coarse sand (Qso)
		85-91	medium-to-coarse sand, gravel (Qso)
		91-103	fine sand, some clay (Qsl)
159	25-16736	0-77	fine sand, no gravel (Qso)
		77-193	gray clay (Qsl)
		193-196	gray clay, water, some gravel (Qsl, possibly some interglacial alluvium)
		196-260	brown clay (Qil? or weathered carbonate rock)
		260-262	brown clay and rotten limestone
160	NJGS files	0-8	fine-to-medium sand, some clay (Qso)
		8-14	medium sand (Qso)
		14-19	medium-tocoarse sand (Qso)
		19-29	medium-to-coarse sand, gravel (Qso)
		29-41	coarse sand, gravel (Qso)
		41-46	medium-to-coarse sand, gravel (Qso)
		46-56	fine sand, clay (Qsl)
		56-66	medium sand (Qso)
		66-70	medium-to-coarse sand (Qso)
161	25-15190	0-18	overburden (Qqw)
		18-240	trap rock, red (quartzite bedrock)
162	25-14455	0-18	overburden (Qqw)
		18-250	sandstone
163	N 25-2-436	0-267	drift (Qnm over Qso over Qsl over Qis?)
		at 267	bedrock
164	25-18016	0-38	overburden, dirt, gravel, boulders (Qnm)
		38-198	granite
165	25-23136	0-10	clay and boulders (Qn)
		10-420	granite
166	25-21077	0-8	clay and boulders (Qn)
		8-348	granite
167	25-15381	0-25	overburden--boulders and mud (Qn)
		25-100	gray granite
168	25-20762	0-113	overburden with gravel, sand, clay (Qnm)
		113-148	granite
169	25-20961		abbreviated log
		0-122	sand, gravel, clay, boulders (Qn)
		122-172	granite
170	25-15441	0-25	overburden (Qn)
		25-97	gray granite
171	25-22215	0-40	silty sand and gravel (Qnm)
		40-90	gray clay (Qspl?)
		90-200	granite
172	25-21982	0-3	clay (Qn)
		3-10	sand (Qn)
		10-90	fine sand (Qspl?)
		90-140	gray granite
173	25-22086	0-119	sand, gravel, clay (Qnm over Qso over Qsl?)
		119-148	granite
174	25-19565	0-100	sand, clay (Qnm over Qsl?)
		100-110	boulders, sand (Qis?)
		110-155	gravel, sand (Qis?)
			screened 145-155, yield 3 gpm
175	25-18112	0-55	overburden with boulders (Qnm)
		55-60	boulders (Qnm)
		60-95	gravel with fine sand and clay (Qnm)
		95-123	granite
176	NJGS files	0-25	clay (Qnm)
		25-38	gravel (Qnm)
		38-59	clay (Qnm)
		59-64	gravel (Qnm), yield 55 gpm
177	25-20957	0-8	clay and boulder (Qnm)
		8-20	sand, gravel, clay (Qnm)
		20-55	clay and gravel (Qnm)
		55-90	sand, gravel, clay (Qnm over Qsp?)
		90-95	sand and gravel (Qsp)
			screened 92-95, yield >20 gpm
178	25-9479	0-10	fill
		10-15	brown hardpan and boulders (Qnm)
		15-22	blue clay and rocks (Qnm)
		22-41	blue muddy sand, some water (Qnm)
		41-43	lighter color clay and broken rock, very little sand (Qnm)
		43-44	blue sand and broken rock (Qnm)
		44-59	gray color clay and sand and rock, hardpan type (Qnm)
		59-79	brown sand and gravel, water quite active (Qsp)
		79-97	fine brown sand (Qsp)
		97-98	brown pure clay (Qspl)
		98-107	sandy clay (Qspl)
179	25-20928	0-12	sand, gravel, boulder (Qnm)
		12-50	sand and gravel (Qnm or Qsp)
		50-70	sand, gravel, clay (Qnm or Qsp)
		70-78	fine sand and gravel (Qsp)
		78-80	sand and gravel (Qsp)
			screened 78-80, yield 40-50 gpm
180	25-21139	0-40	overburden with clay and gravel (Qnm)
		40-97	granite
181	25-17690	0-25	boulders and clay (Qnm)
		25-75	mud, gravel (Qnm over Qsp?)
		75-89	water, gravel (Qsp)
		89-90	granite
182	25-16391	0-20	overburden with big gravel (Qnm)
		20-594	granite
183	25-23547	0-30	gravel (Qn)
		30-60	large gravel (Qn)
		60-85	gravel (Qn or Qsp)
			screened 70-85, yield 50 gpm
184	25-20388	0-25	sand, gravel (Qn)
		25-48	gravel, boulders (Qn)
		48-87	sandy clay (Qspl? or Qgw)
		87-125	granite
185	25-22765	0-20	sand (Qho over Qn)
		20-30	coarse sand (Qn)
		30-60	coarse sand and gravel (Qn)
		60-75	coarse sand (Qn or Qsp)
		75-115	silt (Qspl)
		115-118	gravel (Qgw?)
		118-123	granite
186	25-17173	0-30	overburden (Qn)
		30-245	granite
187	25-19533	0-26	overburden and boulders (Qn)
		26-123	granite
188	25-17907	0-37	sand, gravel (Qn)
		37-147	granite
189	25-17175	0-22	overburden with boulders (Qn)
		22-350	granite
190	22-7964	0-45	sand, gravel (Qn)
		45-95	granite
191	22-16467	0-25	gravel, sand, clay, etc. (Qn)
		25-147	granite
192	25-19156	0-65	sand, clay, gravel (Qn)
		65-98	granite
193	25-20254	0-72	dirt, sand (Qn)
		72-348	granite
194	25-17393	0-21	overburden (Qn)
		21-247	granite
195	25-18488	0-15	overburden (Qn)
		15-248	granite
196	25-18501	0-60	sand, gravel, boulders (Qn)
		60-273	granite
197	25-20183	0-106	sand (Qho)
		106-107	gravel (Qho or Qn), yield 10 gpm
198	25-17978	0-25	gravel (Qho)
		25-125	sand (Qho)
		125-140	sand, gravel (Qho or Qn)
		140-160	gravel (Qho or Qn)
		160-164	gravel, water (Qho or Qn), yield 15 gpm
199	25-16364	0-57	overburden, boulders, gravel, sand, water (Qho over Qn)
		57-222	granite
200	25-16982	0-25	overburden (Qn)
		25-300	granite
201	25-14311	0-46	sand, clay, gravel (Qn)
		46-78	granite
202	25-17019	0-17	overburden (Qn)
		17-155	granite
203	25-20754	0-47	overburden (Qn)
		47-98	granite
204	25-19821	0-20	overburden, gray gravel (Qn)
		20-28	sand and gravel (Qn)
		28-84	granite
205	25-16660	0-34	overburden with gravel, boulders, granite (Qn)
		34-148	granite
206	25-11680	0-20	rock, boulders, sand (Qn)
		20-30	rotten granite (Qgw)
		30-180	hard granite
207	25-15292	0-18	sand, gravel (Qn)
		18-122	granite
208	25-21023	0-18	overburden with boulders (Qn)
		18-348	granite
209	22-20611	0-24	sand, boulders (Qn)
		24-85	sandstone (probable gneiss or Qgw)
		85-300	granite
210	25-12227	0-29	sand and gravel (Qn)
		19-97	granite
211	NJGS files	0-5	fill
		5-22	brown silty fine-to-medium sand, with rounded to subrounded gravel, boulders and cobbles in lower 3 to 4 feet (Qal over Qmc)
		22-50	gneiss
212	NJGS files	0-12	brown very-fine-to-fine sand, little gravel, little to no silt (Qal)
		12-32	gray very-fine-to-fine sand, no gravel, little to no silt (Qmc)
		32-34	gravel (Qmc)
		34-41	gray very fine silty sand (Qmc)
		41-100	fine-to-medium sand, occasional gravel, little to no silt (Qmc)
		100-134	till (Qn)
		134-400	weathered dolomite
213	NJGS files	0-4	brown very-fine-to-fine sand, silt (Qmc)
		4-7	brown medium-to-coarse sand, fine gravel (Qmc)
		7-9	very-fine-to-fine silty sand (Qmc)
		9-60	gray very-fine-to-fine sand, occasional gravel (Qmc)
		60-65	gray small to large gravel, subrounded to rounded, and brown fine-to-medium sand (Qmc)
		65-84	brown, gray very-fine-to-fine sand (Qmc)
		84-150	till, sample shows yellow brown clayey silt with limonitic rock fragments (Qn and weathered carbonate rock)
		150-504	hard and soft dolomite and fault breccia
214	NJGS files	0-69	brown fine-to-coarse sand, trace silt, trace gravel, cobbles from 43-48 (Qnm)
		69-71	gneiss saprolite (Qgw)
215	NJGS files	0-20	gold brown fine sand, trace silt, occasional small cobbles (Qnm)
		20-30	gray brown very fine sand, some silt (Qnm)
		30-32	gray brown fine-to-coarse sand, trace silt, little gravel (Qnm)
		32-69	gray brown fine-to-coarse sand, little silt, cobble zones (Qnm)
		69-72	gray brown fine-to-medium sand, little to some silt, and fine gravel (Qnm)
		72-179	gneiss saprolite (Qgw)
		179-280	weathered dolomite
216	NJGS files	0-4	black very-fine-to-fine sand, coarse gravel, some silt (Qal)
		4-20	brown fine-to-coarse sand, cobbles from 5-7 (Qmc)
		20-50	brown very fine silty sand (Qmc)
		50-61	gray brown very-fine-to-coarse sand, small gravel (Qmc)
		61-115	gneiss saprolite (Qgw)
		115-140	gneiss
217	N 25-1-241	0-40	stratified drift (Qmc)
		at 40	dolomite
218	NJGS files	0-22	brown fine-to-coarse sand and silt, fine-to-coarse gravel, boulders (Qmc)
		22-56	gneiss
219	25-12561	0-20	gravel (Qmc)
		20-39	sand, gravel (Qmc)
		39-43	gravel (Qmc)
220	25-4732	0-12	hardpan, boulders, gravel (Qmc)
		12-20	fine sand, water-bearing (Qmc)
		20-40	coarse sand, water-bearing (Qmc)
		40-47	hardpan and slabs of rock (Qn)
		47-66	light gray and blue slabby rock
221	25-15338	0-11	overburden with gravel, sand, boulders (Qn)
		11-123	granite
222	25-17465	0-45	overburden with boulders, gravel, clay, and water (Qn)
		45-147	granite
223	25-18346	0-30	overburden with sand, gravel, boulders (Qn)
		30-98	granite
224	25-17466	0-25	overburden (Qn)
		25-123	granite
225	25-21579	0-18	overburden with boulders (Qn)
		18-123	granite
226	25-18990	0-52	overburden with boulders and big gravel (Qn)
		52-96	granite
227	25-22337	0-32	sand, gravel, boulders (Qn)
		32-200	granitic gneiss
228	25-22378	0-35	sand, gravel, boulders (Qn)
		35-70	soft weathered dolomite, granular (Qgw?)
		70-130	dolomite--soft dark (Qgw?)
		130-200	granite
229	22-22128	0-15	overburden (Qn)
		15-300	granite
230	22-19094	0-4	overburden (Qn)
		4-340	granite
231	22-7955	0-22	brown sand and water (Qn)
		22-146	dark gray granite
232	22-22078	0-40	overburden (Qn)
		40-100	lime
233	22-20288	0-15	overburden with sand and gravel (Qn)
		15-275	granite
234	25-14845	0-20	overburden (Qn)
		20-98	granite
235	25-16188	0-25	overburden, boulders, gravel (Qn)
		25-146	granite
236	22-7878	0-18	sand and boulders (Qn)
		18-121	white granite
237	22-20090	0-12	overburden (Qn)
		12-225	granite
238	25-14158	0-20	mixed clay, sand, gravel, boulders (Qn)
		20-612	gneiss
239	22-16780	0-31	sand, gravel (Qn)
		31-174	limestone
240	22-16781	0-18	sand and gravel (Qlr1)
		18-75	limestone
241	22-20593	0-35	sand (Qlr1)
		35-98	white granite
242	22-20129	0-45	sand and gravel (Qlr1)
		45-55	granite
243	22-18141	0-6	overburden (Qn)
		6-173	granite
244	22-19523	0-40	sand, clay (Qlr1 over Qlrl)
		40-73	granite
245	22-17482	0-22	clay (Qlr1 over Qlrl)
		22-200	granite
246	22-8305	0-30	sand, gravel (Qlr1)
		30-58	granite
247	22-16734	0-18	sand (Qlr1)
		18-248	granite
248	22-21216	0-23	sand (Qlr1)
		23-54	silt (Qlrl)
		54-95	granite
249	22-22367	0-45	sand, clay, gravel, boulders (Qlr1, Qlrl, over Qn?)
		45-147	granite
250	22-20988	0-62	sand and silt (Qlr1 over Qlrl)
		62-72	granite
251	22-21018	0-25	overburden (Qlr1)
		25-50	gray sand (Qlr1)
		50-83	sand (Qlr1)
		83-85	gravel (Qlrf or Qn)
			screened 83-85, yield 10 gpm
252	22-19375	0-11	clay overburden (Qn)
		11-149	granite
253	22-15994	0-24	overburden (Qn)
		24-100	granite
254	22-22108	0-5	coarse sand (Qlr1)
		5-87	fine sand with water (Qlr1)
		87-90	coarse sand and gravel (Qlrf), yield 12 gpm
255	22-14360	0-15	overburden (Qn)
		15-148	granite
256	22-21069	0-8	clay and gravel (Qlr1)
		8-88	sand (Qlr1)
		88-91	sand with large gravel (Qlrf)
			screened 89-91, yield 20 gpm
257	22-19218	0-103	sand (Qlr1)
		103-110	gravel (Qlrf)
			screened 105-110, yield 7 gpm
258	22-22351	0-27	sand, gravel, boulders (Qn)
		27-123	granite
259	22-21703	0-2	clay (Qlr1)
		2-70	sand (Qlr1)
		70-325	granite
260	22-22289	0-96	sand (Qlr1)
		96-105	granite
261	22-9117	0-6	overburden (Qlr1)
		6-171	granite
262	22-20617	0-21	gravel, sand, large boulders (Qlr1)
		21-122	white granite
263	22-20961	0-40	sand and gravel (Qlr1)
		40-95	granite
264	22-16498	0-40	sand (Qlr1)
		40-41	gravel (Qlr1)
		41-71	sand (Qlr1)
		71-77	sand and gravel (Qlrf), yield 10 gpm
265	22-15998	0-20	clay, sand (Qlr1)
		20-40	sand (Qlr1)
		40-52	sand, gravel (Qlrf), yield >20 gpm
266	22-7561	0-93	sand, gravel (Qlr1)
		93-95	granite
267	22-4481	0-28	clay and hardpan (Qwp1 over Qn)
		28-152	blue and gray granite
268	25-15367	0-25	red clay (Qn)
		25-51	gravel and boulders (Qn)
		51-60	gravel (Qn or Qgw), yield 15 gpm
269	25-17165	0-30	overburden, dirt, gravel, boulders (Qn)
		30-122	gray granite
270	22-10738	0-24	overburden (Qn)
		24-NR	granite
271	25-21561	0-35	overburden with boulders and gravel (Qn)
		35-173	granite
272	25-16722	0-49	sand and gravel (Qn)
		49-92	gray granite
273	25-15058	0-35	sand, gravel, boulders (Qn)
		35-100	gray granite
274	22-10673	0-40	boulders, water, gravel (Qn)
		40-97	granite
275	NJGS files	0-97	sand, gravel (Qn, possibly over Qgw)
		97-173	granite
276	22-15293	0-20	overburden (Qn)
		20-80	clay, gravel (Qn or Qgw)
		80-171	granite
277	25-15594	0-35	overburden (Qn)
		35-98	granite
278	25-15016	0-48	overburden (Qn)
		48-171	granite
279	25-19296	0-45	overburden, sand, gravel, clay (Qn)
		45-47	boulders (Qn)
		47-60	clay, gravel (Qn)
		60-110	granite
280	22-11977	0-30	clay, boulders (Qn)
		30-122	gray granite
281	22-13239	0-20	sand, gravel, water (Qn)
		20-39	gray clay (Qn or Qgw)
		39-115	granite
282	22-14878	0-35	overburden (Qn)
		35-149	granite
283	25-19013	0-66	clay, hardpan (Qn)
		66-123	gray granite
284	22-10624	0-65	gravel, sand (Qn)
		65-98	granite
285	22-10955	0-70	clay and boulders (Qn)
		70-123	clay (Qn or Qgw)
		123-173	gray granite
286	22-11298	0-92	clay, gravel, sand (Qn)
		92-171	gray granite
287	25-16870	0-100	sand, clay, gravel (Qn)
		100-102	decomposed granite and water (Qgw), yield 10 gpm
288	25-14539	0-10	boulders (Qn)
		10-40	clay and gravel (Qn)
		40-60	clay, gravel (Qn)
		60-80	gravel (Qn or Qgw), yield 10 gpm
289	22-11135	0-55	sand, clay, gravel (Qn)
		55-95	gray granite
290	22-10715	0-45	overburden (Qn)
		45-110	granite
291	22-7112	0-44	soft boulders, clay, sand, water (Qn)
		44-90	granite
292	22-14091	0-70	clay, boulders, gravel, sand, etc. (Qn)
		70-97	gray granite
293	22-10582	0-38	overburden (Qn)
		38-90	granite
294	22-14577	0-39	overburden (Qn)
		39-125	granite
295	22-11832	0-40	overburden with gravel and boulders (Qn)
		40-198	granite
296	22-15976	0-15	overburden (Qn)
		15-150	granite
297	25-17256	0-40	clay and boulders (Qn)
		40-298	granite
298	22-14356	0-30	gravel, boulders (Qn)
		30-97	granite
299	22-11262	0-150	sand and gravel, granite (Qn over Qgw)
		150-260	granite
300	22-18424	0-30	dirt, sand (Qn)
		30-154	granite
301	22-18425	0-35	dirt (Qn)
		35-272	granite
302	25-22704	0-26	sandy clay (Qn)
		26-34	sandstone (Qgw?)
		34-200	gray granite
303	22-21229	0-20	clay (Qn)
		20-37	boulders, gravel (Qn)
		37-95	granite
304	22-10145	0-32	dirt, hardpan (Qn)
		32-98	light gray granite
305	22-11442	0-60	overburden with boulders (Qn)
		60-98	granite
306	22-12277	0-26	overburden (Qn)
		26-100	clay (Qgw?)
		100-125	clay and gravel (Qgw?)
		125-132	gravel (Qgw?)
			screened 132-135, yield >10 gpm
307	22-8353	0-17	hardpacked sand and gravel (Qn)
		17-31	boulders, gravel, water (Qn)
		31-223	gray granite
308	22-20098	0-30	overburden (Qn)
		30-348	granite
309	25-23333	0-20	overburden (Qn)
		20-60	sandstone (Qgw?)
		60-223	granite
310	25-14740	0-20	boulders and gravel (Qho)
		20-73	granite
311	22-21219	0-20	sand, gravel, boulders (Qn)
		20-25	boulders (Qn)
		25-30	clay (Qn or Qgw)
		30-40	sandstone (Qgw?)
		40-197	granite
312	22-15433	0-20	sand (Qn)
		20-40	gravel, sand (Qn or Qgw)
		40-61	heavy gravel (Qn or Qgw)
		61-132	clay, gravel, granite (Qgw)
		132-148	granite
313	22-1429	0-12	clay and boulders (Qn)
		12-242	hard granite
314	22-7076	0-30	overburden with gravel (Qn)
		30-71	granite
315	22-13410	0-20	overburden (Qn)
		20-170	granite
316	22-21535	0-50	overburden (Qn)
		50-133	granite
317	22-11664	0-30	overburden with boulders (Qn)
		30-122	granite
318	22-11663	0-35	overburden (Qn)
		35-98	granite
319	22-18545	0-18	gray clay (Qhu2)
		18-33	sand, gravel, water (Qhu2)
		33-223	gray granite
320	22-18920	0-55	overburden (Qn)
		55-148	granite
321	22-12061	0-30	overburden, boulders, clay, gravel (Qn)
		30-122	granite
322	22-16595	0-27	boulders, gravel, etc. (Qn)
		27-50	soft granite (Qgw)
		50-148	granite
323	22-22269	0-2	clay (Qn)
		2-10	sand (Qn)
		10-20	sandstone (Qn or Qgw)
		20-195	granite
324	22-21293	0-80	clay, gravel (Qn over Qgw)
		80-146	granite
325	42-1	0-43	clean sharp sand, gravel, clay, boulders (Qap3)
326	22-7135	0-15	sand, gravel (Qk)
		15-197	limestone
327	22-13368	0-45	clay, sand, gravel (Qap2)
		45-61	sand, gravel (Qap2)
		61-65	gravel (Qap2)
			screened 61-65, yield 150 gpm
328	23-12209	0-20	overburden (Qn)
		20-42	sand (Qn or Qgw)
		42-173	granite
329	22-9684	0-12	boulders (Qn)
		12-70	hardpan (Qn)
		70-123	granite
330	22-16735	0-26	overburden with boulders, sand, gravel (Qcr1)
		26-172	granite
331	22-12241	0-30	sand and gravel (Qcr1)
		30-123	soft and hard layer of sandstone (Qgw and gneiss)
332	22-18254	0-30	sand and gravel (Qn)
		30-198	soft red brown lime (Qgw)
333	22-18082	0-40	overburden (Qcr1 over Qn)
		40-53	sand, gravel (Qn over Qgw)
			screened 51-53, yield 20 gpm
334	22-9919	0-10	overburden (Qcr1)
		10-67	gravel (Qcr1)
			screened 60-67, yield >20 gpm
335	22-7956	0-38	yellow clay (Qn)
		38-70	brown clay (Qgw?)
		70-73	gravel (Qgw?)
		73-77	brown clay (Qgw?)
		77-145	white granite
336	22-8027	0-14	layer of white limestone (Qn?)
		14-30	gravel bed (Qn)
		30-51	brown clay (Qgw?)
		51-53	white limestone (gneiss or Qgw)
		53-54	bad seam, water (Qgw)
			screened 51-54, yield 15 gpm
337	22-7879	0-35	overburden (Qn)
		35-50	granite
338	22-12754	0-30	overburden, gravel (Qn)
		30-172	granite
339	25-14069		located just east of quadrangle boundary, see section AA'
		0-15	overburden (Qnm)
		15-60	sand, gravel (Qnm over Qso)
		60-120	sand (Qso over Qsl)
		120-140	sand, clay (Qsl)
		140-192	clay (Qsl)
		192-206	sand (Qis)
		206-207	sand, gravel, clay (Qis)
		207-210	fine sand (Qis)
		210-220	sand, gravel, clay (Qis)
		221-242	sand (Qis)
		242-262	gray clay (Qil)
		262-265	sand, gravel (Qis)

[1]Numbers of the form xx-xxxxx (for example, 22-18082) are well permit numbers issued by the N. J. Department of Environmental Protection, Bureau of Water Allocation.

Numbers of the form N xx-x-xxx (for example, N 25-1-243) are N. J. Atlas Sheet grid locations of entries in the N. J. Geological Survey permanent note collection.

The notation "NJGS files" indicates records of wells or borings on file at the N. J. Geological Survey that are not entered in the permanent note collection.

[2]All descriptions are as they appear in the original source, except for minor format, punctuation, and spelling changes. Most logs are drillers' reports; a few are reports of geologists or engineers. Inferred map units and comments by author are in parentheses. Logs identified as "abbreviated" have been condensed for brevity. Many bedrock descriptions have been abbreviated; these are not identified. For wells completed in surficial material, the screened interval in feet below land surface (if reported) and yield in gallons per minute (gpm) are provided below the geologic log. Greater-than symbol (>) indicates yield is greater than indicated value.

[3]In feet below land surface.

Table 2.--Composition of pebbles in surficial units

Site	Unit	Number of pebbles[1]	Percentage of pebbles: gneiss	gray sandstone and mudstone	carbonate rock	other[2]
1	Qnm	144	69	31		
2	Qmc	137	81	18	1	
3	Qmc	116	86	10	4	
4	Qlr1	129	70	30		
5	Qwb1	113	88	11	1	
6	Qwb1	127	79	17	2	2r
7	Qnm	123	81	19		
8	Qnm	140	72	27		1r
9	Qnm	107	93	7		
10	Qn	130	84	15	1	
11	Qcr1	144	48	42	7	3w
12	Qcr1	103	46	24	30	
13	Qap2	170	2	34	61	3w
14	Qpq9	142	70	11	19	
15	Qap3	216	8	35	55	2w
16	Qfr1	136	74	12	14	
17	Qwp2	110	91	9		
18	Qhu1	141	71	8	21	
19	Qn	59b	85	8	5	2w
20	Qn	188	80	16	4	
21	Qlr3	152	79	20	1	
22	Qlr3	131	88	11	1	
23	Qlr2	87b	90		10	
24	Qn	220	92	8	1	
25	Qn	104	96	3	1	
26	Qn	122	98			2r
27	Qn	156	96	4		
28	Qn	161	93	7		
29	Qn	172	87	12	0.5	0.5w
30	Qn	159	94	5	1	
31	Qnm	127	94	5	1	
32	Qnm	140	86	7	1	6w
33	Qnm	113	96	4		
34	Qnm	190	79	17	3	1r
35	Qnm	180	92	7	0.5	0.5w
36	Qn	182	88	10	2	
37	Qnm	155	97	3		
38	Qn	132	91	9		
39	Qho	137	90	10		
40	Qn	106	94	5		1w
41	Qn	109	92	7	1	
42	Qnm	169	88	11	1	
43	Qnm	133	75	19	6	
44	Qnm	148	88	11	1	
45	Qn	174	57	9		34p
46	Qso	119	88	11	1	
47	Qso	121	83	16	1	
48	Qnm	147	82	11	5	2r
49	Qnm	171	88	11	1	

[1]"b" indicates count is of boulders and cobbles.

[2]Abbreviations indicate: r=red and reddish purple quartzite and sandstone (chiefly Hardyston Formation), w=white and gray quartzite and quartzite-conglomerate (chiefly Shawangunk Formation), p=purple quartzite-conglomerate (Green Pond Formation).