U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

SURFICIAL GEOLOGIC MAP OF PART OF THE ALLENTOWN 30'x60' QUADRANGLE, BERKS, BUCKS, CARBON, LEHIGH, LUZERNE, MONROE, NORTHAMPTON, AND SCHUYLKILL COUNTIES, PENNSYLVANIA

Compiled by
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Prepared in cooperation with the
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1993

PRELIMINARY SURFICIAL GEOLOGIC MAP OF PART OF THE ALLENTOWN 30'X60' QUADRANGLE, BERKS, BUCKS, CARBON, LEHIGH, LUZERNE, MONROE, NORTHAMPTON, AND SCHUYLKILL COUNTIES, PENNSYLVANIA

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A large assortment of surficial materials overlie bedrock in the Allentown, Pa., 30'X60' quadrangle. Some are residual deposits, derived from the in situ weathering of the underlying bedrock; some were transported downslope over a long period of time as colluvium, talus, and boulder fields; others are the result of very rapid deposition, such as in landslides; others were deposited directly from streams (alluvium, partly in terraces and in fans); a large variety were deposited during several periods of glaciation; these include sorted and stratified sand, gravel, and clay, as well as poorly sorted till; and some deposits are the direct result of recent human activity, such as the many mine dumps that dot the area.

This map is a compilation of these unconsolidated earth materials. It was derived from published sources, including fifteen 1:24,000 maps and one 1:100,000 map (figure 1 and references cited). All the information from the source maps is shown, except that three maps (Berg, 1975; Epstein, 1990; and Ridge, 1983) contain areas of alluvium (Qa), colluvium (Qc or Qsc), and till (Qwt, Qit,or Qd) that are too small to display at this map scale of 1:100,000. Some of the source maps have extensive coverage of their surficial deposits; others show only a few deposits, concentrating mainly on depicting the underlying bedrock units. Thus, the extent of coverage of the surficial deposits on the source maps is quite variable. The information from these maps was transferred without modification, even where the mapping is suspected to be in error. New reconnaissance and detailed mapping is currently underway to revise the previous mapping. Some of the glacial deposits that previously were believed to be early Wisconsin (Altonian) in age are herein reassigned to a pre-Wisconsin (Illinoian) age on the basis of ongoing and published work by Braun (1988,1989) and Ridge and others (1990).

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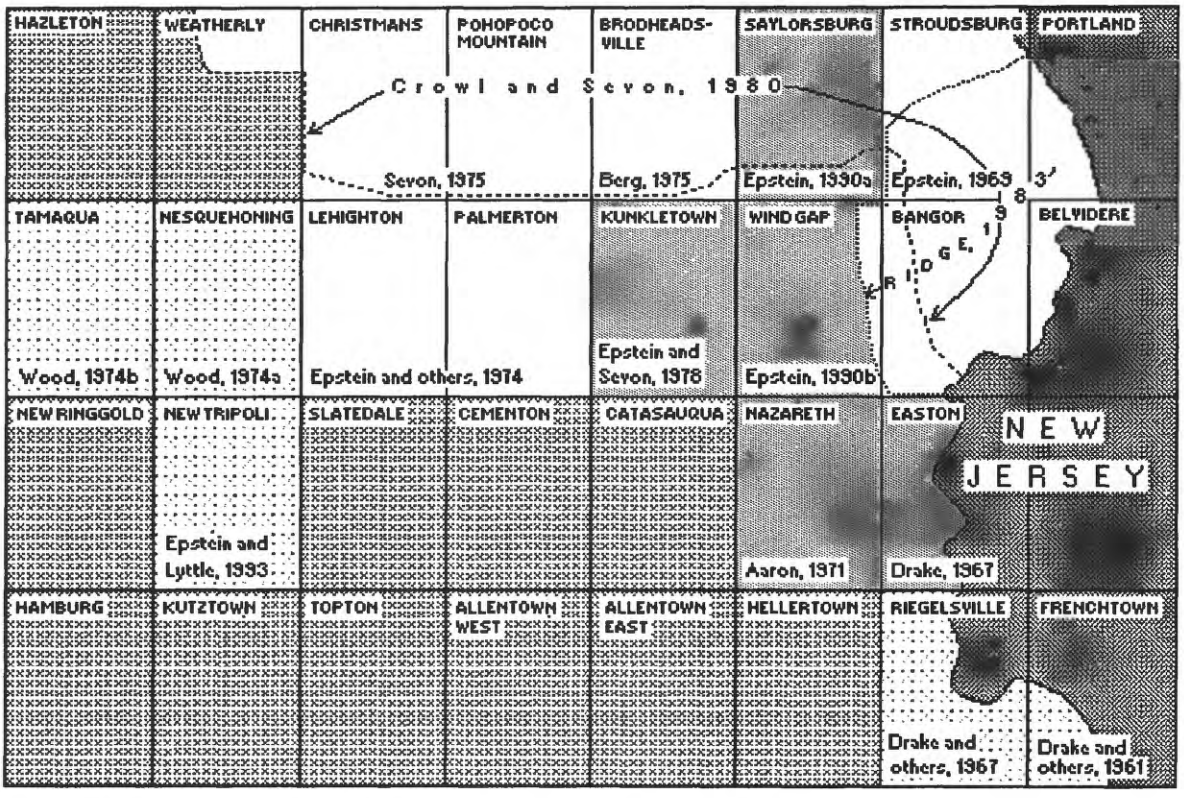
Several of the map units shown on this compilation map are a combination of a variety of units from the published maps. For example, alluvium (Qa) on this map is a mixture of alluvium from eleven sources, alluvium-Woodfordian outwash from one source, and drift and alluvium from two other sources. A complete listing of these combinations is given in *SOURCES OF COMPILATION MAP UNITS* below.

The purpose of this compilation of the surficial deposits in the Allentown 30x60-minute quadrangle is to indicate the areas of published map coverage and to judge their overall quality and consistency from a regional perspective. This effort will guide new reconnaissance and detailed mapping that is presently underway. Additionally, this regional map may be useful for a variety of land use planning purposes. For example, stratified drift might have potential as a sand and gravel resource. The infiltration capacity of these stratified and sorted sediments may be moderate to high, whereas till may have a lower infiltration capacity. This factor might be useful for consideration of potential contamination of ground water resources. The slope stability of some of the map units, such as till, may be low when wet which should be considered for many construction projects.



Maps showing bedrock and surficial deposits

Maps showing bedrock with alluvium and/or outwash

Maps showing bedrock with undifferentiated glacial drift, outwash, and alluvium

Maps showing bedrock but no surficial deposits

Figure 1. Index map showing 7.5-minute quadrangles and sources of surficial mapping in the Allentown 30'X60' quadrangle, Pennsylvania.

Explanation for figure 2, Map showing Pleistocene glacial borders as mapped by previous workers

LATE WISCONSINAN

Braun (1989); Ridge (1983, Stroudsburg and Bangor quadrangles); Crowl and Sevon (1980); Epstein (1969, Stroudsburg quadrangle); Lewis (1884)

Crowl and Sevon (1980); Berg and others, 1980, where border differs from Braun, 1989)

Ridge (1983, where border differs from Braun, 1989)

Ward (1938, where border differs from Braun, 1989)

Behre (1927, where border differs from Braun, 1989)

Lewis (1884, where border differs from Braun, 1989)

EARLY WISCONSINAN

Berg and others (1980); Crowl and Sevon (1980)

Williams (1917, "first phase of Wisconsin")

LATE ILLINOIAN

Braun (1988, 1989)

ILLINOIAN

Berg and others (1980); Gray and others (1960); Leverett (1934); Prime (1879, in Northampton County)

Gray and others (1960, where border differs from Berg and others (1980)

Leverett (1934, where border differs from Gray and others, 1960)

PRE-ILLINOIAN

Braun (1989)

Leverett (1934)

Leverett (1934, questionable pre-Illinoian)

Figure 2. Map showing Pleistocene borders as mapped by previous workers

DESCRIPTION OF MAP UNITS

d **Mine dump or other human-created fill (Holocene)**-Includes slate, limestone, and other waste in hills as much as 200 ft (60 m)

Qa **Alluvium (Holocene and Pleistocene)**-Unconsolidated and stratified silt, sand, and gravel, with some boulders and local pockets of compact clay. Generally less than 5 ft (1.5 m) thick in small valleys and as much as 40 ft thick (12 m) in major valleys

Qat **Alluvial terraces (Holocene and Pleistocene)**-Unconsolidated and stratified silt, sand, and gravel, with some boulders in benches parallel to and above the present floodplain. In places consists of a lag deposit of cobbles and boulders on a bedrock strath

Qf **Alluvial fan (Holocene and Pleistocene)**-Unconsolidated and stratified silt, sand, and gravel, with some boulders. Fan-shaped in map view; cross section is wedge-shaped in the downstream direction. Typically forms where a tributary stream enters the broad floodplain of a much larger stream

Qs **Wetland deposits (Holocene and Pleistocene)**-Organic matter and clay with disseminated silt and sand in poorly drained areas containing standing water much of the year

Qta **Talus (Holocene and Pleistocene)**-Angular to subangular rock fragments, dominantly boulder sized, with no interstitial material. Lie on steep slopes, normally at the angle of repose, and generally are derived from cliff faces above; 15 to 35 ft (5-11 m) thick

Qc **Colluvium (Holocene and Pleistocene)**-Unconsolidated, poorly sorted, and crudely stratified material derived principally from local bedrock. The size of the component particles is a function of the fragmentation characteristics of its source. Accumulates in small valleys, headwater areas of tributaries, and as gently sloping, coalescent lobes on valley sides. Thickness is variable, generally not more than a few ft, but may be more than 50 (15 m).

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Qbc **Boulder colluvium (Holocene and Pleistocene)**-Diamict with subangular to subrounded sandstone or conglomerate boulders ranging from 6 in to 3 ft (0.2 to 0.9 m) or more in diameter; may have several point contacts; boulders are concentrated at the surface of the deposit, with clayey sand to sandy silt matrix; deposit has surface relief of less than 7 ft (2 m)

Qbf **Boulder field (Holocene and Pleistocene)**-Unvegetated area of subangular to well-rounded quartz sandstone and conglomerate cobbles and boulders more than 6 ft (2 m) long with some interstitial sand at depths of 4-6 ft (1-2 m). Boulders are loose and have several point contacts with neighboring boulders. Surface relief generally less than 2 ft (0.6 m). Generally more than 6 ft (2 m) thick

x **Isolated boulder erratic (Holocene and Pleistocene)**- Boulders as much as 30 ft (9 m) long of sandstone, conglomerate, or limestone, transported by glaciers far from their bedrock source

Qg **Undifferentiated Wisconsinan glacial drift (Pleistocene, Wisconsinan)**-Gravel, sand, silt, and clay in stratified drift and unstratified till. Thickness may be more than 100 ft (30 m)

Qwic **Wisconsinan ice-contact stratified drift (Pleistocene, Wisconsinan)**-Unconsolidated, stratified sand and gravel with some boulders. Cross bedded and planar bedded with some internal slump structures; gently sloping upper surfaces with few closed depressions. Generally not more than 20 ft (6 m) thick, but some deposits exceed 100 ft (30 m)

Qwo **Wisconsinan outwash (Pleistocene, Wisconsinan)**- Unconsolidated, commonly crossbedded, stratified silt, sand, and gravel, with some boulders and sporadic lenses of dense clay. May interfinger with colluvium at edge of outwash plain. Forms surface of low relief with many closed kettle depressions near former ice front. May have relict braided drainage pattern distal from former ice front. As much as 200 ft (60 m) thick

Qwd **Wisconsinan proglacial-lake delta deposits (Pleistocene, Wisconsinan)**- Unconsolidated, stratified sand and gravel. Crossbedded, sand and gravel foreset beds overlain by planar-bedded gravel topset beds. Upper surface is gently sloping with kettle lakes and kettle holes on the ice-contact side. As much as 70 ft (20 m) thick

Ql **Wisconsinan proglacial lake deposits (Pleistocene, Wisconsinan)**-Unconsolidated, stratified clay, silt, and sand. Commonly swampy with a few closed depressions. May be more than 150 ft (45 m) thick

Qwt **Wisconsinan till (Pleistocene, Wisconsinan)**-Poorly sorted, unstratified to poorly stratified, moderately cohesive, unconsolidated clay, silt, sand, gravel, and boulders, commonly sandy; fairly smooth landform surface, commonly with strewn boulders; thickness exceeds 25 ft (7.6 m) in many places, with average about 10 ft (3.0 m)

Qwm **Wisconsinan moraine (Pleistocene, Wisconsinan)**-Constructional belt-like deposit of unsorted, unstratified, unconsolidated till or stratified ice-contact drift comprised of thick clay, silt, sand, gravel, and boulders; hummocky with many undrained depressions. As much as 60 ft (20 m) thick

Qsc **Shale-chip colluvium (Pleistocene, Wisconsinan)**-Unconsolidated, crudely layered shale-chip gravel with fragments 1/4 to several inches long and less than 1/2 in thick. Little matrix; clay coats many fragments. Thickness is generally less than 20 ft (6 m)

Qls **Landslide deposit (Pleistocene, Wisconsinan)**-Unsorted mixture of sand, silt, clay, and boulders. Sandstone boulders numerous on surface. Forms elongate mound with generally 2-5 ft (0.5-1.5 m) above adjacent surface.

Qd **Undifferentiated pre-Wisconsinan glacial and non-glacial deposits (Pleistocene, pre-Wisconsinan)**-Deeply weathered, grayish- to dark yellowish orange, light- to moderate-brown, and yellowish-red, cobbly, silty, and clayey diamict. Boulders may be more than 3 ft (1 m) long. May include stratified drift in places. Generally less than 20 ft (6 m) thick

Qo **Pre-Wisconsinan outwash (Pleistocene, pre-Wisconsinan)**-Sorted mixture of sand, pebbles, and cobbles with some silt and clay; crude stratification; reddish yellow; pebbles and cobbles rounded to well rounded with weathering rinds as much as 0.5 in (1 cm) thick on resistant rock; weaker rock weathered throughout. Smooth, sloping to relatively flat surfaces. Maximum thickness about 10 ft (3 m)

Qt **Pre-Wisconsinan glacial till and till/colluvium deposits (Pleistocene, pre-Wisconsinan)**-Poorly sorted mixture of generally very clayey silt, sand, pebbles, cobbles, and boulders. Weathered pebbles and cobbles are yellowish red to reddish yellow and have weathering rinds as much as 0.5 in (1 cm) thick. Forms relatively smooth slopes with scattered boulders on surface. Thickness variable, probably averages 5-10 ft (1-3 m) thick.

SOURCES OF COMPILATION MAP UNITS

Below is a listing of the map units from the source 1:24,000-scale maps that have been combined on this 1:100,000 compilation of the surficial geology of the Allentown quadrangle.

x **Isolated erratic boulders:** Epstein (1969), Epstein and Lyttle (1993), Epstein and Sevon (1978)

d **Mine dump or other human-created fill:** Epstein (1969, 1990a,b), Epstein and Lyttle (1993), Epstein and Sevon (1974)

Qa Alluvium of this map compilation includes:
Qal (Alluvium): Aaron (1971), Berg (1975), Crowl and Sevon (1980),Drake (1967), Drake and others (1967), Epstein (1969), Epstein (1990a,b), Epstein and Sevon (1974, 1978), Sevon (1975), Wood (1974);
Qwoa (Alluvium-Woodfordian outwash): Berg (1975)
Qd (Drift and alluvium): Drake and others (1961), Drake (1967)

Qat Alluvial terrace of this map compilation includes:
Qat (Alluvial terrace): Epstein and Lyttle (1993)

Qf Alluvial fan of this map compilation includes:
Qaf (alluvial fan deposits): Crowl and Sevon (1980), Epstein (1969)
Qf (alluvial fan deposits): Berg (1975)

Qs Wetland deposits in depressions with standing water much of the year of this map compilation includes:
Qs (swamp deposits and wetlands with standing water much of the year): Berg (1975), Drake (1967), Epstein (1969), Epstein (1990a,b)

Qta Talus of this map compilation includes:
Qta (talus): Berg (1975), Epstein (1969), Epstein and Lyttle (1993)

Qls Landslide deposits of this map compilation includes:
Qls (Landslide deposits): Epstein and others (1974), Sevon (1975)

Qc Colluvium of this map compilation includes:
Qac (Alluvium and colluvium undivided): Berg (1975)
Qalc (Alluvium and colluvium undifferentiated): Sevon (1975)
Qc (Colluvium): Berg (1975), Epstein and Lyttle (1993), Epstein and others (1974), Sevon (1975)

Qbc Boulder colluvium of this map compilation includes:
Qbc (Boulder colluvium): Sevon (1975)

Qbf Boulder field-unvegetated of this map compilation includes:
Qbf (Boulder field): Epstein and Lyttle (1993), Epstein and others (1974)

Qsc Shale-chip colluvium of this map compilation includes:
Qsc (Shale-chip colluvium): Ridge (1983)
Qsr (Shale-chip rubble): Berg (1975), Epstein and others (1974)

Qg Undifferentiated Wisconsinan deposits of this map compilation includes:
Qg (Undifferentiated Wisconsinan deposits): Epstein (1990a,b)

Qwt Wisconsinan till of this map compilation includes:
Qwt (Woodfordian till): Crowl and Sevon (1980), Sevon (1975)
Qwgm (Ground moraine): Berg (1975)
Qgm (Ground moraine): Epstein (1969)
Qogm (Olean ground moraine and local colluvium): Crowl and Sevon (1980)

Qwm Wisconsinan moraine- hummocky surface- of this map compilation includes:
Qwem (Woodfordian end moraine): Berg (1975)
Qem (End moraine): Epstein (1969)
Qtm (Terminal moraine of Wisconsinan ice sheet): Epstein (1969)
Qode (Olean distinct end moraine): Crowl and Sevon (1980)

Qwo Wisconsinan outwash of this map compilation includes:
Qoo (Olean outwash): Crowl and Sevon (1980), Epstein and others (1974)
Qwop (Woodfordian proximal outwash): Berg (1975)
Qwo (Wisconsinan outwash): Drake (1967), Epstein and others (1974), Epstein and Sevon (1978)

Qwd Wisconsinan proglacial lake delta of this map includes:
Qd (Delta deposits): Epstein (1969)
Qwkd (Woodfordian kame delta): Berg (1975)

Qwic Wisconsinan ice-contact stratified drift of this map compilation includes:
Qwic (Woodfordian ice-contact stratified drift): Berg (1975)
Qwe (Woodfordian esker): Berg (1975)
Qoie, Qok, Qokt, Qokm, Qwkd (Olean ice-contact stratified drift): Crowl and Sevon (1980)
Qk (Kame): Epstein (1969)
Qkt (Kame terrace): Epstein (1969)
Qe (Esker): Epstein (1969)

Ql Wisconsinan proglacial lake deposits of this map compilation includes:
Ql (Glacial lake bottom deposits): Epstein (1969)
Qwol (Woodfordian distal outwash and lacustrine deposits): Berg (1975)

Qd Undifferentiated Pre):Wisconsinan glacial and non):glacial deposits of this map compilation includes:
Qd (Undifferentiated Pre-Wisconsinan glacial deposits): Aaron (1971), Drake and others (1961, 1967)
Qid (Pre-Wisconsinan glacial deposits undifferentiated): Epstein (1990a,b)
Qod (Older drift): Drake and others (1961, 1967)

Qt Pre-Wisconsinan glacial till and non-glacial deposits of this map compilation includes:
Qt (Pre-Wisconsinan till): Epstein and Lyttle (1993)
Qwt (Warrensville till and colluvium): Crowl and Sevon (1980)
Qat (Altonian till): Berg (1975), Sevon (1975)
Qatc (Altonian till and colluvium, undivided): Berg (1975), Sevon (1975)
Qit (Illinoian till): Berg (1975), Epstein (1990a,b),74), Epstein and Sevon (1978), Sevon (1975)
Qitc (Colluvium and Illinoian till undivided): Berg (1975)
Qod (Older drift): Epstein (1969)
Qpit (Pre-Illinoian till): Epstein and Lyttle (1993)

Qo Pre-Wisconsinan outwash of this map compilation includes:
Qoo (Pre-Illinoian outwash): Epstein and Lyttle (1993)
Qio (Illinoian outwash): Berg (1975), Epstein and others (1974), Epstein and Sevon (1978), Sevon (1975)
Qwk (Warrensville kame): Crowl and Sevon (1980)
Qpi (Pre-Illinoian outwash): Epstein and Lyttle (1993)
Qo (Glacial outwash): Wood (1974a)

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