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Scientific Investigations Report 2012-5282
Plate 1
Heisig, P. M., 2012,
Hydrogeology of the Susquehanna valley-fill aquifer system and adjacent areas in eastern Broome and southeastern Chenango Counties, New York

75°50' 75°45' 75°40' 75°35' 75°30' 75°25'

42°20' 42°15' 42°10' 42°5' 42°0'

EXPLANATION

HOLOCENE

al — ALLUVIUM – Postglacial river and stream floodplain deposits consisting predominantly of stratified silt and clean to silty sand, commonly with some gravel at the base of the deposit. Thickness as much as 15 to 25 feet (ft) in the Susquehanna River valley and large tributary valleys. Typically underlain by stratified glacial deposits in main valleys and by till in narrow upland valleys.

alf1, alf2 — ALLUVIAL FAN – Fan-shaped accumulations of stratified silty sand and gravel, deposited by tributary streams where they enter the Susquehanna River valley and large tributary valleys. The fans typically are underlain by outwash or ice-contact sand and gravel derived, in part, from the tributary drainage area associated with the alluvial fan. Large alluvial fan deposits commonly have two levels: an early postglacial fan (alf 1) deposited over glacial deposits and graded to a former high-altitude floodplain and a lower, more recent alluvial fan (alf 2) graded to the current floodplain. Channels at the head of alf 2 fans typically are incised 25 to 30 ft into the adjacent alf 1 fan. Maximum thickness of alf 1 fans may approach 40 ft. Maximum thickness of alf 2 fans are likely less than 20 ft.
Alluvial fan deposits have relatively high permeability, but are relatively thin and largely unsaturated; however, fan deposits are an important conduit for recharge to underlying glacial deposits. Infiltration of water from precipitation and from tributary streams that lose flow as they traverse fan deposits (Randall, 1978) are important sources of recharge to underlying glacial deposits (outwash or ice-contact) that constitute the stratified-drift aquifer in the Susquehanna River valley. Most municipal wells tap the aquifer beneath alluvial fan deposits.

pm — PEAT AND MUCK – Postglacial organic deposits of generally low permeability. Occupy poorly drained areas in the valleys and the uplands.

w — OPEN WATER – Areas of open water such as rivers, lakes, large ponds, and reservoirs.

PLEISTOCENE

osg, osg(H), osg(L) — OUTWASH SAND AND GRAVEL – Stratified, well-sorted sand and gravel deposited by glacial meltwater streams as outwash terraces, topset beds of deltas near the receding ice front, and as valley-train outwash (originally spanning the width of the valley) away from the ice front. Outwash in the Susquehanna River valley is subdivided into two general categories based on height above present river level and thickness of the deposits. High outwash deposits, designated as osg (H), have upper surfaces greater than or equal to 30 ft above river level and are relatively thick deposits (20 to 70 ft) unless reworked and eroded. High outwash deposited close to the ice margin is pitted with kettle holes. Kettle holes may contain lakes or wetlands with bottom sediments that are typically fine grained with low permeability. Low outwash, designated as osg (L), is defined by upper surfaces less than 30 ft above river level and thicknesses of approximately 5 to 15 ft. Low outwash deposits represent the latest (or most recent) Pleistocene terraces (T2 terraces; defined by a lack of vertical accretion deposits; p. 331, Scully and Arnold (1981)) or outwash infill of areas where stagnant ice blocks eventually melted out (Fleisher, 1986a, b).
Outwash sand and gravel deposits have very high permeability, but limited aquifer potential because of limited saturated thicknesses. No municipal wells tap these deposits. The most favorable aquifer potential is in the high outwash deposits with large areal extent and sufficient saturated thickness. Saturated thicknesses of high outwash deposits are largely undocumented because most domestic wells completed in these settings are completed in bedrock. Low outwash deposits (osg (L)) have insufficient saturated thickness to be substantial aquifer units.

KAME DEPOSITS (ICE–CONTACT DEPOSITS) – stratified sand, gravel, and silt deposited by meltwater in a variety of environments in close proximity to glacial ice. Till may be intermixed with some deposits because of localized slumping or mass movement from melting ice. Highly variable sorting and chaotic bedding from melting ice is paralleled by highly variable permeability. Largely unsaturated in tributary valleys or at the highest altitude occurrences of such deposits on the walls of the Susquehanna River valley.

ksg — KAME SAND AND GRAVEL – Ice-contact deposits of poor- to well-sorted sand and gravel that was deposited beneath, within, or on top of melting glacial ice. Includes kame terraces (along valley walls) in valley segments where active ice retreat was steady; eskers and hummocky terrain in valley areas of ice stagnation (ice-marginal positions). Extreme variability in sorting, grain size, and thickness of individual beds. Moderate to high permeability, high permeability especially in coarse, well-sorted zones. Deposits situated at low altitude (below the valley floor and with favorable characteristics (high permeability) form localized unconfined or confined aquifers.

kd — KAME DELTA – Ice-contact deposits of sorted sand and gravel that were deposited as prograding deltas into proglacial lake(s) that occupied the Susquehanna River valley and the Cornell Brook valley. Delta deposits include fine-grained bottomset beds (lacustrine sand and silt) over which foreset beds (sand and fine gravel) and topset beds (fluvial coarse sand and gravel) prograde. Generally well sorted foreset and topset beds are suitable aquifer material, but deposits are generally above the present-day floodplain and thus may have limited saturated thickness.

ls — LACUSTRINE SAND – Glaciolacustrine deposits of well-sorted sand that were deposited into proglacial lakes in closer proximity to sources of sediment or a higher energy environment than the glaciolacustrine silt and clay deposits. May fill valley depressions where stagnant ice blocks melted. Limited to small areas in the north. Subsurface distribution of lacustrine sand based on well-log descriptions by local well drillers.

SUBSURFACE EXTENT OF LACUSTRINE SILT AND CLAY – Glaciolacustrine deposits of thinly to massively bedded silt, fine to very fine sand, and some clay. Deposited as lake-bottom sediments (bottomset beds) in proglacial lakes that formed as result of the temporary dams created by downvalley ice-marginal deposits such as high-outwash valley trains and kame moraine and kame delta deposits. Thicknesses can reach as much as 275 ft. These deposits have low permeability and form the principal confining unit in the Susquehanna River valley aquifer system. Local lacustrine terraces (Scully and Arnold, 1981) and lacustrine silt and clay exposures are limited in area extent and are not shown on this map. Subsurface lacustrine deposits are also depicted in several of the geologic sections.

SUBSURFACE EXTENT OF LACUSTRINE (?) SAND – "Sand" units denoted in well logs that indicate glaciolacustrine origin in relation to local well logs. If coarse grained, kame delta or kame sand and gravel origin is possible.

t — TILL –Thick (greater than or equal to 30 ft), unsorted, unstratified mixture of clay, silt, sand, gravel, and boulders deposited beneath the ice as lodgment till during a glacial advance or at the edge of the ice sheet by melting ice as ablation till during a pause, or retreat, of the ice front. Thickness 20 to 250 ft. Very low permeability, but may yield adequate amounts of water for domestic use to large-diameter dug wells where sufficiently saturated or where gravelly zones of higher permeability exist. Found mostly in uplands and typically absent in valley floors in Susquehanna River valley.

t/r — THIN TILL OVER BEDROCK – A thin, discontinuous veneer of till, 0 to 30 ft thick, over bedrock. LiDAR imagery in plate 1 shows "stepped" pattern of nearly flat-lying sedimentary rock units in areas with little or no till cover.

t/sg — TILL OVER SAND AND GRAVEL – Till overlying sand and gravel of unknown origin and age.

DEAD-ICE SINK – presumed location of former ice block, covered or partially covered by sediment, which melted out following deglaciation. Locations inferred from anomalously wide floodplain areas partly bordered by terraces. Gradual infilling during post-glacial time results in variable sediment types and permeability. Infilling deposits may consist of outwash sand and gravel, and glaciolacustrine or floodplain silt, fine sand, and clay. Denoted by outline only.

SURFICIAL GEOLOGIC CONTACT – Approximate location of contact between surficial-geologic map units.

A A' TRACE OF GEOLOGIC SECTION – Geologic sections are included as separate illustrations, but will be linked to the map (clickable to bring up pdf file) in the final product.

AQUIFER BOUNDARY – Indicates contact between the stratified drift in the Susquehanna River valley and either bedrock or till valley walls, or hills of bedrock and till within the valleys, and therefore indicates the approximate areal extent of the valley-fill aquifer system.

ESKER – Symbol indicates the axis of esker landform, which is indicative of a stagnant glacial-ice environment.

7 8 ICE-MARGINAL POSITION – Lines delineate approximate extent of active ice margins within the Susquehanna River valley and Cornell Brook valley. Number identifies ice margin. Margins are upvalley from ice-stagnation landforms, kame deltas, and outwash. Margins vary in the form and amount of associated deposits, and these differences reflect the duration of the ice margin at a given location; Braun (2006) has estimated pauses in ice retreat on the order of years to decades. Long lived, well-developed marginal positions are denoted with a solid line and short lived margins are denoted with a dashed line.

ARTIFICIAL CLOSURE – End of mapped extent.

Susquehanna River drainage basin boundary

Upland watershed areas that contribute recharge to community water supplies

1500 ELEVATION – LiDAR derived elevation contours labelled in feet

PASSIVE SEISMIC SURVEY SITE

BM 318 62 WELL – completed in glacial deposits in the Susquehanna River valley or adjacent tributary valleys; mostly domestic. Label is well identification number and thickness of saturated sand and gravel, in feet.

BM 318 20 WELL – completed in bedrock; mostly domestic. Label is well identification number and thickness of saturated sand and gravel, in feet, as applicable.

BM 743 TEST HOLE – test hole or test boring used to define subsurface characteristics for engineering construction properties; no casing installed.

Spring

Village

Note: All boundaries are inferred.

1 0.5 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS

NEW YORK
Study Area

Elevation base from Federal Emergency Management Agency (FEMA), Hazard Mitigation Technical Assistance Program for Disaster Declaration DR-1650, 2008, New York State LiDAR Survey for the Delaware and Susquehanna River Basins, prepared for FEMA by Terrapoint USA Inc., Houston, Texas.
Digital Raster Graphic (DRG) base from U.S. geological survey, 1:24,000
Universal Transverse Mercator projection, zone 18
North American Datum 1983

Plate 1. Hydrogeology of the Susquehanna River valley-fill aquifer system and adjacent areas in eastern Broome and southeastern Chenango Counties, New York

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http://ny.water.usgs.gov