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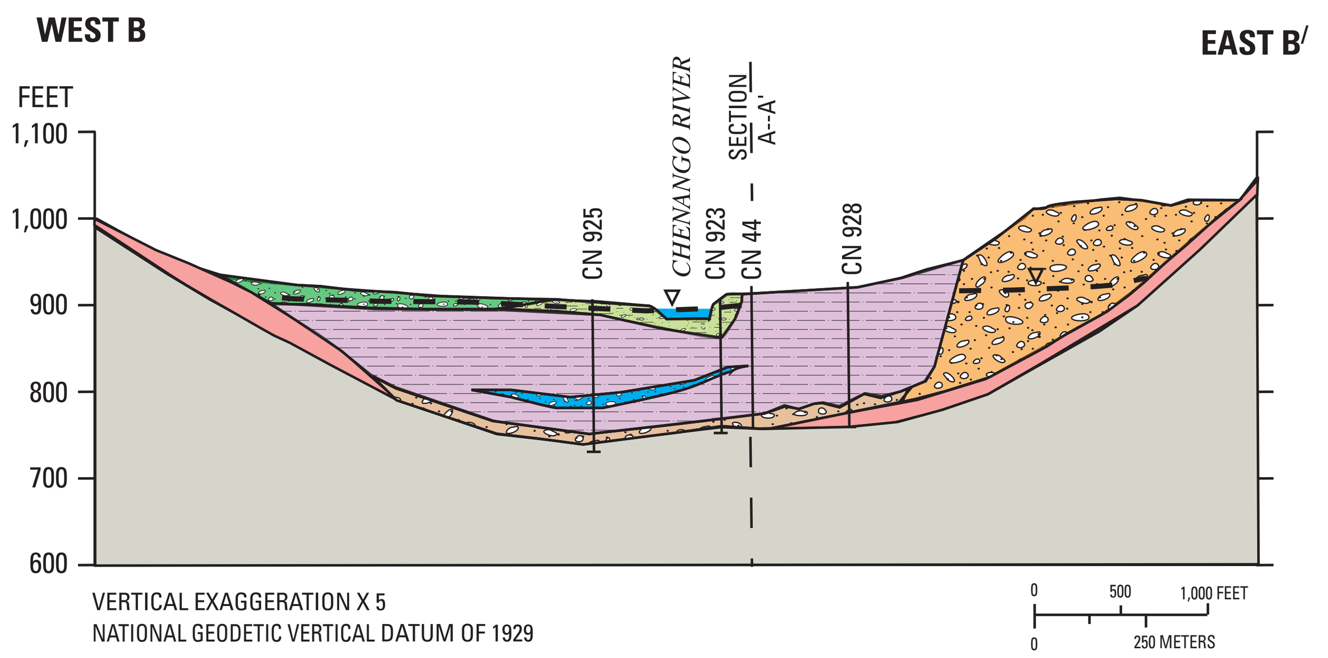
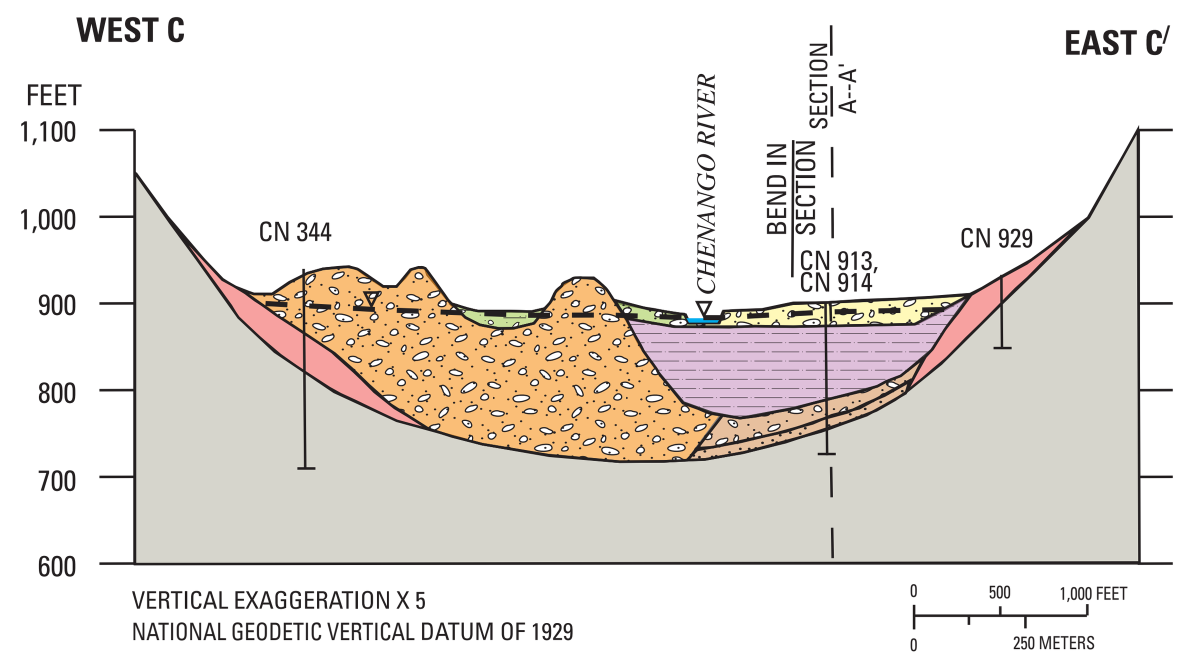
In cooperation with
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Hetcher-Aguila, K.K., and Miller, T.S., 2005,
Geohydrology of the Valley-Fill Aquifers Between the Village of Greene,
Chenango County, and Chenango Valley State Park, Broome County, New York





EXPLANATION

HOLOCENE

- ALLUVIAL-FAN DEPOSITS- stratified sand, silt, and gravel deposited by postglacial streams
- ALLUVIAL FLOODPLAIN AND CHANNEL DEPOSITS- stratified sand and gravel with silt deposited by postglacial streams

PLEISTOCENE

- OUTWASH- well-sorted sand and gravel deposited by glacial meltwater streams
- LACUSTRINE DEPOSITS - stratified fine sand, silt, and clay deposited in a proglacial lake
- ENGLACIAL AND SUPRAGLACIAL ICE-CONTACT DEPOSITS- poorly to well sorted silt, sand, and gravel that were deposited by meltwaters flowing within or on top of the glacier. Includes kames, kame moraines, and kame terraces
- ICE-CONTACT DEPOSITS - predominantly fine to coarse sand
- SUBGLACIAL ICE-CONTACT DEPOSITS - poorly to well sorted silt, sand, and gravel that were deposited by meltwaters at the base of the glacier. Includes eskers, and subaqueous outwash fans
- SUBGLACIAL ICE-CONTACT DEPOSITS - predominantly fine to medium sand
- UNDIFFERENTIATED SAND AND GRAVEL - origin unknown
- TILL - poorly sorted clay, silt, sand, cobbles, and boulders deposited directly by glacial ice

Unconformity

DEVONIAN

- BEDROCK - shale and siltstone

BM 735 WELL AND WELL NUMBER- number assigned by U.S. Geological Survey

GENERALIZED WATER TABLE IN THE UNCONFINED AQUIFER

Lines of geohydrologic sections are shown in plates 2, 3, 6, and 7

GENERALIZED GEOHYDROLOGIC SECTIONS

Surficial geology maps and geologic logs from wells and test holes were used to construct three geohydrologic sections showing aquifer thickness, stratigraphic relations among valley-fill deposits, and the water table in the unconfined aquifer. The lines of sections are shown on plates 2, 3, 6, and 7.

Section A-A' (Chenango Valley State Park to Village of Greene)

Section A-A' represents mostly one long, generalized "morphological sequence," and possibly short segments of other sequences. Koteff and Pessl (1981) define a morphological sequence as a body of stratified drift deposited by meltwater, layer by layer, at and beyond the margin of the glacier and graded to a particular base level (for fluvial environments) or spillway (for lake environments). A spillway may be a bedrock ledge on the valley wall or saddle at a divide, or a channel incised on a moraine or delta that plugs a valley. The spillway for most of the sediments shown in section A-A' was at approximately 1,055 feet elevation along the east side of the kame moraine at Chenango Valley State Park. The moraine formed a plug in this part of the valley, and a lake formed in the valley to the north of the plug as the ice front retreated northward from the moraine. The lake expanded northward, following the retreating ice front, as far as the next major stillstand, which is marked by a kame delta across the Chenango River valley and the northern end of a morphological sequence near Warn Lake, about 1.5 miles north of the Village of Brisben (Hetcher and others, 2003) and approximately 6 miles northeast of the Village of Greene (see plate 1). The southern end of section A-A' reflects a lower base level of about 955 ft that affected the area in the southern part of Chenango Valley State Park.

A subglacial meltwater-flow system functioned throughout deglaciation of the Chenango Valley. It consisted of several ice tunnels through which large amounts of sand and gravel were transported and deposited. Meltwater flowing through the subglacial tunnel system probably discharged at the base of the ice into the proglacial lake, where it deposited fans of coarse-grained deposits (sand and gravel). Finer grained lake-bottom deposits (fine sand, silt, and clay) settled on the lake bottom farther from the ice margin. The eventual melting of ice surrounding the meltwater tunnels left sinuous, possibly discontinuous, deposits of esker sand and gravel on the bedrock, mostly in the central and deepest part of the valley. The eskers probably connect to the scattered subaquatic fans at the bottom of the valley floor.

The lake remained after the ice front retreated from the study area; therefore, continuous settling of fine-grained particles from suspension (mostly silt and clay) eventually resulted in the accumulation of lake-bottom sediment as much as 180 feet thick. The period of lacustrine deposition ended when the lake filled with sediment and(or) the lake outlet was lowered by erosion, causing the lake to drain. The valley has undergone fluvial deposition and reworking of valley-fill deposits since the lake drained. Glacial meltwater postglacial streams deposited 10 to 40 feet of sand, gravel, and silt over the valley floor.

The well data indicate that the largest and most extensive geohydrologic deposit in this reach of the Chenango River valley is a lacustrine unit, consisting of mostly fine sand, silt, and clay. The unit extends north from the kame deposits at the southern part of Chenango Valley State Park to the Village of Greene (section A-A'), and is about 180 feet thick in the central and deepest part of the valley. The lacustrine unit forms a confining unit over the sand and gravel deposits (subglacial meltwater deposits) that lie on top of bedrock in most places. The lacustrine unit rarely crops out at land surface because glacial meltwater streams deposited outwash and alluvium on top of it.

Outwash and alluvial deposits overlie the lacustrine unit in most places and overlie kame deposits locally (such as at Chenango Valley State Park) where the Chenango River cuts through the kame deposits. Outwash consists of well-sorted sand and gravel. Alluvial sediments are comprised of channel, overbank flood, and fan deposits of sand, gravel and silt. The outwash and alluvial deposits form a thin unconfined aquifer in most places but few wells are finished in the unit because it is thinly saturated.

Subglacial meltwater deposits (consisting mostly of sand and gravel) overlie bedrock and underlie the lacustrine confining unit from the Village of Greene to the kame deposits at Chenango Valley State Park. This deposit forms a confined aquifer in much of the study area but it is uncertain if it is continuous and hydraulically connected. Most homes and businesses have wells finished in this unit. The confined aquifer is highly variable in thickness, extent, and degree of sediment sorting, and typically ranges from 10 to 30 feet thick. In some places, it may be more than 40 feet thick but is absent in other areas, such as just south of the Village of Greene (section A-A').

Kame deposits (consisting mostly of sand and gravel) are in some places along the sides of the valley, and possibly extend and connect to the buried subglacial meltwater deposits in the central part of the valley. Kames also are present as hummocky complexes that may entirely plug or partially plug the valley (pl. 3 and section A-A'). The kame deposits at Chenango Valley State Park in the southern part of the study area probably are more than 200 feet thick. In the state park, the upper part of the unit consists of sand and gravel, and the several wells finished in deep zones of the unit indicate the presence of coarse-grained sediments. However, there is insufficient data in the deep zones to ascertain whether these coarse-grained sediments are everywhere, or only in discontinuous lenses. Another, but much smaller complex of kame deposits than in the state park is just north of the Village of Greene (plate 3).

Section B-B' (near the Village of Greene)

Most of the subsurface data in this area are from test drilling done for the Village of Greene. The well data and surficial geology information indicate that coarse-grained deposits (kame deposits) are present in the northeastern and eastern side of the valley with little or no coarse-grained deposits in the western side of the valley. The production wells for the Village of Greene tap the confined aquifer in the middle of the valley. The confined aquifer is 10 to 30 feet thick in the central and eastern parts of the valley and may be less than 10 feet thick or absent in the western side of the valley. A lacustrine unit, as much as 160 feet thick, and consisting of very fine sand, silt, and clay, overlies the confined aquifer. There are few alluvial deposits in this transect of the valley. Data from the eastern side of the valley were insufficient to indicate the degree of hydraulic connection between the kame-terrace deposits along the east valley wall and the confined aquifer in the central part of the valley.

Section C-C' (north of Chenango Valley State Park)

Most of the subsurface data in this area are from logs of two U.S. Geological Survey test wells in the center of the valley, logs of domestic wells along the western and eastern edges of the valley, and extrapolated from the surficial geology. Coarse-grained deposits (kame deposits), possibly more than 100 feet thick, are in the western side of the valley, and confined coarse-grained deposits (subglacial meltwater deposits) 20 to 30 feet thick are at depth in the central part of the valley. A lacustrine unit that is as much as 100 feet thick consisting of very fine sand, silt, and clay overlies the confined aquifer. The outwash and alluvial deposits in this transect of the valley are 20 to 25 feet thick and form a minor unconfined aquifer that may supply sufficient water for homeowners.

REFERENCES CITED

Hetcher, K.K., Miller, T.S., Garry, J.D., and Reynolds, R.J., 2003, Geohydrology of the valley-fill aquifer in the Norwich-Oxford-Brisben area, Chenango County, New York: U.S. Geological Survey Open-File Report 03-242, 7 plates.

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GENERALIZED GEOHYDROLOGIC SECTIONS BETWEEN VILLAGE OF GREENE AND CHENANGO VALLEY STATE PARK, NEW YORK

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2005

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