U.S. DEPARTMENT OF THE INTERIOR
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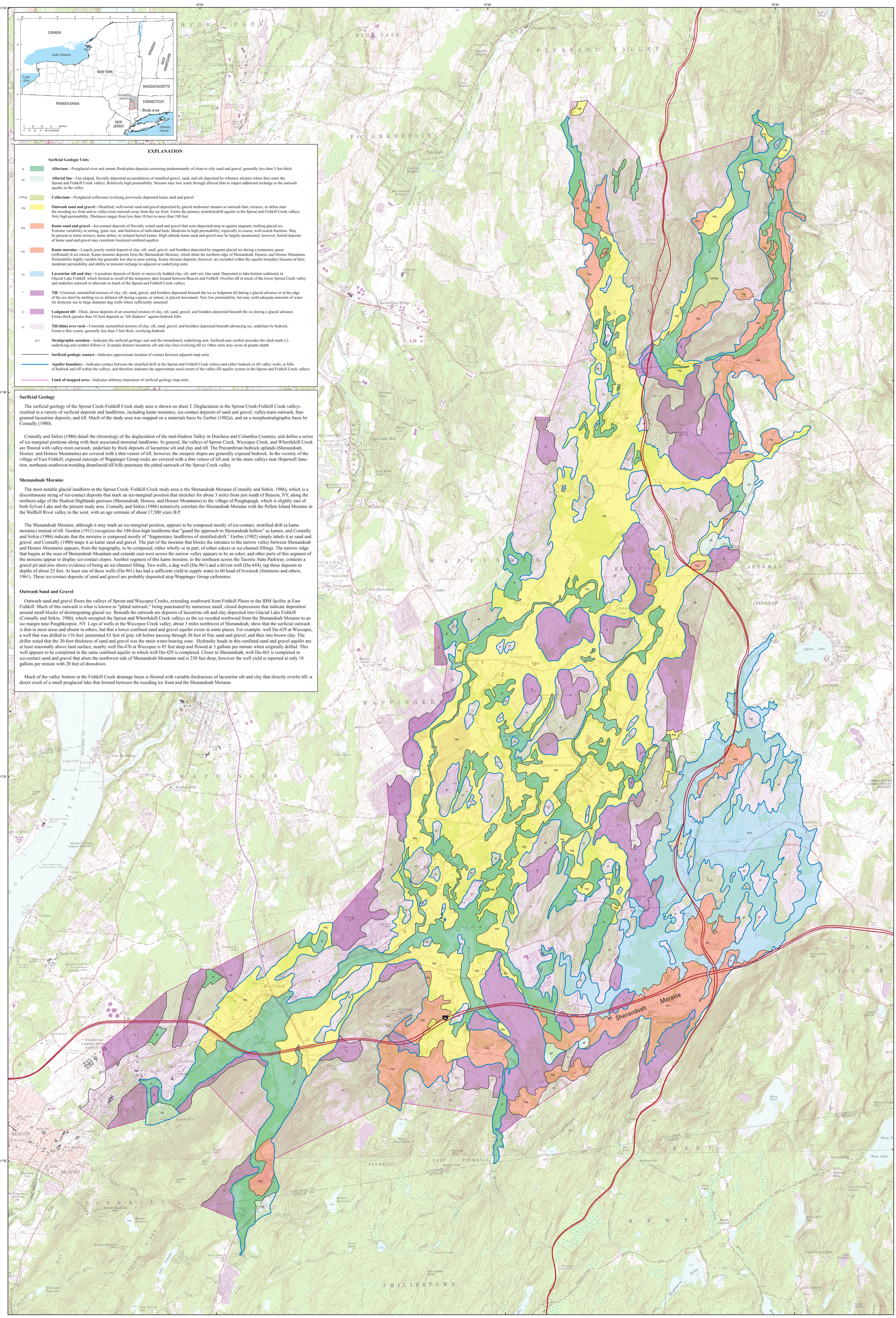
SCIENTIFIC INVESTIGATIONS MAP 3136
Surficial geology - SHEET 2 of 4
Reynolds, R.J., and Calef, F.J., III., 2010,
Hydrogeologic data update for the stratified-drift aquifer in the Sprout and Fishkill Creek valleys, Dutchess County, New York



EXPLANATION

Surficial Geologic Units

al — **Alluvium**—Postglacial river and stream flood-plain deposits consisting predominantly of clean to silty sand and gravel, generally less than 5 feet thick

alf — **Alluvial fan**—Fan-shaped, fluvially deposited accumulations of stratified gravel, sand, and silt deposited by tributary streams where they enter the Sprout and Fishkill Creek valleys. Relatively high permeability. Streams may lose water through alluvial fans to impart additional recharge to the outwash aquifer in the valley

col/ksg — **Colluvium**—Postglacial colluvium overlying previously deposited kame sand and gravel

osg — **Outwash sand and gravel**—Stratified, well-sorted sand and gravel deposited by glacial meltwater streams as outwash fans, terraces, or deltas near the receding ice front and as valley-train outwash away from the ice front. Forms the primary stratified-drift aquifer in the Sprout and Fishkill Creek valleys. Very high permeability. Thickness ranges from less than 10 feet to more than 100 feet

ksg — **Kame sand and gravel**—Ice-contact deposits of fluvially sorted sand and gravel that were deposited atop or against stagnant, melting glacial ice. Extreme variability in sorting, grain size, and thickness of individual beds. Moderate to high permeability, especially in coarse, well-sorted fractions. May be present as kame terraces, kame deltas, or isolated buried kames. High-altitude kame sand and gravel may be largely unsaturated; however, buried deposits of kame sand and gravel may constitute localized confined aquifers

km — **Kame moraine**—Largely poorly sorted deposit of clay, silt, sand, gravel, and boulders deposited by stagnant glacial ice during a temporary pause (stillstand) in ice retreat. Kame moraine deposits form the Shenandoah Moraine, which abuts the northern edge of Shenandoah, Honess, and Hosner Mountains. Permeability highly variable but generally low due to poor sorting. Kame moraine deposits, however, are included within the aquifer boundary because of their moderate permeability and ability to transmit recharge to adjacent or underlying units

lsc — **Lacustrine silt and clay**—Lacustrine deposits of thinly to massively bedded clay, silt, and very fine sand. Deposited as lake-bottom sediments in Glacial Lake Fishkill, which formed as result of the temporary dam located between Beacon and Fishkill. Overlies till in much of the lower Sprout Creek valley and underlies outwash or alluvium in much of the Sprout and Fishkill Creek valleys

t — **Till** –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, in glacial movement. Very low permeability, but may yield adequate amounts of water for domestic use to large-diameter dug wells where sufficiently saturated

tl — **Lodgment till**—Thick, dense deposits of an unsorted mixture of clay, silt, sand, gravel, and boulders deposited beneath the ice during a glacial advance. Forms thick (greater than 10 feet) deposits as "till shadows" against bedrock hills

t/r — **Till (thin) over rock**—Unsorted, unstratified mixture of clay, silt, sand, gravel, and boulders deposited beneath advancing ice, underlain by bedrock. Forms a thin veneer, generally less than 5 feet thick, overlying bedrock

lsc/t — **Stratigraphic notation**—Indicates the surficial geologic unit and the immediately underlying unit. Surficial-unit symbol precedes the slash mark (/); underlying-unit symbol follows it. Example denotes lacustrine silt and clay (lsc) overlying till (t). Other units may occur at greater depth

Surficial geologic contact—Indicates approximate location of contact between adjacent map units

Aquifer boundary—Indicates contact between the stratified drift in the Sprout and Fishkill Creek valleys 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 in the Sprout and Fishkill Creek valleys

Limit of mapped area—Indicates arbitrary truncation of surficial geology map units

Surficial Geology

The surficial geology of the Sprout Creek-Fishkill Creek study area is shown on sheet 2. Deglaciation in the Sprout Creek-Fishkill Creek valleys resulted in a variety of surficial deposits and landforms, including kame moraines, ice-contact deposits of sand and gravel, valley-train outwash, fine-grained lacustrine deposits, and till. Much of the study area was mapped on a materials basis by Gerber (1982a), and on a morphostratigraphic basis by Connally (1980).

Connally and Sirkin (1986) detail the chronology of the deglaciation of the mid-Hudson Valley in Dutchess and Columbia Counties, and define a series of ice-marginal positions along with their associated morainal landforms. In general, the valleys of Sprout Creek, Wiccopee Creek, and Whortlekill Creek are floored with valley-train outwash, underlain by thick deposits of lacustrine silt and clay and till. The Precambrian bedrock uplands (Shenandoah, Hosner, and Honess Mountains) are covered with a thin veneer of till; however, the steepest slopes are generally exposed bedrock. In the vicinity of the village of East Fishkill, exposed outcrops of Wappinger Group rocks are covered with a thin veneer of till and, in the main valleys near Hopewell Junction, northeast-southwest-trending drumlinoid till hills punctuate the pitted outwash of the Sprout Creek valley.

Shenandoah Moraine

The most notable glacial landform in the Sprout Creek–Fishkill Creek study area is the Shenandoah Moraine (Connally and Sirkin, 1986), which is a discontinuous string of ice-contact deposits that mark an ice-marginal position that stretches for about 3 miles from just south of Beacon, NY, along the northern edge of the Hudson Highlands gneisses (Shenandoah, Honess, and Hosner Mountains) to the village of Poughquag, which is slightly east of both Sylvan Lake and the present study area. Connally and Sirkin (1986) tentatively correlate the Shenandoah Moraine with the Pellets Island Moraine in the Wallkill River valley to the west, with an age estimate of about 17,500 years B.P.

The Shenandoah Moraine, although it may mark an ice-marginal position, appears to be composed mostly of ice-contact, stratified drift (a kame moraine) instead of till. Gordon (1911) recognizes the 180-foot-high landforms that "guard the approach to Shenandoah hollow" as kames, and Connally and Sirkin (1986) indicate that the moraine is composed mostly of "fragmentary landforms of stratified-drift." Gerber (1982) simply labels it as sand and gravel, and Connally (1980) maps it as kame sand and gravel. The part of the moraine that blocks the entrance to the narrow valley between Shenandoah and Hosner Mountains appears, from the topography, to be composed, either wholly or in part, of either eskers or ice-channel fillings. The narrow ridge that begins at the nose of Shenandoah Mountain and extends east-west across the narrow valley appears to be an esker, and other parts of this segment of the moraine appear to display ice-contact slopes. Another segment of this kame moraine, to the northeast across the Taconic State Parkway, contains a gravel pit and also shows evidence of being an ice-channel filling. Two wells, a dug well (Du-961) and a driven well (Du-444), tap these deposits to depths of about 25 feet. At least one of these wells (Du-961) has had a sufficient yield to supply water to 60 head of livestock (Simmons and others, 1961). These ice-contact deposits of sand and gravel are probably deposited atop Wappinger Group carbonates.

Outwash Sand and Gravel

Outwash sand and gravel floors the valleys of Sprout and Wiccopee Creeks, extending southward from Fishkill Plains to the IBM facility at East Fishkill. Much of this outwash is what is known as "pitted outwash," being punctuated by numerous small, closed depressions that indicate deposition around small blocks of disintegrating glacial ice. Beneath the outwash are deposits of lacustrine silt and clay deposited into Glacial Lake Fishkill (Connally and Sirkin, 1986), which occupied the Sprout and Whortlekill Creek valleys as the ice receded northward from the Shenandoah Moraine to an ice margin near Poughkeepsie, NY. Logs of wells in the Wiccopee Creek valley, about 3 miles northwest of Shenandoah, show that the surficial outwash is thin in most areas and absent in others, but that a lower confined sand and gravel aquifer exists in some places. For example. well Du-429 at Wiccopee, a well that was drilled to 116 feet, penetrated 63 feet of gray silt before passing through 30 feet of fine sand and gravel, and then into brown clay. The driller noted that the 30-foot thickness of sand and gravel was the main water-bearing zone. Hydraulic heads in this confined sand and gravel aquifer are at least seasonally above land surface; nearby well Du-476 at Wiccopee is 85 feet deep and flowed at 3 gallons per minute when originally drilled. This well appears to be completed in the same confined aquifer in which well Du-429 is completed. Closer to Shenandoah, well Du-465 is completed in ice-contact sand and gravel that abuts the northwest side of Shenandoah Mountain and is 230 feet deep; however the well yield is reported at only 18 gallons per minute with 20 feet of drawdown.

Much of the valley bottom in the Fishkill Creek drainage basin is floored with variable thicknesses of lacustrine silt and clay that directly overlie till--a direct result of a small proglacial lake that formed between the receding ice front and the Shenandoah Moraine.

Base from U.S. Geological Survey digital raster graphics, 1:24,000
Universal Transverse Mercator projection, North American Datum 1983, Zone 18N

Hydrology modified from Moore and others, 1982

0 0.25 0.5 0.75 1 MILE
0 0.5 1 KILOMETER

SCALE 1:24,000

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by
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2010