U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

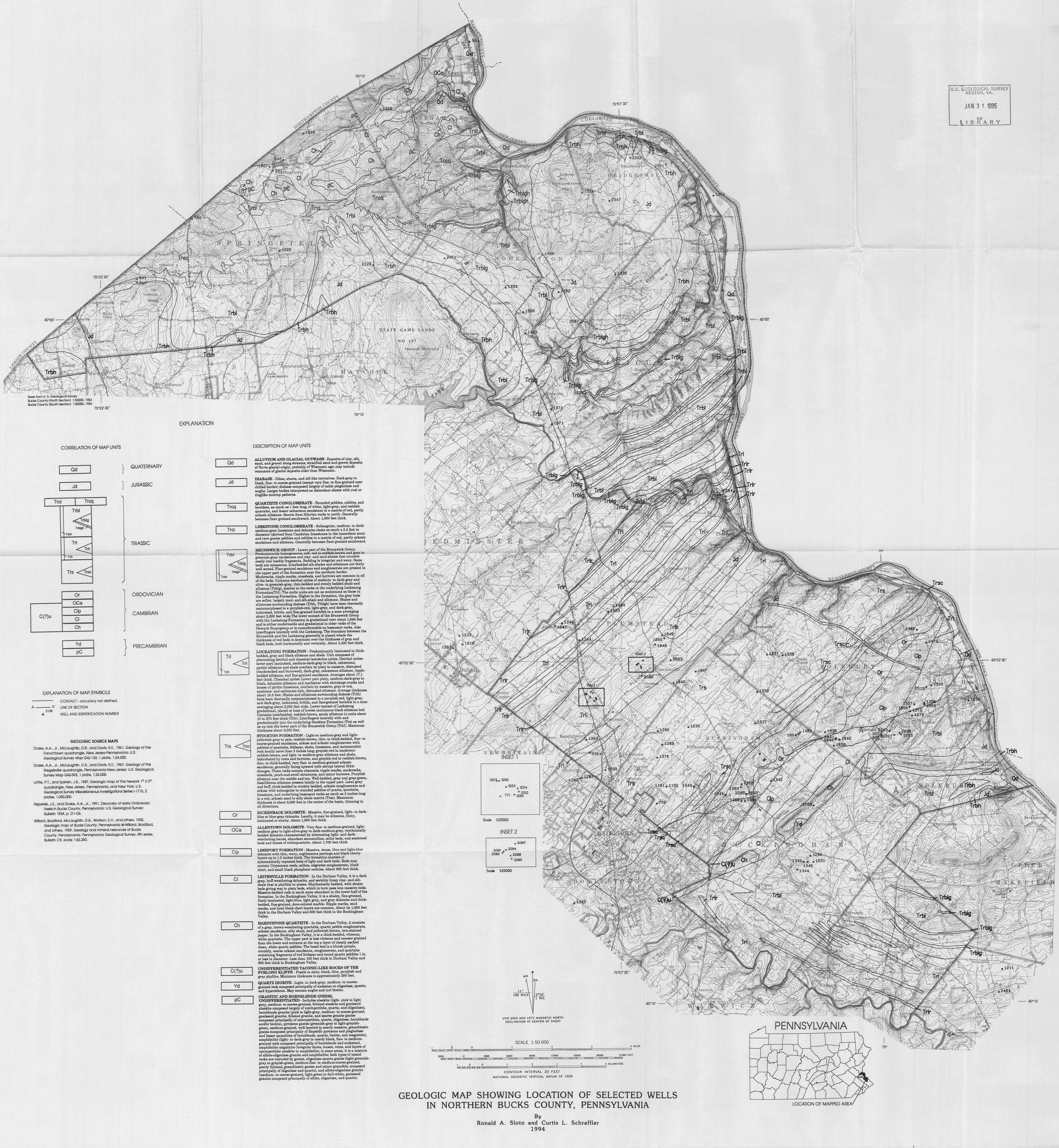
PREPARED IN COOPERATION WITH
NEW HOPE BOROUGH AND BRIDGETON, BUCKINGHAM, NOCKAMIXON, PLUMSTEAD, SOLEBURY, SPRINGFIELD, TINICUM, AND WRIGHTSTOWN TOWNSHIPS, BUCKS COUNTY, PENNSYLVANIA

WATER-RESOURCES INVESTIGATIONS REPORT 94-4109

Geologic map showing selected wells in northern Bucks County—PLATE 1

Sloto, R.A., and Schreffler, C.L., 1994, Hydrogeology and Ground-Water Quality of Northern Bucks County, Pennsylvania

U.S. GEOLOGICAL SURVEY
RESTON, VA.
JAN 31 1995
LIBRARY



EXPLANATION

CORRELATION OF MAP UNITS

Qd	QUATERNARY
Jd	JURASSIC
Trcl, Trcq, Trbl, Trblg, Trblgh, Trbh, Trl, Trlr, Trh, Trs, Trsc	TRIASSIC
Or, OCa, Clp, Cl, Ch	ORDOVICIAN, CAMBRIAN
C(?)u	
Yd, pC	PRECAMBRIAN

EXPLANATION OF MAP SYMBOLS

- CONTACT - accuracy not defined
- A — A' LINE OF SECTION
- 2128 WELL AND IDENTIFICATION NUMBER

GEOLOGIC SOURCE MAPS

Drake, A.A., Jr., McLaughlin, D.B., and Davis, R.E., 1961, Geology of the Frenchtown quadrangle, New Jersey-Pennsylvania: U.S. Geological Survey Map GQ-133, 1 plate, 1:24,000.

Drake, A.A., Jr., McLaughlin, D.B., and Davis, R.E., 1967, Geology of the Riegelsville quadrangle, Pennsylvania-New Jersey: U.S. Geological Survey Map GQ-593, 1 plate, 1:24,000.

Lyttle, P.T., and Epstein, J.B., 1987, Geologic map of the Newark 1° X 2° quadrangle, New Jersey, Pennsylvania, and New York: U.S. Geological Survey Miscellaneous Investigations Series I-1715, 2 plates, 1:250,000.

Repetski, J.E., and Drake, A.A., Jr., 1991, Discovery of early Ordovician fossils in Bucks County, Pennsylvania: U.S. Geological Survey Bulletin 1934, p. D1-D6.

Willard, Bradford, McLaughlin, D.B., Watson, E.H., and others, 1950, Geologic map of Bucks County, Pennsylvania in Willard, Bradford, and others, 1959, Geology and mineral resources of Bucks County, Pennsylvania: Pennsylvania Geological Survey, 4th series, Bulletin C9, scale 1:62,250.

DESCRIPTION OF MAP UNITS

Qd — **ALLUVIUM AND GLACIAL OUTWASH** - Deposits of clay, silt, sand, and gravel along streams; stratified sand and gravel deposits of fluvio-glacial origin, probably of Wisconsin age; may include remnants of glacial deposits older than Wisconsin.

Jd — **DIABASE** - Dikes, sheets, and sill-like intrusives. Dark-gray to black, fine- to coarse-grained (except very fine- to fine-grained near chilled border) diabase composed largely of calcic plagioclase and augite. Larger bodies interpreted as discordant sheets with oval or ringlike outcrop patterns.

Trcq — **QUARTZITE CONGLOMERATE** - Rounded pebbles, cobbles, and boulders, as much as 1 foot long, of white, light-gray, and reddish quartzite, and lesser calcareous sandstone in a matrix of red, partly arkosic siltstone. Source from Silurian rocks to north. Generally becomes finer grained southward. About 1,000 feet thick.

Trcl — **LIMESTONE CONGLOMERATE** - Subangular, medium- to dark-medium-gray limestone and dolomite clasts as much a 3.3 feet in diameter (derived from Cambrian limestones in the immediate area) and rare gneiss pebbles and cobbles in a matrix of red, partly arkosic sandstone and siltstone. Generally becomes finer grained southward.

Trbl, Trblg, Trblgh, Trbh — **BRUNSWICK GROUP** - Lower part of the Brunswick Group. Predominantly homogeneous, soft, red to reddish-brown and gray to greenish-gray mudstones and clay- and mud-shales that crumble easily into hackly fragments. Bedding is irregular and wavy. Some beds are micaceous. Interbedded silt-shales and siltstones are fairly well sorted. Fine-grained sandstone and conglomerate are present in the upper part of the formation near the northern border. Mudcracks, ripple marks, crossbeds, and burrows are common in all of the beds. Contains detrital cycles of medium- to dark-gray and olive- to greenish-gray, thin-bedded and evenly bedded shale and siltstone (Trblg), similar to the rocks in the underlying Lockatong Formation(Trl). The cyclic units are not as continuous as those in the Lockatong Formation. Higher in the formation, the gray beds are softer, largely mud- and silt-shale and siltstone. Shales and siltstones surrounding diabase (Trbh, Trblgh) have been thermally metamorphosed to a purplish-red, light-gray, and dark-gray, indurated, brittle, and fine-grained hornfels in a zone averaging about 2,000 feet wide.The lower contact of the Brunswick Group with the Lockatong Formation is gradational over about 1,640 feet and is either conformable and gradational to older rocks of the Newark Supergroup or is unconformable on basement rocks. Also interfingers laterally with the Lockatong. The boundary between the Brunswick and the Lockatong generally is placed where the thickness of red beds is dominant over the thickness of gray and black beds, both horizontally and vertically. About 3,420 feet thick.

Trl, Trlr — **LOCKATONG FORMATION** - Predominantly laminated to thick-bedded, gray and black siltstone and shale. Unit composed of alternating detrital and chemical-lacustrine cycles. Detrital cycles: lower part laminated, medium-dark-gray to black, calcareous, pyritic siltstone and shale overlain by platy to massive, disrupted (mudcracked and burrowed), dark-gray, calcareous siltstone, ripple-bedded siltstone, and fine-grained sandstone. Averages about 17.1 feet thick. Chemical cycles: Lower part platy, medium-dark-gray to black, dolomitic siltstone and marlstone with shrinkage cracks and lenses of pyritic limestone, overlain by massive, gray or red, analcime- and carbonate-rich, disrupted siltstone. Average thickness about 10.5 feet. Shales and siltstones surrounding diabase (Trh) have been thermally metamorphosed to a purplish-red, light-gray, and dark-gray, indurated, brittle, and fine-grained hornfels in a zone averaging about 2,000 feet wide. Lower contact of Lockatong gradational, placed at base of lowest continuous black siltstone bed. Contains interbedded, reddish-brown, sandy siltstone in units about 10 to 270 feet thick (Trlr). Interfingers laterally with and gradationally into the underlying Stockton Formation (Trs) as well as up into the lower part of the Brunswick Group (Trbl). Maximum thickness about 3,500 feet.

Trs, Trsc — **STOCKTON FORMATION** - Light-to medium-gray and light-yellowish-gray to pale, reddish-brown, thin- to thick-bedded, fine- to coarse-grained sandstone, arkose and arkosic conglomerate with pebbles of quartzite, feldspar, shale, limestone, and metamorphic rock locally more than 3 inches long; grayish-red to moderate-reddish-brown, and light- to medium-gray siltstone and shale, bioturbated by roots and burrows, and grayish-red to reddish-brown, thin- to thick-bedded, very fine- to medium-grained arkosic sandstone, generally fining upward with abrupt lateral lithic changes. These rocks contain channels, ripple marks, mudcracks, crossbeds, pinch-and-swell structures, and minor burrows. Purplish siltstone near the middle and top. Well-bedded, gray and gray-green, fossiliferous siltstone present locally in the upper part. Local gray and buff, thick-bedded to crudely bedded, arkosic conglomerate and arkose with subangular to rounded pebbles of quartz, quartzite, limestone, and underlying basement rocks as much as 3 inches long in a red, arkosic sand to silty shale matrix (Trsc). Maximum thickness is about 6,000 feet in the center of the basin, thinning in all directions.

Or — **RICKENBACK DOLOMITE** - Massive, fine-grained, light- to dark-blue or blue-gray dolomite. Locally, it may be siliceous, flinty, laminated or shaley. About 1,000 feet thick.

OCa — **ALLENTOWN DOLOMITE** - Very fine- to medium-grained, light-medium gray to light-olive-gray to dark-medium-gray, rhythmically bedded dolomite characterized by alternating light- and dark-weathering bands, abundant stromatolites, oolite beds, and scattered beds and lenses of orthoquartzite. About 1,700 feet thick

Clp — **LIMEPORT FORMATION** - Massive, dense, blue and light-blue dolomite with thin, wavy, argillaceous partings and black cherty layers up to 1.5 inches thick. The formation consists of systematically repeated beds of light and dark beds. Beds may contain Cryptozoon reefs, oolites, edgewise conglomerate, black chert, and small black phosphate nodules. About 900 feet thick.

Cl — **LEITHSVILLE FORMATION** - In the Durham Valley, it is a dark gray, buff-weathering dolomite, and sericitic limey clay- and silt-shale that is phyllitic in places. Rhythmically bedded, with shaley beds giving way to platy beds, which in turn pass into massive beds. Massive-bedded rock is much more abundant in the lower half of the formation. In the Buckingham Valley, it is a shaley, fine-grained, finely laminated, light-blue, light gray, and gray dolomite and thick-bedded, fine-grained, dove-colored marble. Ripple marks, mud cracks, and local black chert layers are common. About be 1,000 feet thick in the Durham Valley and 600 feet thick in the Buckingham Valley.

Ch — **HARDYSTONE QUARTZITE** - In the Durham Valley, it consists of a grey, brown-weathering quartzite, quartz pebble conglomerate, arkosic sandstone, silty shale, and yellowish-brown, iron-stained jasper. In the Buckingham Valley, it is a thick-bedded, vitreous, white quartzite. The upper part is less vitreous and coarser grained than the lower and contains at the top a layer of closely packed clean, white quartz pebbles. The basal bed is a bluish-purple, crumbly, coarse arkosic sandstone, conglomerate, and quartzite containing fragments of red feldspar and round quartz pebbles 1 in. or less in diameter. Less than 100 feet thick in Durham Valley and 900 feet thick in Buckingham Valley.

C(?)u — **UNDIFFERENTIATED TACONIC-LIKE ROCKS OF THE FURLONG KLIPPE** - Pisslle to slaty, black, blue, purplish and gray phyllite. Minimum thickness is approximately 200 feet.

Yd — **QUARTZ DIORITE** - Light- to dark-gray, medium- to coarse-grained rock composed principally of andesine or oligoclase, quartz, and hypersthene. May contain augite and (or) biotite.

pC — **GRANITIC AND HORNBLENDE GNEISS, UNDIFFERENTIATED** - Includes alaskite (light- pink to light gray, medium- to coarse-grained, foliated alaskite and gneissoid alaskite composed largely of microperthite, quartz, and oligoclase), hornblende granite (pink to light-gray, medium- to coarse-grained, gneissoid granite, foliated granite, and sparse granite gneiss composed principally of microperthite, quartz, oligoclase, hornblende and/or biotite), pyroxene gneiss (greenish-gray to light-grayish-green, medium-grained, well-layered to nearly massive, granoblastic gneiss composed principally of diopsidic pyroxene and plagioclase and lesser quantities of hornblende, quartz, biotite, and magnetite), amphibolite (light- to dark-gray to nearly black, fine- to medium-grained rock composed principally of hornblende and andesine), amphibolite migmitite (irregular knots, lenses, veins, and layers of microperthite alaskite in amphibolite; in some areas, it is a mixture of albite-oligoclase granite and amphibolite; both types of mixed rocks are intruded by gneiss, oligoclase-quartz gneiss (light-greenish-gray to grayish-green, medium-fine- to medium-coarse-grained, poorly foliated, granoblastic gneiss and minor granofels, composed principally of oligoclase and quartz), and albite-oligoclase granite (medium- to coarse-grained, light-green to dull-white, gneissoid granite composed principally of albite, oligoclase, and quartz).

GEOLOGIC MAP SHOWING LOCATION OF SELECTED WELLS IN NORTHERN BUCKS COUNTY, PENNSYLVANIA

By
Ronald A. Sloto and Curtis L. Schreffler
1994