MAP GQ-738

DEPARTMENT OF THE INTERIOR
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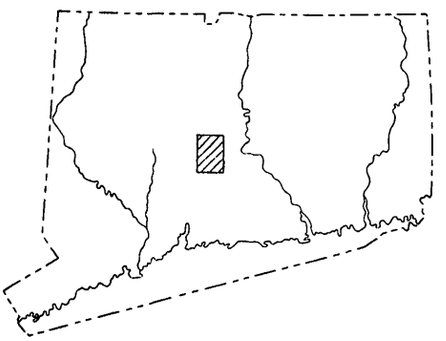
GEOLOGIC QUADRANGLE MAPS OF THE UNITED STATES

BEDROCK GEOLOGIC MAP OF THE MERIDEN QUADRANGLE NEW HAVEN, HARTFORD, AND MIDDLESEX COUNTIES, CONNECTICUT

By
Penelope M. Hanshaw



QUADRANGLE LOCATION

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TO ACCOMPANY MAP GQ-738

BEDROCK GEOLOGIC MAP OF THE MERIDEN QUADRANGLE, NEW HAVEN, HARTFORD, AND MIDDLESEX COUNTIES, CONNECTICUT

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INTRODUCTION

The rocks in the Meriden quadrangle are part of the Newark Group of Late Triassic age (about 200 million years old). Surficial deposits cover more than 98 percent of the quadrangle, and are mostly glacial in origin (Hanshaw, 1962).

Four red continental sedimentary formations intercalated with three basaltic lava flows are broken by a series of northeast-trending, west-dipping, high-angle, normal faults. Relative movement and amount of displacement on most faults cannot be accurately determined because there are neither good exposures nor marker beds within the formations. However, the outcrop pattern suggests that relative movement was upward and (or) northeastward on most southeast fault blocks. Only the major faults are shown on the map and displacements across these are shown cumulatively on the cross sections. Countless minor faults parallel the major ones but cannot be differentiated from joint surfaces in outcrops. Slickensides on minor faults have been observed in active quarries in adjacent quadrangles, but have been obliterated by weathering in the inactive quarries in this quadrangle.

No direct measurements of the thickness of stratigraphic units were made owing to almost ubiquitous faults and to lack of contact exposures and marker beds within the units. Outcrop distribution, observed structural data, and water-well data were used to plot cross sections and to estimate the thickness of the units within the quadrangle.

Kyrnine (1950) studied the petrography of the sedimentary rocks and delineated facies on the basis of heavy mineral content. He suggested that the climate during deposition was similar to that of present-day savannas.

The sedimentary rocks are red to pink, crossbedded and crosslaminated, poorly exposed, arkosic, and have abrupt lateral and vertical changes in grain size. They have been derived from crystalline rocks. Hematitic cement accounts for much of the color, but grains of feldspar produce pink mottling in some of the coarser grained sandstone and conglomerate. Joints in the sedimentary rocks are generally smooth surfaced and tight, showing little evidence of solution or deposition.

The basalts are bluish to greenish gray, generally massive, relatively well exposed, generally fine grained, and have accessory magnetite and intergranular to subophitic texture consisting of plagioclase laths partly enclosed in clinopyroxene grains. Differences in some trace elements in the basalts have been noted by Hanshaw and Barnett (1960).

NEW HAVEN ARKOSE

The New Haven Arkose consists of arkosic conglomerate and sandstone and medium- to fine-grained feldspathic sandstone and siltstone. Bedding is preponderantly lenticular, and cut-and-fill stratification is common in the coarser grained rocks.

Krynine (1950, p. 54) described two facies within the upper New Haven Arkose: "east of Meriden -- a coarse, gray or white arkose; west of Meriden -- a fine- to medium-grained bright red to brick red, micaceous feldspathic sandstone." Both facies are present in, southwest of, and, in a few places, southeast of Meriden; but interbedding of the two facies is more common than he reported.

Red micaceous siltstone forms the bulk of the outcrops at the west end of the Quinnipiac gorge, but lenticular arkosic sandstone and conglomerate are dominant at the east end.

Thin beds and lenses of very well sorted openwork granule or pebble conglomerate are a distinctive feature of the New Haven Arkose in the northern part of Meriden. A massive pebble conglomerate with unsorted sand matrix occurs just southwest of the dam on Merimere Reservoir. Pebbles are mainly quartz and quartzite; some are schist and phyllite. An extremely micaceous sandstone, almost resembling a mica schist, was noted a few hundred feet north of the junction of U.S. Route 5 and the Wilbur Cross Parkway.

In places, coarse arkose weathers by exfoliation; finer grained sandstone weathers into prisms and small irregular chunks.

Green mottling and some beds of green sandstone occur in the Quinnipiac gorge area. On the north side of the Quinnipiac gorge light-green sandstone is common. Light-green and light-purple fine-grained sandstone, light-green siltstone with green shale laminae, very fine grained green sandstone with limestone nodules which weather out and are replaced by limonite also occur. Limonite specks are common, especially at the top of the New Haven Arkose in the southeast part of the quadrangle.

Strike and dip measurements were difficult to obtain because of lenticular bedding, friable nature of many of the sandstones, and paucity of outcrops.

The formation is poorly indurated. It is more poorly exposed in the southern and southwestern parts of the quadrangle than in the central eastern part.

The degree of cementation of the New Haven Arkose varies considerably. In the area south of the city of Meriden, the arkosic conglomeratic sandstone is so

poorly cemented that it can be dug with a shovel to a depth of 2 feet in places. However, the prominent ridge in the southeast corner of the quadrangle is underlain by coarse-grained arkosic sandstone so well cemented that the rock fractures across the grains. In some places, fine-grained sandstone and siltstone fracture into small irregular chunks only ¼ inch in diameter. The uppermost part of the New Haven is nonconglomeratic and well indurated in the few exposures observed.

Thickness of beds ranges from a few inches to several feet and locally beds of fine-grained rock are only fractions of an inch thick.

Bedding in the New Haven Arkose is generally lenticular; lenses are commonly less than 4 feet thick and in places are separated by beds of fissile fine-grained sandstone or siltstone a few inches thick. Beds of massive sandstone alternate with those which have broken, hackly surfaces. Bedding north of Meriden is more even than elsewhere. Regular continuous beds occur in outcrops on the east side of U.S. Route 5 north of its junction with the Wilbur Cross Parkway.

Outcrops along Spruce Glen Brook show very well the common relation of conglomerate filling channels cut into fine-grained red sandstone. In other areas, the channel-filling unit is of the same grain size as the surrounding rock.

It has been assumed that the New Haven Arkose is at least 4,500 feet thick, but gravimetric work (Eaton and Rosenfeld, 1960) indicates that the New Haven may be only about 1,000 feet thick in the vicinity of Broad Brook Reservoir.

The upper contact of the New Haven Arkose was observed in only two places in the Meriden quadrangle, but at several places exposures of the New Haven Arkose and Talcott Basalt are only a few feet apart. Beds in the upper few feet of the New Haven Arkose are generally more continuous, finer grained, more micaceous, and less arkosic than in the lower part of the formation.

One exposure of the contact between the New Haven and the Talcott is in the cliff northeast of Mirror Lake, 0.15 mile south of the southern tip of Merimere Reservoir. A section 2 feet thick shows the New Haven to be even bedded, fine- to very fine grained gray limonitic and micaceous laminated sandstone having some graded bedding. This sandstone is overlain by chocolate-brown to light-red banded siltstone contorted in places with folds of 2-inch amplitude. The contact is conformable and lies at the top of red plastic clay about 2 inches thick. The overlying basalt contains inclusions of sandstone at the base and grades upward into finely crystalline basalt without inclusions.

The other exposure of the contact is on the east side of U.S. Route 5 and State Route 15 about 0.6 mile north of the junction of these roads. Reddish-tan siltstone and very fine-grained sandstone underlie 40 feet of pillowed basalt. The contact is conformable but not smooth because bedding planes in the upper New Haven follow the undulatory bottom surface of the pillow structure in the Talcott Basalt.

TALCOTT BASALT

Joints are tight and very sparse in the Talcott Basalt, in contrast to those in the other two basalts in the quadrangle. The columnar and prismatic joints of the younger basalts do not occur in the Talcott.

The formation weathers tan, orange or light gray and is bluish gray or bluish green on fresh surfaces.

The basalt is mostly fine grained, but is medium grained locally.

Massive basalt forms the bulk of the outcrops, but vesicular basalt is common. Vesicles are mainly irregular or ovoid in shape but are tabular in a few places; most are empty but some contain quartz crystals, drusy quartz, and zeolites.

Pillow structure is characteristic of the Talcott and is well developed in several places. In some exposures pillow structure dies out within 100 feet horizontally and passes abruptly into massive basalt within 15 feet vertically. In other exposures it is much more extensive. The average maximum diameter of a pillow is about 2 feet. Radiating tubules are present in the outer parts of some pillows; other pillows are vesicular or massive. In places, pillows are flattened and measure 1 to 4 feet long but only 8 to 10 inches thick. A thin shaly black matrix separates pillows in most places.

An agglomerate composed of angular fragments of vesicular and dense basalt ½ inch to 8 inches in diameter in a basalt matrix crops out on the east side of U.S. Route 5 near the north end of Silver Lake. Calcite and quartz cement form an intricate network around basalt polygons 2 inches in diameter at the south end of this outcrop. A dike, only a few inches wide, of fine-grained diabase cuts the agglomerate. Northward along strike, pillow structure occurs at the level of the agglomerate.

Basalt and agglomerate interstratified with thin beds of fine-grained sandstone crop out at the top of the first ridge due south of the outcrop described above. Red and tan fine-grained sandstone in beds 6 to 18 inches thick and containing pisolitic layers is generally conformable, but locally undulatory or contorted, with basalt layers 8 inches to 6 feet thick. Fragments in the agglomerate are mainly basalt but also include red sandstone and siltstone, and quartz pebbles. The agglomerate grades downward into pillow lava and upward into slightly vesicular basalt.

The Talcott weathers into a variety of forms from fine grus (generally derived from vesicular basalt) to exfoliating spheroidal masses as much as 8 inches in diameter to rounded blocks several feet in diameter.

Some outcrops are smooth, others are hackly with siliceous fracture- and vesicle-fillings in raised relief.

The Talcott Basalt is estimated to be about 200 feet thick in this quadrangle.

SHUTTLE MEADOW FORMATION

The Shuttle Meadow Formation is composed of fine-grained sandstone, siltstone, and shale ranging from red to chocolate brown, to dark gray or gray. No exposures of the lower contact with the Talcott Basalt were seen in the quadrangle. The upper contact was not observed; a covered interval only a few feet thick obscured the contact at the north end of Lamentation Mountain on the east border of the quadrangle. At this locality, thin-bedded and crossbedded red very fine grained sandstone and shale show small-scale folds; the Holyoke Basalt immediately above is dense and columnar jointed.

The Shuttle Meadow generally forms a steep talus-covered slope at the foot of Holyoke Basalt cliffs. The formation is composed of shaly sandstone and fine-

to very fine grained, well-cemented, slightly micaceous sandstone with limonite spots and mudstone partings. The formation also contains sandy shale, fissile red or black shale, and dense black shale and siltstone in beds 3 to 5 inches thick. Small purple crystals of fluorite occur on joint surfaces in the quarry that supplied an ancient lime kiln about one mile northwest of Ragged Mountain.

Sandstone and siltstone beds range from a few inches to 2 feet in thickness. The siltstone is mostly thin bedded and crossbedded on a small scale; the sandstone generally is thicker bedded than the siltstone. On the northwest shoulder of Lamentation Mountain, tan sandstone fills mud cracks in red siltstone. Prominent graded bedding is displayed in coarse- to very coarse grained sandstone in the gully on the west side of Cathole Mountain.

The Shuttle Meadow ranges from 250 to 325 feet in thickness in this quadrangle.

HOLYOKE BASALT

The Holyoke Basalt is greenish to bluish gray on fresh surfaces and tan to reddish orange on weathered surfaces. Weathered surfaces locally have a dark purplish-black stain. This basalt is the major cliff former in the quadrangle, and is composed of two or more flows. In the large quarry north of Meriden, purplish-red vesicular weathered basalt is overlain by fresher basalt but also grades horizontally into typical fresh Holyoke Basalt. On the north slope of the Hanging Hills, vesicular reddish basalt was found in a few places and possibly may represent the same horizon exposed in the quarry north of Meriden.

Columnar jointing is a prominent feature in the Holyoke; columns are generally polygonal but some are hexagonal. On the north slope of the Hanging Hills siliceous material fills joints which commonly are less than half an inch wide.

The Holyoke probably ranges from 350 to 500 feet in thickness in this quadrangle, but could be as little as 250 feet thick, as shown in the New Britain quadrangle to the north (Simpson, 1966), if additional faults are inferred.

EAST BERLIN FORMATION

The East Berlin Formation is composed of light-brown shale and sandstone interbedded with red shale and sandstone, as well as micaceous sandy shale, red siltstone, medium- to fine-grained micaceous sandstone, and coarse-grained reddish-gray or tan well-indurated sandstone. Weathered surfaces are generally light brown. Limonite stains are common on major joint faces; dark-purplish-blue stains occur on some outcrops. Some well-fractured siltstone units weather into grus; sandstones are generally well indurated.

Most sandstone beds are less than one foot thick. Some red shales are extremely thin bedded resembling "paper shales." Bedding is lenticular in coarse-grained sandstone. Siltstone units are well fractured.

The East Berlin is probably about 600 feet thick in the quadrangle.

HAMPDEN BASALT

The Hampden Basalt is greenish gray to bluish green on fresh surfaces and dark gray to rusty tan on weathered surfaces. The basalt ranges from aphanitic to medium grained. Layers of very vesicular basalt, as much as one foot thick, are found separating slightly vesicular, easily broken basalt from massive dense basalt. Vesicular layers occur throughout the formation but in general massive basalt is prevalent in the lower part and vesicular basalt in the upper part.

The Hampden ranges from 150 to about 200 feet in thickness in the quadrangle.

PORTLAND ARKOSE

Only one small outcrop of Portland Arkose was found in the Meriden quadrangle (see map explanation).

Thickness of the Portland is unknown, but may exceed 1,000 feet. The formation is lithologically similar to the New Haven Arkose.

DIABASE DIKES

Diabase dikes in the New Haven Arkose are exposed in the southern part of Walnut Grove Cemetery and on the knob at an altitude of 400 feet about 1,000 feet west of Ceppa Field in Meriden.

The dike west of Ceppa Field is only about 15 feet wide and contains xenoliths of green sandstone. Pebble conglomerate in a red fine-grained sandy matrix borders the dike and is altered to dark reddish gray for a few inches adjacent to the contact.

Exposures of the contact between diabase dike and sandstone in the south part of Walnut Grove Cemetery show only slight darkening of the color of the sandstone; the diabase is fine grained and has many surfaces bearing vertical slickensides. Both diabase and well indurated arkose are brecciated. An exposure of sandstone overlying diabase on the east side of the hill west of Walnut Grove Cemetery shows the limit of vertical penetration of the dike in the New Haven Arkose here.

ECONOMIC DEPOSITS

The only rock now being exploited commercially in the Meriden quadrangle is the Holyoke Basalt which provides excellent crushed stone. Other mineral industries were operated in the past.

Some copper was mined before the Civil War from the hill west of Walnut Grove Cemetery (Curtis, 1906, p. 229).

A lead mine which was opened during the Revolutionary War is described by Percival (1822, p. 44), probably near the point where Mattabesset River is crossed by the first north-south road east of Route 71. He mentions galena, sphalerite, pyrite, and barite from this locality.

Bluish-gray limestone from the Shuttle Meadow Formation was formerly used to make hydraulic cement (Lowrey, 1828, p. 382).

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