Preliminary geologic map of the Peru quadrangle, Berkshire and Hampshire Counties, Massachusetts

by

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Surficial Deposits

Pleistocene and Holocene

Swamp deposits of Holocene age are shown by the standard topographic may symbol for swamps.

Holocene alluvium, consisting of silt, sand, and gravel is present in Geer and Factory Brooks in the south-central part of the quadrangle, in Windsor Brook in the north-central part of the quadrangle, in the Westfield River in the northeast part of the quadrangle, and in Cleveland and Wahconah Brooks in the northwest part of the quadrangle.

Pleistocene waterlaid ice-contact stratified sand and gravel are present as deltas, eskers, kames, and kame terraces along the east side of the Windsor Reservoir in the northwest corner of the quadrangle and along the north, east, and south sides of the large swamp bisected by the railroad in the southwestern part of the quadrangle. The swamp occupied by the Housatonic River probably was occupied by an ice-block and drainage to the north and south was impeded, forming a temporary lake with an elevation of about 1520 feet. Much of the area between Wahconah and Cleveland Brooks is underlain by sand and may be part of this complex.

Pleistocene till covers much of the quadrangle with a mantle ranging in thickness from zero to probably as much as 35m. Bedrock exposures are most common on south- and east-facing slopes with till ranging in thickness from zero to as much as 8m.

Note: Although many hills have their long dimensions in a north to north-west direction, the direction of ice movement, these hills are probably erosional, not depositional. The preferred orientation is controlled by bedrock structure and ice movement direction.

Unconformity

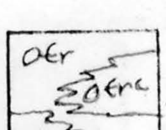
Metamorphic Rocks - Eastern Sequence

Rowe Schist

Lower to Upper Cambrian and Lower Ordovician (?)

OЄr, fine- to medium-grained, light green to silvery, quartz-muscovite-chlorite schist with garnet, clinozoisite, plagioclase, and magnetite; abundant quartz lenses and rods throughout. Well developed schistosity composed of muscovite and chlorite. Locally there are two nearly parallel schistosities which give rise to anastomosing foliation. Weathers dull gray. Minor, thin beds of light to dark green medium-grained plagioclase-hornblende-quartz amphibolite and greenstone. Amphibolite and greenstone constitute 2 to 4 percent of the schist member.

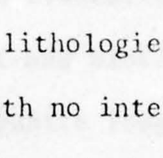
OЄrc, fine-grained, silvery grey to black, slightly rusty to very rusty weathering, muscovite-paragonite-quartz graphitic phyllite with accessory chlorite, chloritoid, garnet, magnetite, and plagioclase; interbedded with thin micaceous and highly graphitic quartzites which constitute several percent of the member; also interbedded with minor sandy and brown weathering quartz-plagioclase-muscovite-biotite schist. Facies boundaries between OЄr and OЄrc are generally gradational by change in proportions of minerals and interbedding of the schist (OЄr) and phyllite (OЄrc). Metavolcanic rocks are very rare in OЄrc. The Rowe Schist is between 1,000 and 1,300 m



thick at the latitude of the Peru quadrangle; the contact with the overlying Moretown Formation is betw n 500 and 1,000 m east of the quadrangle.

Hoosac Formation

Ꞓh, grey, brown, or green plagioclase-quartz- and quarte-plagioclase-muscovite medium- to coarse-grained schist, most commonly with biotite. Accessory minerals include chlorite, garnet (B.B. shot) and clinozoisite. It is more biotitic to the south, more chloritic to the north. Plagioclase porphyroblasts typically form conspicuous grey to white spots up to 1 cm in diameter. Bedding is typically obscure but locally may be indicated by quartz-rich layers, ribbons, and lenses. Very rare graded beds, as thick as 5 cm. Very minor quartz-pebble conglomeratic schist in the middle of the formation at the south end of the quadrangle. The contact with the OꞒr is gradational with a decrease of plagioclase and an increase in muscovite with minor interbedding of the two lithologies over an interval of about 100 m. The contact with OꞒrc is sharp, with only minor interbedding of the lithologies. The contact with the Precambrian rocks is sharp with no interbedding or gradation. Schist essentially identical to the main body of the Ꞓh schist is present in 2 discontinuous bands within the Precambrian terrane. One band is in the north-central part of the quadrangle, parallel to Peru Road. Fifty meters of outcrop of schist are present under the power line and one other 2 meter thickness of schist is exposed at the north end of the quadrangle. The other band is exposed in the south-central part of the quadrangle and is well located from Middlefield Road south to the quadrangle boundary and continues 9 km farther



farther south in the Becket quadrangle. The band ranges from a few meters to as much as 30 m wide. Contacts with bounding gneisses are generally sharp but rarely are interlayered or gradational over a meter or less. Blocks of gneiss are locally completely surrounded by schist. The rock is brown, slightly rusty weathering quartz-plagioclase-muscovite-microcline-biotite schist. Quartz ribbons are common; bedding is rare. The schistosity is caused by alignment of the mica and crushed and smeared quartz and feldspar which is drawn out into trains parallel to the mica foliation. These bands of schist, although not physically continuous ~~with~~ and not traceable into the main body of Ɛh, are equated with the Ɛh and interpreted to be Ɛh schist caught along north-trending faults.

Ɛhg, coarse-grained, generally rusty-weathering crenulated schist composed dominantly of quartz, muscovite, garnet, and trace but ubiquitous ilmenite, tourmaline, and graphite. In the northern half of the quadrangle, additional minerals include paragonite, chlorite, and chloritoid. South of the staurolite isograd paragonite and chloritoid are generally absent and biotite and plagioclase are commonly present. South of the kyanite isograd a typical assemblage is quartz-muscovite-garnet-staurolite-biotite-kyanite.

From the latitude of Peru southward, Ɛhg is split into 2 units. The upper unit (Ɛhgu) is distinctly but discontinuously banded and weathers to an orange and black striped rock. The orange layers, up to 2 cm thick are granular, weather rusty, and are rich in quartz. The black layers, up to 4 cm thick, are nearly void of quartz, highly graphitic, and contain as much as 75 percent

Lower Cambrian or older

garnet, staurolite, and kyanite. The lower unit (Ꞓhgl) is massive orange-brown rusty-weathering quartz-muscovite-garnet-biotite-staurolite-kyanite schist with garnets commonly as large as 1 cm. Quartz ribbons and lenses are abundant and give outcrops a ribbed appearance.

The breadth of outcrop for the Hoosac Formation ranges from 1,500 to 4,000 m. The former figure probably is close to the true thickness; the latter is believed to be caused by tectonic repetition. The thickness of Ꞓhg is less than 150 m; the combined thickness of Ꞓhgu and Ꞓhgl is about 200 m.

Lower Cambrian or ~~Older~~ Precambrian

?Ꞓgg

Granitic Gneiss

Fine- to very coarse-grained, white to brown weathering, massive to foliated, microcline-quartz-plagioclase-biotite augen gneiss; microcline as large as 3 cm in diameter but more commonly 1 cm, or crushed and strung out in trains 2 to 3 cm long. Accessory minerals include muscovite (in foliated varieties), clinozoisite, garnet, zircon, and magnetite. Foliation is strongest near contacts with pꞒ and Ꞓh and is related to a mortared and sheared texture.

Unconformity?

?pꞒs

Medium- to coarse-grained quartz-muscovite non-rusty weathering, spangly schist with accessory microcline and plagioclase, mortared biotite, garnet, with secondary chlorite replacing garnet

Precambrian or Lower Cambrian

and biotite. Magnetite octahedra as large as 4 mm crosscut the muscovite foliation and the mortared plagioclase. Exposed only in a narrow fault-bounded band at the south end of the quadrangle at a point 3,000 m along the fault extending to the north. The band extends 2,000 m south into the Becket quadrangle where it thins to zero along the fault. The thickness of this unit ranges from zero to about 150 m.

Precambrian

pЄb

Banded Gneisses

Fine-to coarse-grained quartz-plagioclase microcline-biotite generally non-rusty weathering gneiss. Layering ranges from 1 cm to 1 m thick and is evidenced by variation in the quartz:feldspar ratio and most commonly by concentrations of biotite. Accessory minerals may include clinozoisite (or epidote), garnet, zircon, tourmaline, magnetite, muscovite, and amphibole. Dominant foliation is parallel to compositional banding. Locally this compositional banding is cut by a later cleavage. Where this is intense, the early foliation is transposed into a new orientation and the older foliation is obliterated. This younger foliation is cataclastic, marked by crushed quartz and feldspar strung out in trains, realignment of biotite, and neocrystallization of muscovite. Other lithologies include minor amounts of pЄw, pЄs, and pЄt which are not separable on this scale. The stratigraphic relationship to other Precambrian units is not known.

pЄw { pЄwa, pЄwc, pЄwg, pЄwm }

Washington Gneiss

Highly varied unit. pЄwa, fine-to coarse-grained hornblende-plagioclase-quartz-epidote-garnet gneiss with accessory sphene and opaque minerals. Non-rusty- to very slightly rusty-weathering. Generally massive. pЄwc, calc-silicate gneisses including: feldspar-quartz-actinolite-garnet non-rusty-weathering, fine-grained well banded gneiss; quartz-feldspar-diopside-hornblende-biotite non-rusty weathering gneiss; rusty- to sulfidic weathering quartz-feldspar-muscovite-biotite-pyrrhotite-graphite schist; minor very coarse-grained calcite-diopside-actinolite-graphite gneiss. pЄwg, the most characteristic unit within the Washington is an orange-rusty weathering well layered quartz-feldspar-biotite-graphite-pyrrhotite gneiss with accessory garnet and spangly muscovite. Commonly weathers to a ribbed surface. Quartz is commonly milky to light blue and occurs as granules, stringers, and pods. About 10 percent of this unit consists of well but irregular bedded quartz-feldspar-garnet-biotite quartzite, commonly frosty blue or white weathering. The quartzite is interlayered throughout pЄwg but is particularly abundant just east of Camp Lenore on Lake Ashmere and on the hills northeast of the intersection of Bullards Crossings and Fassell Roads. Biotite commonly pseudomorphs garnet. pЄwm, coarse-grained white calcite marble, with accessory diopside, biotite, and minor beds of calc-silicate gneiss, occurs at 6 localities: 700 m east of Muddy Pond, 700 m north-northwest of the intersection of Bullards Crossing and Fassell Roads, 900 m northeast of the same location, at the intersection of Washington State Road and the railroad, and just east of Cleveland Brook Reservoir. The maximum thickness exposed for the five localities is about 15 m. The sixth locality is along Bennett Brook northeast of B.M. 1481 for a distance of about 600 m. Much of the marble there is dolomitic. The thickness here is unknown because of repetition by folding but probably exceeds 100 m. These are interpreted to be lenses within p€w. Calcareous schists, gneisses and small amounts of marble are present throughout p€w, especially p€wc but are not mappable. p€w, signifies those areas underlain by two or more of the above members which are interlayered on an intimate scale too small for representation. Locally, within the members, different lithologies may be present, the member taking its name from the dominant lithology.

p€t

Tyringham Gneiss

Chalky to light tan weathering plagioclase-microcline-quartz,biotite gneiss, commonly with hornblende or garnet. Accessory minerals include sphene, apatite, and euhedral zircon. The fabric ranges from weakly foliated (coarsest-grained), to well foliated in one direction, to strongly penciled due to two intersecting penetartive foliations (finest-grained). The latter is commonly associated with a cataclastic texture. Although contacts with other rocks have not been observed the homogeneous composition and mineralogy suggest an igneous origin for this unit. Isolated outcrops of this lithology are present in all Precambrian units but are not separately mapped. Their abundance diminished northward.

Note: Foliated to non-foliated grey quartz-microcline-plagioclase-biotite fine-grained granite occurs in isolated outcrops too small to map separately.

Igneous and Metamorphic Rocks (Western Sequence)

Middle to Upper Ordovician

Ou

Ultramafic Rock

An elliptical zoned ultramafic body about 35 m long north-south in present just south of Wahconah Falls Brook in the northwest corner of the quadrangle. The body has been quarried for talc and asbestoes (Chute, 1945). Blackwell alteration zones with successive inward development of biotite, anthophyllite, and chlorite are well developed. The main body consists of talc, talc-carbonate, and talc-anthophyllite. The age is assigned on the basis of the occurrence of similar bodies further east which intrude rocks as young as Middle Ordovician (Norton, 1967) and possess Acadian and possibly Taconic foliation (Norton, in press, b).

Middle Ordovician

Ow

Walloomsac Formation

Medium-grained, grey to slightly sulfidic weathering quartz-muscovite-plagioclase-biotite-garnet-kyanite crenulated schist with accessory ubiquitous graphite and secondary chlorite. Crops out only in the area northeast of Windsor Reservoir and southeast of Cleveland Brook Reservoir. The true thickness of this unit is unknown because it is bounded by faults.

Unconformity

Ꞓc

Cheshire Quartzite

Lower Cambrian

Non-rusty to light tan or pink weathering, massive quartzite forms the west dip-slope of Windsor Brook for about 600 m in the northwest corner of the quadrangle. The maximum thickness is about 10 m. To the north and south the Cheshire is cut out by faults. The contact with the Precambrian to the west is not exposed. The contact with the structurally overlying but younger Dalton Formation is sharp with no gradation or interlayering.

Ꞓd

Dalton Formation

Tan to orange-brown weathering, slabby to fissile quartz-microcline-plagioclase-muscovite-biotite schist and gneiss. Exposed only along Windsor Brook in the northwest corner of the quadrangle. The maximum thickness is about 15 m.

To the north and south the Dalton is cut out by faults. The contact with the structurally overlying Precambrian rocks is structurally conformable but the Precambrian rocks are strongly foliated due to isoclinal folding and shearing. Although no exposures are present, Dalton rocks are presumed to underlie the northwest corner of the quadrangle, based on the mapping in the Windsor quadrangle.

Symbols Used

Bedrock outcrops examined in field

Contact

Thrust faults; teeth on upper place

High angle fault

Isograd - index mineral on tick side

St = staurolite; Ky = kyanite

Anticline

Syncline

Overturned anticline

Overturned syncline

Location of trace of axial surface of major folds.

Arrow indicates plunge.

Planar Features

Where two structural symbols are combined, their intersection is the point of observation.

Horizontal Inclined Vertical Overturned Upright Overturned
(top of bed unknown) (known structurally) (top of bed known)

Strike and Dip of Beds

Horizontal Inclined Vertical

Strike and dip of axial plane schistosity or penetrative schistosity of unknown origin.

Horizontal Inclined Vertical Horizontal Inclined Vertical

Probably parallel to bedding Transposed from original orientation

Strike and dip of compositional banding in Precambrian rocks.

Horizontal Inclined Vertical

Strike and dip of cleavage

Inclined Vertical Inclined Vertical

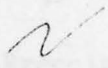
Widely spaced Closely spaced

Strike and dip of shears developed in Precambrian rocks.

Inclined Vertical Inclined Vertical

tight fold open fold

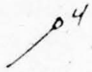
Strike and dip of axial planes




right-handed   left-handed   symmetrical (open)   symmetrical (isoclinal)

Shear sense of folds

Linear Features


Horizontal   Inclined   Horizontal   Inclined

Generally open folds which fold compositional banding or schistosity

Generally tight folds which have an associated axial plane foliation. May or may not fold an earlier foliation.

Direction and Plunge of Fold Axes

Schistosity 1 - Schistosity 2
Compositional Banding - Schistosity
Cleavage - Schistosity
Pencils

Bedding - Schistosity

Direction and plunge of lineations caused by intersecting planar features

Mineral lineation

Rodding

Glacial groove or striation

Breccia

Prospect pit; M = marble, T = talc, A = asbestos, G = graphite

Gravel pit

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