DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF SCIENCE AND RESEARCH
NEW JERSEY GEOLOGICAL SURVEY

EXPLANATION OF MAP SYMBOLS

Where multiple measurements were taken, the station location is shown preferentially by bedding, small faults, cleavage, lineation, then jointing. Other symbols are fitted as closely as possible.

Contact - Dotted where concealed, queried where inferred.

FAULTS

High Angle - U, Upthrow side; D, downthrow side. Arrows indicate relative strike-slip component. Dotted where concealed, queried where inferred.

Thrust fault - Sawteeth on overthrust plate

Shear zone

Breccia zone

Inclined fault - showing dip

Vertical fault

FOLDS

Anticline - Showing crest line and direction of plunge. Queried where inferred.

Syncline - Showing trough line and direction of plunge. Queried where inferred.

Overturned anticline - Showing trace of axial surface, direction of dip of limbs, and direction of plunge

Overturned syncline - Showing trace of axial surface, direction of dip of limbs, and direction of plunge

MINOR FOLDS

Minor anticline or antiform - Showing bearing and plunge

Minor syncline or synform - Showing bearing and plunge

Minor fold - Showing bearing and plunge

Minor asymmetric fold - Showing bearing, plunge and rotation sense

PLANAR FEATURES

Strike and dip of beds
- Horizontal
- Inclined
- Vertical
- Overturned
- Undulatory (average strike and dip)

Strike and dip of cleavage
- Spaced cleavage
  - Inclined
  - Vertical
- Crenulation or spaced cross cleavage
  - Inclined
  - Vertical

Strike and dip of joints
- Horizontal
- Inclined
- Vertical
- Multiple joint readings
  - indicates the dominant joint where multiple joints were observed.
  - indicates the second most dominant joint where multiple joints were observed.

Strike and dip of Proterozoic foliation
- Inclined
- Vertical
- Mylonitic

LINEAR FEATURES

Bearing and plunge of intersection of bedding and cleavage

Bearing and plunge of intersection of disjunctive cleavages

Mineral lineation in Middle Proterozoic rocks

OTHER SYMBOLS

Strike of small fault, bearing and plunge of slickenline(s) indicated where observed

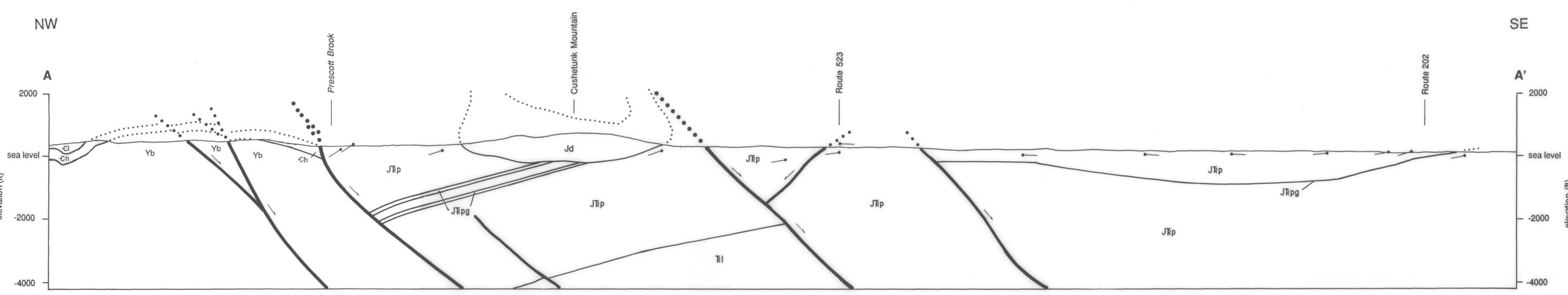
Abandoned iron mine

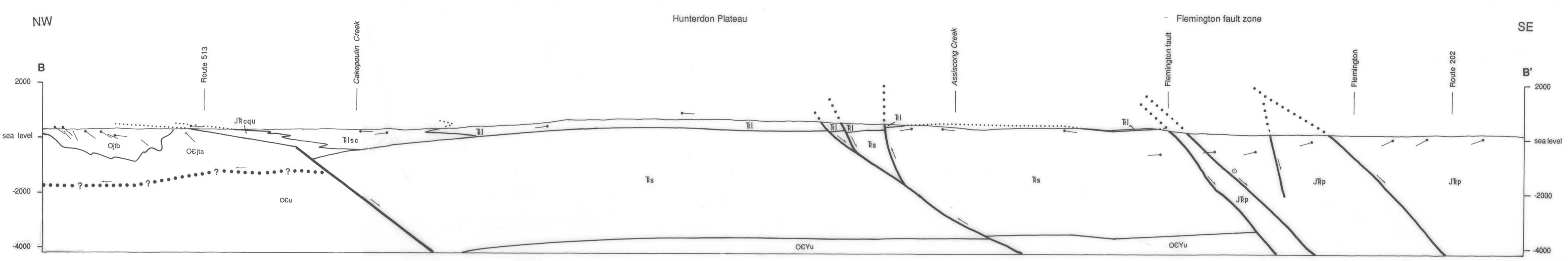
Abandoned quarry

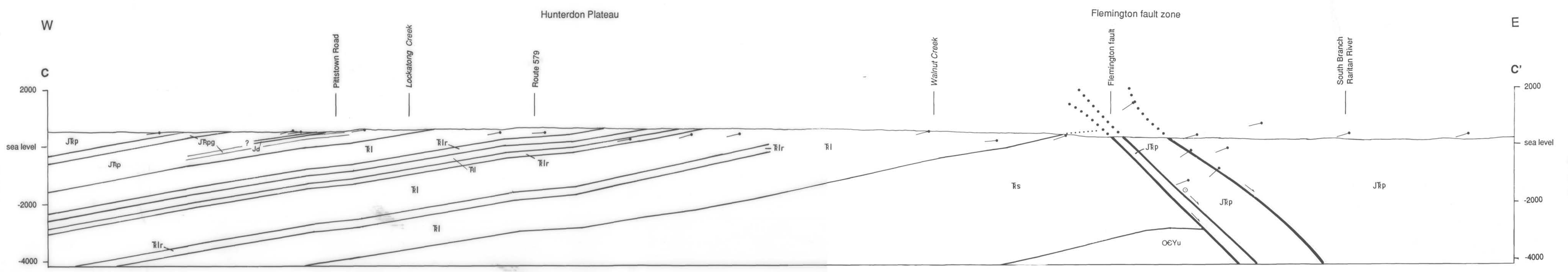
EXPLANATION OF CROSS-SECTION SYMBOLS

Projected apparent dip
- upright bedding
- overturned bedding
- spaced cleavage

Fault-motion (apparent-slip component)
- dip slip
- dextral strike slip



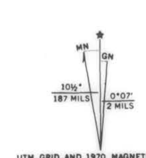




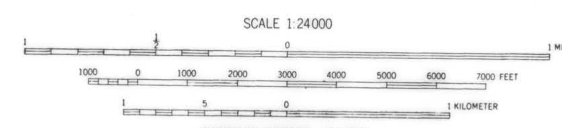
BEDROCK GEOLOGIC MAP OF THE PITTSTOWN AND FLEMINGTON QUADRANGLES, HUNTERDON AND SOMERSET COUNTIES, NEW JERSEY

by G. C. Herman, H. F. Houghton, D.H. Monteverde, and R. A. Volkert

1992



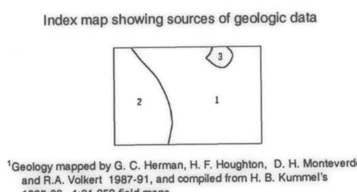
UTM GRID AND 1970 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET



SCALE 1:24000

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

Location of the study area in New Jersey



Index map showing sources of geologic data

[1] Geology mapped by G. C. Herman, H. F. Houghton, D. H. Monteverde, and R. A. Volkert 1987-91, and compiled from H. B. Kummel's 1895-98, 1:21,250 field maps

[2] Compiled mainly from H. B. Kummel's 1895-98, 1:21,250 field maps.

[3] Mapped by M. E. Johnson and F. J. Markewicz 1958, unpublished maps on file at the New Jersey Geological Survey.

Cartography by G. C. Herman 1991

Base from U. S. Geological Survey 7.5' quadrangles, Flemington, 1954 revised 1970, and Pittstown, 1955 revised 1970.

References:

Bayley, W. S., Salisbury, R.D., and Kummel, H. B., 1914, Description of the Raritan quadrangle (New Jersey): U. S. Geological Survey Geologic Atlas 191, 32p.

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Dept. of Conservation and Economic Development, 1958, Spruce Run-Round Valley Reservoir Project: Raritan River Basin Water Resources Development, Special Report 15, August 1958, Trenton, N.J., variously paginated, 2 pl.

Dodge, H. W., Jr., 1952, Paleontology and stratigraphy of the Ordovician shales west of Clinton, Hunterdon County, New Jersey: Princeton University, Princeton, N.J., Senior thesis, 42 p.

Kummel, H. B., ca 1900, unpublished field maps and notes: On file in the office of the New Jersey Geological Survey, Trenton, N.J.

Perissoratis, Constantine, 1974, Jutland Klippe: A Taconic type allochton in western New Jersey: Queens College, The City University of New York, Queens, N.Y., Masters thesis, 117 p.

Perissoratis, Constantine, Brock, P. W. G., Brueckner, H. K., Drake, A. A. Jr., Berry, W. B. N., 1979, The taconides of western New Jersey: New evidence from the Jutland Klippe: Geological Society America Bulletin, Part II, v. 90, p. 154-177.

The interpretations presented here are provisional pending peer review. There may be revisions prior to publication.

DESCRIPTION OF MAP UNITS

ROCKS OF THE NEWARK BASIN

INTRUSIVE ROCK

Jd — **Diabase** (Lower Jurassic) - Discordant to concordant intrusions of very fine- to coarse-grained diabase and granophyric diabase; dark greenish-gray to black; sub-ophitic and seriate textured. Dense, hard, sparsely fractured rock composed mostly of plagioclase (An_{50-70}), augite, clinopyroxene, magnetite-ilmenite, and rare olivine. Accessory minerals include apatite, quartz, alkali feldspar, hornblende, sphene, and zircon. Sedimentary rocks close to the diabase contact are thermally metamorphosed; grayish-red and reddish-brown mudstone, siltstone, and sandstone are typically altered to indurated, greenish-gray to yellowish-gray hornfels, commonly with clots or crystals of tourmaline or cordierite; gray argillitic siltstone is typically altered to brittle, black, very fine-grained hornfels. Thickness of intrusions ranges from a few feet to over 2,000 feet.

SEDIMENTARY AND BEDDED VOLCANIC ROCKS OF THE NEWARK SUPERGROUP

BRUNSWICK GROUP (Lower Jurassic and Upper Triassic)

Jo — **Orange Mountain Basalt** (Lower Jurassic) - Dark greenish-gray to greenish-black basalt composed mostly of calcic plagioclase (typically An_{65}) and clinopyroxene (mostly augite and pigeonite); crystals smaller than 0.04 inch. Poorly exposed, highly fractured and weathered. Estimated thickness ranges from 0 to 520 feet.

Passaic Formation Lithofacies

JTrp, JTrpg, JTrpsc — **Passaic Formation** (Lower Jurassic and Upper Triassic) - Red beds (JTrp) of grayish-red, reddish-brown, and dusky red, thin-laminated, mudcracked mudstone, thick-laminated siltstone, and very thin-bedded, fine-grained sandstone with occasional medium-bedded, medium-grained sandstone. Sandstones commonly show trough and climbing-ripple cross-lamination. Red beds are typically arranged in 13 to 23-foot thick sequences of fluvial, playa-lake, and mudflat deposits; upper parts of sequences contain fining-upward fluvial beds in many areas. Silt- and sand-filled burrows, paleosol features, and evaporite casts are common throughout these sequences. Interbedded gray beds (JTrpg) are less common and typically are very thin to thick-bedded sequences of thinly laminated dark-gray to black silty mudstone, thickly laminated to very thin-bedded, yellowish-gray and greenish-gray siltstone and medium- to dark-gray, very fine-grained sandstone. Gray beds are isolated or in interbedded red- and gray-bed sequences with as many as 5 gray beds. Gray beds are more abundant and thicker in the lower half of the Passaic Formation. A pebble conglomerate to pebbly sandstone (JTrpsc) facies occurs near the border fault region. Conglomerate clasts are quartz and quartzite pebbles, subrounded to subangular, in a matrix of red-brown feldspathic sandstone. Sandstone is reddish-brown, medium- to coarse-grained, feldspathic (as much as 20% feldspar), commonly fining upward in sequences 3.3-6.6 feet thick, with basal pebble lags and scattered layers of pebbles to cobbles. The estimated thickness of the formation in the hanging wall region of the Flemington fault zone is 12,000 feet.

OTHER ROCKS OF THE NEWARK SUPERGROUP

JTrcqu — **Conglomerate, quartzite-clast** - Undivided conglomerates of the Passaic, Lockatong, and Stockton Formations, very poorly exposed so that formation contacts are only approximately located. Thick- to very thick-bedded, pebble-to-boulder conglomerate with mostly subrounded quartzite and quartz clasts in matrix of light-red sand to brownish-red silt. Imbrication and bedding-plane orientation are weak, especially in coarser beds. The conglomerate is coarsest and most thickly bedded near the border fault, corresponding to the position of alluvial-fan apexes. Maximum clast size decreases and interbeds of coarse- to fine-grained red sandstone thicken and are more abundant with increasing distance from the border fault. Unit thickness exceeds 5,000 feet.

Trl, Trlr, Trlsc — **Lockatong Formation** (Upper Triassic) - Cyclical fresh-water (detrital) and alkaline (chemical) lake and lake-margin deposits consisting of light- to dark-gray, greenish-gray, and black mudstone, silty argillite, argillaceous siltstone, very fine-grained argillaceous sandstone, and minor argillaceous limestone. Interbedded grayish-red, grayish-purple, and dark brownish-red sequences (Trlr) thicken and are more abundant in the upper part of the formation. Basal (transgressive-fluvial to lake-margin) parts of fresh-water-lake cycles consist of planar or cross-laminated siltstone or very fine sandstone with disrupted or convolute bedding, or silty mudstone with desiccation cracks, root casts, soil-ped casts, and tubes. Medial (lake-bottom) parts of cycles consist of dark-gray to black laminated mudstone, silty mudstone, or silty limestone, containing calcite laminas, pyrite lenses, fish scales, articulated fish, conchostracans, or carbonized plant fragments. The upper (regressive-lake-margin, playa-lake, and mudflat) parts of cycles contain silty to dolomitic or analcime-rich mudstone or argillitic siltstone, are light- to dark-gray, mostly thick-bedded to massive, and commonly contain mudcracks, crackle breccias, faint wavy lamination, burrows, euhedral pyrite grains, and dolomite or calcite specks. Alkaline-lake cycles are generally thinner (10-21 feet thick) than fresh-water ones, have few fossils (mainly conchostracans), and commonly have red beds, extensive desiccation features, and abundant analcime and dolomite specks in the upper parts of cycles. Unit becomes coarser near the border fault, where a sandstone and conglomeratic sandstone facies (Trlsc) is shown. This facies contains mostly reddish-brown to light-brown, feldspathic, coarse-to-fine sandstone, pebbly sandstone, and pebble-to-cobble conglomerate, in fining-upward sequences. Unit thickness is about 4,000 feet on the Hunterdon Plateau.

Trs, Trssc — **Stockton Formation** (Upper Triassic) - High-gradient stream-channel and floodplain deposits of light-gray, light-grayish-brown, violet-gray, yellowish- to pinkish-gray, and reddish-brown, fine- to coarse-grained arkosic sandstone, silty mudstone, argillaceous siltstone, and shale. Sandstones are mostly planar-bedded, with scoured bases containing pebble lags and mudstone rip-ups. Upper parts of channel beds are commonly burrowed. Large-scale trough cross-beds occur in some very coarse-grained sandstone beds; smaller scale trough and climbing-ripple cross-lamination occur in the upper parts of channel sequences and in finer grained sandstone beds. Unit becomes coarser near the border fault, where a conglomeratic sandstone facies (Trssc) is shown. This facies contains mostly reddish-brown to light-brown, feldspathic, coarse sandstone, pebbly sandstone, and pebble-to-cobble conglomerate, in fining-upward sequences. Estimated thickness is 4,000 feet on the Hunterdon Plateau.

ROCKS OF THE LEHIGH VALLEY SEQUENCE

Oj — **Jacksonburg Limestone** (Middle Ordovician) - Medium- to dark-gray, fossiliferous, very thin- to medium-bedded, medium-grained limestone and pebble-and-cobble conglomerate. The unit is poorly exposed, both upper and lower contacts concealed. Outcrop thickness is 6 feet, unit thickness unknown at this location. Regionally, unit thickness ranges from about 135 to 300 feet.

Ow — **"Wantage" Sequence** (Middle Ordovician) - Restricted post-Beekmantown veneer and crevice-fill deposit of grayish-green to pale-green pebble-to-cobble conglomerate with a fine sandstone-to-siltstone matrix. Pebbles and cobbles consist of reddish-brown, fine-grained quartzite, milky-white vein quartz, light-gray and laminated green argillite. Estimated thickness ranges from 0 to 150 feet.

Kittatinny Supergroup

Beekmantown Group

Obu — **Beekmantown Group, Upper part** (Lower Ordovician) - Medium-light to medium-gray, thin- to thick-bedded, aphanitic to medium-grained dolomite, weathering light- to medium-gray to yellowish-gray; locally laminated and slightly fetid, grading downward into medium-dark- to dark-gray, medium- to thick-bedded, medium- to coarse-grained dolomite, strongly fetid, with a mottled weathered surface. Contains pods and lenses of dark-gray to black chert. Cauliflower-textured black chert beds of variable thickness occur locally. Lower contact gradational with finely laminated to thin-bedded, fine- to medium-grained dolomite of the Beekmantown Group, lower part. Commonly contains paleokarst rubble breccia near the upper contact. Eroded to unit thickness of 200 to 450 feet.

Obl — **Beekmantown Group, Lower part** (Lower Ordovician) - Very thin- to thick-bedded dolomite and minor interbedded limestone. Upper part is light-olive to dark-gray, thin- to thick-bedded, fine- to medium-grained dolomite. Middle part is dark-gray and olive-gray weathering to light-brown and dark yellowish-orange, aphanitic to fine-grained, well-laminated dolomite and medium-dark to dark-gray, light-gray to light-bluish-gray weathering limestone characterized by "reticulate" mottling and light-olive-gray to grayish-orange laminas surrounding limestone lenses. Lower part consists of medium-light to dark-gray, thinly laminated to medium-bedded, aphanitic to coarse-grained dolomite having very thin to thin, black chert beds, quartz sand laminas, and recrystallized oolites, slightly fetid locally. Lenses of light-gray, very coarse- to coarse-grained dolomite occur at the base of the sequence. "Floating" quartz sand grains and quartz sand stringers occur near base of unit. Lower contact is commonly placed immediately above a distinctive sequence of thin-bedded, steel-gray quartzites. Unit is about 900 feet thick.

OCa — **Allentown Dolomite** (Lowermost Ordovician and Upper Cambrian) - Very thin- to very thick-bedded dolomite containing minor interbeds of orthoquartzite and shale. The upper part, at most places, is medium-light- to medium-dark-gray, medium- to very thick-bedded, fine- to medium-grained, locally coarse-grained dolomite. Commonly "floating" quartz sand and two sequences of medium-light to very light-gray, thin-bedded quartzite and discontinuous dark-gray chert lenses occur directly below the upper contact. The rhythmically bedded lower dolomite sequence is medium- to very light-gray weathering and contains oolites and algal stromatolites. Weathered exposures show alternating light- and dark-gray beds. Ripple marks, cross-beds, edgewise conglomerate, mud cracks, and paleosol zones occur in the lower unit. Interbedded shaly dolomite increases downward towards the lower conformable contact with the Leithsville Formation. Unit thickness is about 1,560 feet.

Cl — **Leithsville Formation** (Middle to Lower Cambrian) - Thin- to thick-bedded dolomite containing subordinate clastic rocks. Dolomite in the upper part is massive, fine- to medium-grained, pitted, friable, mottled and medium- to medium-dark gray. Dolomite in the middle part is thin- to medium-bedded, stylolitic, fine-grained and medium gray. Shaly dolomite and clastic interbeds of varicolored quartz sandstone, siltstone, and shale occur throughout the unit but are most abundant in the middle part. The lower part contains fine- to medium-grained, thin- to medium-bedded, medium-gray dolomite and contains quartz sand interbeds near the contact with the Hardyston Quartzite. Unit thickness is approximately 800 feet.

Ch — **Hardyston Quartzite** (Lower Cambrian) - Medium- to light-gray, medium- to thick-bedded, fine-grained quartzite, arkosic sandstone and dolomitic sandstone. Unit thickness is approximately 10 - 200 feet.

ROCKS OF THE JUTLAND KLIPPE SEQUENCE

Ojtb — **Jutland klippe upper unit B** (lower Middle and upper Lower Ordovician) - Heterogeneous sequence of interbedded red and green shale, interbedded dolomite and shale, interbedded fine-grained graywacke-siltstone to sandstone, and yellow, red, green, tan, and gray shale, and light-gray to pale pinkish-gray quartzite. Also contains interbedded fine-grained, thin-bedded limestone. The limestone may be disrupted, boudined, and surrounded by shale interbeds resembling an intraformational conglomerate. Lower contact placed where sandstone, siltstone, and carbonate rocks are much less common. Some beds contain conodonts, graptolites and brachiopod fragments of uppermost Cambrian age. Estimated unit thickness ranges from 1,500 to 1,800 feet.

OCjta — **Jutland klippe lower unit A** (middle Lower Ordovician and uppermost Cambrian) - Interbedded red and green shale, sandstone, and minor dark-gray, fine-grained to aphanitic limestone locally showing trough crossbedding and floating quartz sand. Grades downward into red and green shale and siltstone, and a medium-bedded sequence of siltstone, medium-grained sandstone, and a quartz-pebble conglomerate. Basal unit is a thick sequence of dark gray to black shale, and siltstone with minor interbedded dark gray micritic limestone with rounded quartz grains. Lower contact is interpreted as a thrust fault. Contains graptolites and conodonts. Estimated unit thickness ranges from 3,000 to 4,000 feet.

fnd — **formation not determined** - An anomalous sequence of brecciated, locally dolomitic, grayish-green, pale bluish-green, and grayish-olive-green siltstones, argillites, and fine-grained sandstones weathering yellowish-brown, grayish-orange, yellowish-gray to light-olive-gray, light-olive- brown, and very dark-gray. Angular- to rounded lithic clasts commonly occur in thin to thick beds having a silty to argillaceous matrix that is locally calcareous. The sandstone beds are thin- to medium-laminated and locally show relict trough cross bedding and asymmetric folding. These rocks occur as a fault-bounded lense within the Newark Basin. Previous workers correlated this sequence of rocks with altered Triassic sediments, probably of the Stockton Formation. However, a Jutland klippe correlation is also considered here because of the anomalous, variable lithologies and because Jutland klippe rocks to the north, at Clinton, plunge southward beneath the Newark Basin rocks.

ROCKS OF THE NEW JERSEY HIGHLANDS

Byram Intrusive Suite

Yba — **Microperthite alaskite** (Middle Proterozoic) - Medium- to coarse-grained, pink to buff, gneissoid to indistinctly foliated granite composed principally of microcline microperthite, quartz and oligoclase. Includes small bodies of amphibolite not shown on map.

Metasedimentary Rocks

Yb — **Biotite-quartz-feldspar gneiss** (Middle Proterozoic) - Medium-fine to medium-coarse-grained, gray to tan, commonly rusty-weathering, moderately layered and foliated gneiss that is variable in texture and composition. Composed of oligoclase, microcline microperthite, quartz, and biotite. Contains sparse garnet, graphite, sillimanite, and magnetite. In places unit resembles a biotite granite where it has undergone local anatexis.

Rocks of Uncertain Origin

Ya — **Amphibolite** (Middle Proterozoic) - Medium-grained, gray- to grayish-black, moderately well-foliated rock composed of hornblende and andesine. Some phases contain biotite or clinopyroxene. Ubiquitous and associated with almost all other Middle Proterozoic units. Unit is host to the magnetite deposit at the Large mine.

OTHER ROCKS

OCu — Undivided rocks of Cambrian-Ordovician age. May include rocks of the Lehigh Valley and Jutland Sequences. Shown in section only.

OCYu — Undivided rocks of Middle Proterozoic through Ordovician age. May include rocks of the Lehigh Valley and Jutland Sequences and Middle Proterozoic rocks of the New Jersey Highlands. Shown in section only.

CORRELATION OF MAP UNITS