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Division of Financial and Technical Assistance
Geological Survey Program
7.5 Minute Series Geologic Quadrangle Map 26

Geologic Map of the Mount Rushmore Quadrangle, South Dakota

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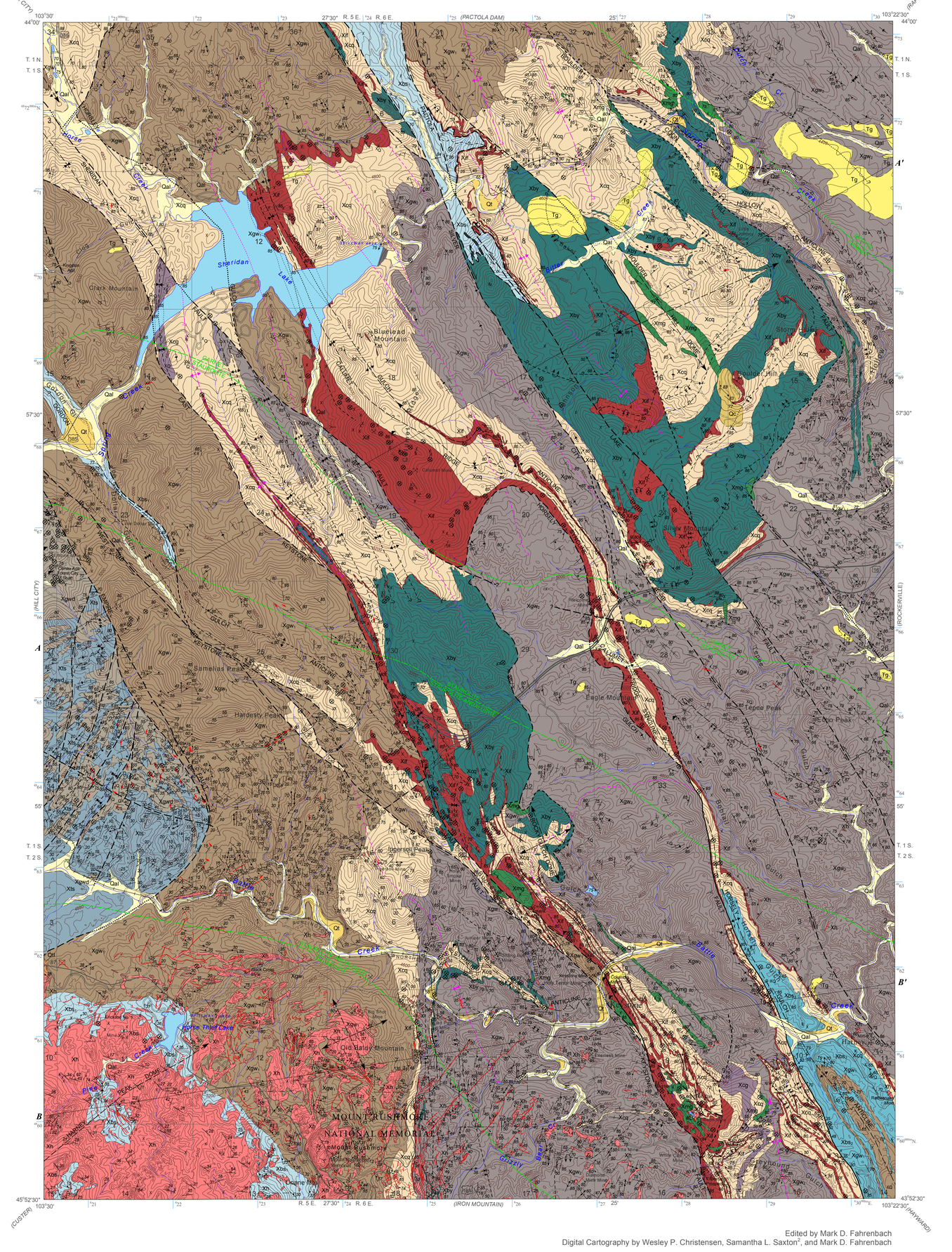
Prepared in cooperation with the West Dakota Water Development District and the South Dakota School of Mines and Technology, Rapid City, South Dakota

State of South Dakota
Dennis Daugaard, Governor

South Dakota Geological Survey
Derric L. Iles, State Geologist



Edited by Mark D. Fahrenbach
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Map base modified from U.S. Geological Survey 1:24,000-scale Mount Rushmore digital line graph.
Projection is Universal Transverse Mercator, Zone 13N.
Datum is 1983 North American.
UTM grid information generated from the ArcMap™ layout grid function.

The Geological Survey Program, Department of Environment and Natural Resources, engages in an ongoing data collection and interpretation process. An outcome of that process is to reflect those interpretations on maps such as this one. Reasonable efforts have been made to ensure that this map accurately reflects the source data used in its preparation. As additional data become available, geologic interpretations may be revised and the map may be updated by the Geological Survey Program. This map should not be enlarged or otherwise used in an attempt to interpret more detail than can be seen at a scale of 1:24,000.

SCALE 1:24,000

1 0.5 0 1 Mile
1,000 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 Feet
1 0.5 0 1 Kilometer

Contour Interval 40 Feet

NORTH
0° 53′ E
15.5 MILS
7° 53′
140 MILS
UTM GRID AND 2014 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Quadrangle location

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EXPLANATION

Quaternary

- Qal — **Alluvium** - Unconsolidated to poorly consolidated; clasts to boulder-size dominantly of Precambrian lithologies. Deposited in present-day drainages
- Qc — **Colluvium** - Locally derived unconsolidated rock debris developed along steep slopes below resistant rock units. Typically mixed with soil and supporting vegetation
- Qtl — **Talus deposit** - Locally derived, large angular blocks of Harney Peak Granite and other rock debris deposited along steep slopes. Typically loose and devoid of soil or vegetation
- Qt — **Terrace deposit** - Unconsolidated to poorly consolidated; clasts to boulder-size dominantly of Precambrian lithologies. May occur as much as 20 ft (6.1 m) above present streams

Disconformity

Tertiary

- Tg — **Gravel deposit** - Clasts to boulder-size dominantly of Precambrian lithologies with variable amount of pinkish bentonitic beds. Poorly consolidated to unconsolidated. Most deposits designated as Tg are based on elevations of known deposits of the White River Group or of general Tertiary age. Occur as much as 200 ft (61 m) above present-day streams

Unconformity

Precambrian

Early Proterozoic

- Xh — **Harney Peak Granite** - S-type granite, leucocratic, fine-grained to pegmatitic, typically layered. Occurs as sills and dikes to large bodies; some are zoned. Dominant minerals include perthitic microcline, oligoclase, quartz, and muscovite with accessory tourmaline, biotite, apatite, and garnet. Age 1.715 Ga (Redden and others, 1990)
- Xmg — **Metagabbro** - Hornblende plagioclase amphibolite and chloritic amphibole schist. Occurs as thin dark-green sills and dikes; some may be foliated, especially in areas of shear. Age inferred to be ~1.98 Ga, which is the Pb-Pb zircon age of a metagabbro sill in the Pactola Dam quadrangle, but may be equivalent to younger (~1.8 Ga) metagabbro sills (Redden and others, 1990) also in the Pactola Dam quadrangle. Protolith is gabbro
- Xts — **Tenderfoot Formation** - Muscovite phyllite to muscovite schist. Silver-gray to greenish-gray, laminated to thin-bedded with distinct layering. Includes some metagraywacke interbeds. Typically has accessory magnetite and ilmenite, locally with malachite-stained muscovite-rich schist and thin spessartine-bearing beds. Staurolite, sillimanite, and andalusite are associated with higher metamorphic grade due to proximity to the Harney Peak Granite. Equivalent to ash flow tuffs and volcanoclastic rocks in the Rochford area which have a Pb-Pb zircon age of 1.88 Ga (Redden and others, 1990). Protolith is submarine weathered volcanic tuff and shale
- Xgwd — **Metagraywacke (distal)** - Quartz-mica schist, quartzose schist, and aluminous schist. Includes unmapped subunits approximately 33-230 ft (10.1-70.1 m) thick of former distal to proximal graywacke, shale, and debris flow material as well as locally derived conglomerate and arkosic grit resembling flysch deposits. Proximity to the Harney Peak Granite caused alteration of early metamorphic minerals, resulting in large biotite-rich spots. May be equivalent to part of Xgw_1 on the Hill City quadrangle and the Mayo Formation of the southern Black Hills. Protolith is distal to proximal graywacke deposits
- Xgw_2 — **Metagraywacke unit 2** - Quartz-mica schist and phyllite. Tan, greenish-gray, to gray, thick- to thin-bedded. Contains primarily proximal Bouma A-C beds with lesser amounts of more distal D-E deposits. Calcareous and calc-silicate concretions occur locally in quartz-rich Bouma A beds. Contains biotite, garnet, staurolite, or andalusite-sillimanite depending on metamorphic grade which increases from north to south. Lithologically identical to Xgw_3 on the Hill City quadrangle, and similar to Xgw_1. Protolith is proximal to medial graywacke deposits
- Xby Xif Xcq Xcg — **Metaconglomerate, quartzite, and metapelite** - Xcq - Schist, quartzite, and metaconglomerate having clasts as much as 3 ft (1 m) across typically of quartzite, and rarely metabasalt, in a pelitic matrix. Gray, dark-gray, and tan; typically thin- to thick-bedded. Includes beds of metagraywacke which increase in abundance as metaconglomerate and quartzite decrease. Pelitic beds may be garnetiferous at higher metamorphic grade. May be equivalent to part of unit Xgwd. Xcg - Metagraywacke lenses similar to Xgw_1 and Xgw_2. Xby - Metabasalt (younger), composed of pale-green to dark-gray or green amphibolite. Typically finely crystalline, but crystal size varies from coarse, with large hornblende phenocrysts in the southern portion of the quadrangle, to massive, finely crystalline amphibolite in the Pactola Dam quadrangle. Foliation is commonly present near the termination of flows. Some flows have pillow structures. Protolith is basalt flows. Xif - Carbonate facies iron-formation, iron-stained metachert, and carbonaceous phyllite occuring as interflow deposits. May contain cummingtonite-grunerite depending on metamorphic grade. Protolith of formation is debris flow deposits with associated thermal springs
- Xbs_2 — **Biotite schist and phyllite** - Biotite-rich schist, phyllite, or slate. Thin-bedded, typically graphitic. Areas of schist usually contain thin garnet-rich beds, metachert beds, and metagraywacke beds. Equivalent to part of the Oreville Formation. Protolith is black shale and pelite
- Xgw_1 — **Metagraywacke unit 1** - Quartz-mica schist, mica schist, and phyllite. Tan, gray, to black, thick- to thin-bedded, fine- to very fine-grained. Lithologically similar to Xgw_3 on the Hill City quadrangle, and to Xgw_2, but contains more distal Bouma B-E beds and few proximal Bouma A beds locally containing calc-silicate concretions. Protolith is proximal to medial graywacke deposits
- Xbs_1 — **Biotite-garnet schist and biotite schist** - Graphitic schist and phyllite with garnet- and biotite-rich layers and massive quartzose beds. Gray to black, thin-bedded, fine- to medium-grained. Localized thin metachert beds occurring in the northern portion of the quadrangle are commonly associated with iron carbonate and contain accessory pyrite and other sulfides. Typically poorly exposed. Formation may be equivalent to the Loues Formation at Bear Mountain on the Medicine Mountain quadrangle (Ratte, 1986), and the Reausaw Slate of Bayley (1972). Protolith is black shale
- Xu — **Precambrian (undifferentiated)** - Shown only in cross section

Contact
Long dashed where approximately located; dotted where concealed or where projected above land surface in cross section; queried where uncertain. Arrow indicates dip direction and amount

FAULTS

Fault
Long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where uncertain. Bar and ball on downthrown side. Arrows indicate lateral movement. Tic indicates dip direction and amount

FOLDS (Early Proterozoic)

D_1 Folds

Anticline
Showing generalized trace of the axial plane and direction of plunge. Long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where uncertain

Syncline
Showing generalized trace of the axial plane. Long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where uncertain

Overturned anticline
Showing generalized trace of the axial plane and dominant dip direction of limbs. Long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where uncertain

Overturned syncline
Showing generalized trace of the axial plane and dominant dip direction of limbs. Long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where uncertain

D_2 Folds

Antiform
Showing generalized trace of axial plane and direction of plunge. Long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where uncertain

Synform
Showing generalized trace of axial plane. Long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where uncertain

Undifferentiated fold
Showing generalized trace of axial plane. Short dashed where inferred; dotted where concealed; queried where uncertain

Dome
Long dashed where approximately located.
Formed by intrusion of Harney Peak Granite

STRIKE AND DIP OF BEDDING

- Inclined
- Inclined — Ball indicates top direction of beds known to be in dip direction
- Inclined — Xenolith of schist in Harney Peak Granite too small to be shown
- Vertical
- Vertical — Ball indicates top direction of beds
- Overturned — Where direction of younging is known
- Overturned — Ball indicates top direction of beds known to be opposite dip direction
- Top of bed — Shown by sedimentary structures
- Top of pillow lava

STRIKE AND DIP OF FOLIATION

- Inclined
- Inclined — Parallel to bedding
- Vertical

STRIKE AND DIP OF LAYERING IN HARNEY PEAK GRANITE

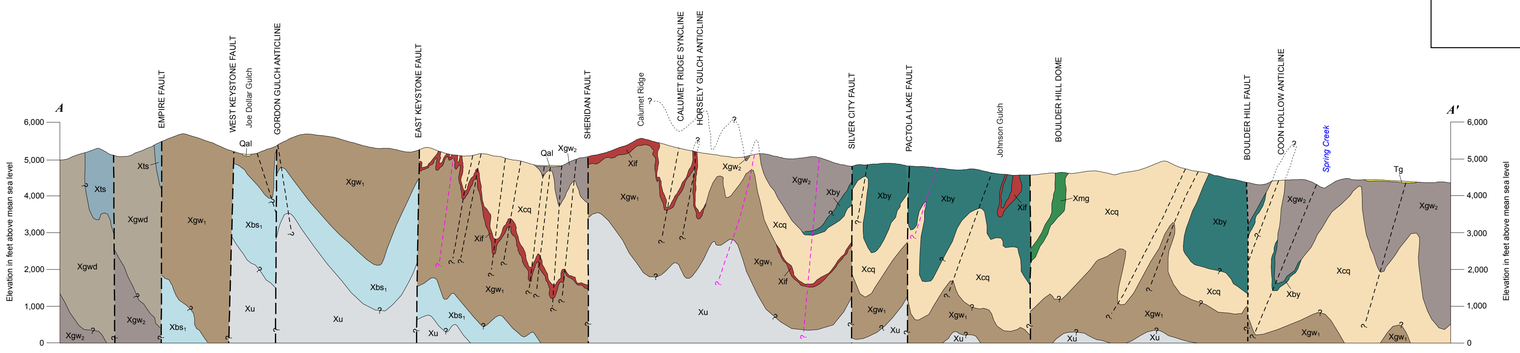
- Inclined

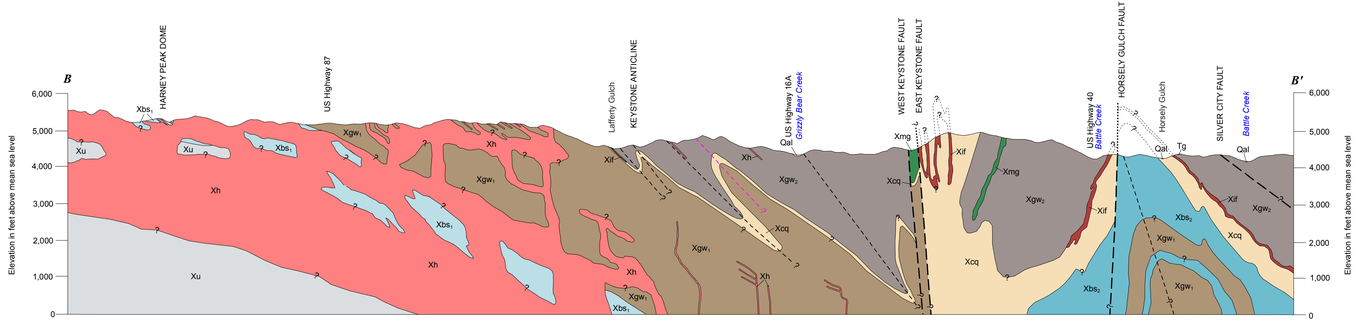
STRIKE AND DIP OF JOINTS

- Inclined

LINEAR STRUCTURES

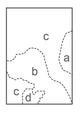
- Lineation — Showing bearing and plunge. Based on orientation of elongated clasts, calc-silicate concretions, and mineral aggregates
- Minor fold axis — Showing bearing and plunge
- GARNET / STAUROLITE ? — Metamorphic Isograd — Queried where uncertain
- Quartz vein
- Open pit mine or glory hole
- Mine shaft
- Mine adit
- Trench
- Q — Group of prospect pits — Q - Indicates pits in quartz vein
- Q — Prospect pit — Q - Indicates pit in quartz vein
- Mine Tailings





Index to sources of geologic data

(letters correspond to those listed in Selected References)



Acknowledgements

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