GEOLOGIC MAP OF THE RAPID CITY EAST QUADRANGLE, SOUTH DAKOTA

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State of South Dakota
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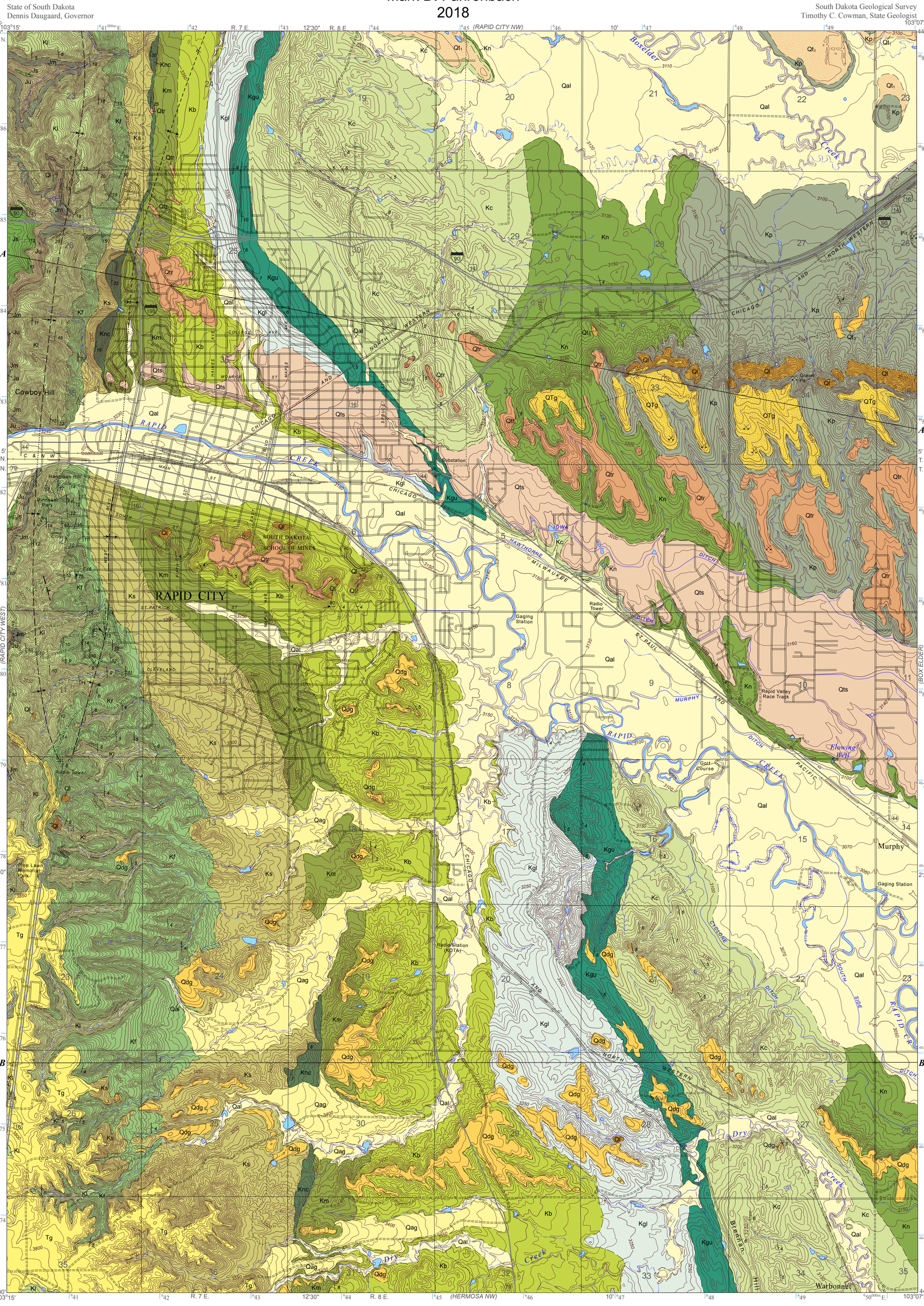
SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF FINANCIAL AND TECHNICAL ASSISTANCE
GEOLOGICAL SURVEY PROGRAM
7.5 MINUTE SERIES GEOLOGIC QUADRANGLE MAP 28



Map base modified from U.S.G.S. 1:24,000-scale Rapid City East digital line graph.
Projection is Universal Transverse Mercator, Zone 13.
Datum is 1983 North American.
UTM grid from U.S.G.S. 1:24,000-scale Rapid City East quadrangle, datum is 1927 North American

The Geological Survey Program, South Dakota 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. This map is date specific. 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 the 1:24,000 scale.

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

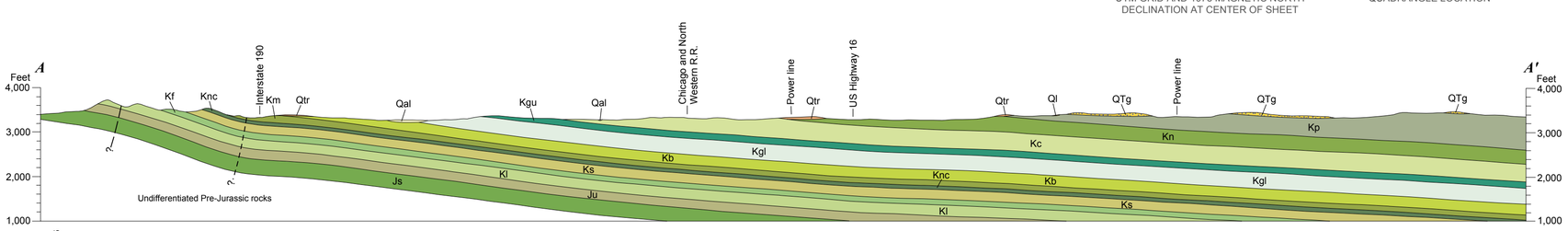
1 0.5 0 1 Kilometer

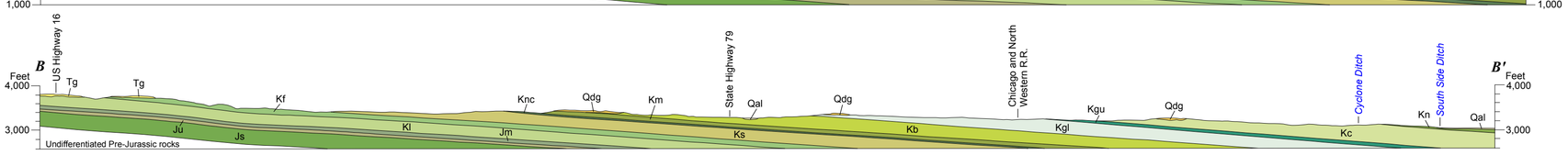
CONTOUR INTERVAL 10 FEET

Initial geologic mapping by J.M. Cattermole, 1967-1968
Digital Cartography by M.D. Fahrenbach

UTM GRID AND 1978 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
(GN, MN; 1°16' 23 MILS; 12° 213 MILS)

SOUTH DAKOTA
QUADRANGLE LOCATION





EXPLANATION

QUATERNARY

Qal — Alluvium - Unconsolidated to loosely consolidated, subangular to rounded clasts to boulder-size. Deposited in present-day stream drainages and on flood plains. May include terrace deposit Qt_1. Maximum thickness of approximately 30 ft (9.1 m) reported from well logs

Ql — Landslide - Unconsolidated, randomly oriented, poorly sorted debris of locally derived material deposited along steep slopes. Occurs as block glides, listric slumps, and debris flows. Landslides in sections 34 and 35, T. 2 N., R. 8 E. are uncertain (Cattermole, 1972)

Qag — Alluvium and gravel - Unconsolidated to loosely consolidated, subangular to rounded clasts to boulder-size of locally derived material and reworked gravel deposits. Deposited in, and up to 20 ft (6.1 m) above present-day stream drainages in the southwest portion of the quadrangle. Generally equivalent in elevation to terrace deposit Qt_1

Qt_1 — Terrace deposit 1 - Unconsolidated to loosely consolidated, subangular to rounded clasts to boulder-size. Composed of approximately 78% Precambrian metachert, quartzite, quartz, metaigneous rocks and minor schist, and 22% Phanerozoic chert, sandstone, and minor limestone. Deposited up to 20 ft (6.1 m) above Boxelder Creek. Mapped by Cattermole (1972) as "Gravel deposits of Boxelder Creek" and as "Younger gravel deposits of Boxelder Creek" (McGregor and Cattermole, 1973)

Qts — Sturgis terrace deposit - Unconsolidated to loosely consolidated, subangular to rounded clasts to boulder-size. Composed of approximately 75% Precambrian metachert, quartzite, quartz, metaigneous rocks and minor schist, and 25% Phanerozoic chert, sandstone, and minor limestone (Cattermole, 1969). Occurs 25-50 ft (7.6-15.2 m) above Rapid Creek. Mapped by Plumley (1948) as the Sturgis terrace of Fillman (1929). Generally equivalent in elevation to terrace deposit Qt_2 shown on other quadrangles. Thickness approximately 5-35 ft (1.5-10.7 m) reported from well logs

Qdg — Gravel deposits of Dry Creek - Unconsolidated to loosely consolidated, subangular to rounded clasts to boulder-size. Composed of approximately 71% Precambrian metachert, quartzite, quartz, metaigneous rocks, and minor schist and granite, and 29% Phanerozoic chert, sandstone, and minor limestone. Likely contains material reworked from Tertiary gravel deposits (Tg). Deposited approximately 20-100 ft (6.1-30.5 m) above Dry Creek and adjacent drainages. Possibly equivalent to terrace deposit Qt_2 shown on other quadrangles. Thickness of 12-26 ft (3.7-7.9 m) reported from well logs

Qt_3 — Terrace deposit 3 - Unconsolidated to loosely consolidated, subangular to rounded clasts to boulder-size. Composed of approximately 96% Precambrian metachert, quartzite, quartz, and metaigneous rocks, and 4% Phanerozoic chert, sandstone, and minor limestone. Deposited 130-140 ft (39.6-42.7 m) above Boxelder Creek. Mapped by Cattermole (1972) as "Gravel deposits of Boxelder Creek." Equivalent in elevation to "Older gravel deposits of Boxelder Creek" of McGregor and Cattermole (1973), and generally intermediate in elevation between the Sturgis terrace deposit (Qts) and the Rapid terrace deposit (Qtr)

Qtr — Rapid terrace deposit - Unconsolidated to loosely consolidated, subangular to rounded clasts to boulder-size. Composed of approximately 67% Precambrian metachert, quartzite, quartz, metaigneous rocks, and minor schist and granite, and 33% Phanerozoic chert, sandstone, and minor limestone. Deposited approximately 100-200 ft (30.5-61.0 m) above Rapid Creek. Mapped by Plumley (1948) as the Rapid terrace of Fillman (1929), and by Cattermole (1972) as "Gravel deposits of Rapid City." Equivalent to the "Older terrace deposit" (Qto) on the Rapid City West quadrangle (Cattermole, 1969; Fahrenbach and Sawyer, 2001). Estimated thickness 23-30 ft (7.0-9.1 m)

Disconformity

QUATERNARY — TERTIARY — Pliocene (?) - Eocene (?)

QTg — Gravel deposit - Unconsolidated to loosely consolidated, subangular to rounded clasts to boulder-size. Brownish-orange to reddish-brown. Composed of approximately 91% Precambrian metachert, quartzite, quartz, metaigneous rocks and minor schist, and 9% Phanerozoic chert, sandstone, and minor limestone. Mapped by Plumley (1948) as the Mountain Meadow surface of Fillman (1929). Thickness approximately 10-25 ft (3.0-7.6 m)

Disconformity

Tg — Gravel deposit - Unconsolidated to loosely consolidated, subangular to rounded clasts to boulder-size. Brownish-orange to reddish-brown. Composed of approximately 85% Precambrian metachert, quartzite, quartz, metaigneous rocks and minor schist, and 17% Phanerozoic chert, sandstone, and minor limestone. Bentonitic clay content is variable. Mapped by Darton and Paige (1925) as White River Group. Thickness of 10-60 ft (3.0-18.3 m) reported from well logs

Unconformity

CRETACEOUS — Upper Cretaceous

Kp — Pierre Shale - Shale, dark-gray, weathers brown to olive-brown. Plastic, breaks into blocky, irregular fragments. Noncalcareous. Includes thin bentonite partings and beds over 2 ft (0.6 m) thick. Shale in the lower 60 ft (18.3 m) is light-gray, weathering light-brown, and transitional into the Niobrara Formation. Contains ironstone concretions, selenite crystals, fracture fillings of limonite, and the cephalopod *Baculites* sp. Exposed thickness of formation greater than 650 ft (198.1 m)

Kn — Niobrara Formation - Shale, marl, and siltstone. Shale, light-gray, gray, to blue-gray, weathers light-brown to tan with gray flecks of calcium carbonate. Thinly laminated, calcareous. Orange to brown spherical concretions as much as 2 ft (0.6 m) across occur in the middle of formation. Lower part of formation is gray calcareous siltstone interbedded with marl. Appears to grade into the underlying Carlile Shale (Cattermole, 1972). Thickness approximately 265 ft (80.8 m)

Disconformity

Kc — Carlile Shale - Includes the following members which were observed in the field but not differentiated on the map or cross section. Combined thickness approximately 370 ft (112.8 m)

Sage Breaks Shale Member - Shale, dark-gray. Gray to tan concretions 4-6 ft (1.2-1.8 m) across occur 15 ft (4.6 m) below top of formation, with gray to tan sandy concretions as much as 8 ft (2.4 m) across occurring in the lower portion

Turner Sandy Member - Sandstone, light-brown to gray-brown. Fine- to medium-grained, subangular, thin-bedded, calcareous, and micaceous. Interbedded with silty limestone and gray, noncalcareous shale. Sandy calcareous concretions are throughout the member, with a zone of concretions up to 8 ft (2.4 m) in diameter at the base

Pool Creek Shale Member - Shale, gray, silty. Some brown calcareous mudstone interbeds occur in the lower part. Yellowish-brown to grayish-tan concretions up to several feet in daimeter are present in the lower and upper portions

Kgu, Kgl — Greenhorn Limestone (upper) - Limestone, gray, blue-gray, to light-brown, weathers tan. Thin-bedded with calcareous shale interbeds. Contains abundant fragments of *Mytiloides labiatus* shells. Typically forms a resistant ridge with a prominent dip slope. Thickness 35-80 ft (10.7-24.4 m)

Greenhorn Limestone (lower) - Shale with minor thin limestone and siltstone beds. Shale, gray to dark-gray, silty, calcareous, weathers brown to light-brown. Bentonite beds to over 2 ft (0.6 m) thick occur in the upper part of the unit. Includes limestone calcarenite, light-gray to gray-brown, thin-bedded, silty, dominantly composed of fragments and calcite prisms from *Mytaloides labiatus* shells. Siltstone, light-gray, weathers tan. Calcareous, and interbedded throughout the section. Contact of unit with underlying Belle Fourche Shale placed at the base of the lowest persistent limestone bed 0.5 ft (0.2 m) or more in thickness. Thickness of unit 190-280 ft (57.9-85.3 m)

Kb — Belle Fourche Shale - Shale, dark-gray to black, plastic, clayey. Contains thin bentonite partings and beds up to 2 ft (0.6 m) thick throughout the formation. Iron-manganese concretions as much as 2 ft (0.6 m) thick and 6 ft (1.8 m) across occur in the lower 50 ft (15.2 m) and at the base. Thickness approximately 240 ft (73.2 m)

Km — Mowry Shale - Shale, dark-gray, weathers medium-gray. Fissile, siliceous, noncalcareous. Contains thin bentonite partings and beds 1 ft (0.3 m) or more in thickness. An approximately 2 ft (0.6 m) thick bentonite bed occurs locally at the top of the formation. May contain sandstone dikes. Basal contact drawn at the top of the highest sandstone bed where the Newcastle Sandstone is present. Where the Newcastle Sandstone is absent, the contact is placed between light-colored fissile shale of the Mowry and the underlying darker and coarser Skull Creek Shale. Thickness approximately 125 ft (38.1 m)

Disconformity

CRETACEOUS — Lower Cretaceous

Knc — Newcastle Sandstone - Sandstone, siltstone, and shale. Sandstone, light-brown, fine- to medium-grained, poorly sorted. Typically has thin, slabby bedding but has very thick-bedded lenses up to 6 ft (1.8 m) thick. Locally contains carbonized wood. Siltstone and shale is brownish-gray and interbedded with the sandstone. From Rapid Creek south to section 19, T.1 N., R. 8 E., the sandstone is absent and appears to have graded laterally into siltstone and shale (Cattermole, 1972). Thickness 25-45 ft (7.6-13.7 m)

Ks — Skull Creek Shale - Shale, dark-gray to black, weathers light- to dark-brown. Thinly laminated, fissile. Breaks into large fragments. Interbedded with siltstone. Very fine-grained sandstone lenses occur in upper part. Thickness 190-260 ft (57.9-79.2 m)

Kf — Fall River Sandstone - Sandstone interbedded with shale and siltstone. Sandstone, gray, tan, to light-brown, weathers red to brown. Fine-grained, thinly and evenly bedded, typically ripple marked. Shale, tan to gray, weathers red, brown, or purple. Siltstone, tan, weathers gray or brown. Local lenses of conglomerate occur at the contact with the Lakota Formation. A 10-20 ft (3.0-6.1 m) thick transitional zone of siltstone interbedded with dark-gray or purplish-gray shale at the top of the formation grades into the overlying Skull Creek Shale. Thickness approximately 125 ft (38.1 m)

Disconformity

Kl — Lakota Formation - Sandstone, shale, and siltstone. Sandstone, brown, light-gray, to white, subrounded, coarse- to very fine-grained. Silty, laminated, and micaceous. A brown, fluvial, fine-grained, cross-bedded sandstone over 50 ft (15.2 m) thick and iron-stained beds occur locally in the upper part of the formation. Shale, gray to brownish-yellow near the top, becomes dark-gray or brown lower in the section where sandy or silty shale is interbedded with sandstone. Locally, an approximately 30 ft (9.1 m) thick gray to tan hard claystone, or an approximately 50 ft (15.2 m) thick brown, fine-grained fluvial cross-bedded sandstone is present in the upper part of the formation. Some petrified wood occurs locally in the lower portion of the formation. Variable thickness of formation indicates channeling into the underlying Morrison Formation. Thickness 225-375 ft (68.6-114.3 m)

Disconformity

JURASSIC — Upper Jurassic

Jm — Morrison Formation - Shale, siltstone, and sandstone. Shale is gray to light-tan, typically weathering brown, fissile, and sandy. Siltstone, tan to brownish-yellow, is interbedded with sandstone and shale. Red siltstone lenses occur locally in lower part of formation. Sandstone is white to light-tan, fine- to very fine-grained. Thickness 0-100 ft (0-30.5 m)

Disconformity

Ju — Unkpapa Sandstone - Sandstone, upper part buff to white, lower 5-30 ft (1.5-9.1 m) yellow. Fine-grained, subrounded. Where the Unkpapa is thick, the overlying Morrison Formation is thin. In W 1/2 of section 26, T. 2 N., R. 7 E., the Unkpapa appears to grade laterally into the Morrison by becoming finer grained. Thickness 60-150 ft (18.3-45.7 m)

Js — Sundance Formation - Includes the Canyon Springs Sandstone, Stockade Beaver Shale, Hulett Sandstone, Lak Shale, and Redwater Shale members. Total thickness approximately 300-360 ft (91.4-109.7 m). Only the Redwater Shale Member is exposed in the map area, but was not differentiated on the map or cross section

Redwater Shale Member - Shale, gray to greenish-gray. Fissile, silty, and glauconitic. Sandy fossiliferous limestone occurs near the top of the member. Contains the belemnite *Pachyteuthis* sp. throughout. Exposed thickness greater than 75 ft (22.9 m)

CONTACTS
Long dashed where approximately located; short dashed where inferred

FAULTS
Long dashed where approximately located. Tic indicates dip direction

FOLDS
Monocline, anticlinal bend — Shorter arrow indicates steeper beds. Long dashed where approximately located; dotted where concealed; queried where uncertain

Monocline, synclinal bend — Shorter arrow indicates steeper beds. Long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where uncertain

BEDDING
33 Inclined

FRACTURES
33 Inclined

OTHER FEATURES
Gravel pit
Observation water well — From which lithologic information was obtained (J.P. Gries, South Dakota School of Mines and Technology, unpub. data, 1968). Located in the NE 1/4, NW 1/4, sec. 26, T. 2 N., R. 7 E. and the NE 1/4, SE 1/4, sec. 10, T. 1 N., R. 8 E.
Flowing water well — Located in the NW 1/4, NE 1/4, sec. 15, T. 1 N., R. 8 E.

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