

GEOLOGIC AND STRUCTURE CONTOUR MAP OF THE
SIDNEY 30'x 60' QUADRANGLE
EASTERN MONTANA AND ADJACENT NORTH DAKOTA

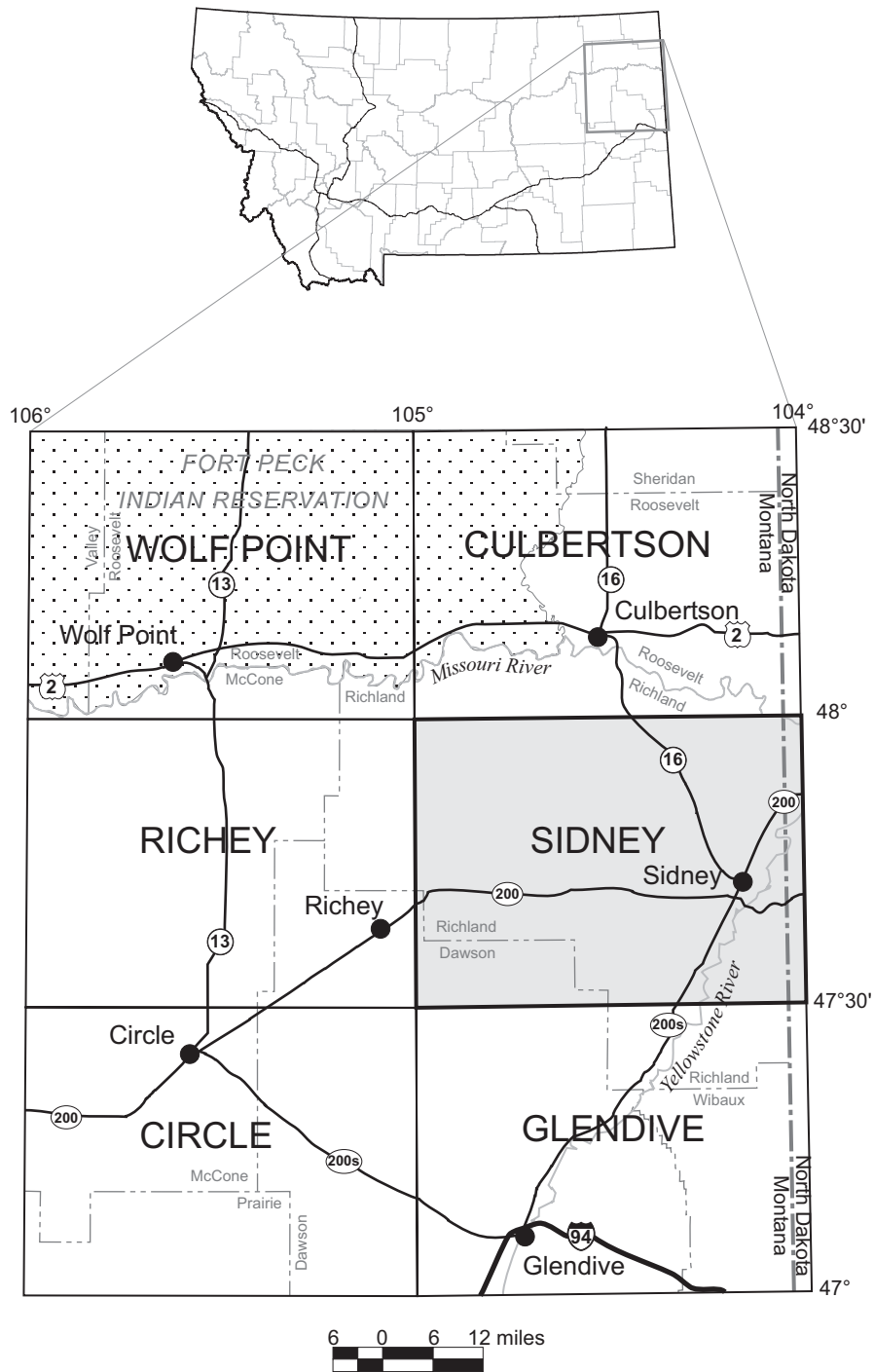
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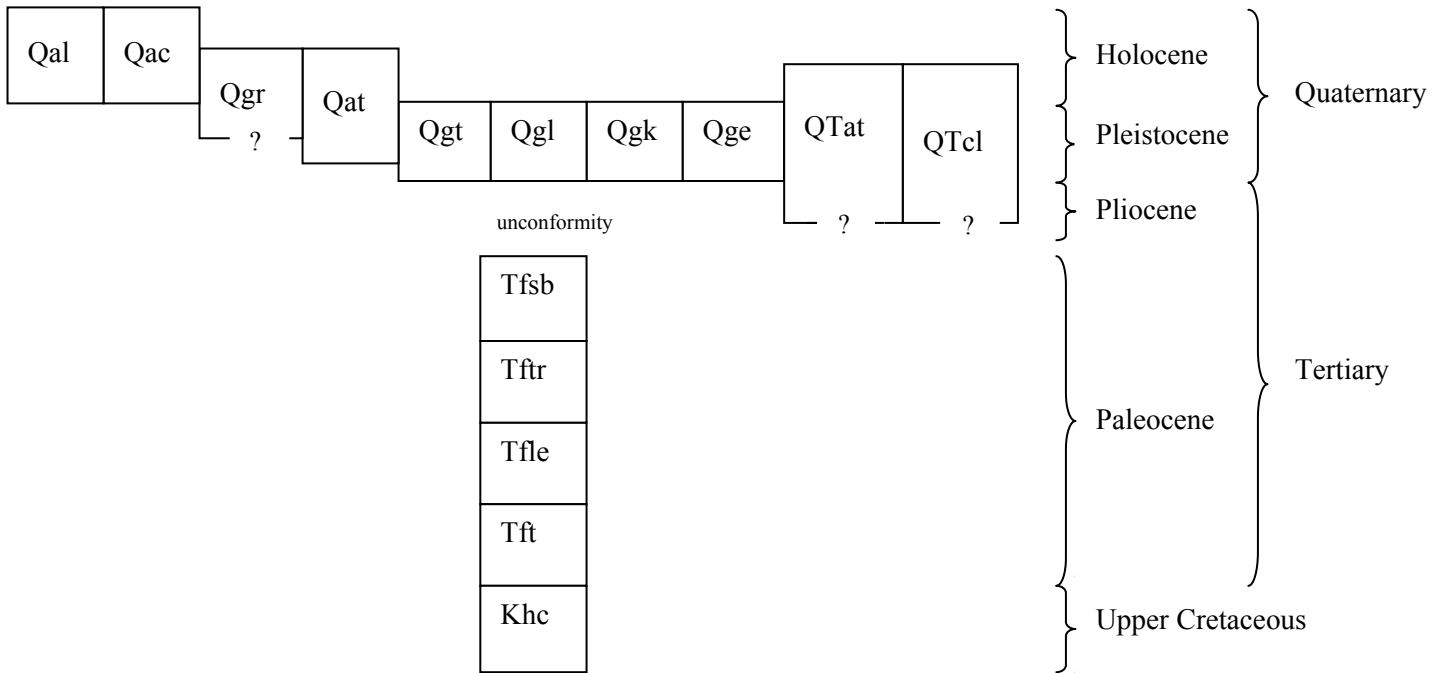
This report has been reviewed for conformity with Montana Bureau of Mines and Geology's technical and editorial standards.

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Location map of Sidney 30'x60' quadrangle and adjacent geologic maps published by MBMG.

CORRELATION DIAGRAM
SIDNEY 30' X 60' QUADRANGLE



GEOLOGIC MAP SOURCES AND INDEX OF 7.5' QUADRANGLES
SIDNEY 30'x 60' QUADRANGLE

105°								104°
48°	Elmdale NW	Elmdale	Elm Coulee 3	Andes 3	Blue Hill 3	Sioux Pass 3	Fairview NW 3	Dore 3
	Elmdale SW 2	Carda Coulee 2	Three Buttes Creek West 2	Three Buttes Creek East 2, 3	Girard 3	Brorson 3	Fairview SW 3, 4	Fairview 3
	Kuester Lake 2	Enid 1, 2	Fox Lake 1, 2	Lambert 2, 3	Crane NW 3	Crane NE 3, 4	Sidney 3, 4	Sidney NE 4
	Clay Butte 1, 2	Enid SE 1, 2	Butler Table 2	McCone Heights 1, 2, 3	Larson School 1, 3	Crane 3, 4, 5	Piche 4, 5	Sidney SE 4
47°30'								

Numbers above correspond with reference list below.

1. Culbertson, W.S., 1954, scale 1:42,240
2. Parker, F.S., 1936, scale 1:190,000
3. Prichard, G.E., and Landis, E.R., 1955, scale 1:62,500.
4. Stebinger, Eugene, 1912, scale 1:125,000.
5. Torrey, A.E., and Kohout, F.A., 1956, scale 1:125,000.

Entire quad

- Mathews, J.E., 1989a, b, c, and d, scale 1:100,000.
 Stoner, J.D., and Lewis, B.D., 1980, scale 1:500,000.
 Vuke, S.M., Wilde, E.M., and Bergantino, R.N., 1994, scale 1:100,000.

DESCRIPTION OF MAP UNITS
SIDNEY 30' x 60' QUADRANGLE

Note: Thicknesses are given in feet because original base maps used feet. To convert feet to meters (the contour interval unit on this map), multiply feet x 0.3048.

- Qal Alluvium (Holocene)**—Light-brown, yellowish-brown, grayish-brown, brown, olive, gray, and light-gray gravel, sand, silt, and clay deposited in stream and river channels and on flood plains. Gravel clasts poorly to well sorted and as much as 2 ft in diameter. Deposits poorly to well stratified. Thickness generally less than 20 ft, but locally as much as 40 ft.
- Qgr Gravel (Holocene and Pleistocene?)**—Alluvium and colluvium reworked directly from QTat deposits and deposited on slopes. Color and composition identical to uncemented QTat. Thickness less than 20 ft.
- Qac Alluvium and colluvium, undivided (Holocene)**—Dominantly sand, silt, and clay in glacial meltwater channels. Color reflects that of older Quaternary and Tertiary units from which it was derived. May locally overlie glacial outwash deposits. Thickness not determined.
- Qat Alluvial terrace deposit (Holocene and Pleistocene)**—Light-brown, grayish-brown, and light-gray gravel, sand, and silt in terrace remnants at elevations ranging from 5 to 360 ft above modern rivers and streams. Gravel clasts generally well sorted and dominantly well rounded. Deposits poorly to well stratified. Thickness generally less than 20 ft.
- Qgt Glacial till (Pleistocene)**—Heterogeneous mixture of light-brown, grayish-brown, and light-gray clay, silt, sand, and gravel with rare to abundant cobbles and boulders. Locally contains lenses and stringers of moderately well sorted clay, silt, sand, or gravel. Thickness generally less than 30 ft, but as much as 100 ft.
- Qgo Glacial outwash deposit (Pleistocene)**—Light-brown, yellowish-brown, brown, and light-gray, fine-grained sand, silt, and clay in glacial meltwater and stream-diversion channels. Thickness not determined. May be more than 50 ft thick in places (Prichard and Landis, 1975).
- Qgl Glacial lake deposit ? (Pleistocene)**—Assumed deposit obscured by younger fine-grained alluvium and colluvium. Thickness not determined.
- Qgk Glacial kame deposit**—(from Prichard and Landis, 1975) Chaotically cross-bedded cobbles, pebbles, and sand in rounded hills. Thickness not determined.
- Qge Glacial esker deposit**—(from Prichard and Landis, 1975) Cross-bedded gravel, sand, silt, and clay in sinuous ridges. Thickness not determined.

QTat Alluvial terrace deposit (Pleistocene and Pliocene?)—Light-brown, yellowish-brown, brown, and light-gray gravel, sand, silt, and clay at elevations higher than Qat. Alluvium of several terraces of different ages and elevations included in this unit. Crudely to well stratified, and poorly to moderately well sorted. In places deposits have been cemented to conglomerate by calcium carbonate or iron oxide. Nearly all clasts are well rounded and composed dominantly of quartzite, chert, volcanic rocks, ironstone concretions, sandstone, and siltstone with minor amounts of shale, agate, silicified wood, jasper, chalcedony, and clinker. Clasts are as much as 15 inches in diameter, but most less than 2 inches. Thickness about 30 ft.

QTcl Clinker (Holocene, Pleistocene, and Pliocene?)—Red, pink, orange, black, and yellow, resistant metamorphosed sandstone, siltstone, and shale of the Fort Union Formation. Bedrock was baked by natural burning of adjacent coal bed. Locally, baked rock was melted and fused to form buchite, a black, glassy, vesicular or scoriaceous rock. Unaltered glacial till lies directly on thick clinker in parts of the map area indicating that some of the beds must have burned before the advance of the ice sheet into this area (Prichard and Landis, 1975). Thickness as much as 60 ft.

Fort Union Formation (Paleocene)

Tfsb Sentinel Butte Member—Dark-gray shale locally underlain by orangish-brown or brown, iron oxide-stained, cross-bedded channel sandstone with medium- to coarse-grained, angular to subangular, poorly sorted clasts. Channel bases display scour features including abundant rip-up clasts. Gray or grayish-brown, poorly resistant mudstone about 20 ft thick underlies the sandstone locally. Prominent coal beds are present near the base of the member in most areas. Upper part of member removed by erosion. Thickness of about 300 ft exposed in map area.

Tftr Tongue River Member—Yellow, orange, or tan, fine- to medium-grained sandstone and thinner interbeds of yellowish-brown, orange, or tan siltstone and light-colored mudstone and clay. Clay dominantly nonswelling. Contains several prominent lignite beds (Mathews, 1989a, b, c, and d). Member generally poorly cemented and weathers to badland topography, but some relatively resistant sandstone beds form caprocks. Locally contains silicified wood, freshwater mollusks, and plant molds. Thickness 850 ft.


Tfle Lebo Member—Medium- to dark-gray, grayish-brown and olive-gray sandstone, siltstone, and mudstone that is typically smectitic or carbonaceous, interbedded with gray to dark-gray, silty shale, thin yellowish-gray siltstone and sandstone, and thin, lenticular lignite beds. Contains small-scale, light-gray, fine- to medium-grained, cross-bedded channel sandstones. Clay typically exhibits characteristic “popcorn” weathering. Thickness about 200 ft.


Tft **Tullock Member**—Alternating tan, yellow, brown, and gray, dominantly planar beds of sandstone, siltstone, and shale, and thinner dark gray or black beds of carbonaceous or lignitic shale, and thin, lenticular lignite beds. Thickness about 180 ft.

Khc **Hell Creek Formation**—Dominantly gray and grayish-brown sandstone, smectitic, silty mudstone, and a few thin beds of lignite or carbonaceous shale. Only about 70 ft of uppermost part of formation exposed in map area.

MAP SYMBOLS

 **Contact**—Dotted where concealed.

 **Structure contour line**—Number indicates estimated feet above sea level of top of Pierre (Bearpaw) Shale.

 **Well-log location**—Number indicates altitude of top of Pierre (Bearpaw) Shale.

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