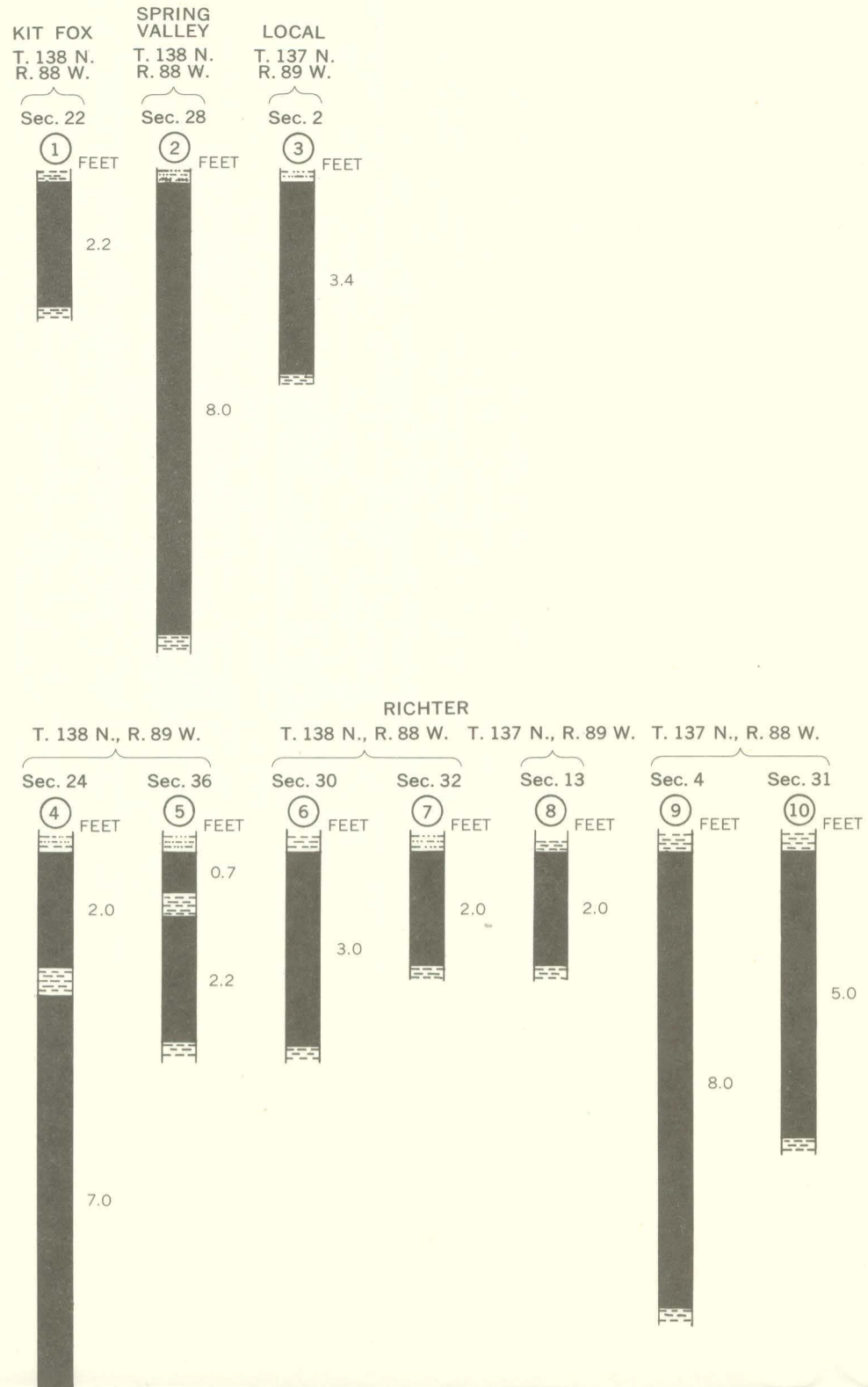
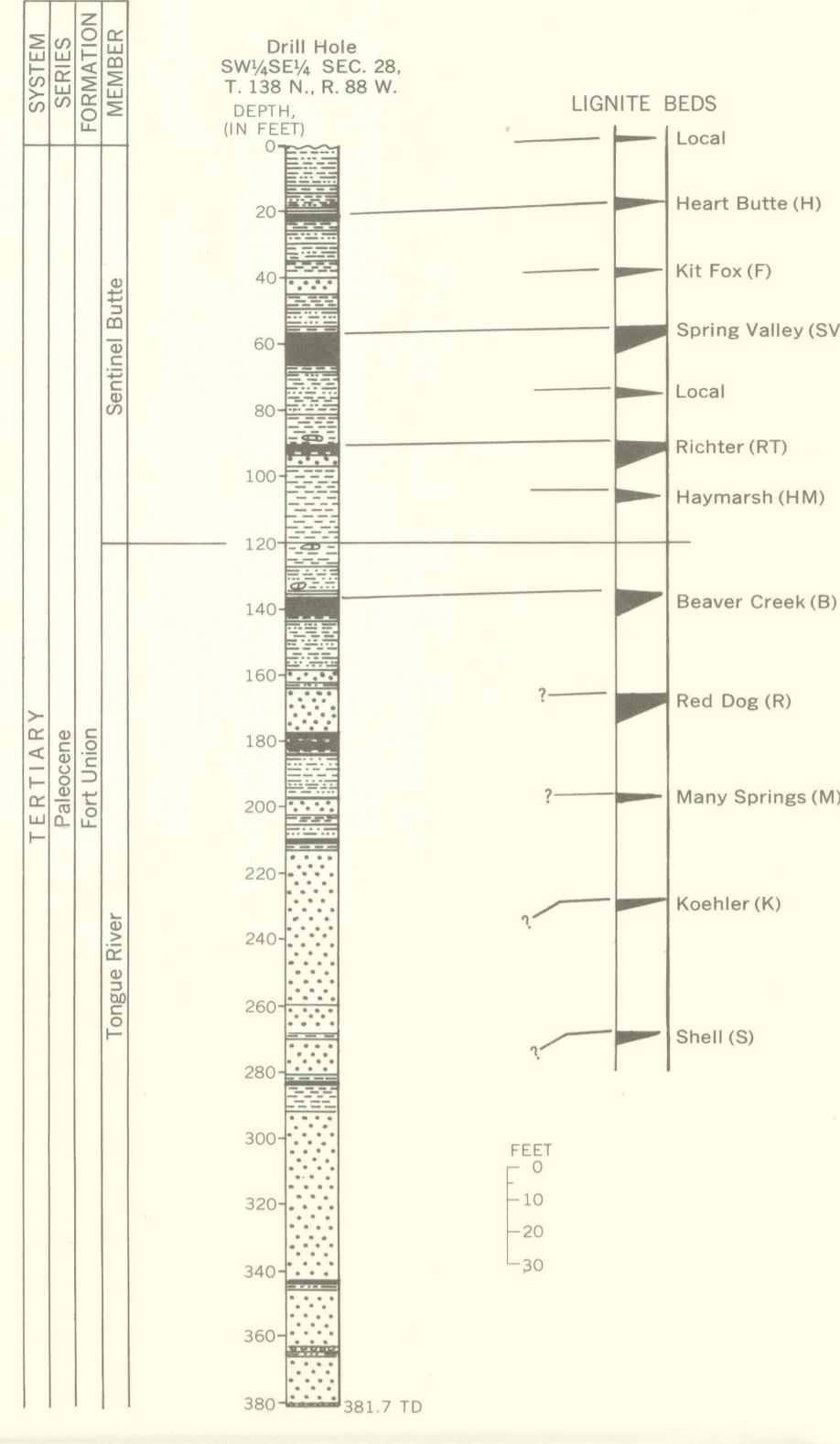


COAL SECTIONS AND LIGNITE BEDS IN THE HEART BUTTE QUADRANGLE

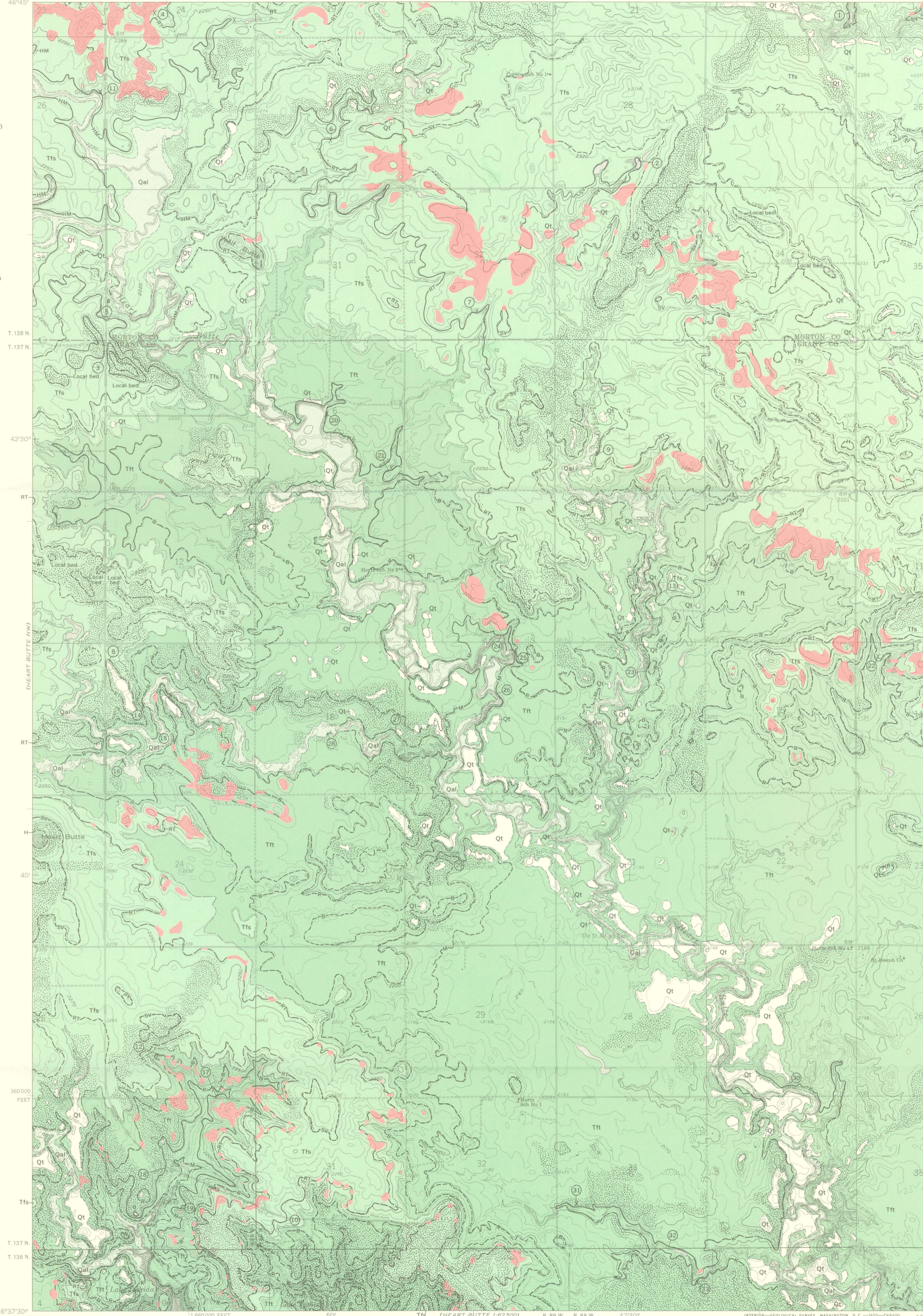


GENERALIZED STRATIGRAPHIC SECTION



EXPLANATION

- Sandstone
- Conglomerate
- Siltstone
- Claystone
- Carbonaceous shale
- Lignite  
Thickness in feet
- Impure lignite
- Silicified carbonaceous material
- Limestone concretion
- Location shown on map



EXPLANATION

- Quaternary
    - Qal Alluvium
    - Qt Terrace deposits
  - Tertiary
    - Tfs Fort Union Formation
    - Tfs Sentinel Butte Member
    - Tft Tongue River Member
  - Lignite bed
    - Dashed where approximately located; short dashed where inferred; dotted where concealed. Circled number indicates location of measured section; letters indicate name of bed shown in generalized stratigraphic section.
  - Baked and fused rock
  - Silicified blocks
  - Contact
    - Dashed where approximate; short dashed where indefinite
  - X Prospect
  - Drill hole
- Drilled under contract for the U.S. Geological Survey to test for coal. Total depth 881.7 feet.

GEOLOGY

The quadrangle was mapped as part of the U.S. Geological Survey program of classifying and evaluating mineral lands in the Public Domain. Rocks exposed in the Heart Butte quadrangle are included in the Tongue River and Sentinel Butte Members of the Fort Union Formation of Paleocene age. Numerous areas of bedrock have been baked and fused above burned lignite beds. Extensive areas of the surface are littered by blocks of silicified sandstone, siltstone, and mudstone derived from beds of the Fort Union. Glacial erratics of gneissic granite of Precambrian age are scattered across the quadrangle. Deposits of alluvium and terrace gravels are in and along the larger drainageways. The Tongue River Member consists of coarse-grained to very fine grained sandstone, siltstone, claystone, and lignite. Colors range from dark-gray claystone to nearly white sandstone, but the overall cast of the member is yellowish gray. Well-preserved freshwater gastropods and pelecypods, ironstone concretions, and limonite layers are characteristic of the member, especially the lower part. The Sentinel Butte Member is similar to the underlying Tongue River Member except that the Sentinel Butte is more drab and gray and petrified wood and silicified carbonaceous layers are common. The contact between the two members in western North Dakota is described in detail by Royse (1967). In the quadrangle the contact is arbitrarily placed at the base of dark bentonitic claystone beds that overlie light-colored siltstone. The low-level terrace gravels and the alluvium are composed almost entirely of material derived from the Fort Union Formation. Other fragments are limestone and ironstone concretions, petrified wood and other silicified material, and some rare pieces of baked and fused beds. High-level terrace gravels contain mostly gneissic granite, and fragments of feldspar, amphibole, and sedimentary rocks of Precambrian to Paleozoic age. The highest gravels in the quadrangle, in secs. 22, 26, and 27, T. 138 N., R. 88 W., are far removed from a present drainage way and may be glacial drift. The Heart Butte quadrangle is on the southeast margin of the Williston Basin. Regional dip in the basin is northwest, about 15 feet per mile. Within the quadrangle, however, beds rise very slightly toward the northeast to a high point near sec. 27, T. 138 N., R. 88 W., and then dip more steeply toward Muddy Creek drainage. Nomenclature of the lignite beds is informal; the Spring Valley and Richter lignite beds are named after lignite mines north of the quadrangle. Lignite resources seem to be too small to expect future exploitation; no production figures are available for the lignite prospect pits shown on the map. Heating values of the lignite are about 6,500 Btu as-received and 9,800 Btu air-dried. Oil and gas have been produced from rocks ranging in age from Triassic to Ordovician in the Williston Basin. At least 5,000 feet of these reservoir rocks exist beneath the quadrangle. The quadrangle lies on the trend of a possible anticline that seems to connect the Nesson anticline in northern North Dakota with the Pierre anticline in South Dakota (Sandberg and Mapel, 1965). The trend parallels the Cedar Creek anticline, and stratigraphic or structural traps may occur in the rocks beneath the quadrangle. The baked and fused rocks above burned lignite beds and gravel from stream terraces are used locally for road metal. Blocks of silicified rocks and glacial erratics have been used for riprap.

REFERENCES CITED

Royse, C. F., Jr., 1967, The Tongue River-Sentinel Butte contact in western North Dakota: N. Dak. Geol. Surv. Rept. Inv. 45, 53 p.  
Sandberg, C. A. and Mapel, W. J., 1965, Devonian System of the Northern Rocky Mountains and Plains, in Oswald, D. H., ed., Internat. Symposium on the Devonian System, Calgary, Alberta, Sept. 1967: Calgary, Alberta Soc. Petroleum Geologists, v. 1, p. 843-877.

GEOLOGIC MAP OF THE HEART BUTTE QUADRANGLE, MORTON AND GRANT COUNTIES, NORTH DAKOTA

By  
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1970