

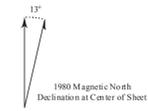


# Uranium

## Belfield 100K Sheet, North Dakota

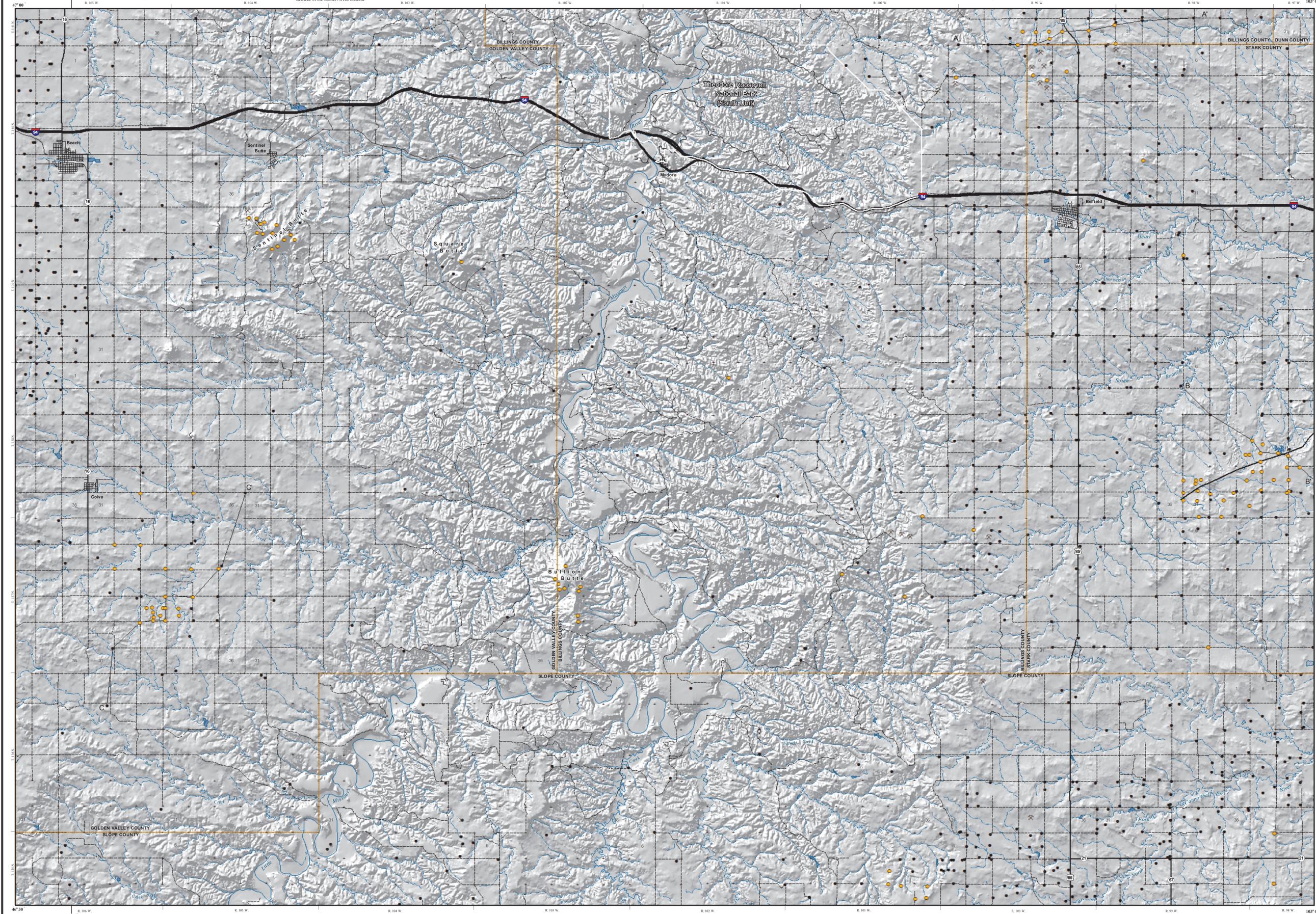
Glendive	Grassy Butte	Killdeer
Wibaux		Dickinson
Baker	Bowman	Mott

Adjoining 100K Maps



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2006



Rocks exposed at the surface of the Belfield 100K sheet are primarily 60 million year old sandstones, siltstones, claystones, mudstones, and lignites of the Sentinel Butte and Bullion Creek Formations (Paleocene). The Golden Valley Formation is present in some upland settings and rocks of the White River Group (Chadron and Brule Formations) are preserved in the Little Badlands southeast of Belfield and as a caprock on Bullion, Sentinel, and Square Butte. The Golden Valley Formation (Paleocene to Eocene) consists of alternating beds of sandstone, siltstone, claystone, mudstone, and lignite. The Golden Valley is split into two members: the lower member (Bear Den) is Paleocene in age and consists primarily of kaolinitic-rich claystones and mudstones. The upper member (Carnegie Butte) is Eocene in age and lithologically similar to the underlying Sentinel Butte Formation. A massive sandstone within the Carnegie Butte Member forms the caprock for Bullion, Sentinel, and Square Butte (Murphy et al., 1993). Lithologies of the Chadron Formation (Eocene) include conglomerates, claystone, and marlstone. The Brule Formation (Oligocene) contains beige colored sandstones, siltstones, and mudstones. The White River Group is a 6000 feet thick wedge of coarse grained sandstone, but is approximately 250 feet thick in the Little Badlands (Murphy et al., 1993). The Fort Union Group has a maximum thickness of approximately 1,500 feet in this area (Murphy, 2006). A northeast trending syncline is present in the Little Badlands. First noted by Denson and Gill (1965) the axis can be plotted on a structure map of the lower member (Bear Den) of the Golden Valley Formation and traced northeast of Dickinson (Bick and Murphy, 1997).

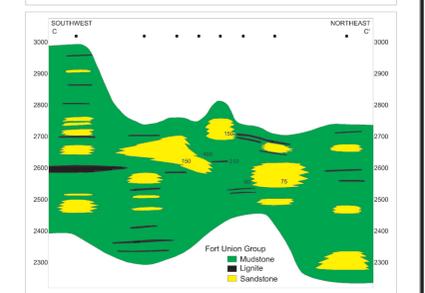
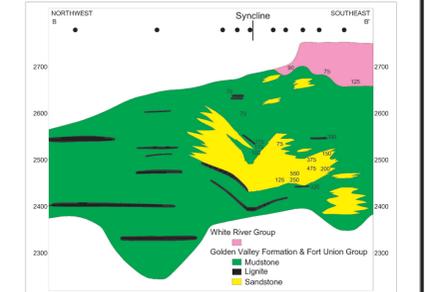
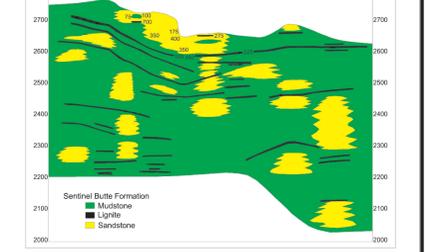
Volcanic-rich White River strata are the likely source rocks for uranium in this area (Denson and Gill, 1965). Over millions of years, groundwater has leached uranium from this strata and deposited it in the underlying carbonaceous rocks and sandstones within the Golden Valley Formation and Fort Union Group. According to this model, uranium should be concentrated in the stratigraphically highest lignite or carbonaceous zone beneath the White River unconformity. As expressed in the gamma logs within this map sheet and demonstrated in the enclosed cross sections, this is not always the case.

The North Dakota Geological Survey's database for the Belfield Sheet contains exploration holes and monitoring wells that have electric logs to the surface. These electric logs are typically suites of gamma, resistivity, density, and to a lesser degree spontaneous potential or sp. The gamma probe passively measures the natural radioactivity in the borehole. Zones or horizons of increased radioactivity are recognizable as spikes on gamma logs. All gamma logs in this database were examined for radioactive spikes or indicators of increased radioactivity on the log traces. Background radioactivity in the Fort Union strata ranges from 20 to 60 gamma counts per second (gps). The magnitude of most gamma spikes or deflections in this area was less than 150 gamma counts.

The zones of increased radioactivity in this area generally occur at or beneath the base of the White River Group or within the first carbonaceous layer or sandstone below the base of the unconformable contact. The highest gamma value (700 gps) occurred in a lignite underlying a sandstone within the Golden Valley or Sentinel Butte Formations (section A). In addition to these stratigraphic horizons elevated gamma counts were also detected in carbonaceous layers (typically thin lignites) and sandstones more than 200 feet beneath the base of the White River Group. Generally these zones are only a few feet thick, but in one gamma log there was a 200-foot-thick zone of increased radioactivity at the base of a channel sandstone (T137N, R105W, section 29).

According to Kazimiri (1990) there are 14 abandoned uranium mine sites within this map sheet. The number of individual sites is likely higher because I am aware of several small pits that are present in and around T137N, R105W that were not in Kazimiri's inventory. These mines operated in the 1960s, by 1968 all uranium mining had ceased in this area. Uraniferous lignite was mined at each of these sites by surface methods. The uraniumiferous lignite was burned on site to reduce volume or shipped to Belfield or Griffin for burning and then the ash was sent to South Dakota, Colorado, or Utah for further processing.

Bick, R. F., Murphy, E. C., 1997. Uranium geology: a guide to the geology, mineral resources, and geologic hazards of the Dickinson area. North Dakota Geological Survey Bulletin 100. 72 pp.



Cross sections through White River, Golden Valley, and Fort Union strata in the Belfield map sheet. The numbers in the diagram are the gamma counts per second (gps) obtained from spikes on gamma logs. The gaps correspond to the stratigraphic position from which they were detected.

**Geologic Symbols**

- Yellow circle: Geophysical logs that contain one or more gamma spikes, indicating the presence of uranium.
- Black circle: Geophysical logs that do not contain gamma spikes. Data points include coal exploration and subsurface mineral drill holes, oil and gas wells, and ND State Water Commission drill holes.
- Star: Old Uranium Mines.
- Line with 'A': Axis of Syncline.
- Line with 'A-A'' and 'C-C'' : Cross Sections.

**Other Features**

- Blue line: Water.
- Blue hatched: Water - Intermittent.
- Blue line with 'R': Run of Stream - Perennial.
- Blue line with 'R' and 'S': Run of Stream - Intermittent.
- Blue line with 'S': Section Centers.
- Black line: State of Park Boundary.
- Red line: State Boundary.
- Red line with 'H': Inter-County Highway.
- Red line with 'F': US Highway.
- Red line with 'S': State Highway.
- Red line with 'P': Paved Road.
- Red line with 'U': Unpaved Road.

Scale: 1:100,000  
North Arrow: 1927 North American Datum  
Geographic Projection: NAD 83  
Central meridian: 103° 30' W  
Standard Parallel: 46° 30' N  
False Easting: 1000000.00  
False Northing: 0.00  
Units: Meter