North Dakota Geological Survey
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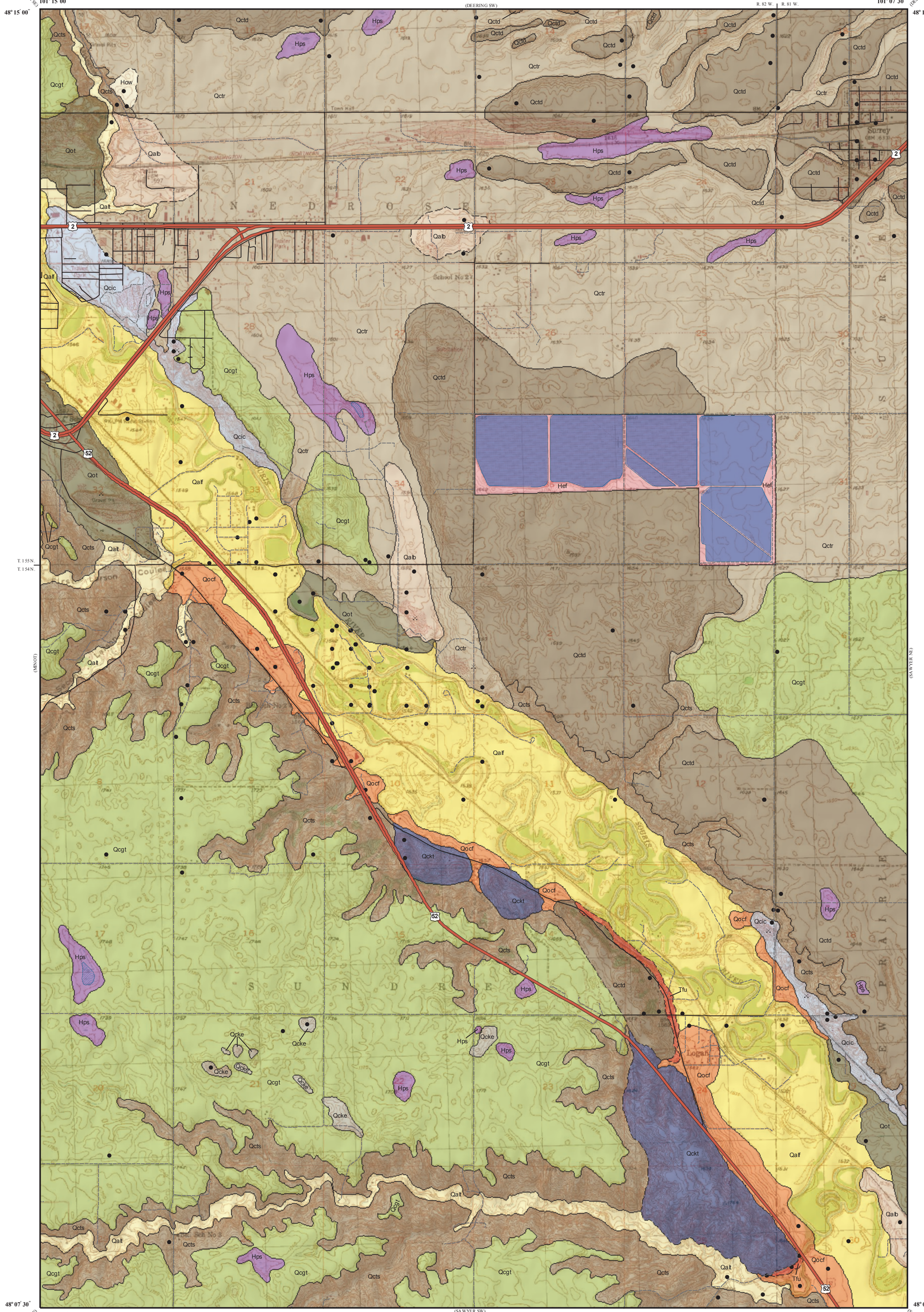
Surface Geology

Surrey Quadrangle, North Dakota



Fred J. Anderson
2006

EXPLANATION

HOLOCENE

ANTHROPOGENIC (RECENT) DEPOSITS

Hef — **Engineered Fill Deposits**

Anthropogenic deposits of engineered sediments consisting of well sorted clays, sands, and gravels placed in cut and fill areas associated with impoundment structures.

OAHE FORMATION

Hps — **Modern Pond and Slough Sediments**

Dark brown to black obscurely bedded clay, silt, and organic debris generally around one to three feet in thickness.

How — **Loess**

Yellow to tan silt deposited as windblown sediment above glacial sediments commonly 10 feet or more in thickness at outcrop.

QUATERNARY

Qocf — **Colluvial Fan Deposits**

Obscurely bedded sandy and silty clay originating as channel and slope wash sediments found at the mouths of coulees and ravines in alluvial fan type deposits along the margins of the Souris River floodplain.

Qot — **River Terrace Deposits**

Planar bedded sands and gravels with abundant cobbles and boulders deposited in terrace form bars along the northern and southern valley walls of the Souris River.

Qalt — **Tributary Alluvium**

Gray to brown fluvial channel and overbank sands, gravels, silts, and clays deposited within tributary coulees and drainageways of the Souris River floodplain as reworked slopewashed till ranging from three to 30 feet in thickness.

Qalb — **Channel Alluvium**

Gray to brown sands and gravels deposited as channel form bars and localized areal deposits within the floodplain of the Souris River and the Souris River discharge plain.

Qalf — **Floodplain Alluvium**

Gray to brown fluvial channel and overbank sands, gravels, silts, and clays deposited within the Souris River floodplain. Prone to slumping and instability along meander loop cutbanks along the Souris River. Commonly 100 feet or more in thickness within the floodplain.

COLEHARBOR GROUP

Qcke — **Kames and Esker Deposits**

Generally poorly sorted bedded to non-bedded sands and gravels deposited as linear or circular collapse deposits mantling Coleharbor Group subglacial sediments. Typically located on the southern side of the Souris River drainageway.

Qctr — **Glacial Till (Channel Washed)**

Dark-grey brown clay with silt, low to moderate plasticity and cohesiveness, massive, clay matrix supported diamicton, ocassional fine to coarse gravel clasts. Typically oxidized and unleached (calcium carbonate), with ocassional clay and lignite clasts. Eroded by discharge of the Souris River towards Glacial Lake Souris expressed as channels of relatively low local topographic relief.

Qctd — **Glacial Till (River Washed)**

Dark-grey brown clay with silt, low to moderate plasticity and cohesiveness, massive, clay matrix supported diamicton, ocassional fine to coarse gravel clasts. Typically oxidized and unleached (calcium carbonate), with ocassional clay and lignite clasts. Eroded by discharge of the Souris River towards Glacial Lake Souris.

Qcts — **Glacial Till (Slope Washed)**

Dark-grey brown subglacial till consisting of clay with silt of low to moderate plasticity and cohesiveness, massive at outcrop consisting of clay matrix supported diamicton with ocassional fine to coarse gravel clasts. Typically oxidized and unleached (calcium carbonate) with ocassional clay and lignite clasts. Eroded by slope wash along the sides of coulees and ravines.

Qckt — **Kame Terrace Deposits**

Brown to tan ice contact sand and gravel with cobbles deposited in kame terraces along the walls of the Souris River Valley. Commonly over 200-feet in thickness with typically greater relief and elevation than surrounding sediments.

Qcic — **Glacial Ice Contact Deposits**

Brown to tan sand and gravel with silt, poorly sorted and generally displaying laminated or contourted bedding at outcrop. Typically overidden by subglacial diamicton (subglacial till) sediments. Exposed along lower portions of valley walls along the Souris River. Beds range in thickness from one to ten feet at outcrop.

Qcgt — **Glacial Till**

Dark-grey brown clay with silt, generally moist with moderate plasticity and cohesiveness, massive, clay matrix supported diamicton, occasional fine to coarse garvel, cobbles, and boulders, typically oxidized and unleached for calcium carbonate with occasional clay and lignite clasts (subglacial till). Occus within areas of low to moderate relief with undulating topography. Generally around 100 to 150 feet in thickness.

TERTIARY

EROSIONAL UNCONFORMITY

Tfu — **FORT UNION GROUP**

Poorly exposed, weakly lithified, loosely consolidated, sandstone, siltstone, and claystone bedrock present beneath unconsolidated glacial sediments at depths between 100 and 200 feet.

Geologic Symbols

- Known contact between two geologic units
- Approximate contact between two geologic units
- Control Point: Drill Holes, Observation Sites, and Outcrop Locations
- Sand and Gravel Pit

Other Features

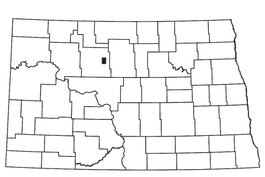
- Water
- Water, Intermittent
- Federal Highway
- Paved Road
- Unpaved Road

Scale 1:24,000

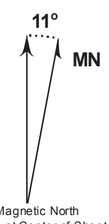
0 0.5 1

Miles

Lambert Conformal Conic Projection Standard Parallels 48° 07' 30" and 48° 15' 00"
1927 North American Datum NGVD 1929
USGS 7.5 Minute Topographic Map Contour Interval 5 Feet
Road and Hydrologic Layers Rectified to 2003 NAIP Digital Orthophoto

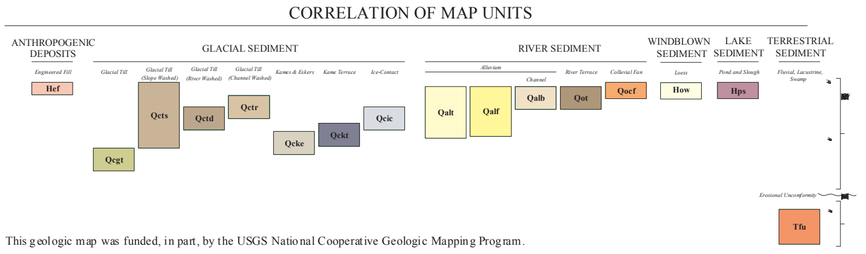


Surrey Quadrangle, North Dakota



1981 Magnetic North
Declination at Center of Sheet

CORRELATION OF MAP UNITS



This geologic map was funded, in part, by the USGS National Cooperative Geologic Mapping Program.

Cartographic Compilation: Elroy L. Kadrmas