

Surface Geology McKenzie Quadrangle, North Dakota

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QUATERNARY SYSTEM

HOLOCENE

OAHE FORMATION

Sand, silt, clay, gravel, and organic debris; all postglacial sediment deposited on the landscape; includes river sediment, windblown sediment, and lake sediment.

Qow Windblown silt and sand

Moderately to well sorted grayish brown to tan, silt and sand; deposited as a thin mantle draped over, and only slightly modifying, the pre-existing glacial and non-glacial topography; generally less than 10 feet (3 meters) thick.

Qop Pond and slough sediment

Organic debris, clay, and silt; obscurely bedded; dark colored; generally more than 3 feet (1 meter) thick; deposited in poorly drained depressions in the landscape.

Qor Alluvium and overbank sediment

Sand, silt, clay, and disseminated organic debris; obscurely bedded, dark colored; locally abundant gastropod and pelecypod shells including *Valvata tricarinata*, *Sphaerium* sp., and *Pisidium* sp.; commonly more than 3 feet (1 meter) thick.

PLEISTOCENE

COLEHARBOR GROUP

The Coleharbor Group includes all sediments in North Dakota associated with deposition by Pleistocene glaciers.

Qccl Collapsed glacial sediment

Light olive-brown to olive-brown; unsorted; unbedded; calcareous; very shaly; lignite fragments common; contains abundant cobbles and surface boulders of mostly crystalline lithologies, with minor amounts of limestone, dolostone, and, more rarely, local bedrock types; undulating to rolling, hummocky surface; deposited as end moraine on a predominantly non-glacial surface by an early Late Wisconsinan glacier (Long Lake Advance).

Qcdn Draped glacial sediment

Light olive-brown to olive-brown; unsorted; unbedded; calcareous; shaly; lignite fragments common; contains abundant cobbles and surface boulders of mostly crystalline lithologies, with minor amounts of limestone, dolostone, and, more rarely, local bedrock types; undulating to hilly surface; discontinuous; thin; lacks hummocky topography owing to postglacial erosion; deposited on a non-glacial surface as a thin mantle draped over, and only slightly modifying, the pre-existing topography by a pre-Late Wisconsinan glacier (Napoleon Advance). May be covered by a patchy, thin (<5 feet [1.5 meters]) veneer of windblown sediment.

Qcoh Collapsed lake sediment

Flat-bedded to gently folded, light olive-brown to olive-brown laminated clay, clayey silt, silty clay, silt and sand; non to moderately calcareous; iron-stained in places; small (generally less than pebble-sized) carbonate nodules and masses of gypsum, and sand-sized organic fragments common; subtle, flat to gently undulating hummocky surface, pitted by steep-sided, bowl-shaped depressions (kettle holes) formed by the melting of detached blocks of buried ice; offshore sediment deposited in a proglacial, ice-dammed lake. May be covered by a patchy, thin veneer of windblown sediment.

Qcrf Collapsed outwash

Moderately well-sorted, light to dark olive brown, low-angle flat-bedded to high-angle cross-bedded silt, sand, and gravel; calcareous; shaly; bouldery in places; gently undulating to rolling surface, pitted by steep-sided, bowl-shaped depressions (kettle holes) formed by the melting of detached blocks of buried ice; deposited as outwash by meltwater flowing through the Apple Creek and Random Creek meltwater channels. May be covered by a patchy, thin veneer of windblown sediment.

Qces Slopewash-eroded glacial sediment

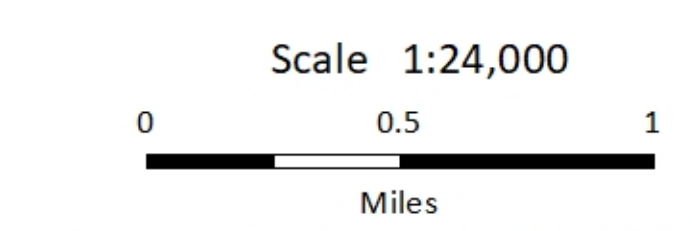
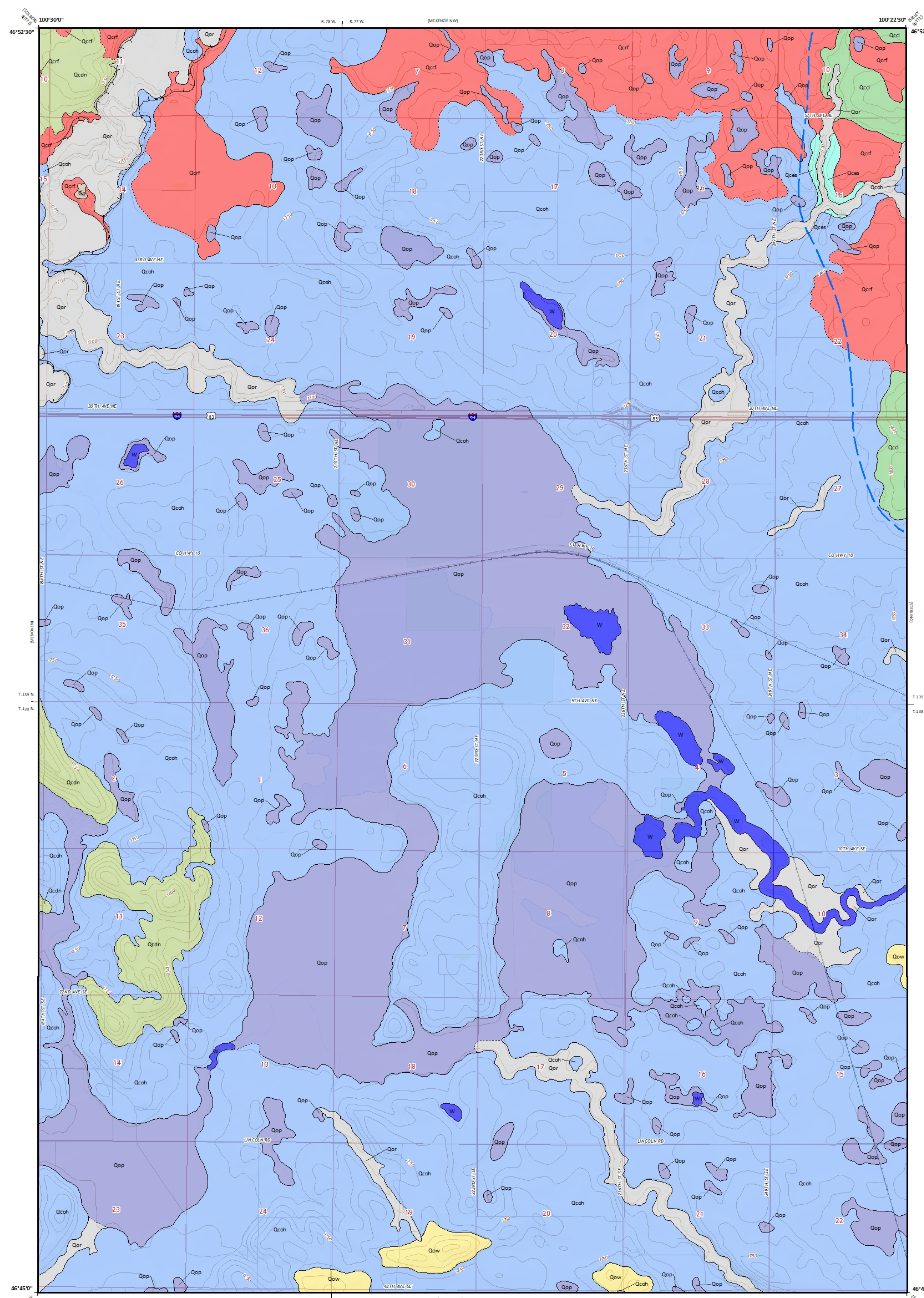
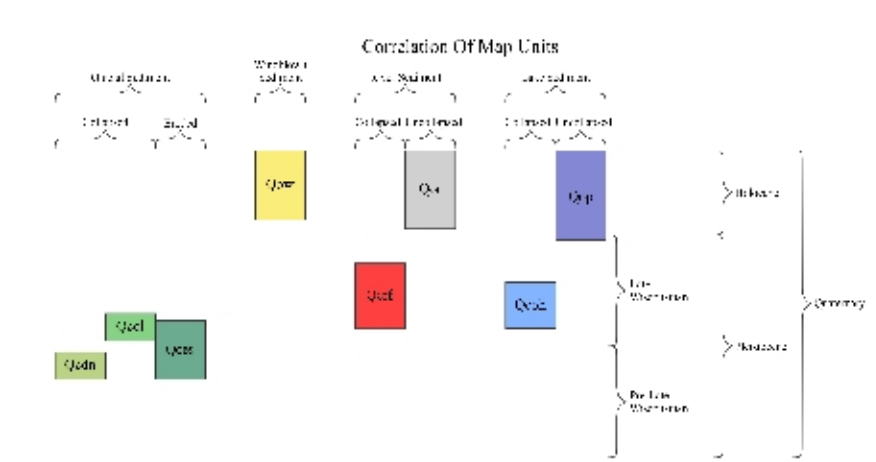
Light olive-brown to olive-brown; unsorted; unbedded; contains cobbles and boulders; shale pebbles abundant; flat to gently sloping surface; glacial sediment on the sides of small, modern streams eroded by running water.

Geologic Symbols

- Geologic contact
- Geologic contact (inferred)
- Sharp-walled channel - Established from aerial photographs and LIDAR; paired sharp scarps; lines indicate the crests of the scarps and hachures point downslope; interpreted as a meltwater channel; apparent on topographic maps and on the ground.
- Ice margin - Established from aerial photographs, LIDAR, and soil survey maps; marks the approximate limit of the early Late Wisconsinan Long Lake glaciation.
- Water
- Gravel pit (abandoned and/or reclaimed)

ROAD CLASSIFICATION

- Expressway
- Secondary Hwy
- Ramp
- Local Connector
- Local Road
- 4WD
- Interstate Route
- US Route
- State Route



Lambert Conformal Conic Projection
North American 1983 Datum
USGS 7.5 Minute Topo Map

Standard Parallel: 46°14'00"N, 46°52'30"N
NGVD 1988

2019 Magnetic North
Declination at Center of Sheet