Minnesota Department of Natural Resources
County Atlas Program
mndnr.gov/groundwatermapping

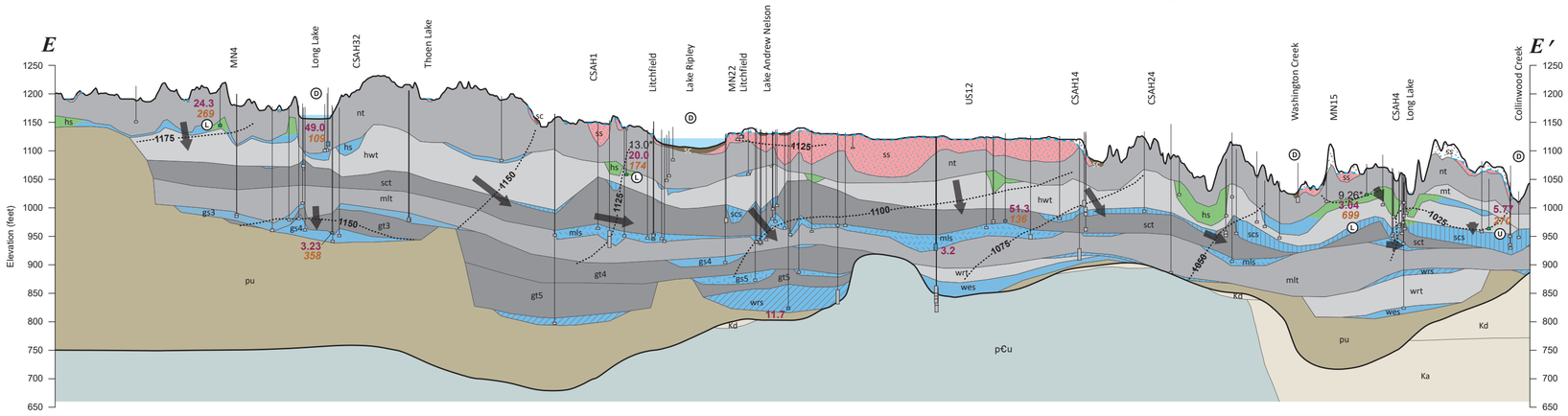
Hydrogeologic Cross Sections

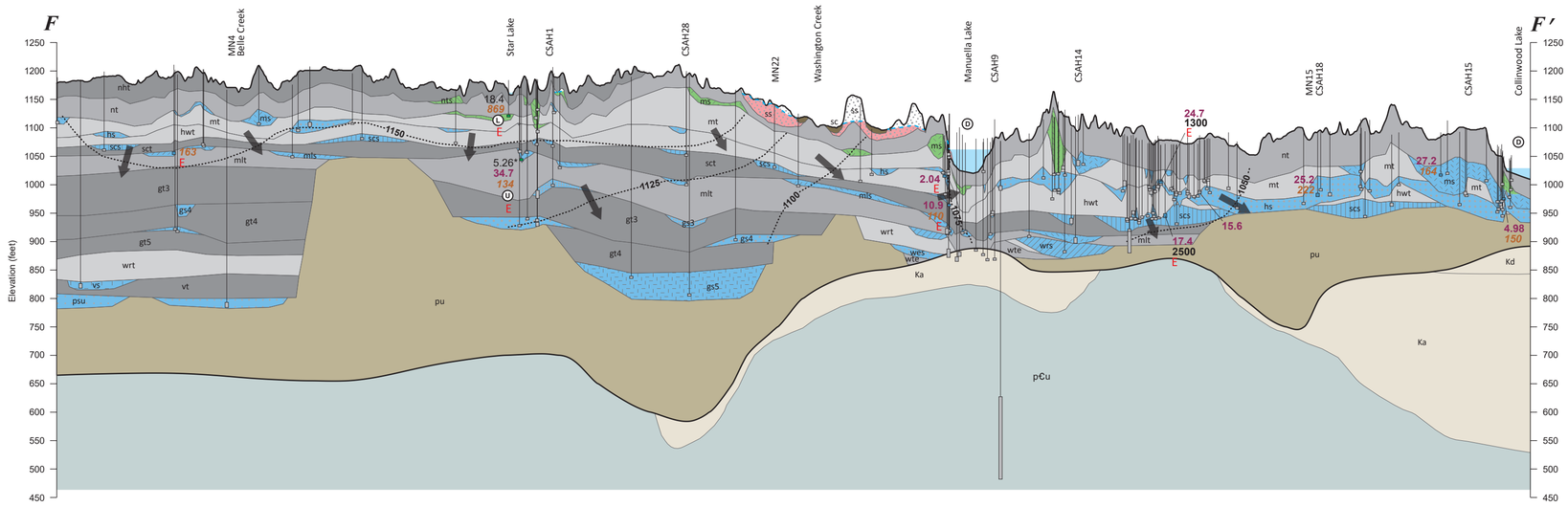
By Randy J. Bradt

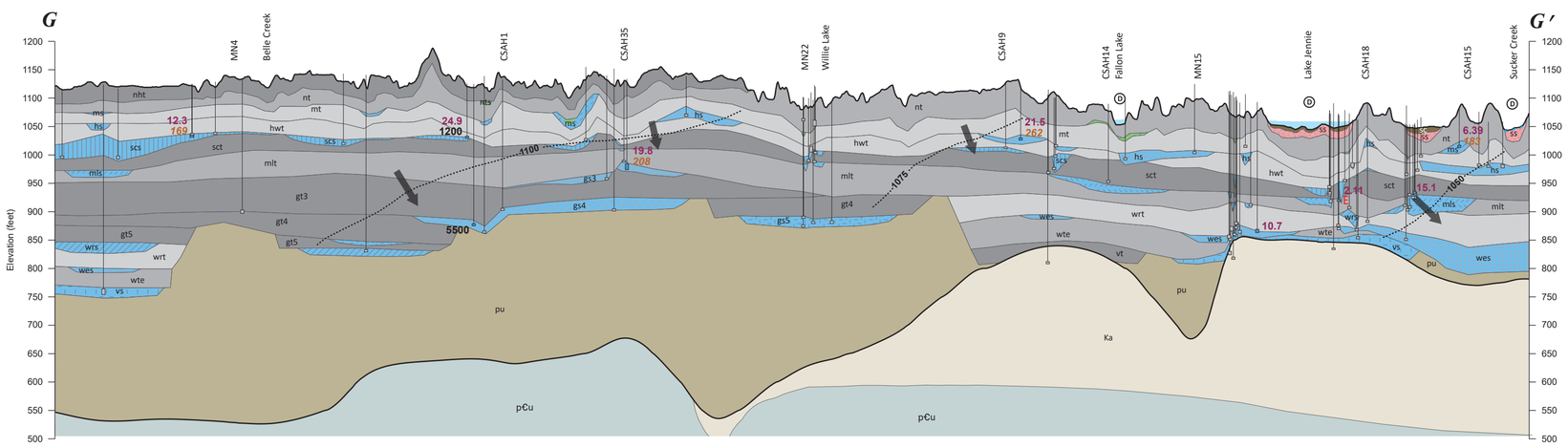
2019

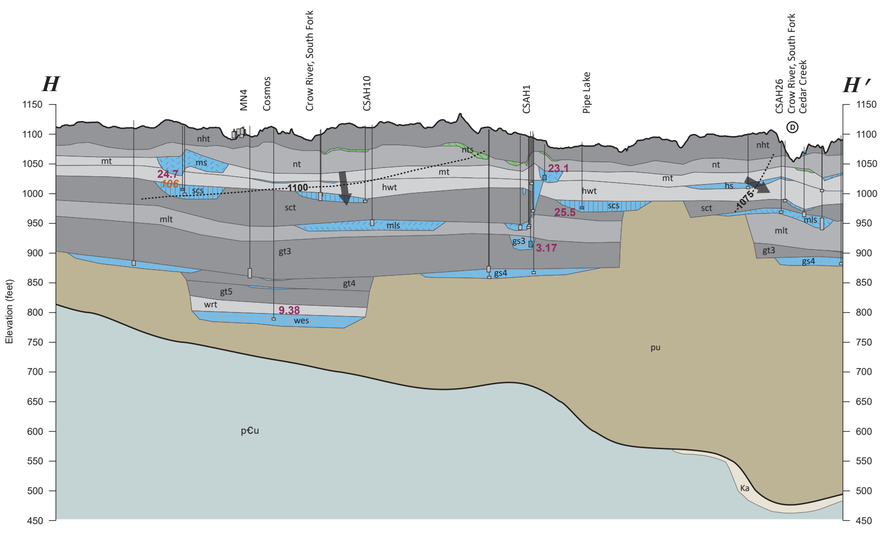
Groundwater Atlas of Meeker County
County Atlas Series C-35, Part B
Plate 8 of 8
Hydrogeologic Cross Sections
E–E′ through H–H′

To accompany atlas Report, Plate 6, and Plate 7.









Buried sand aquifers are listed in each section from the surface down to include the deepest buried sand aquifer that may have detectable tritium. Additional aquifers discussed include those with relevant carbon-14 residence time.

Cross Section E–E′

A total of 10 wells were sampled for tritium along this cross section from wells ranging in depth from 56 to 312 feet.

The ss aquifer deposits are at the land surface in scattered locations on top of the nt aquitard. The most extensive and thickest deposits are located between MN 22 and CSAH 14 in the middle of the cross section. Recent tritium-age water was mapped in this aquifer.

The hs aquifer was mapped as both mixed and vintage tritium age. All samples were collected from areas with very low pollution sensitivity. The mixed tritium-age results suggest lateral recharge from adjacent areas of higher sensitivity.

The scs aquifer is mostly well protected and was mapped as vintage tritium-age water. Mixed tritium-age water was found in a sample collected on the east end of the cross section where vintage tritium was expected. The source of mixed tritium is not discernible with the available information.

Cross Section F–F′

A total of 11 wells were sampled for tritium along this cross section from wells ranging from 65 to 158 feet deep.

The ss aquifer deposits are at the land surface on top of the nt aquitard near MN 22 in the middle of the cross section. Recent tritium-age water was mapped in this aquifer.

The nts aquifer is limited to locations near and slightly west of CSAH 1. The buried sands were all mapped as mixed tritium-age water.

The ms aquifer was mapped as vintage tritium-age water east of CSAH 14 where the nt aquitard is thicker, and west of CSAH 28 where the combined thickness of the nht and nt aquitards provide sufficient aquifer protection. Between these locations mixed tritium-age water is mapped where the aquifer is not as well protected. Groundwater recharge is likely moving laterally from adjacent higher sensitivity areas to the west where the overlying nts aquifer enhances recharge to this aquifer and possibly from Star Lake.

The hs aquifer was mapped as vintage tritium-age water in most locations. There is one exception just west of CSAH 1. A shallower nts aquifer appears to be connected to the underlying hs aquifer, thereby enhancing recharge to the deeper hs aquifer.

On the south shore of Lake Washington east of CSAH 14, two closely spaced wells had carbon-14 residence times of 1,300 years for the shallower 68-foot-deep well in the hs aquifer and 2,500 years for the deeper 130-foot-deep well in the scs aquifer.

Cross Section G–G′

Nine wells were sampled for tritium in this cross section from wells ranging from 70 to 250 feet deep.

The ss aquifer deposits are at the land surface on top of the nt aquitard at three locations in the eastern portion of the cross section. Recent tritium-age water was mapped for this aquifer.

The nts aquifer was mapped as mixed tritium-age water for the single shallow buried aquifer found near CSAH 1.

The ms aquifer was mapped as vintage tritium-age water west of MN 22 because the nht and nt aquitards are both present. Mixed tritium-age water is mapped east of MN 22 where only the nt aquitard is present.

The scs and gs4 aquifers were mapped as vintage tritium-age water throughout. Just west of CSAH 1 two closely spaced wells having different depths were sampled for carbon-14 residence time. The shallower 97-foot-deep well in the scs aquifer dated 1,200 years old. The deeper 250-foot-deep well in the gs4 aquifer dated 5,500 years.

Cross Section H–H′

A total of 4 wells were sampled for tritium along this cross section from wells ranging from 60 to 195 feet deep.

The nts aquifer was mapped as mixed tritium-age water for these shallow buried aquifer units.

The ms aquifer was mapped as vintage tritium-age water with the exception of the far eastern Crow River, South Fork location where the overlying nht aquitard has been removed and the nt aquitard partially dissected.

CROSS SECTION EXPLANATION

Aquifers and aquitards grouped by stratigraphy

Quaternary unconsolidated sediment

Interpreted tritium age is indicated by the background color. See Figure 5 in the report for geologic unit correlation.

Surficial sand and gravel

- sc*
- ss

Buried aquifers and aquitards

- nht*
- nts
- nt*
- ms
- mt*
- hs
- hwt*
- scs
- sct*
- mls
- mlt*
- gs3
- gt3*
- gs4
- gt4*
- gs5
- gt5*
- wrs
- wrt*
- wes
- wte*
- vs
- vt*
- psu
- pu

*aquitard

Bedrock

- Kd — Dakota Formation
- Ka — Cretaceous undifferentiated
- p€u — Precambrian crystalline

Quaternary aquitards

Grouped by texture ranging from highest to lowest sand content indicating relative hydraulic conductivity.

Geologic unit code	Percent sand
mt, hwt, wrt	>50% and ≤60%
nt, mlt, wte	>40% and ≤50%
nht, sct, gt3, gt4, gt5, vt	>30% and ≤40%

Tritium age

Darker color in small vertical rectangle (well screen symbol) indicates tritium age of water sampled in well. Lighter color indicates interpreted age of water in aquifer.

- Recent: water entered the ground since about 1953 (8 to 15 tritium units [TU]).
- Mixed: water is a mixture of recent and vintage waters (greater than 1 TU to less than 8 TU).
- Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- Well not sampled for tritium.

Symbols and labels

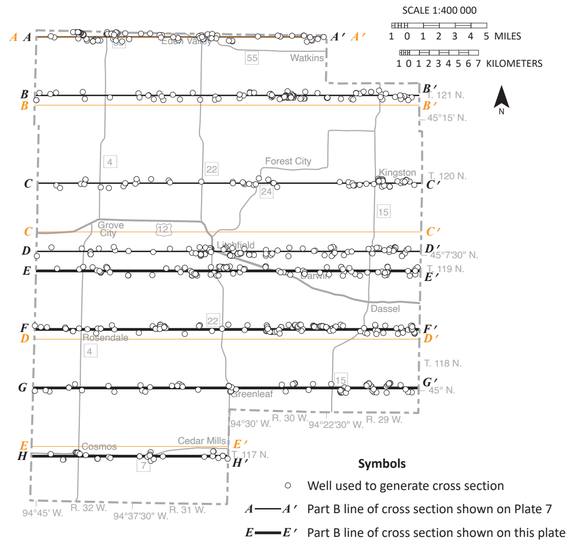
- 18.4 — Chloride: if shown, concentration is ≥5 ppm. (* naturally elevated)
- 3.17 — Arsenic: if shown, concentration is ≥2 ppb.
- *183* — Manganese: if shown, concentration is ≥100 ppb.
- 1200 — Carbon-14 (^{14}C): estimated groundwater residence time in years.
- E — Groundwater sample with evaporative signature
- General groundwater flow direction
- ····1100···· — Approximate equipotential contour; contour interval 25 feet
- Geologic contact
- Land or bedrock surface
- Water table

Groundwater conditions

- (L) Groundwater flows laterally.
- (U) Groundwater flowpath is unknown.
- (D) Groundwater discharges to a surface-water body.

SCALE 1:100 000
VERTICAL EXAGGERATION X 50

1 0 1 2 3 4 5 MILES
1 0 1 2 3 4 5 6 7 8 9 KILOMETERS



Symbols

- ○ Well used to generate cross section
- A—A′ Part B line of cross section shown on Plate 7
- E—E′ Part B line of cross section shown on this plate
- A—A′ Part A line of cross section

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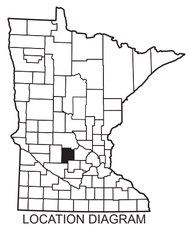

This map was compiled and generated in a geographic information system. Digital data products are available on the DNR County Atlas Program page (mndnr.gov/groundwatermapping).

This map was prepared from publicly available information. Every reasonable effort has been made to ensure the accuracy of the factual data on which this map interpretation is based. However, the DNR does not warrant the accuracy, completeness, or any implied uses of these data. Users may wish to verify critical information; sources include both the references in the report and information on file in the offices of the Minnesota Geological Survey and the DNR. Every effort has been made to ensure the interpretation shown conforms to sound geologic and cartographic principles. This map should not be used to establish legal title, boundaries, or locations of improvements.

Base modified from Minnesota Geological Survey, Meeker County Geologic Atlas, Part A, 2015.

Universal Transverse Mercator projection, zone 15N, North American Datum of 1983. North American Vertical Datum of 1988.

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