UNIVERSITY OF MINNESOTA
MINNESOTA GEOLOGICAL SURVEY
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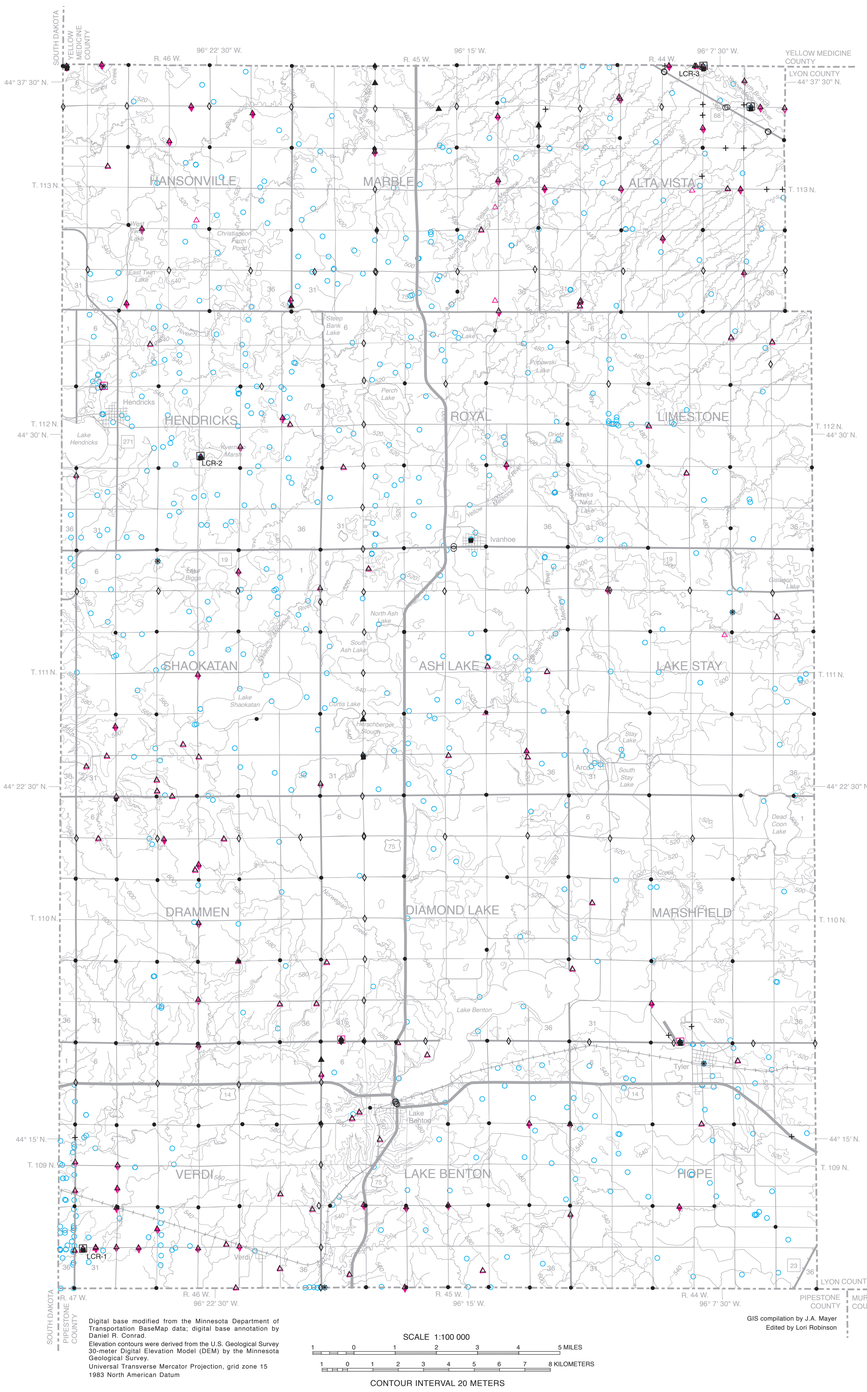
COUNTY ATLAS SERIES
ATLAS C-58, PART A
Lincoln County
Plate 1—Database Map



Digital base modified from the Minnesota Department of Transportation BaseMap data; digital base annotation by Daniel R. Conrad.
Elevation contours were derived from the U.S. Geological Survey 30-meter Digital Elevation Model (DEM) by the Minnesota Geological Survey.
Universal Transverse Mercator Projection, grid zone 15
1983 North American Datum

GIS compilation by J.A. Mayer
Edited by Lori Robinson

SCALE 1:100 000

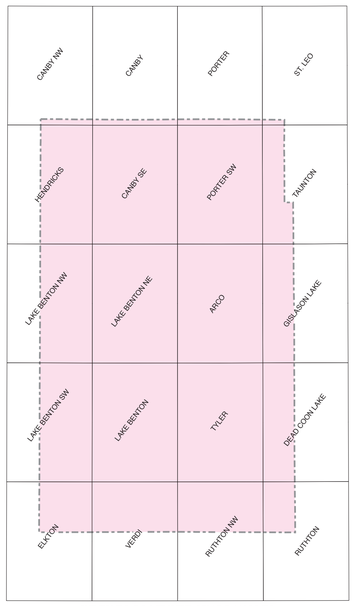
1 0 1 2 3 4 5 MILES
1 0 1 2 3 4 5 6 7 8 KILOMETERS

CONTOUR INTERVAL 20 METERS

MAP SYMBOLS

- Record of water-well construction (well driller's log)
- Rotary-sonic core sample
- Diamond drill core sample
- Soil boring
- Cutting sample
- Borehole geophysical log
- Giddings probe hole
- Scientific investigation hole
- Field site
- Textural analysis
- Seismic refraction survey
- Passive seismic measurement
- Gravity data

Note: More than one symbol can occur at the same location.



INDEX TO 7.5-MINUTE QUADRANGLES

DATABASE MAP

By

Jordan A. Mayer and Margeurite C. Bradley

2023

INTRODUCTION

The public health and economic development of Lincoln County are directly dependent on the wise use and management of its land and water resources. Geologic and hydrologic information are essential before decisions are made that affect natural resources. Although the amount of geologic information required for making specific decisions can vary, the information will not be used if it is unavailable when needed, or if it is available only in a highly technical form, or scattered in many different maps and reports. The databases described here address this need.

County Geologic Atlases, prepared jointly by the Minnesota Geological Survey and the Minnesota Department of Natural Resources, present detailed geologic and hydrologic information in an interpretive as well as descriptive form. Maps and texts summarize basic geologic and hydrologic conditions at a county scale, and interpret these conditions in terms of the impacts of possible land- and water-use decisions.

Several sources commonly provide information about an area or an individual property, but they may use different classification schemes to describe the same geologic materials. As a result, discrepancies in interpreting the data may arise or the different sources may appear to contradict each other. For example, water-well drillers may describe glacial till as "clay," but engineering records will describe it as "clayey sand." Both descriptions are acceptable for their original purpose of describing the physical attributes of the material. "Clay," the term used by well drillers, defines the general inability of the till to yield groundwater to a well. "Clayey sand," the term from the engineering record, defines the physical composition of the till relative to particle size and engineering properties. The geologist must take the analysis one step further and define the material in terms of how it formed rather than how it is to be used. In this example, till consists of an unsorted mixture of rock fragments ranging in size from clay to cobbles and boulders, and it is interpreted by the geologist to have been deposited directly by glacial ice. Understanding the process by which the material formed allows geologists to make predictions about what lies between and beyond data points.

All of the types of data described on this plate were interpreted by geologists or hydrogeologists to make them meaningful for mapping purposes. The 1:100,000 scale of the maps in this atlas was chosen because it shows the geologic and topical studies of the county while keeping the physical size of each plate to a manageable level. As a result, some detailed information that was gained by data interpretation and mapping cannot be shown on these maps or discussed in the texts. Some of this information is available in digital files that accompany the atlas.

Whether to use the atlas alone, or in combination with the databases, depends on the amount of detail needed. Generally, database information must be used to evaluate site-specific conditions.

THE DATABASE MAP

The types, locations, and density of information used to prepare the Lincoln County atlas are shown on this map. The data are described below to aid the user in assessing what types may be useful for a particular information need. The Database Map serves as a guide to the precision of the other maps in the atlas. It shows where data are sparse or lacking and interpretation and extrapolation were required to prepare the maps.

DRILL-HOLE INFORMATION

A **record of water-well construction (well driller's log)** is a water-well contractor's description of the geologic materials penetrated during drilling and the construction materials used to complete the well. Hydrologic data, such as the static water level and test-pumping results, are commonly included. Before any driller's log can be used, the location of the well must be verified, and a geologist must interpret the log. Driller's logs are the primary source of subsurface geologic and hydrologic data for Lincoln County; about 700 logs were used for this atlas.

Diamond drill and rotary-sonic core samples were collected at various sites throughout Lincoln County as a means to establish the nature of the subsurface material. Bedrock core is commonly collected using a diamond bit rotating at the end of a drill rod. A column of rock moves up the drill pipe and is recovered at the surface for study. Diamond drill core exists for three sites in Lincoln County. This method was used for exploration of minerals as well as scientific investigation. Three rotary-sonic cores were collected by the Minnesota Geological Survey for this project (labeled LCR-1 through LCR-3) to aid the interpretation of the Quaternary deposits and in determining bedrock depth and nature. The coring technique enables recovery of a continuous core, 3.5 inches (8.9 centimeters) in diameter, from glacial deposits and bedrock (where intersected). It provides excellent subsurface samples for detailed study and comparison with cuttings, geophysical logs, and driller's logs from surrounding sites. Detailed geologist's logs for the rotary-sonic cores are shown on Plate 4, *Quaternary Stratigraphy*. These detailed logs were entered into the County Well Index (CWI) and are available in Minnesota Geological Survey file data. The core is available for inspection at the Minnesota Department of Natural Resources Drill Core Library in Hibbing (the state repository for bedrock and earthen material core samples collected during exploration, engineering, and geoscience research programs across Minnesota).

Soil borings are test holes drilled to obtain information about the physical properties of subsurface materials for engineering, mapping, or exploration purposes. They are logged by an engineer or a geologist using a variety of classification schemes based on particle sizes, penetration rate, moisture content, and color. Soil-boring data were collected by the Minnesota Department of Transportation (MNDOT) and are concentrated along major roadways including State Highway 68 and U.S. Highway 75. Descriptions of the geologic materials penetrated are interpreted by Minnesota Geological Survey geologists for mapping purposes. These descriptions and interpretations can be found in the data package associated with this atlas. Original soil-boring data can be found on MNDOT's online portal for soil borings (https://foundationborings.dot.state.mn.us/geotechnical/FoundationBorings/).

Cutting samples collected during drilling provide physical evidence of subsurface geologic materials. Cuttings are the samples generated as the drill bit cuts through the subsurface material and are used to interpret and verify driller's logs. They are logged and stored at the Minnesota Geological Survey. Descriptions of cutting samples are housed at the Minnesota Geological Survey and are available upon request.

Borehole geophysical logs are collected by Minnesota Geological Survey staff or private entities by lowering instruments down a well or drill hole and measuring the physical and chemical properties of the geologic materials through which the hole passes. Different logging techniques measure naturally occurring gamma radiation, spontaneous potential, and resistivity. Gamma logs characterize in graphic form the geologic formations penetrated. Spontaneous potential and resistivity are mainly used to locate water levels in wells and the depth of the well casing. An interpretive log is prepared by a geologist from the geophysical log and correlated with drilling samples from the same hole, information obtained from nearby outcrops, or a geophysical log from a nearby drill hole. Geophysical logs can provide high-quality subsurface geologic and hydrologic information for wells that have little or no other information available. Information and interpretations from geophysical logs are entered into the County Well Index. Logs can be viewed at the Minnesota Geological Survey or accessed online (http://z.umn.edu/borehole_geo). The geologic interpretations are available through the County Well Index database described below.

Giddings probe holes are borings of glacial materials, 2 inches (5.1 centimeters) in diameter, collected by Minnesota Geological Survey staff using a truck-mounted hydraulic auger. A description was generated at every site and samples were taken for textural analyses at most locations. Samples were generally taken about every 5 feet (1.5 meters), at unit contacts, or where the geologist believed it was important. The information from these holes can be found within the digital file data provided with this atlas.

Scientific investigation holes are soil auger holes, test wells, and observation wells drilled by the U.S. Geological Survey, Water Resources Division to determine the hydrologic properties of the local and regional aquifers. Geologic logs were generated for each hole. Test-well and observation-well data were entered into Minnesota Geological Survey databases. Non-well drill-hole data are available in Minnesota Geological Survey files. Study results and conclusions may be found in U.S. Geological Survey published reports.

OTHER INFORMATION

Field sites are natural and artificial exposures of unconsolidated Quaternary deposits that were described by Minnesota Geological Survey staff in detail; samples from many sites were texturally analyzed. Field sites include stream and river cuts, gravel pits, excavations, and road cuts. Information and descriptions of these sites can be found within the digital file data provided with this atlas.

Textural analyses express the proportion of sand-, silt-, and clay-size particles that make up a sample. The samples analyzed were taken from natural and artificial exposures, Giddings holes, and the rotary-sonic cores. They are helpful in determining the origin, correlation, and hydrologic properties of unconsolidated sediments. The data are available in Minnesota Geological Survey files.

Seismic refraction surveys measure the time required for seismic body waves to travel from a controlled source through the subsurface and be refracted back to a receiver. The refraction travel time can be correlated with the density and rigidity of the geologic material. Precambrian and Paleozoic rocks commonly exhibit seismic wave velocities that are 1.5 to 2.5 times those of unconsolidated Quaternary sediments below the water table. The spacing of the receivers (geophones) and the refraction arrival times (measured in milliseconds) are used to calculate the depth to bedrock. Seismic refraction surveys are more labor intensive than many passive seismic methods, but can provide seismic velocity information and higher-quality depth estimates. A total of six seismic refraction surveys have been acquired in Lincoln County by the Minnesota Department of Natural Resources. The data are stored in paper and digital formats and can be obtained by contacting the collecting agency.

Passive seismic depth to bedrock measurements provide information based on the analysis of ambient shear- and surface-wave energy in the ground that allow for a calculation of the depth to bedrock (thickness of Quaternary deposits) beneath that point. The measurements employ a seismic recording device that is planted into the ground surface and records ambient ground vibrations in three orthogonal directions (two horizontal and one vertical) during a 16-minute interval. The method is considered passive because no energy is directly input into the ground at the time of measurement, such as is the case for conventional seismic reflection/refraction surveys. Instead, the unit measures background vibrations from a variety of natural and artificial sources that include wind, machinery, and traffic. The averaged horizontal spectra of the seismic noise is divided by the corresponding vertical spectrum, and the resulting Horizontal to Vertical Spectral Ratio (HVSR) should display a prominent peak that closely approximates the resonant frequency (surface and shear waves) of the unconsolidated sequence overlying the bedrock surface (Chandler and Lively, 2014). In general, depth to bedrock calculated by this method can have errors up to 25 percent of the depth; however, in areas with little to no other data, this is still useful information and many passive seismic measurements can be inexpensively collected over a short period of time with one or two operators. A total of 83 passive seismic points were collected in Lincoln County for this atlas. The data are stored in Minnesota Geological Survey databases and are available upon request.

Statewide gravity and aeromagnetic (airborne-magnetic) data that are available at the Minnesota Geological Survey are used to assist mapping Precambrian geology. The utility of these two datasets relies on the strong contrasts in density and magnetization that commonly exist between various Precambrian rocks. The aeromagnetic data in Lincoln County were acquired approximately 656 feet (200 meters) above ground along flight lines spaced 1,640 feet (500 meters) apart and were compiled into a 328-foot (100-meter) grid (line data not indicated on the map due to high density). The gravity data are based on ground stations that are generally spaced 1.5 to 2 miles (2.4 to 3.2 kilometers) apart along roads and drivable trails, and these data are compiled into a 3,281-foot (1,000-meter) grid. Derivative-enhanced grids of the gravity and aeromagnetic data are used in conjunction with information from bedrock wells.

DATABASE MANAGEMENT

All of the data shown on the map were plotted on maps at 1:24,000 or finer resolution and assigned inventory numbers. Included with the Lincoln County Atlas are regularly updated databases containing digital GIS files, developed to provide easy access and rapid retrieval of these site-specific data.

Computer storage and retrieval systems are ideal for manipulating large amounts of data because automated geologic databases can be designed to interact with other computer files, such as land-use data. Such interaction permits more efficient assessment of cause-and-effect relationships concerning natural resources than is commonly possible with manual files.

DIGITAL DATABASES

Computerized files were developed for point-source data such as wells and borings in Lincoln County. They use Public Land Survey descriptions, Universal Transverse Mercator (UTM), and latitude-longitude coordinates as location criteria; thus, they are compatible with the natural-resources databases housed at the Minnesota Land Management Information Center (LMIC). One computerized database developed for Lincoln County by the Minnesota Geological Survey is the County Well Index (CWI).

County Well Index (CWI)—Information from water-well records and other subsurface boring records is entered into this statewide database. Each record is assigned either a five- or six-digit unique number. These reference numbers are also used by state agencies and the Water Resources Division of the U.S. Geological Survey. Elevations are expressed in feet above sea level and were determined from either topographic maps (see the index to 7.5-minute quadrangles) or Minnesota's lidar high-resolution elevation dataset. Elevations from the topographic maps are generally accurate to plus or minus 5 feet (1.5 meters) and the lidar elevations are generally accurate to within 3 feet (1 meter). The street address of each well is also included wherever possible to provide data users with a well-location system that is compatible with local regulatory programs. Software at the Minnesota Geological Survey is used to display and tabulate many of the data elements contained on the original well log. The program also denotes if there are additional data, such as borehole geophysical logs, cutting samples, or core, for an individual record.

The County Well Index is stored in a database that consists of 10 related tables. These tables contain information such as well depths, well construction, addresses, aquifers, dates drilled, static water levels, and pumping-test data. They also contain alternate well identifiers such as permit numbers or emergency-service numbers, and the well stratigraphy (the geologic materials encountered during drilling).

CWI application software developed by the Minnesota Department of Health provides two types of reports:

WELL LOG contains all the information about the well as it was reported by the contractor (Fig. 1). There may also be additional location information, land-surface elevation, aquifer designation, and remarks about the drill holes.

WELL STRATIGRAPHY contains the geologic log described by a well driller (Fig. 2). A geologist makes stratigraphic interpretations based on this description, and on her or his knowledge and understanding of the geology of Lincoln County. The interpretations are augmented in some cases by additional data sources, such as cuttings, borehole geophysical logs, or core. Only those drill holes with verified locations have stratigraphy assigned to them.

Other digital data—Details about other types of data shown on this plate are available in attribute tables for individual GIS shapefiles included in the atlas products. This includes information that is part of the Quaternary Data Index (QDI), an internal working database. The Quaternary Data Index contains information from field sites, rotary-sonic cores, soil borings, Giddings probe holes, soil auger holes, and textural analyses. Some detailed information associated with these data sources is not included in the digital files that are part of this atlas. This includes descriptions of cutting samples and borehole geophysical logs. It is stored in various formats and can be obtained by request from the Minnesota Geological Survey.

Soil borings commonly contain detailed information that is not part of the files included in this atlas. The information can be accessed in other digital and paper files from the Minnesota Geological Survey. Additionally, soil-boring data can be obtained from the source at the Minnesota Department of Transportation Foundations Unit's web page (https://www.dot.state.mn.us/materials/foundations.html).

Lidar (light detection and ranging) is an optical remote-sensing technique that uses a sensor, pulsed laser light, and a GPS receiver to sample the Earth's surface and produce highly accurate land-surface information. Lidar data in southwest Minnesota (including Lincoln County) were procured by the Minnesota Department of Natural Resources during a regional acquisition in 2010 and are available from the Minnesota Geospatial Commons website (https://gisdata.mn.gov/dataset/elev-lidar-swmn2010). Data quality for the southwest region is reported at the 95 percent confidence level: ± 0.98 foot for the horizontal direction and ± 0.23 foot for the vertical direction. Lidar elevation data are used to map bedrock exposures and glacial landforms. They help mappers more accurately delineate contacts between both bedrock and surficial geologic units. Lidar can also help define the structure of a bedrock unit based on visible features such as fractures, faults, bedding, and weathering profile.

FUTURE DATA COLLECTION

Additional geologic information is generated continuously as new water wells are drilled, construction activities expose more bedrock, or additional wells are tested for water quality. To address this, the library of information prepared for Lincoln County is flexible so that old data can be reevaluated in light of new information, and new forms of data can be added if required. The need to manage groundwater and other natural resources wisely will never become outdated. Future demands on these resources will require current data to assess the impacts.

ACKNOWLEDGEMENTS

The staff from the Environmental Office of Lincoln County contributed greatly to the development of the County Well Index database. We thank local water-well contractors and landowners for their valuable assistance.

REFERENCE

Chandler, V.W., and Lively, R.S., 2014, Evaluation of the horizontal-to-vertical spectral ratio (HVSR) passive seismic method for estimating the thickness of Quaternary deposits in Minnesota and adjacent parts of Wisconsin: Minnesota Geological Survey Open-File Report 14-01.

Unique Well Number 854549	**County** Lincoln	MINNESOTA DEPARTMENT OF HEALTH		**Entry Date**	2020/12/15
	Quad Lake Benton NW	**WELL AND BORING RECORD**		**Update Date**	2021/10/28
	Quad Id 84B	*MINNESOTA STATUTES CHAPTER 1031*		**Received Date**	

Well Name LCR-2 | **Township** 112 | **Range** 46 | **Dir** W | **Section** 22 | **Subsection** CBCCAC | **Field Located** MNDNR | **Elevation** 1768.90 ft.

contact address STATE OF MN, DNR
500 LAFAYETTE RD
ST PAUL MN 55155

Well Depth 420.00 ft | **Depth Completed** 209.00 ft | **Date Well Completed** 2020/12/10

Drillhole Angle

Drilling Method Vibracore/rotasonic

Drilling Fluid Bentonite | **Well Hydrofractured?** YES ☑ NO | From ft. to

Use monitor well

Casing Type Plastic | Drive Shoe? YES ☑ NO | Diameter 2 in. from 0.00 to 199.00 ft. | Depth 199 lbs/ft
Hole Diameter (in.): 9.00 To 390.0 | 7.00 To 420.0

Screen Yes | Make JOHNSON | Diameter 2.00 | Slot 10 | Length 10 | Set 199 ft. to 209 ft.
Open Hole(ft.) From to | Type stainless steel

Static Water Level 62.00 ft. land surface | Date measured 2020/12/11

Pumping Level (below land surface) 209.00 ft. after 1.00 hrs. pumping 2.00 g.p.m.

Wellhead Completion
Pitless adapter manufacturer | Model | ☐ 12 in. above grade
☑ Casing Protection | ☐ Basement offset
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☑ YES ☐ NO ☐ NOT SPECIFIED

Material	From	To	Sacks
neat cement		4.0 ft.	2.00
high solids bentonite	4.0 ft.	196.0 ft.	18.00
high solids bentonite	210.0 ft.	420.0 ft.	22.00

Nearest Known Source of Contamination feet | Direction | Type
Well disinfected upon completion? YES ☑ NO

Pump ☑ Not Installed | Date Installed
Manufacture's name
Model number | HP | Volts
Length of drop pipe | Material | Capacity g.p.m.
Type

Abandoned Wells Does property have any not in use and not sealed well(s)? YES ☑ NO

Variance Was a variance granted from the MDH for this well? YES ☑ NO

Well Contractor Cerfication
Mark J Traut Wells, Inc. 1404
License Business Name | **Lic. or Reg No.**
KARASCH, D.
Name of Driller | **Date**

Remarks
GAMMA LOGGED ON 12-9-2020 FOR ATLAS. MNDNR OB WELL 41007.

First Bedrock | **Aquifer** Quat. buried artes. aquifer
Last Strat QTJU | **Depth to Bedrock** ft.

County Well Index v.5 | **REPORT** | Printed on 12/21/2021 | HE-01205-07 (Rev. 2/99)

Description	Color	Hardness	From	To (ft.)
TOPSOIL, WETLAND MUCK, HEAVY VEG			0	6
OX. CLAY & TILL			6	7
OX. CLAY LOAM		SOFT	7	17
UNOX. TILL, GRAVELLY AT TIMES	VARIED		17	94
FINE TO MEDIUM LAMINATED SAND			94	148
MASSIVE SILT TO VF SAND.			148	158
FINE TO VF SAND			158	163
COARSE SAND TO GRAVEL			163	172
FINE MASSIVE SAND			172	178
MASSIVE SILTY VF SAND	OLIVE		178	189
COARSE SAND TO COBBLES, OX.			189	208
CLAY LACUSTRINE SED, DENSE	DK. GRY		208	212
REDUCED LOAM TO CLAY LOAM TILL			212	216
OX. LOAM TILL, GRAVELLY			216	237
OX. TILL			237	244
MEDIUM SAND, SPARSE GRAVEL			244	252
OX. LAKE SEDIMENT	GRY/GRN		252	253
F TO MED. SAND	GRY/BRN		253	258
LAKE SEDIMENT	GRN/GRY		258	260
SAND AND GRAVEL, FINING UPWARD			260	273
LAKE CLAY, FAINT LAMINATIONS			273	274
OX. TILL, CLAY LOAM, GRAVELLY			274	280
TILL, UNOX TILL	OLV/GRY		280	353
PEAT			353	355
TILL	GRN/GRY		355	362
SANDIER TILL, LOAM TO SANDY LOAM			362	367
UNOX. GRAY TILL, MORE GRAVELLY	GRAY		367	387
MIX OF OX AND UNOX GLEYED TILL			387	389
OXIDIZED TILL			389	404
UNOX TILL, SUPER DENSE, CLAY LOAM			404	420

Figure 1. Example of a WELL LOG record, showing all the information about the well as reported by the well driller.

Unique Well Number 854549	**County** Lincoln	MINNESOTA DEPARTMENT OF HEALTH		**Entry Date**	2020/12/15
	Quad Lake Benton NW	**WELL AND BORING RECORD**		**Update Date**	2021/10/28
	Quad Id 84B	*MINNESOTA STATUTES CHAPTER 1031*		**Received Date**	

Well Name	Township	Range	Dir	Section	Subsection	Depth Drilled	Depth Completed	Date Completed	Lic/Reg. No.	Driller Name
LCR-2	112	46	W	22	CBCCAC	420 ft	209 ft	2020/12/10	1404	KARASCH, D.

Elevation 1768.90 ft. **Method** Surveyed **Aquifer** Quat. buried artes. aquifer **Depth to Bedrock** ft. **Screen** 199-209 **SWL** 62

Field Located Mn Department of Natural Resources | **Location Method** Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters | **UTM Easting (X)** 231015 | **UTM Northing (Y)** 4832122
Program | **Input Source** Minnesota Geological Survey
Uni No.Verified Information from owner-site visit | **Input Date** 2020/12/15
Geologic Interpretation Dan Conrad | **Agency** MGS | **Interpretation Method** Interpreted from core

Geological Material	Color	Hardness	DEPTH From	DEPTH To	DEPTH Thick	ELEVATION From	ELEVATION To	Stratigraphy	LITHOLOGY Primary	LITHOLOGY Secondary	LITHOLOGY Minor
TOPSOIL, WETLAND MUCK, HEAVY VEG			0	6	6	1768.9	1762.9	Recent undiff.	soil	muck	organic deposits
OX. CLAY & TILL			6	7	1	1762.9	1761.9	till	till		
OX. CLAY LOAM		SOFT	7	17	10	1761.9	1751.9	clay/sand/silt-no peb.	loam	clay	
UNOX. TILL, GRAVELLY AT TIMES	VARIED		17	94	77	1751.9	1674.9	till	till		
FINE TO MEDIUM LAMINATED SAND			94	148	54	1674.9	1620.9	sand	sand		
MASSIVE SILT TO VF SAND			148	158	10	1620.9	1610.9	sand+silt	silt	sand	
FINE TO VF SAND			158	163	5	1610.9	1605.9	sand	sand		
COARSE SAND TO GRAVEL			163	172	9	1605.9	1596.9	sand +larger	sand	gravel	
FINE MASSIVE SAND			172	178	6	1596.9	1590.9	sand	sand		
MASSIVE SILTY VF SAND	OLIVE		178	189	11	1590.9	1579.9	sand+silt	sand	silt	
COARSE SAND TO COBBLES, OX.			189	208	19	1579.9	1560.9	sand +larger	sand	cobble	
CLAY LACUSTRINE SED, DENSE	DK. GRY		208	212	4	1560.9	1556.9	clay-gray	clay		
REDUCED LOAM TO CLAY LOAM TILL			212	216	4	1556.9	1552.9	till	till	clay	loam
OX. LOAM TILL, GRAVELLY			216	237	21	1552.9	1531.9	till	till	loam	gravel
OX. TILL			237	244	7	1531.9	1524.9	till	till		
MEDIUM SAND, SPARSE GRAVEL			244	252	8	1524.9	1516.9	sand	sand		
OX. LAKE SEDIMENT	GRY/GRN		252	253	1	1516.9	1515.9	clay	clay		
F TO MED. SAND	GRY/BRN		253	258	5	1515.9	1510.9	sand	sand		
LAKE SEDIMENT	GRN/GRY		258	260	2	1510.9	1508.9	clay	clay		
SAND AND GRAVEL, FINING UPWARD			260	273	13	1508.9	1495.9	sand +larger	sand	gravel	
LAKE CLAY, FAINT LAMINATIONS			273	274	1	1495.9	1494.9	clay	clay		
OX. TILL, CLAY LOAM, GRAVELLY			274	280	6	1494.9	1488.9	till	till	clay	loam
TILL, UNOX TILL	OLV/GRY		280	353	73	1488.9	1415.9	till	till		
PEAT			353	355	2	1415.9	1413.9	peat,muck	peat		
TILL	GRN/GRY		355	362	7	1413.9	1406.9	till	till		
SANDIER TILL, LOAM TO SANDY LOAM			362	367	5	1406.9	1401.9	till	till	sand	loam
UNOX. GRAY TILL, MORE GRAVELLY	GRAY		367	387	20	1401.9	1381.9	till	till	gravel	
MIX OF OX AND UNOX GLEYED TILL			387	389	2	1381.9	1379.9	till	till		
OXIDIZED TILL			389	404	15	1379.9	1364.9	till	till		
UNOX TILL, SUPER DENSE, CLAY LOAM			404	420	16	1364.9	1348.9	till	till		

Figure 2. Example of a WELL STRATIGRAPHY record, which contains a geologist's interpretation of the geologic materials listed by the driller in the WELL LOG record (Fig. 1). Additional downhole information for this well and nearby data points control the geologist's interpretation, which may not match the driller's description of the geologic material encountered.

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND