

# USGS National Ground-Water Monitoring Network Cooperative Agreement

## Final Technical Report

Award #G20AC00384- Minnesota Department of Natural Resources



*Figure 1: MN Unique Well #855032, near the City of McKinley, which was one of the wells installed as part of this project.*

Project Title: Groundwater Level Monitoring Network Expansion

Project Term: December 1, 2020 through November 30, 2022

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## Background

The Minnesota Department of Natural Resources (MN DNR) applied for a USGS National Ground-Water Monitoring Network (NGWMN) grant in 2020 to expand both the NGWMN and the MN DNR's groundwater level monitoring networks. The goal was to install up to 25 new dedicated groundwater observation wells at 20 different locations throughout Minnesota. The wells would fill gaps in the existing networks and be used for long-term groundwater level monitoring of principal aquifers. MN DNR was awarded up to \$110,674.01 of funding from the NGWMN later that year to install the wells.

## Summary of Accomplishments

The project commenced on December 1, 2020 and ended on June 30, 2022 (MN DNR chose to end the project slightly ahead of the November 30, 2022 deadline due to staffing/budgeting reasons). All of the work fell under Objective 5 (well drilling) of the NGWMN program. All work performed under this project was funded 50/50 (50% from the MN DNR and a matching 50% from the NGWMN grant). **In summary, 17 out of the originally-planned 25 wells were successfully installed:**

- 15 of the 25 wells were installed as planned in the project scope. MN DNR had to adjust the locations of several wells (within several miles) to find a suitable location to drill.
- 2 of the 25 wells were installed as part of a separate effort or project (with non-NGWMN funds), but were still added to the NGWMN network and registry.
- 4 of the 25 well sites did not encounter the anticipated aquifer while drilling, so a well was not installed.
- 4 of the 25 well sites were not accessible or suitable for drilling and/or well installation, and a nearby location was not able to be identified.

The 17 successful wells have been surveyed, added to MN DNR's databases, and added to the NGWMN well registry. Most of the wells have been instrumented with pressure transducers and data loggers, so they are providing hourly water level data to the network. The few wells that are not instrumented are measured by hand approximately 8 times per year until they can be instrumented in the future when budget and resources allow.

## Description of Work

The first steps of the project involved coordinating and scoping final well site selection. It was discovered that 7 of the sites were not suitable for well drilling or long-term well installation, so nearby locations with similar hydrogeologic characteristics were identified and selected instead. Access agreements were obtained for all of the sites to ensure long-term access and clarify well ownership.

Well supplies were then ordered and well permits were obtained. The first wells to be installed were the four bedrock wells in Steele County. MN DNR hired a private well contractor to install these in August 2021. The mud rotary drilling method was used. Drill cuttings were examined in the field and later bagged and submitted to the Minnesota Geological Survey (MGS) for detailed interpretation. The wells were also gamma-logged by the MGS to help identify the different stratigraphic units present at the sites.

The MN DNR drill crew began installing the unconsolidated Quaternary wells in September 2021. The shallower wells (less than 100 feet deep) were installed using hollow augers, while the deeper wells

(100ft+) were installed using mud rotary. Drill cuttings were examined in the field as the drilling progressed, which helped to identify hydrologically-productive Quaternary aquifers and determine where to place the screened intervals of the wells. All wells were constructed according to Minnesota Department of Health (MDH) rules for well and boring construction. See Figure 2 (below) for a cross-sectional diagram of how the wells were constructed.

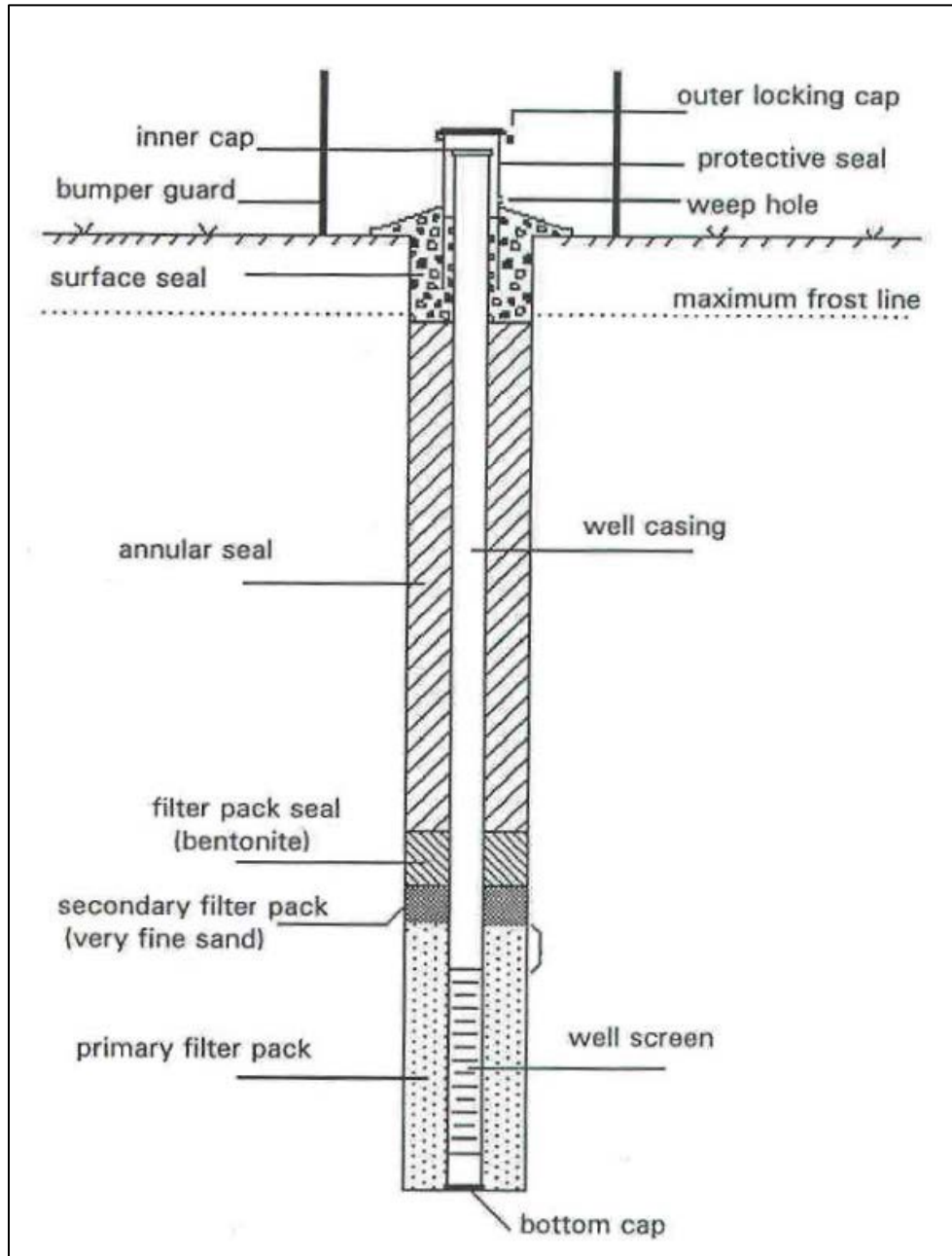


Figure 2: Diagram of typical observation well construction into unconsolidated materials. Source: Ohio EPA

Drilling and installation of the 17 wells was completed by June 2022. See Table 1 (below) for specific details of all the wells that were installed.

New Wells Added to the NGWMN Network				
Site Name	NGWMN Site Number	Geologic Formation	Principal Aquifer	Depth (ft)
Chapa-kak-say-za WMA	855359	Galena- Stewartville	Upper Carbonate	260
Aurora WMA	855358	Maquoketa - Dubuque	Upper Carbonate	130
Prairie Rose WMA (1 of 2)	855357	St. Peter Sandstone	Cambrian-Ordovician	207
Prairie Rose WMA (2 of 2)	855356	Shakopee Dolostone	Cambrian-Ordovician	380
Hoffman WMA	855030	Quaternary (QWTA)	Sand and Gravel	23
Kent WPA	855031	Quaternary (QBAA)	Sand and Gravel	174
City of McKinley	855032	Quaternary (QBUA)	Sand and Gravel	67.5
Storden WPA	855034	Quaternary (QBUA)	Sand and Gravel	40
Greenwater Lake SNA	855033	Quaternary (QWTA)	Sand and Gravel	67
Dustoff WMA	855035	Quaternary (QBAA)	Sand and Gravel	79
Fort Ridgely State Park	855039	Quaternary (QBUA)	Sand and Gravel	51.5
Carver Park Reserve	855043	Quaternary (QBAA)	Sand and Gravel	179
Brenner Lake WPA	855038	Quaternary (QWTA)	Sand and Gravel	99.5
Barrett WMA (1 of 2)	876340	Quaternary (QBAA)	Sand and Gravel	250
Barrett WMA (2 of 2)	855046	Quaternary (QWTA)	Sand and Gravel	18
Pillsbury State Forest	855044	Quaternary (QWTA)	Sand and Gravel	147
Sioux Nation WMA	854407	Quaternary (QBAA)	Sand and Gravel	169

Table 1: New wells added to the NGWMN network through this project.

Well logs and construction records were completed for all of the new wells (see Figure 3 (below) for an example). In addition, a survey-grade GPS was used to record the location of the wells and also determine the ground elevation and the measure-point elevation at the top of the well casing. Water levels were measured using a calibrated electronic tape and some of the wells received a pressure transducer/data logger for recording hourly water levels. The loggers will be visited quarterly by the MN DNR (or their partners) to manually measure the water levels and download the data. Data are then uploaded into the MN DNR's database, where they are reviewed and approved by staff before going to the MN DNR's Cooperative Groundwater Monitoring website (<https://www.dnr.state.mn.us/waters/cgm/index.html>) and to the NGWMN Data Portal website.

**MINNESOTA DEPARTMENT OF HEALTH  
WELL AND BORING CONSTRUCTION RECORD**  
*Minnesota Statutes, chapter 103I*

MINNESOTA UNIQUE WELL AND BORING NO.  
**855044**

**WELL OR BORING LOCATION**  
County Name: Cass

Township Name: 134 Township No. 30 Range No. 39 Section No. SW 1/4 SW 1/4 Fraction (sm. → lg.)

WELL/BORING DEPTH (completed) 147.5 ft. DATE WORK COMPLETED 6-24-2022

GPS LOCATION — decimal degrees (to four decimal places): UTM Coordinates:  
Latitude N5136111 Longitude E 388297

House Number, Street Name, City, and ZIP Code of Well Location  
Pillsbury State Forest, off 33rd Ave, P. Lager, 56473

Show exact location of well/boring in section grid with "X." Sketch map of well/boring location, showing property lines, roads, buildings, and direction.

DRILLING METHOD  
 Cable Tool  Driven  Dual Rotary  
 Auger  Rotary  Rotasonic  
 Other

DRILLING FLUID Pentacrite Mud WELL HYDROFRACTURED?  Yes  No  
From \_\_\_\_\_ ft. To \_\_\_\_\_ ft.

USE  Domestic  Monitoring  Heating/Cooling  
 Noncommunity PWS  Irrigation  Industry/Commercial  
 Community PWS  Dewatering  Remedial  
 Elevator

CASING MATERIAL Drive Shoe?  Yes  No  
 Steel  Threaded  Welded  
 Plastic

HOLE DIAM. 6 in. To 151 ft.

CASING Diameter 2 in. To 137.5 ft. Weight 137.5 lbs./ft. Specifications sch. 40 PVC

PROPERTY OWNER'S NAME/COMPANY NAME  
MN DNR - Forestry  
Property owner's mailing address if different than well location address indicated above.  
4391 State Highway 87  
Backus, MN 56435

SCREEN Make Johnson OPEN HOLE From \_\_\_\_\_ ft. To \_\_\_\_\_ ft.  
Type Stainless slotted Diam. 2"  
Slot/Gauze .010" Length 10'  
Set between 147.5 ft. and 137.5 ft. FITTINGS Threaded

STATIC WATER LEVEL 95.48 ft.  Below  Above land surface  
Date measured 6/28/2022 Dry hole  Yes  No

WELL OWNER'S NAME/COMPANY NAME  
MN DNR EWR  
Well/boring owner's mailing address if different than property owner's address indicated above.  
500 Lafayette Rd  
St. Paul, MN 55155

PUMPING LEVEL (below land surface)  
Air lift ft. after 1 hrs. pumping 3 g.p.m.

WELLHEAD COMPLETION  
 Pileless/adaptor manufacturer \_\_\_\_\_ Model \_\_\_\_\_  
 Casing protection Steel Pro-Top \_\_\_\_\_ Model \_\_\_\_\_  
 At-grade  Well House  Hand Pump  12 in. above grade

GROUT INFORMATION (specify bentonite, cement-sand, neat-cement, concrete, cuttings, or other)  
Material HS Bentonite From 128 To 0 ft. 5.5 Yds.  Bags  
Material \_\_\_\_\_ From \_\_\_\_\_ To \_\_\_\_\_ ft. \_\_\_\_\_ Yds.  Bags  
Material \_\_\_\_\_ From \_\_\_\_\_ To \_\_\_\_\_ ft. \_\_\_\_\_ Yds.  Bags

GEOLOGICAL MATERIALS	COLOR	HARDNESS OF MATERIAL	FROM	TO
Topsoil	Dark brown	Soft	0	1
Fine-Med Sand Trace Gravel	Brown	Soft	1	5
Clay, fine-Med Sand	Brown	Soft	5	7
Clay, fine-coarse sand	Multi/brown	Soft	7	17
Clay with Sand	Brown	Soft	17	18
Fine Sand trace Silt Gravel	Brown to multicolored	Soft	18	137
Sand with Gravel	Grey brown	Soft	137	151

NEAREST KNOWN SOURCE OF CONTAMINATION  
Well is \_\_\_\_\_ feet \_\_\_\_\_ direction from \_\_\_\_\_ type  
Well disinfected upon completion?  Yes  No

PUMP  Not installed Date installed \_\_\_\_\_  
Manufacturer's name \_\_\_\_\_  
Model Number \_\_\_\_\_ HP \_\_\_\_\_ Volts \_\_\_\_\_  
Length of drop pipe \_\_\_\_\_ ft. Capacity \_\_\_\_\_ g.p.m.  
Type:  Submersible  L.S. Turbine  Reciprocating  Jet

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 TN# \_\_\_\_\_

REMARKS, ELEVATION, SOURCE OF DATA, etc.  
DNR observation well #11018  
Ground elevation: 1334.9 ft (NAVD 88)

WELL CONTRACTOR CERTIFICATION  
This well was drilled under my supervision and in accordance with Minnesota Rules, chapter 4725. The information contained in this report is true to the best of my knowledge.

MN Dept. of Natural Resources 1759  
Licensee Business Name Lic. or Reg. No.  
Matthew C. Meyer 3181 9/30/22  
Certified Representative Signature Certified Rep. No. Date  
P. Dean & M. Meyer  
Name of Driller

**IMPORTANT - FILE WITH PROPERTY PAPERS WELL OWNER COPY 855044**

ID #52603 HE-01205-18 (Rev. 3/19)

Figure 3: A completed well construction record for NGWMN Site #855044.