Wisconsin Geological
and Natural History Survey
DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN-MADISON

Wisconsin Groundwater-Level Monitoring Network Improvements, 2020–2022

Final report to the U.S. Geological Survey
Project activities: well maintenance (objective 4) and well drilling (objective 5)

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Contents

Introduction

Wisconsin Groundwater-Level Monitoring Network

The Wisconsin Geological and Natural History Survey (WGNHS) is part of the Division of Extension at University of Wisconsin-Madison. Our mission is as follows:

"The WGNHS conducts earth-science surveys, field studies, and research. We provide objective scientific information about the geology, mineral resources, water resources, soil, and biology of Wisconsin. We collect, interpret, disseminate, and archive natural resource information. We communicate the results of our activities through publications, technical talks, and responses to inquiries from the public. These activities support informed decision making by government, industry, business, and individual citizens of Wisconsin."

As part of our mission, the WGNHS and U.S. Geological Survey's Upper Midwest Water Science Center (USGS-UMWSC) have collaborated for decades to operate, maintain, and manage the Wisconsin Groundwater-Level Monitoring Network (WGLMN). The WGLMN is a cooperative monitoring network that dates to 1946, when the Wisconsin State Legislature requested that the WGNHS and U.S. Geological Survey (USGS) formally establish a groundwater monitoring network. In recent decades, the Wisconsin Department of Natural Resources (WDNR) has become more involved and today serves as a critical partner in supporting the ongoing operation, maintenance, and management of the WGLMN. Today the WGLMN is operated, maintained, and managed by the WGNHS, USGS-UMWSC, and WDNR. Water levels collected from the network help scientists and managers evaluate effects of well pumping, the response of groundwater levels to drought or increased precipitation, and effects of land-use change on groundwater resources. These data are also routinely used in the development of regional groundwater flow models, as long-term water-level measurements serve as reliable calibration targets.

During the late 1940s and 1950s the WGLMN rapidly grew to 270 wells, before stabilizing around 200 wells from the 1960s through the 1980s. Beginning in the late 1980s, the number of wells decreased rapidly as funding support decreased and wells were filled and sealed or fell into disrepair. While the USGS-UMWSC, WGNHS, and WDNR have continued to maintain, operate, actively manage, and add new wells to the WGLMN, there are only 111 Core Network long-term monitoring wells (as of the end of this grant period: October 2023) and the recommended minimum is 133, and many of the wells require re-evaluation, re-habilitation, or replacement.

National Groundwater Monitoring Network

The National Groundwater Monitoring Network (NGWMN) was established in 2009 and is focused on Principal and Major Aquifers of the United States. Because the USGS uses the terms "Principal", "Major", and "National" aquifers interchangeably, we have opted to consistently refer to them as "national" aquifers throughout this report. This also helps distinguish national aquifers from "local" aquifers, which are also referenced throughout the report. The primary goal of the NGWMN is to *"provide information needed for planning, management, and development of groundwater supplies to meet current and future water needs and ecosystem requirements through the compilation of groundwater data from local, State, and Federal organizations."*

The 111 WGLMN Core Network long-term monitoring wells that represent the NGWMN in Wisconsin (fig. 1) provides a consistent, long-term record of fluctuations in water levels in several shallow and deep national aquifers. As of October 2023, there are 48 wells monitoring the Sand and gravel aquifers (N100GLCIAL), 9 wells monitoring the Silurian-Devonian aquifer system (N400SLRDVN), 52 wells monitoring the Cambrian-Ordovician aquifer system (S300CAMORD), and 2 wells monitoring the Other aquifer systems (N9999OTHER), which represents the Precambrian aquifer system in northern Wisconsin.

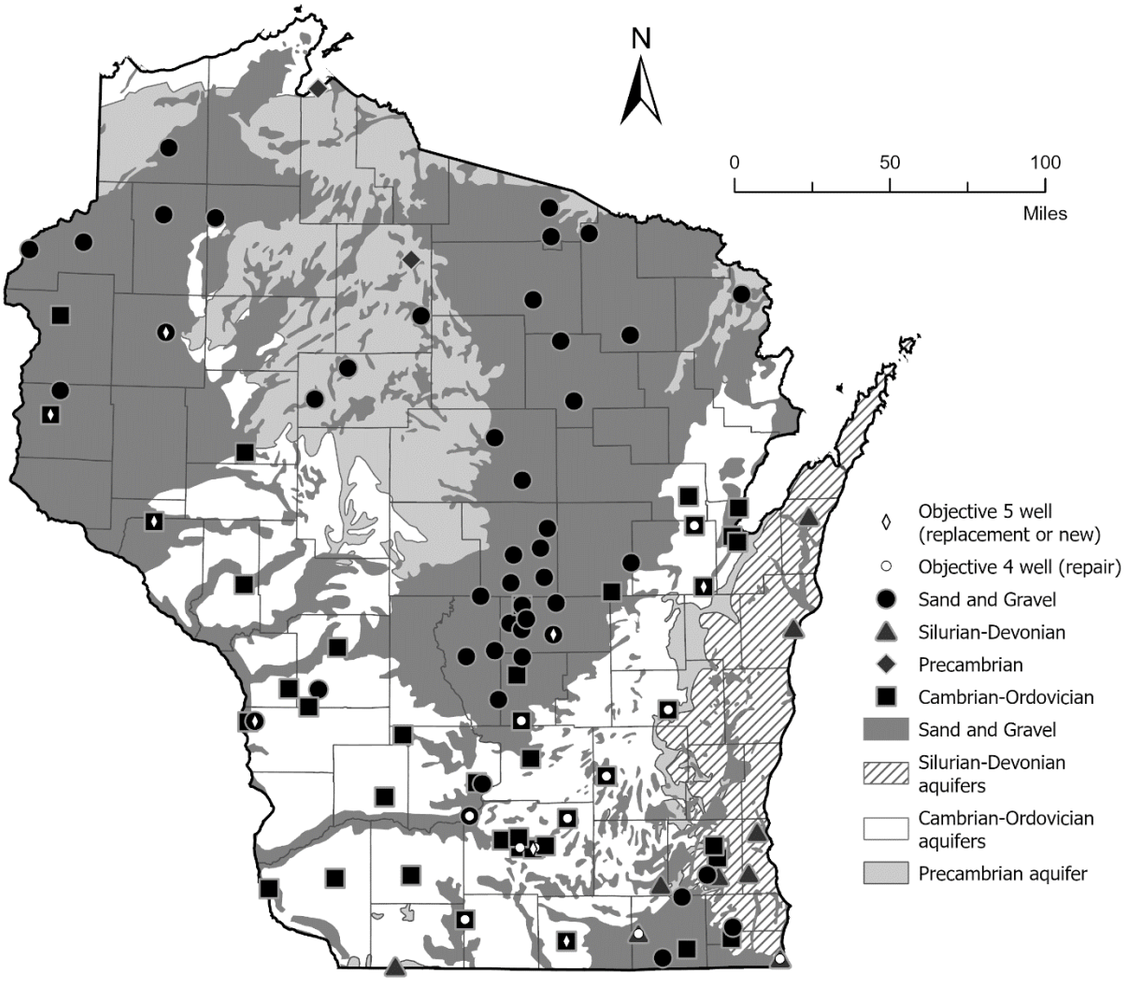

***Figure 1**. Locations of all monitoring sites in the WGLMN (and NGWMN) as of October 2023. The base map depicts the spatial extent of the USGS national aquifers in Wisconsin as well as county boundaries. Wells are symbolized by national aquifer and represent the locations of the long-term Core Network wells, which comprise the NGWMN in Wisconsin. Objective 4 and 5 wells are denoted with white circles and diamonds, respectively. Spatial extents of national aquifers are derived from the USGS' Ground Water Atlas of the United States data (https://doi.org/10.3133/ha730), which was published as part of the National Atlas in 1998, revised 2003. Political boundaries from Wisconsin Department of Natural Resources, 2011. Wisconsin Transverse Mercator projection, 1991 Adjustment to the North American Datum of 1983 (NAD 83/91); EPSG 3071.*

Methods

Historical records review

For each well site, a thorough search for, and review of, relevant historical records was completed by the WGNHS. Relevant documents were compiled from a variety of sources, including the USGS, WDNR, and WGNHS, and are included in appendices 1 through 18 of this report. Some of the most common documents include USGS well schedules, WGNHS geologic logs, and WDNR well construction reports. Supplemental WGNHS documents have also been included, which often contain sketches and maps of monitoring sites as well as plots of historical water-level trends and miscellaneous notes. During the records review, several discrepancies were found, particularly with respect to reported well depth and casing depth measurements. In the well sections below, outlining work details, WGNHS reconciled discrepancies where possible, and noted

uncertainties when appropriate. Sources for our presented well measurements are listed in each section. The historical documents were left uncorrected.

Geophysical logs

The WGNHS' borehole geophysical logging equipment is contained in a dedicated geophysical logging van and transported directly to the well site (fig. 2). For this report, a full suite of geophysical logs includes natural gamma, single point resistivity (SPR), spontaneous potential (SP), caliper, fluid temperature, fluid conductivity/resistivity, and optical borehole image (OBI) logs. Geophysical logs were run on wells with boreholes open to the aquifer (typically lithified), not in wells constructed with PVC well screens. Geophysical data are collected using the following models of slimline tools, all manufactured by Mount Sopris Instrument Co.:

- Temperature/Fluid resistivity/3-Armed Caliper, probe model: 2CAA-1000F
- Natural gamma/Single Point Resistivity/Spontaneous Potential, probe model: 2PGA-1000
- Optical borehole imaging tool, probe model: OBI40Mk5

To collect the logs, a tripod outfitted with a pulley is positioned and secured directly above the open well casing (fig. 2). The logging cable, with tool(s) attached, is run through the pulley, and lowered down the well using a level-winding electric winch equipped with a depth encoder. Logging tools are slowly lowered down the well (5-20 ft/min); as the tool descends, it collects measurements with depth and relays them to the Mount Sopris Instruments MATRIX data acquisition system at the surface, via the logging cable. The logging process is monitored and recorded on a laptop computer. Depth measurements are made relative to the top of casing, which is the benchmark elevation datum for all the geophysical logging tools. The slimline tools vary in length and are of larger diameter than the weighted line (a.k.a., tagline or tape) used to measure well depths. The larger diameter slimline tools may not pass obstructions or borehole wall irregularities that the tagline can, which can lead to differing depth measurements from those by the tagline. Once the geophysical data are collected, they are processed using WellCAD v5.3 software and a draft log is generated. The draft log is checked for accuracy and completeness and put into a standardized format for publication. The published log is then added to the WGNHS statewide subsurface database, which is actively maintained and available to the public through the WGNHS website (https://data.wgnhs.wisc.edu/data-viewer/). Geophysical logs completed for this grant period are available through the above website. When appropriate, links are provided in the individual well sections.

Borehole video

Wells with open boreholes or suspected blockages were evaluated using a Laval Underground Surveys R-CAM 1300 portable borehole camera with both down-facing and side-facing cameras. A depth encoder records the depth of the camera, and the depth is displayed as it collects a continuous video image of the well. Depth measurements are made relative to the top of casing, which is the benchmark elevation datum for all the geophysical logging tools. In general, the geophysical logs have better depth recording accuracy than the borehole video logs because the video camera does not have a level winding winch and the depth encoder is less precise.

Both cameras rotate which allows for complete examination of wells through which the camera can pass. The camera is 1.9 inches in diameter; however, the best results are obtained when the camera is used with centralizers set to the nominal well diameter. After zeroing the depth encoder with the camera at the top of the well casing, the camera is slowly lowered over a pulley into the well with an electric winch. The speed and direction of the camera, and which camera (side-facing or down-facing) is recording is controlled at the surface by the operator. The videos are recorded in a digital format and stored on WGNHS servers for future reference. The videos are used to determine the nature of obstructions or debris in the well, in addition to the

integrity of the casing and borehole. The video images are also useful for documenting cascading water above the static water level and can sometimes show water movement below the static water level within the well.

RTN-GPS

The WGNHS coordinates with the USGS-UMWSC to survey the latitude, longitude, and land surface elevation (at an established land surface datum) of each well using Real-Time Network GPS surveying (RTN-GPS). RTN-GPS uses a network of reference stations that broadcast real-time corrections to the user. The Wisconsin Department of Transportation maintains the network of reference stations in Wisconsin, which is called the Wisconsin Continuously Operating Reference Station (WISCORS) Network.

The USGS-UMWSC uses a Topcon GR-5 GPS receiver, with an FC-5000 tablet running Magnet Field software, to collect data at each survey point (each well). The Magnet Field software automatically corrects the data using the real-time data correction broadcasted from the WISCORS network. Benchmarks were also shot in with the RTN-GPS. Published benchmark locations were compared with locations from the GR-5 to confirm the accuracy of the survey. Vertical accuracy is 0.1 ft. and horizontal location confidence is 1 ft. (0.3 m).

In situations where there was poor GPS signal at the well head, a temporary point away from the well was shot in with the GPS. A differential level was then used to carry the elevation from the temporary point to the well. Latitude and longitude were determined by measuring the distance between the well head and the temporary point and using Google ™ Earth Pro to manually identify the location of the well in relation to the temporary point. In this case, horizontal location confidence is 10 ft (3 m). For more information, see Global Positioning System (U.S. Geological Survey, 2016).

Well development and redevelopment

Wisconsin Administrative Code NR141 requires that all newly installed monitoring wells be developed with a goal to produce water free of sediment and to remove all drill cuttings and drilling fluids. The depth of the water, well size, and well location determined which well development method was used. Approved development methods include surging and purging of water from within the well bore and pumping. Surging is any procedure that forces water from the well bore out into the aquifer, purging is the removal of water and sediment from the well bore. Wells completed for this report were surged with either a check-valve fitted bailer or with the pump body and discharge line of a submersible pump. Purging methods included pumping (with submersible, peristaltic or oscillating inertial pump), bailing (with steel or PVC bailer), and air lifting. Air lifting is a method of purging water, sediment, and debris by delivering compressed air to the bottom of the borehole. As the compressed air escapes up the casing (or a tremie pipe), water and sediment are entrained and removed from the well.

In wells where excessive sediment and/or debris had accumulated, or a blockage had been detected, the methods described above were often performed to try and remove the buildup or dislodge the blockage. Redevelopment efforts were effective at removing several feet of debris and some blockages, but some wells could not be rehabilitated and warrant replacement.

Slug tests

Slug tests were performed by the USGS-UMWSC by quickly lowering a solid PVC slug into the water column. Various size slugs are used depending on the well diameter. Water levels are recorded during the process using a submersible pressure transducer. The change in water level over time is then plotted and used to evaluate the well-aquifer connection.

As part of the USGS-UMWSC routine monitoring, wells are periodically slug tested. If the slug response for a well changes over time, the well is flagged for evaluation. In some instances, redevelopment may be necessary to restore connectivity to the aquifer.

Groundwater-level measurements

All groundwater-level measurements collected by the USGS-UMWSC, or its cooperators, follow strict quality assurance procedures. The USGS report titled, "Groundwater Technical Procedures of the U.S. Geological Survey" (Cunningham and Schalk, 2011) provides detailed technical procedures that are followed.

The following summarizes some of the most important procedures. To start, all measuring devices that are used to take manual discrete groundwater level measurements are sent in for calibration at the USGS Hydrologic Instrumentation Facility. The tape corrections, if any exist, are added to the measurement before they are entered into the USGS' database. Each well also has a physically marked measuring point (MP) that serves as a reference point from which all water-level depths are measured. A permanent land surface datum (LSD) is also established at each well and commonly corresponds to the top elevation of a bolt secured into the base of the steel well casing or a steel bar driven into the ground. The exact location of the LSD is determined by GPS surveying (see RTN-GPS section above for details). The distance between the LSD and the MP is subtracted from the tape down measurement. The MP distance is periodically checked using a folding ruler to ensure nothing has moved. Some wells are also equipped with instruments that collect continuous water-level data, usually at 15- or 60-minute intervals. Either a shaft encoder or submersible pressure transducer is used to collect and record the data. The equipment is periodically checked against a discrete tape-down measurement with electronic tape or steel tape. If the equipment reads differently than the discrete tape down, the USGS corrects the continuous data. Continuous data are initially set to provisional status when entered into USGS's web-based National Water Information System (NWIS) (U.S. Geological Survey, 2022). The data are reviewed by separate individuals before they are set to an approved status. For this study, depth-of-water measurements reported on newly collected geophysical logs incorporate USGS tape downs.

Routine monitoring and maintenance

During site visits, the main objective is for the USGS-UMWSC to perform manual tape-down measurements of depth-to-water in the monitoring well and download continuous water-level data where available. This data are subsequently analyzed and approved as part of the USGS' quality-assurance/quality-control process and published to NWIS.

As part of these routine visits, the USGS-UMWSC also verifies that the wellhead is secure and protected from environmental factors (e.g., rain, snow) and ensures the proper functioning of all monitoring equipment. When necessary, well covers, shelters, or monitoring equipment may be repaired or replaced. Verifying the hydraulic connection of the monitoring well to the surrounding aquifer is done by performing slug tests, analyzing hydrograph data, and making total depth checks.

Project summary

The project proposal submitted in January 2020, included 23 work items in fulfillment of objective 4 (well maintenance) and objective 5 (well drilling) as outlined in the program announcement (USGS funding opportunity G20AC00189). While Figure 1 depicts these wells in relation to all NGWMN wells in Wisconsin, Figure 2 only shows the location of the 23 wells that were worked on as part of this funding opportunity.

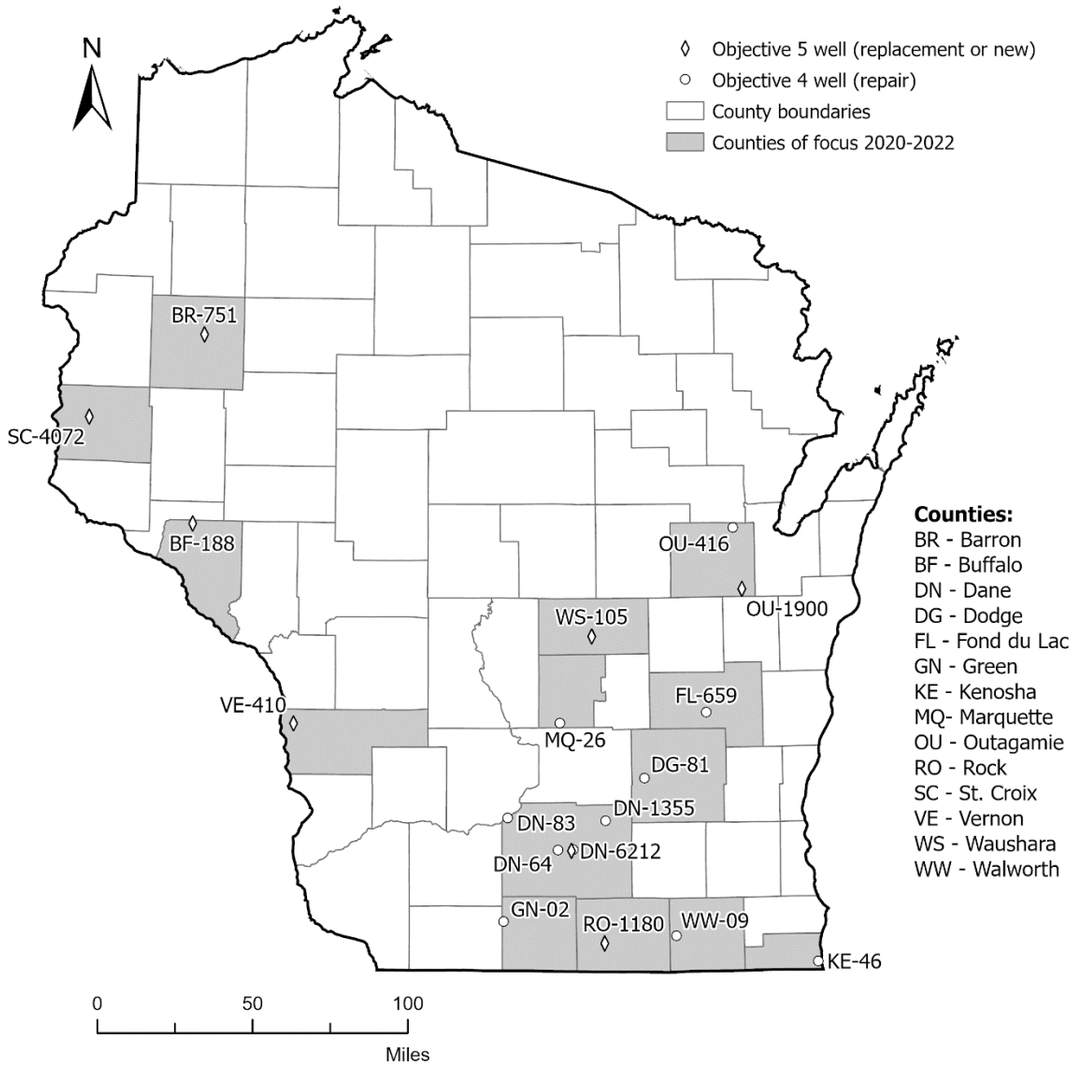

Figure 2. *Locations and site names of all monitoring wells in the WGLMN (and NGWMN) that were worked on as part of this funding opportunity. Site names referenced here are short-hand names for the full WGNHS well identifying numbers (WIDs). Full WIDs are provided in each respective well section in the Project details section of this report. Political boundaries from Wisconsin Department of Natural Resources, 2011. Wisconsin Transverse Mercator projection, 1991 Adjustment to the North American Datum of 1983 (NAD 83/91); EPSG 3071.*

At the conclusion of this project, most work items were successfully completed as originally proposed. At some monitoring sites, the work plan changed due to information gained from reviewing historical documents and performing well evaluations. A summary of activities originally proposed, work completed between September 1, 2020, and October 2023, and the status of the well sites as of October 2023 is presented in table 1. The grant was originally approved as a two-year project, from September 1, 2020, to August 31, 2022, but was later extended under a two-year no-cost extension until August 31, 2024. This extension was needed due to an unexpected increase in drilling costs and the COVID 19 pandemic.

Table 1. Work activities proposed, work completed, and status of well sites as of Oct. 2023

Well	Objective[1]	Goal[2]	Outcome	Status of Well[3]
BR-751 Barron Co.	5	Drill new well	Work successfully completed	BR-751 added to network Aug. 2022; depth = 150.9; national aquifer = N100GLCIAL USGS-UMWSC to continue routine monitoring and maintenance
BF-188 Buffalo Co.	5	Drill new well	Work successfully completed	BF-188 added to network July 2023; depth = 80; national aquifer = S300CAMORD USGS-UMWSC to continue routine monitoring and maintenance
DN-05 Dane Co.	4	Replace well head, redevelop well, characterize well, and test well-aquifer connection	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
DN-64 Dane Co.	4	Collect a borehole video	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
DN-83 Dane Co.	4	Characterize well and test well-aquifer connection	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
DN-1297 Dane Co.	5	Replace well	Work successfully completed, well replaced by DN-6212	DN-1297: removed from network (NGWMN and WGLMN); filled, sealed, and abandoned 11/6/22 DN-6212: added to network Oct. 2021; depth = 94.8; national aquifer = S300CAMORD; USGS-UMWSC to continue routine monitoring and maintenance

Well	Objective[1]	Goal[2]	Outcome	Status of Well[3]
DN-1355 Dane Co.	4	Characterize well and test well-aquifer connection, reconcile local aquifer uncertainty	Work successfully completed; Local aquifer is 365STPR, St. Peter sandstone	USGS-UMWSC to continue routine monitoring and maintenance
DG-81 Dodge Co.	4	Characterize well and test well-aquifer connection	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
DU-743/744 Dunn Co.	5	Drill new well	Unsuccessful	Not drilled
DU-745 Dunn Co.	5	Drill new well	Unsuccessful	Not drilled
FL-659 Fond du Lac Co.	4	Characterize well and test well-aquifer connection, reconcile aquifer uncertainty	Work successfully completed; Well open to the Ordovician Prairie du Chien dolomite and underlying Cambrian Jordan sandstone	USGS-UMWSC to continue routine monitoring and maintenance. Recommend collecting flow logs to characterize aquifer
GN-02 Green Co.	4	Characterize well and test well-aquifer connection	Work successfully completed	Future replacement of GN-02 or retrofitting a 2-in.-diameter PVC well inside the existing well is recommended
KE-46 Kenosha Co.	4	Characterize well and test well-aquifer connection	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
MN-28 Manitowoc Co.	4	Characterize well	No work was performed. This well was included by mistake.	Well is in good condition following work completed 2018-2021 (Bremmer and others, 2022)
MQ-26 Marquette Co.	4	Characterize well, test well-aquifer connection, and replace well head	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance

Well	Objective[1]	Goal[2]	Outcome	Status of Well[3]
OU-416 Outagamie Co.	4	Characterize well and test well-aquifer connection	Work successfully completed with the exception of a full video log	Redevelopment followed by a complete video log is recommended
OU-1900 Outagamie Co.	5	Drill new well	Work successfully completed	OU-1900 added to network Jan. 2022; depth = 321.4; national aquifer= S300CAMORD; USGS-UMWSC to continue routine monitoring and maintenance
RO-1180 Rock Co.	5	Drill new well	Work successfully completed	RO-1180 added to network Dec. 2021; depth = 99.3; national aquifer= S300CAMORD; USGS-UMWSC to continue routine monitoring and maintenance
SC-4072 St. Croix Co.	5	Drill new well	Work successfully completed	SC-4072 added to network July 2023; depth = 98; national aquifer = S300CAMORD; USGS-UMWSC to continue routine monitoring and maintenance
VE-08 Vernon Co.	5	Replace well	Work successfully completed, well replaced by VE-410	VE-08: removed from network (NGWMN and WGLMN); filled, sealed, and abandoned August 2023 VE-410: added to network Jan. 2022; depth = 51; national aquifer=N100GLCIAL; USGS-UMWSC to continue routine monitoring and maintenance

Well	Objective[1]	Goal[2]	Outcome	Status of Well[3]
WS-105 Waushara Co.	5	Replace well	Work successfully completed, well replaced by WS-2372	WS-105: removed from network (NGWMN and WGLMN); filled, sealed, and abandoned June 2022 WS-2372: added to network Dec. 2021; depth = 25.5; national aquifer=N100GLCIAL; USGS-UMWSC to continue routine monitoring and maintenance
WW-09 Walworth Co.	4	Collect OBI and geophysical logs and test well-aquifer connection	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance

[1] Objective 4: Well Maintenance, Objective 5: Well Drilling
[2] Characterize well = full suite of geophysical logs, borehole video, and well construction evaluation; well-aquifer connection is evaluated with a slug test
[3] All depths are reported as feet below land surface datum (ft blsd); N100GLCIAL = glacial sand and gravel aquifer system; N400SLRDVN = Silurian-Devonian aquifer system; S300CAMORD = Cambrian-Ordovician aquifer system

The following section of the report termed “Project details” presents all relevant information associated with each monitoring site worked on as part of this grant. Details about each monitoring site are structured under the headings: 1) Well information, 2) Initial work plan, 3) Description of work completed, and 4) Suggestions for future work. Slug tests and concurrent water-level monitoring results, along with video stills from borehole video logging and fieldwork photos are presented as figures under the *Description of work completed* section.

Project details

BR-751 (Barron County, WI) – new well

USGS Site Number: 452904091482101
USGS Site Name: BR-35/21W/25-0751
WGNHS Well ID: 3000751
WDNR Well Number: VU539

Well information

BR-751 was drilled as a new WGLMN and NGWMN well on June 30, 2022, by DMB Drilling Company Inc [1]. The well is located on property owned by Norswiss Farms within the town of Stanfold, 4 miles southwest of Rice Lake, Wisconsin (fig. 3). The 6 -in. borehole was rotary drilled to a reported total depth of 150.9 feet below land surface datum (ft blsd) [1,2]. A 2-in.-diameter PVC casing was installed to a reported depth of 135.9 ft blsd, below which is a PVC screen from 135.9 to 150.9 ft blsd [1]. Monitoring began on August 17, 2022 [3] and the well is currently in good condition.

Latitude, longitude: 45°29’04.28 ”, -91°48’21.11 ” (NAD83) [3]
Current land surface datum: 1232.2 feet above mean sea level (NAVD88) [3]
Hydrologic Unit (USGS Watershed Code): 070500070310 [3]
Well completed in: USGS national aquifer N100GLCIAL (Sand and gravel aquifers (glaciated regions)) and local aquifer 100SDGV (Sand and Gravel Aquifer) [3]
Current well depth: 153.0 ft-BTOC (150.9 ft blsd) [2]
Current depth of screened interval: 137.9–153.0 ft-BTOC (135.9–150.9 ft blsd) [1,2]

[1] Well details obtained from 2022 WDNR monitoring well construction report (form 4400-113A)
[2] Well details obtained from work completed for this funding opportunity; well depth is from USGS-UMWSC tape-down on 8/22/22; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum
[3] Well details obtained from the USGS

Documentation for this well is included in appendix 1.

Figure 3. *Location of well BR-751 (red marker) in Barron County, Wisconsin. The site is located on property owned by Norswiss Farms, approximately 145 ft east of 17th St. and 1300 ft north of 19th Ave. within the town of Stanfold, 4 miles southwest of Rice Lake.*

Initial work plan

This well was initially proposed under objective 5 for well drilling. Work planned to include drilling a new well approximately 75 ft blsd into the shallow sand and gravel aquifer system. Borehole cuttings were to be collected, processed, used to generate a geologic log, and archived at the Core Repository in Mt. Horeb, Wisconsin. Following the completion of the drilling, the plan of work for this site also included characterization of the well with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection. This new well is designed to fill a data gap within a region of intensifying water use, which is also home to sensitive surface water features.

Description of work completed

In December 2021, the WGNHS established a written land-access agreement with Norswiss Farms to place a new well on their property. The well was sited on private property to place it further from local streams and along the divide between the Yellow and Red Cedar rivers. Drilling of BR-751 began on June 29, 2022, and was completed on June 30, 2022, by DMB Drilling Company Inc. using mud rotary. The 6-in borehole was completed to a total depth of 150.9 ft blsd. Drill cuttings were collected every 5 feet and used to generate a lithologic description of the well borehole. Cuttings were archived at the Core Repository in Mt. Horeb, Wisconsin. A 2-in.-diameter PVC casing was subsequently installed to a reported depth of 135.9 ft blsd, below which a schedule-40 PVC screen was installed from 135.9 to 150.9 ft blsd, open to the local unconsolidated glacial sand and gravel aquifer (fig. 4, panel A). The well was filter-packed with red flint sand and gravel around the screened interval and finished with a locking protective well cover (fig. 4, panel B). The well was completed in compliance with Wisconsin Administrative Code NR141. BR-751 was initially developed on June 30, 2022, using compressed air and a submersible pump, and turbid water was reported. The well was later developed again on July 23, 2022, and clear water was reported. Both times, the work was completed by DMB drilling.

To fulfill reporting requirements with the WDNR, monitoring well construction form 4400-113A, soil boring log 4400-122, and monitoring well development form 4400-113B were completed and submitted to the WDNR.

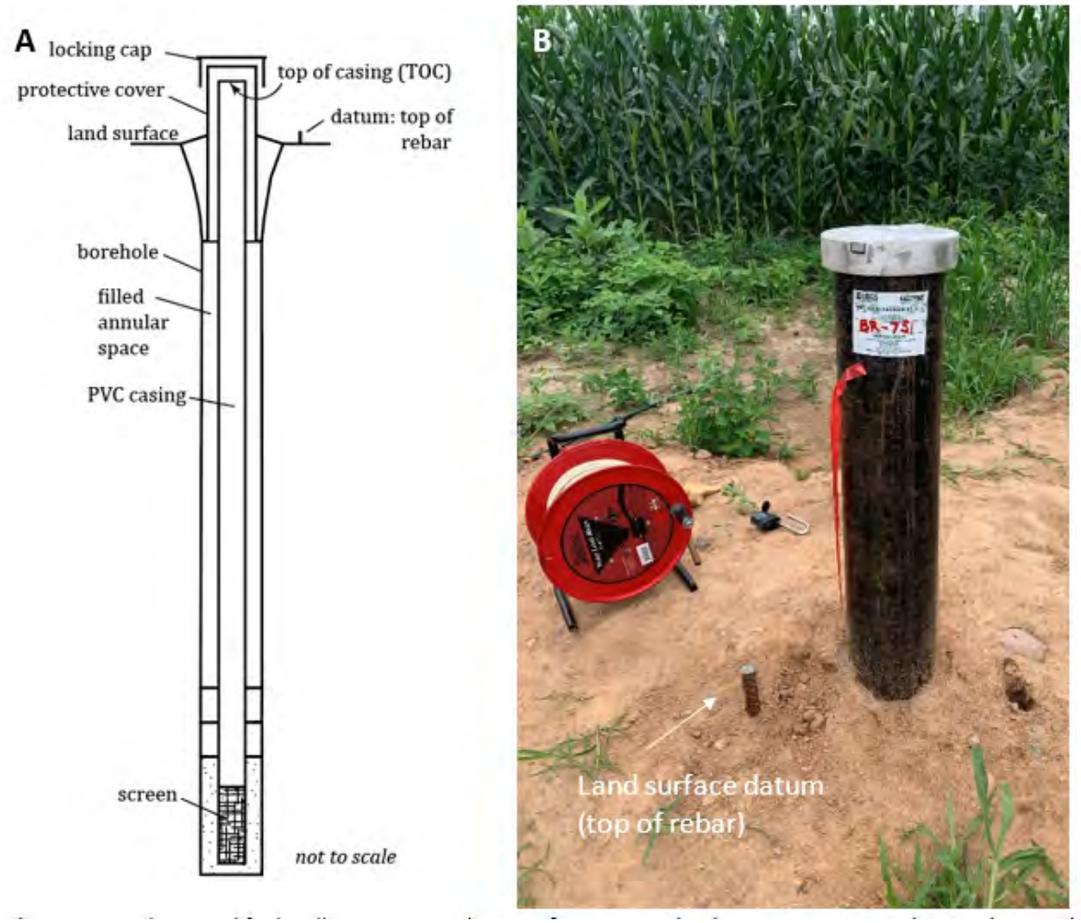

Figure 4. *Panel A, Simplified well construction diagram for BR-751. The diagram is not to scale. Panel B, Newly completed well BR-751 with locking well head protector. An electrical water-level tape is visible on the ground to the left of the well. The established land surface datum – a metal rebar - can also be seen in the ground, left of the well. Photo courtesy of USGS-UMWSC.*

In August 2022, the USGS-UMWSC surveyed the well using RTN-GPS, completed a slug test to test the well-aquifer connection, and installed a pressure transducer to begin recording continuous water-level data.

The slug test was completed using a 1 and 3/8th in.-diameter by 5 ft. long cylindrical solid PVC slug and the results show a good connection to the aquifer (fig. 5). The water column was displaced by approximately 3 feet and showed a rapid hydraulic response suggesting it is well connected to the surrounding aquifer

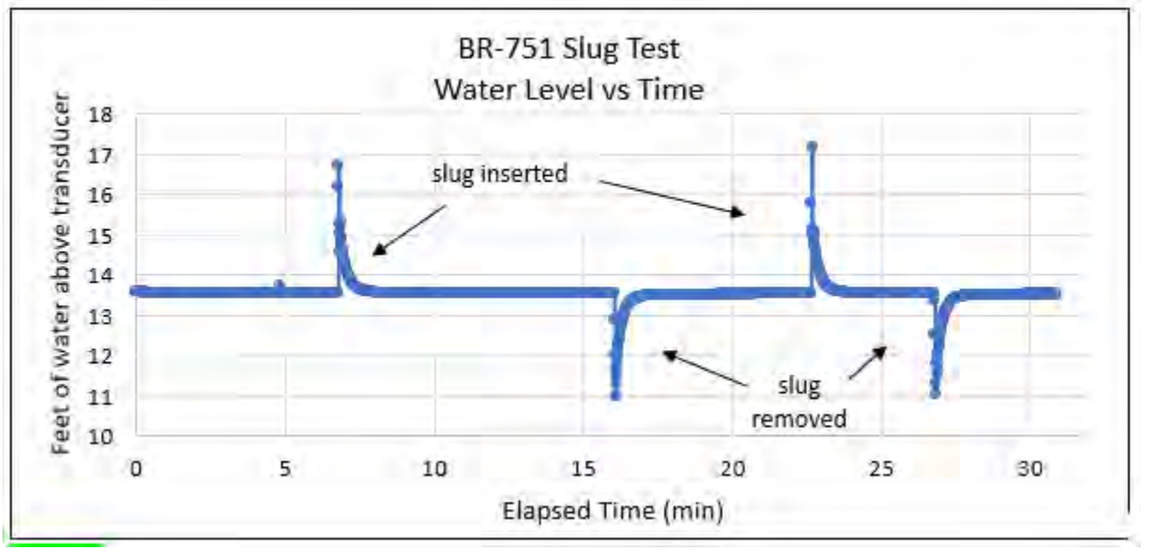

***Figure 5**. Slug test results for BR-751. Slug testing was performed on August 17, 2022, and shows a slow hydraulic response. Data courtesy of USGS-UMWSC.*

The WGNHS did not collect geophysical logs, a video log, or an optical borehole image because this well was completed with a 2-in.-diameter PVC casing and bentonite seal. Monitoring for BR-751 began August 17, 2022.

Suggestions for future work

No future work is anticipated for this well with the exception of routine monitoring and maintenance by the USGS-UMWSC.

BF-188 (Buffalo County, WI) – new well

USGS Site Number: 443420091465901
USGS Site Name: BF-24/12W/12-0188
WGNHS Well ID: 6000188
WDNR Well Number: ABA923

Well information

BF-188 was drilled as a new WGLMN and NGWMN well on June 14, 2023, by DMB Drilling Inc. The well is located on private property owned by Tri-Parish in the Town of Canton, Wisconsin (fig. 6). The well was drilled using mud rotary [1]. A 10-in. borehole was drilled to a reported total depth of 40 feet below land surface datum (ft blsd) and a 6-in. borehole was drilled from 40 to approximately 80 feet bls. A 6 -in.-diameter steel casing was installed and cemented-in to a reported depth of 40 ft blsd, below which, the borehole is left open to the local sandstone bedrock. Monitoring began on July 26, 2023 [2] and the well is currently in good condition.

Latitude, longitude: 45°03’53.33”, -92°23’57.00” (NAD83) [2]
Current land surface datum: 884.27 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 070400030107 [2]
Well completed in: USGS national aquifer 300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDS (Sandstone Aquifer) [2]
Current well depth: 82.4 ft-BTOC (80 ft blsd) [3]
Current casing depth: 42.8 ft-BTOC (40.4 ft blsd) [3]

[1] Well details obtained from the June 14, 2023 WDNR well construction report completed by the driller (form 3300-077A)
[2] Well details obtained from the USGS
[3] Well details from work completed for this funding opportunity. Casing and well depths are interpreted from June 14, 2023 geophysical logs; well depth incorporates July 26, 2023 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 2.

Geophysical logs collected on June 14, 2023, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/6000188

***Figure 6**. Location of well BF-188 (red marker) in Buffalo County, Wisconsin. The site is located on property owned by Tri-Parish near Canton Cemetery, approximately 125 ft north of County Highway A and 800 ft west of County Highway W, 5.5 miles west of Mondovi, WI.*

Initial work plan

This well was initially proposed under objective 5 for well drilling. Work planned to include drilling a new well approximately 60 ft blsd into the Cambrian sandstone aquifer system. Borehole cuttings were to be collected, processed, used to generate a geologic log, and archived at the Core Repository in Mt. Horeb, Wisconsin. Following the completion of the drilling, the plan of work for this site also included characterization of the well with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection. This new well is designed to fill a data gap within a region of intensifying water use, which is also home to sensitive surface water features.

Description of work completed

In November 2021, the WGNHS established a written land-access agreement with Tri-parish to place a new well on their property. The well was sited on private property to place it within the area of need identified in Buffalo County and establish easy well access into the future. Drilling of BF-188 was completed on June 14, 2023 by DMB Drilling Company Inc. using mud rotary (fig. 7, panel A). The 6-in borehole was completed to a total depth of 80 ft blsd. Drill cuttings were collected every 5 feet and used to generate a lithologic description of the well borehole. Cuttings were archived at the Core Repository in Mt. Horeb, Wisconsin. A 6-in.-diameter steel casing was subsequently installed to a reported depth of 40.4 ft blsd, below which the borehole was left open, from 40.4 to 80 ft blsd, to the local Cambrian sandstone bedrock aquifer. The well was finished with a locking protective well cover and two protective bollards were installed around the well (fig. 7, panel B). The well was completed in compliance with Wisconsin Administrative Code NR812. BF-188 was developed on June 14, 2023 by DMB Drilling using compressed air.

To fulfill reporting requirements with the WDNR, a soil boring log (form 4400-122) was completed and submitted to the WDNR. DMB Drilling submitted the completed well construction report.

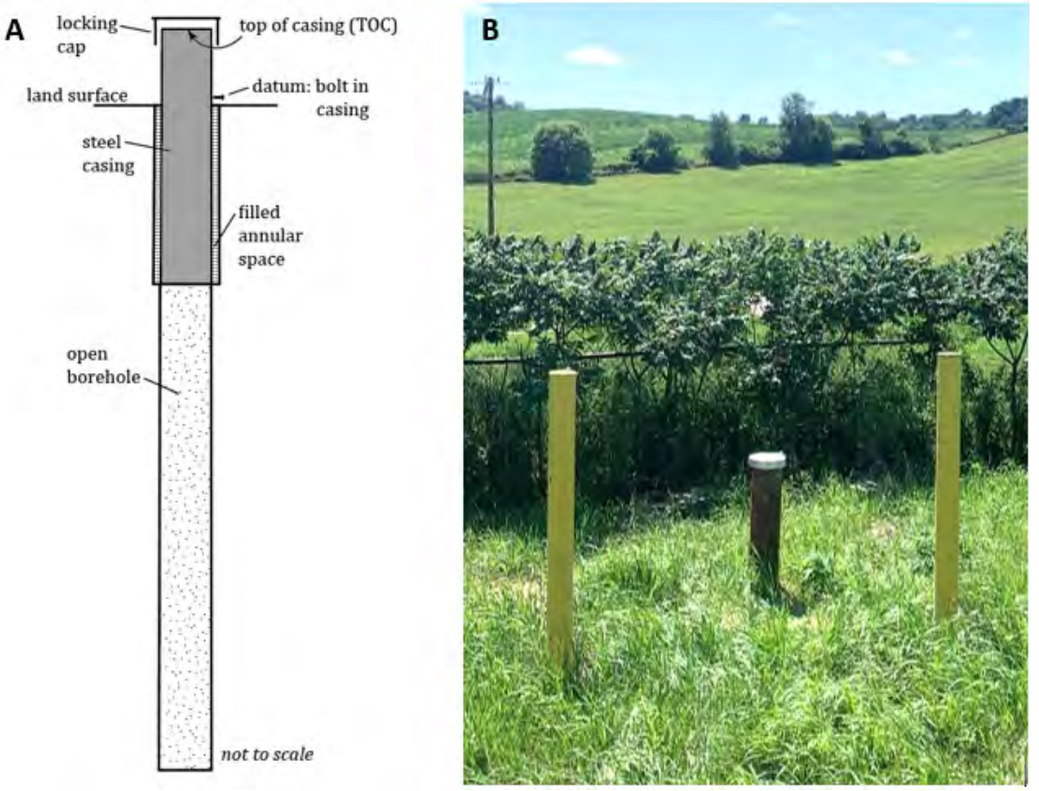

Figure 7. *Panel A, Simplified well construction diagram for BF-188. The diagram is not to scale. Panel B, Newly completed well BF-188 with locking well head protector and protective yellow bollards. Photo courtesy of USGS-UMWSC.*

On June 14, 2023, the WGNHS completed geophysical logging of the well and collected an optical borehole image. The WGNHS was unable to collect a video log due to broken equipment. The geophysical logs and borehole image show that the casing is in good condition, well seated into bedrock, and likely open to the Eau Claire Formation.

In July 2023, the USGS-UMWSC surveyed the well using RTN-GPS, completed a slug test to test the well-aquifer connection, and installed a pressure transducer to begin recording continuous water-level data. The slug test was completed using a 1 and 3/8th in.-diameter by 5 ft. long cylindrical solid PVC slug and the results show a good connection to the aquifer (fig. 8). The water column was displaced by approximately 2 feet and showed a rapid hydraulic response suggesting it is well connected to the surrounding aquifer.

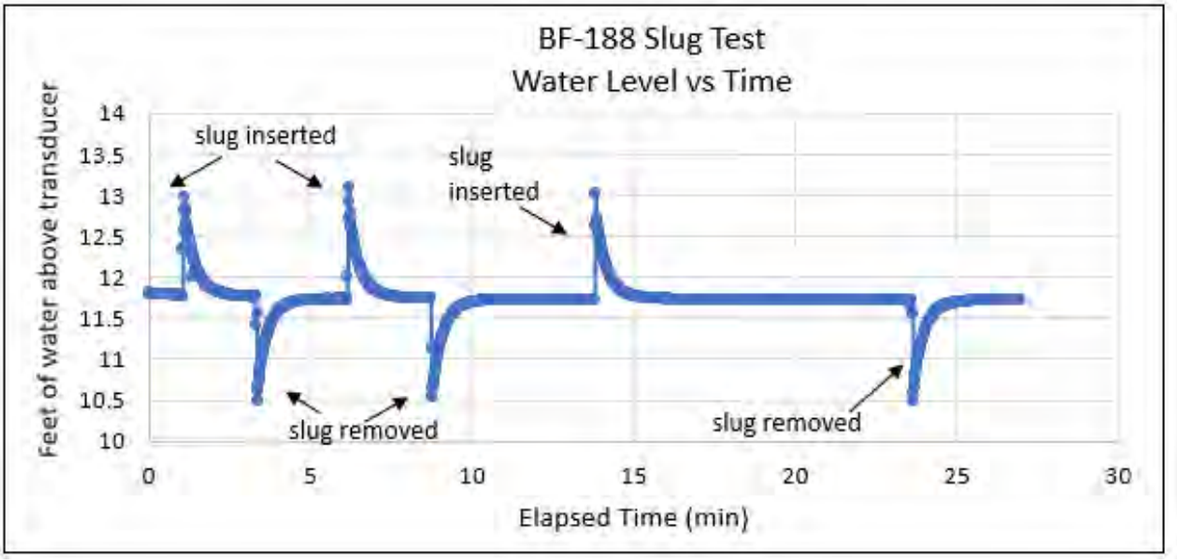

Figure 8. *Slug test results for BF-188. Slug testing was performed on July 26, 2023, and shows a good hydraulic response. Data courtesy of USGS-UMWSC.*

Monitoring for BF-188 began July 26, 2023.

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

DN-05 (Dane County, WI) – well maintenance

USGS Site Number: 430429089230301
USGS Site Name: DN-07/09E/23-0005
WGNHS Well ID: 13000005
WDNR Well Number: None

Well information

DN-05 was drilled in 1874 [1]. A few historical documents were found for this well, including a geologic log, indicating the hole was completed to a reported total depth of 1015 feet below land surface (ft blsd) [2]. The well was completed to a reported total depth of 346.5 ft blsd and an 8-in.-diameter casing was subsequently installed to a reported depth of 265 ft blsd [1]. Below the casing, the hole was left open to bedrock from 265 to 346.5 ft bls. Work completed for this project indicates the casing and hole to be less than 3-in. diameter; however, no detailed well construction records are known to exist to indicate when and why this change was made. The well is located in the basement of the Wisconsin State Capitol buildings south wing in Madison, WI (fig. 9). The well is currently owned by the State of Wisconsin. Monitoring began in 1946 and the well is currently in satisfactory condition.

Latitude, longitude: 43°04’28.6”, -89°23’03.0” (NAVD83) [1]
Current land surface datum: 930 feet above mean sea level (NGVD29) [1]
Hydrologic Unit (USGS Watershed Code): 07090001 [1]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDS (Sandstone Aquifer) [1]
Current well depth: 316.3 ft-BTOC (320 ft blsd) [2]
Current casing depth: 252 ft-BTOC (255.7 ft blsd) [2]

[1] Well details obtained from the USGS
[2] Well details obtained from a geologic log in Geology of Wisconsin, Vol. II, pg. 50 (Geological and Natural History Survey (Wis.), 1877)
[3] Well details obtained from work completed for this funding opportunity; casing interpreted from February 19, 2021 WGNHS geophysical logs; well depth interpreted from WGNHS geophysical logs and March 8, 2022 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 3.

Geophysical logs collected on February 29, 2021, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/13000005

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***Figure 9**. Location of well DN-05 (red marker) in Dane County, WI. The site is located in the south wing of the State Capitol building basement. The Capitol building is between Lake Mendota and Lake Monona in Madison, WI.*

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include removal of the old hand pump and 4-in. interior pipe so that the well could be evaluated and depth to casing and well-bottom could be established. Following removal of the hand-pump and pipe, characterization of the well was to include a borehole video, full suite of geophysical logs, and slug test to evaluate the well-aquifer connection.

Description of work completed

In late 2020, WGNHS obtain permission to access and perform work on DN-05 in the basement of the State Capitol building and work began early 2021. In February 2021 Water Wells Inc. and WGNHS successfully removed the hand pump and pipe from DN-05 in a room with very limited overhead clearance (fig. 10).

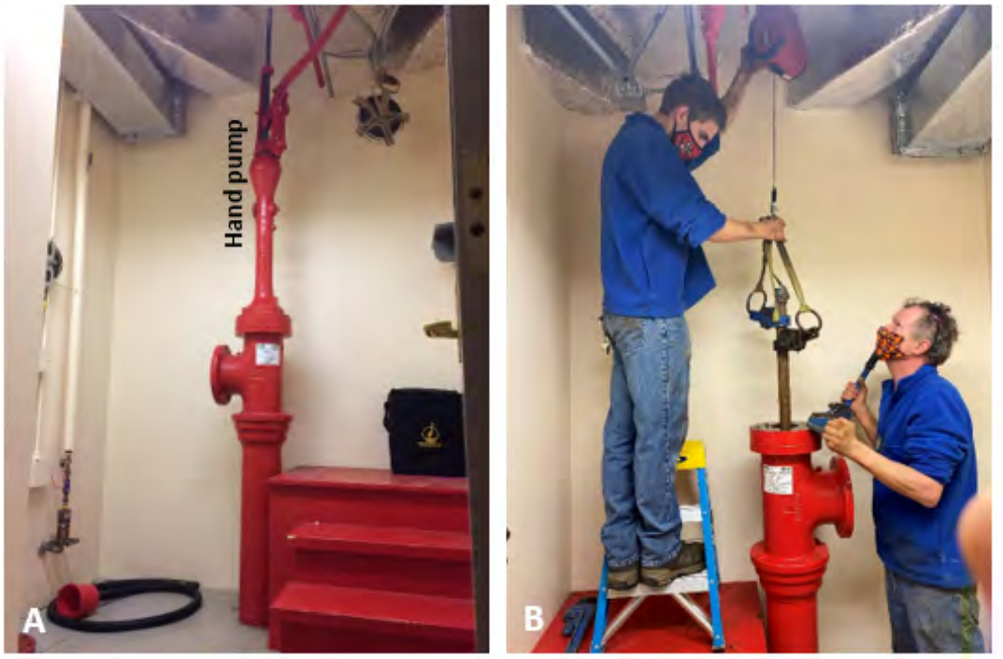

***Figure 10**. Well DN-05 located in the basement of the south wing of the State Capitol building. Panel A, before work was completed to remove the hand pump and pipes. Panel B, after removal of the hand pump. Water Wells Inc. is shown removing the final pipes from the well, allowing access for a full well characterization.*

On February 19, 2021, the WGNHS completed geophysical logging of the well and collected a borehole video. Geophysical logging, coupled with a tape-down measurement by the USGS-UMWSC indicate the well depth is 320 ft blsd, approximately 26.5 ft shallower than the original reported depth, indicating the well is accumulating material at the bottom. Logging also shows that the casing inside diameter is approximately 2.7 in., not 8 in., suggesting the well was modified at some point since its original construction; however, no records were located mentioning modifications. Fluid conductivity was also noted to be quite high near the bottom of the well (257 to 320 ft blsd) increasing from approximately 1175 microsemens/centimeter (µS/cm) at the water surface to 5000 µS/cm.

The borehole video collected shows that the water is very turbid and there is quite a bit of biofilm in the water and on the surface of the casing (fig. 11, panel A). The casing appears to be in decent condition, although it is difficult to see in the video. The bottom of casing was briefly imaged before the condition of the well became too poor for the video to capture footage (fig. 11, panel B); the well bottom was not captured on video.

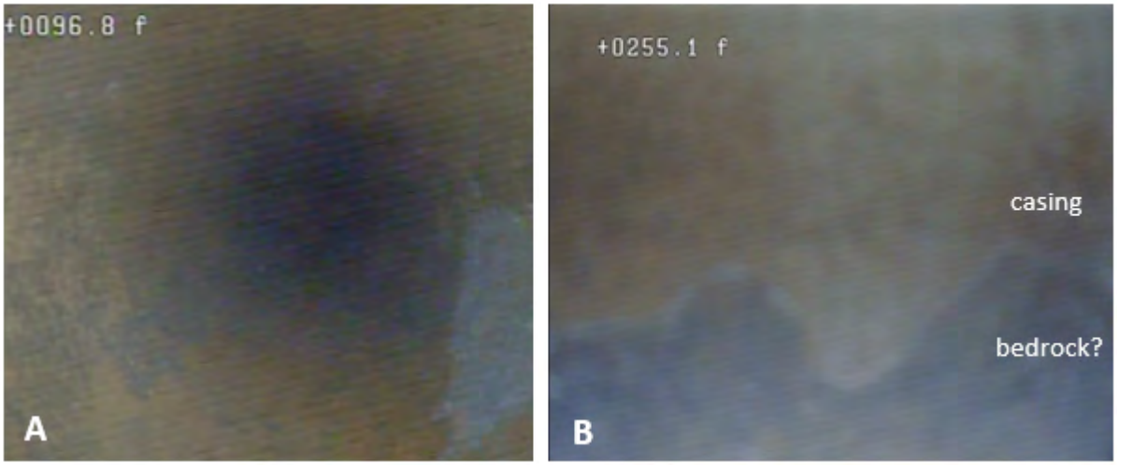

***Figure 11**. Screen shots from the borehole video of DN-05. Panel A, down-hole views of DN-05 captured at approximately 97 ft BTOC showing the turbid condition of the water and biofilm coating the casing surface and Panel B, at approximately 255 ft BTOC showing a side view of the borehole believed to be the bottom of casing. This was the last footage of the well before the water conditions became too poor to continue the video collection.*

The USGS-UMWSC performed a slug test on DN-05 April 20, 2021, using a 1 and 3/8-in.-diameter, 5-ft-long solid PVC slug. The water column was displaced rapidly by approximately 1 foot and showed a relatively slow response (45-minute recovery time) (fig. 12).

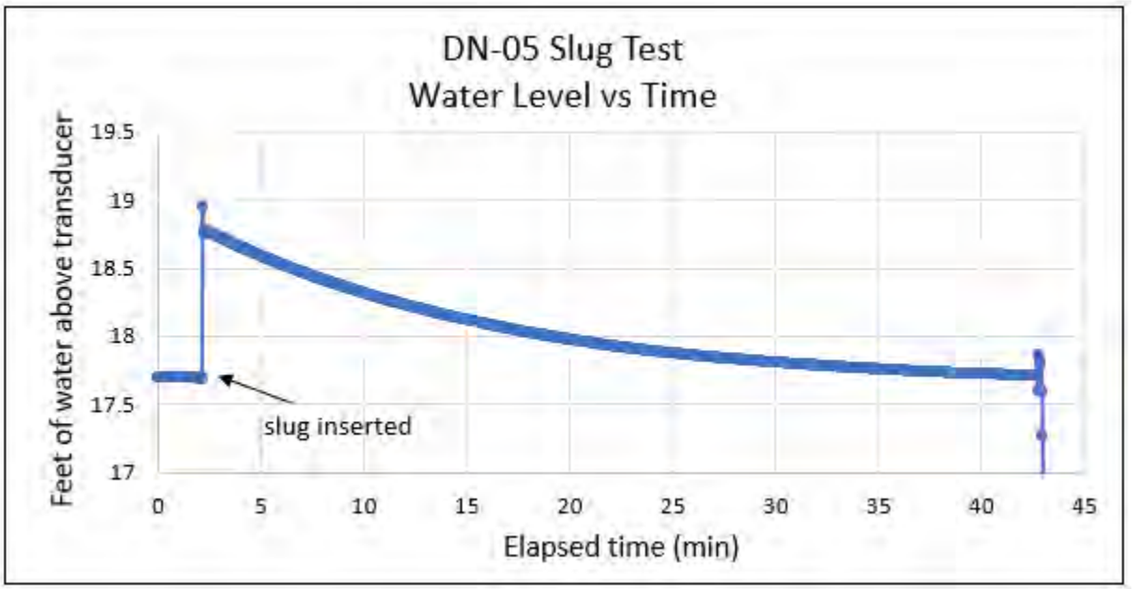

***Figure 12.** Slug test results for DN-05. Slug testing was performed on April 20, 2021 and shows a good hydraulic response. Data courtesy of U.S. Geological Survey.*

The slow response is likely due to a restriction in the well, but with limited access and an indoor location, redevelopment is not feasible. However, this well, although old with minor restrictions, continues to exhibit regional trends observed in other deep-aquifer wells in central Dane County, for example, DN-1482 (https://maps.waterdata.usgs.gov/mapper/index.html?state=wi).

Suggestions for future work

Based on the borehole video results and the shallow depth of the well (relative to the reported drill depth), redevelopment could improve the conditions of DN-05; however, we do not recommend redevelopment at this point would be logistically problematic in the basement of the Capitol building. More importantly, the water level trend is very similar to other wells in the same aquifer, indicating the well is still connected to the regional deep aquifer and remains a valuable well for the network.

DN-64 (Dane County, WI) – well maintenance

USGS Site Number: 430427089284901
USGS Site Name: DN-07/09E/19-0064
WGNHS Well ID: 13000064
WDNR Well Number: None

Well information

DN-64 was drilled in 1938 [1] and completed to a reported total depth of 300 feet below land surface (ft bls). A 15-in. hole was drilled to 150 ft bls. An 8-in.-diameter casing was cemented into bedrock to a reported depth of 150 ft bls. Below the casing, an 8-in. hole was left open to bedrock from 150 to 300 ft bls. The well is located in Crestwood Neighborhood on Owen Conservation Park property in Madison, WI (fig. 13) and is difficult to access with heavy equipment. Monitoring began in 1977 [2] and the well is currently in good condition.

Latitude, longitude: 43°04’27.42”, -89°28’48.62 ” (NAD83) [2]
Current land surface datum: 930.9 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 07090001 [2]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDS (Sandstone Aquifer) [2]
Current well depth: 302 ft-BTOC (299 ft blsd) [3]
Current casing depth: 153 ft-BTOC (150 ft blsd) [3]

[1] Well details obtained from 1938 well log and report and geologic log from unknown date
[2] Well details obtained from the USGS
[3] Well details from work completed for this funding opportunity. Casing depth interpreted from 8/3/2021 video log. Well depth from video log and 7/19/2021 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 4.

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***Figure 13**. Location of well DN-64 (red marker) in Dane County, WI. Site is located in the Crestwood Neighborhood area, approximately 350 ft south of Old Sauk Rd. and 0.83 miles southwest of Lake Mendota.*

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include collecting a borehole video log to fully evaluate potential maintenance needs for this well. Geophysical logs were not planned for collection due to the difficulty of getting equipment to this site. A geophysical log was last collected for DN-64 in 1999 (Rauman and others, 1999).

Description of work completed

On April 20, 2021, USGS-UMWSC completed a slug test using two 3-in.-diameter, 5-ft-long solid PVC slugs. The water column was displaced rapidly by approximately 0.6 ft and showed a good hydraulic response, suggesting DN-64 is well connected to the surrounding aquifer (fig. 14).

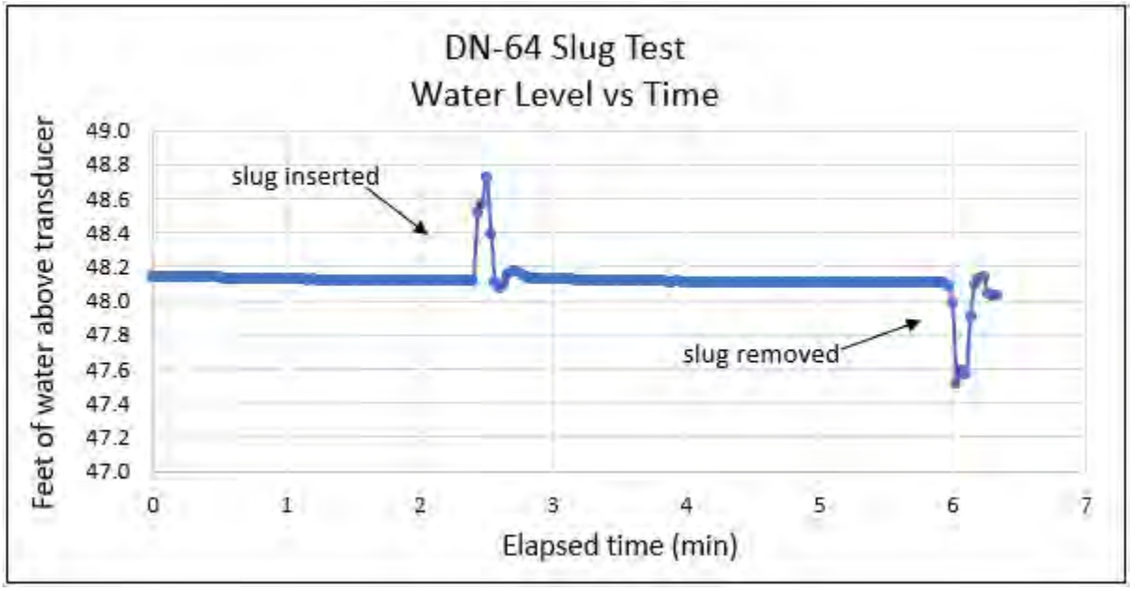

***Figure 14**. Slug test results for DN-64. Slug testing was performed on April 20, 2021 and shows a good hydraulic response. Data courtesy of U.S. Geological Survey.*

A borehole video was collected by WGNHS on August 3, 2021 (fig. 15).

***Figure 15**. WGNHS setting up to collect a borehole video for well DN-64 on August 3, 2021. The video camera cable winch is shown set up on a wagon next to the well. The extended cable pulley suspended over the open well casing will lower the borehole video camera down the well. Inside the well shelter, the groundwater level float recorder is visible in the foreground (white box), blocking the view of the well opening.*

The borehole video shows the casing to be in fairly good condition and measured the bottom of casing at approximately 153 ft blsd and it appears to be well-seated to the bedrock (fig. 16).

***Figure 16.** Screenshot for well DN-64 borehole video showing the bottom of casing and sandstone bedrock below, as seen from the side-view camera.*

A small amount of biofilm was observed on the casing and borehole wall. Turbidity in the upper part of the water column was low but increased significantly directly below the bottom of casing. Approximately two feet below the high turbidity horizon, a large bedding-plane opening was observed (fig. 17, panel A). The water column at the opening has very low turbidity and falling particles knocked loose by the video camera moved in swirling patterns at the opening, indicating horizontal flow at this depth.

The bottom of well DN-64 was measured to be 299 ft blsd by the USGS-UMWSC on July 19, 2021, and this depth was confirmed by the borehole video. The measured depth of the well is approximately 1 ft shallower than the reported original drill depth, indicating accumulation of material at the bottom of the well. This was observed during the video collection (fig. 17, panel B), and the materials appears to be mostly casing debris.

Based on the results of the borehole video, slug test, and well measurements, DN-64 is considered to be in good condition and well connected to the aquifer.

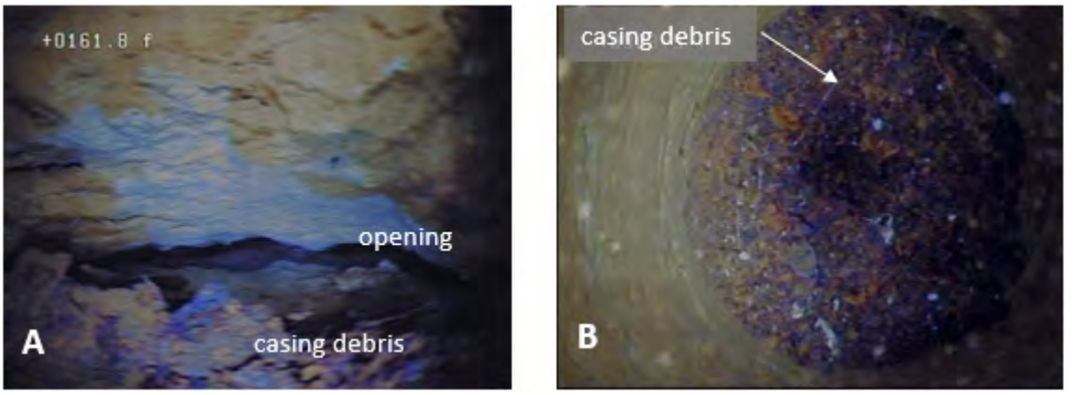

Figure 17. *Screenshots from DN-64 borehole video collected on August 3, 2021. Panel A, bedding plane opening as seen from the side-view camera. Note the casing debris accumulating on the ledge of the bedding plane opening. Panel B, bottom of the well with accumulated casing debris.*

Suggestions for future work

No future work is anticipated for this well with the exception of routine monitoring and maintenance by the USGS-UMWSC.

DN-83 (Dane County, WI) – well maintenance

USGS Site Number: 431312089475301
USGS Site Name: DN-09/06E/29-0083
WGNHS Well ID: 13000083
WDNR Well Number: None

Well information

DN-83 was drilled by Geo. Reynolds & Son in 1948 and completed to a reported total depth of 146 feet below land surface (ft bls) [1]. A 6-in.-diameter steel casing was set to a reported depth of 136 ft bls, and a 6-in.-diameter, 10-ft screen was installed from 136 to 146 ft bls. The well is located on WDNR property east of the Wisconsin River and north of the Village of Mazomanie, WI (fig. 18). Monitoring began in 1953 [2]. The well's original purpose was to supply water to a WDNR game farm, and the well is currently in good condition.

Latitude, longitude: 43°13'22.63", -89°47'59.70" (NAD83) [2]
Current land surface datum: 739.3 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 07070005 [2]
Well completed in: USGS national aquifer N100GLCIAL (Sand and gravel aquifers (glaciated regions)) and local aquifer 100SDGV (Sand and Gravel Aquifer) [2]
Current well depth: 142 ft-BTOC (139 ft blsd) [3]
Current depth of screened interval: 136.3 ft-BTOC to bottom of well (133.4 to 139 ft blsd) [3]

[1] Well details obtained from 1948 well construction report
[2] Well details obtained from the USGS
[3] Well details obtained from work completed for this funding opportunity; well depth interpreted from WGNHS March 9, 2021 geophysical logs and July 13, 2021 USGS-UMWSC tape-down; screened interval interpreted from November 7, 2022 WGNHS borehole video; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 5.

Geophysical logs collected on March 9, 2021, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/13000083

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***Figure 18**. Location of well DN-83 (red marker) in Dane County, WI. Site is located in a wooded area 0.27 miles west of County Rd. Y, 0.45 miles southwest of Old Y Rd. and 0.9 miles east of the Wisconsin River.*

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include a complete borehole evaluation. Borehole geophysics and video logging were last performed in the 1990s (Rauman and others, 1999) and was last slug-tested in 2016 (fig. 19).

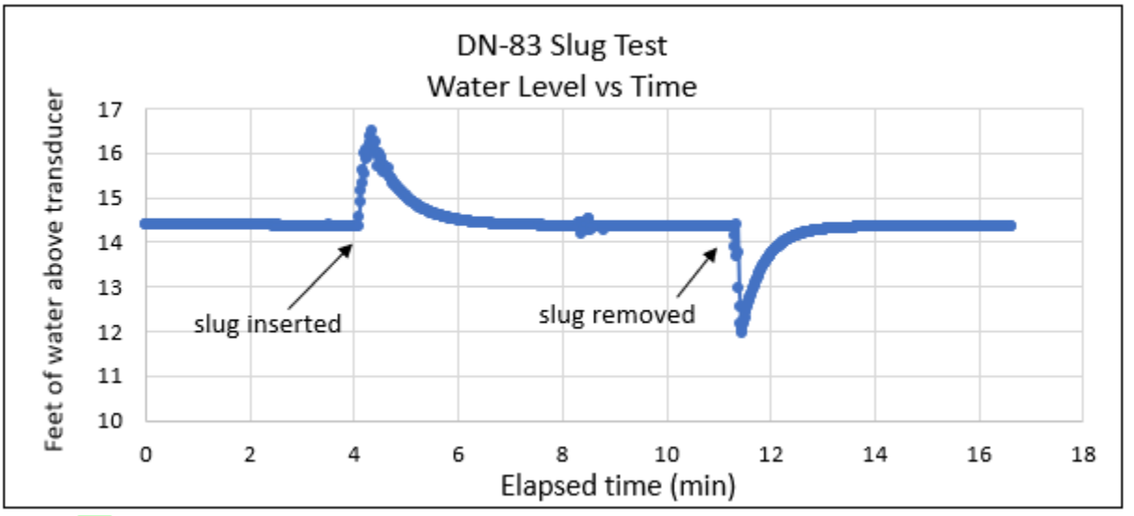

***Figure 19**. Slug test results for DN-83. Slug testing was performed on August 15, 2016 and shows a good hydraulic response. Data courtesy of U.S. Geological Survey.*

Description of work completed

A gamma log was collected by WGNHS on March 9, 2021. Other geophysical logs were not collected because of the steel-screened well construction. The gamma log and a USGS-UMWSC tape down collected July 13, 2021, indicate the well depth is 139 ft blsd.

On November 7, 2022, a borehole video was collected by the WGNHS documenting the condition of the well and screened interval. The casing is in good condition, with very low amounts of biofilm, except for within a few feet of the water table. The water column has very low turbidity throughout the well. The screened interval is logged on the video to start at 133.4 ft blsd (136.3 ft BTOC) and continue to the bottom of the well (fig. 20). This measurement is consistent with older well construction records and the caliper log collected in the 1990s (Rauman and others, 1999).

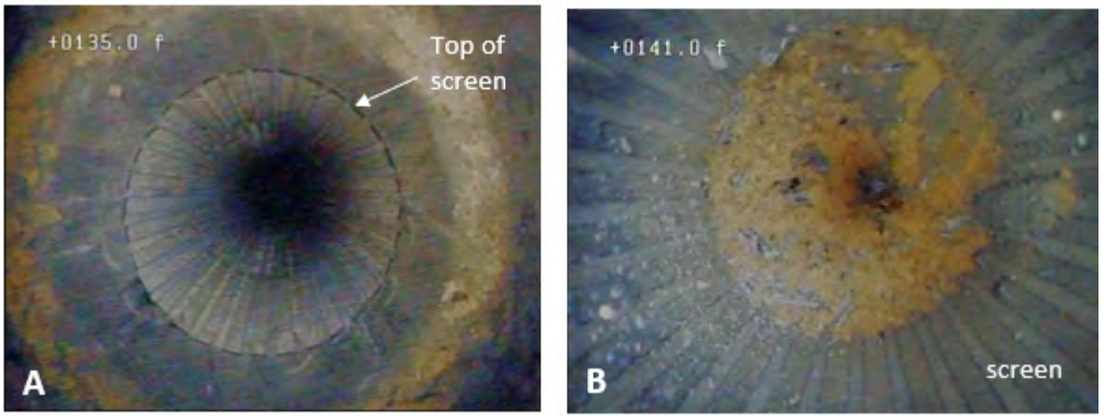

***Figure 20**. Screenshots of the borehole video collected on well DN-83 November 7, 2022. Panel A, down-hole view of the bottom of casing and top of screened interval. Panel B, Down-hole view of the bottom of well DN-83 showing material accumulation.*

The well depth measurements and video log show that the well has accumulated approximately 4 to 6 ft of material at the bottom. However, the slug test performed on April 20 2021 by the USGS-UMWSC (fig. 21), using two 3-in.-diameter, 5 ft. long solid PVC slugs, shows a good hydraulic response indicating a good connection with the sand and gravel aquifer (fig. 22).

***Figure 21**. USGS-UMWSC staff performing a slug test on well DN-83. Staff member is holding two solid PVC slugs prior to dropping them inside the open well casing located out of view and inside the flip-top wells shelter. Image courtesy of U.S. Geological Survey.*

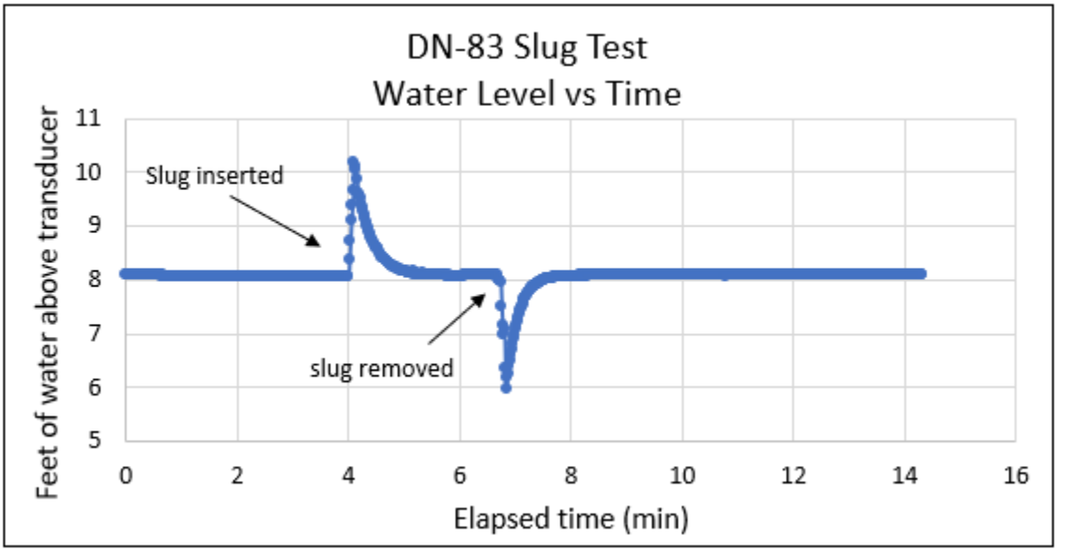

***Figure 22**. Slug test results for DN-83. Slug testing was performed on April 20, 2021 and shows a good hydraulic response. Data courtesy of U.S. Geological Survey.*

At the start of this project, the purpose of well DN-83 was noted as "uncertain;" however, work done for this project shows that DN-83 was originally drilled for the Wisconsin Conservation Department (known today as the WDNR) to supply water to a game farm on. The borehole video also captured footage of a lateral pipe at approximately 3.8 ft blsd (6.7 ft BTOC), supporting the documentation that this well was not drilled for monitoring purposes.

Suggestions for future work

No future work is anticipated for this well with the exception of routine monitoring and maintenance by the USGS-UMWSC.

DN-1297 (Dane County, WI) – replaced by DN-6212

USGS Site Number: 430406089232901
USGS Site Name: DN-07/09E/23-1297
WGNHS Well ID: 13001297
WDNR Well Number: None

Well information

DN-1297 was originally called DN-1099 [1]. Neither a well construction report (WCR) nor a geologic log are available for this well, therefore, the geology and well construction is largely unknown. Previous well characterization work by WGNHS as part of the NGWMN Round II project (Guenther and others, 2017), attempted to determine the geology surrounding the well [2]. The results were inconclusive, and the aquifer type and geologic setting could not be confirmed due accumulation of sediment above the bottom of the well's casing. As part of the NGWMN 2018 project (Bremmer and others, 2022), DN-1297 was found to be unrepairable [3]. DN-1297 was effectively replaced in both the WGLMN and NGWMN by DN-6212 in September 2021 as part of this grant opportunity. DN-1297 was located within the City of Madison-owned right-of-way in downtown Madison, WI (fig. 23) and monitoring began in 1978 [2] and ended in mid-April 2022.[4].

Latitude, longitude: 43°04'06.14", -89°23'34.08" (NAD83) [4]
Land surface datum: 859.0 feet above mean sea level (NAVD88) [4]
Hydrologic Unit (USGS Watershed Code): 07090001 [4]
Well completed in USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDSA (Sandstone Aquifer) [4]
Current well depth: 71.5 ft-BTOC (69.8 ft blsd) [5]
Current casing depth: Bottom of steel casing extends into at least 3 feet of accumulated sediment at bottom of well [2]

[1] USGS 1980 well records
[2] Well details obtained from NGWMN Round II project work (Guenther and others, 2017)
[3] Well details obtained from NGWMN 2018 project work (Bremmer and other, 2022)
[4] Well details obtained from the USGS
[5] Well details obtained from July 19, 2021 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Historical documentation for this well can be found in appendix A of WGNHS Open-File Report 2017-04 (Guenther and others, 2017). The fill and seal form for this well is included in appendix 6 of this report.

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***Figures 23**. Location of well DN-1297 (red marker) in Dane County, Wisconsin. The site was located on the grass terrace within the City of Madison-owned right-of-way on the southeast side of East Washington Avenue in Madison, WI.*

Initial work plan

This well was initially proposed under objective 5 for well replacement. Redevelopment of the well as part of the NGWMN 2018 project was unsuccessful and DN-1297 was found to be unrepairable (Bremmer and other, 2022). Work planned to include drilling a replacement well nearby in the same aquifer. Prior to the filling and sealing of DN-1297 concurrent operation of the well and its replacement was also planned to establish an overlapping water-level record.

Description of work completed

WGNHS obtained approval to drill a replacement well for DN-1297 and continue monitoring at this site until appropriate concurrent water level data was collected to establish and adequate replacement. Replacement well DN-6212 was drilled September 13, 2021.

DN-6212 was monitored concurrently with DN-1297 to ensure continuity in the water-level record. Then, DN-1297 was filled and sealed on November 6, 2022. The WGNHS, with permission from the WDNR, completed a fill and seal report for DN-1297, saved a copy in the WGNHS statewide subsurface database, and submitted a copy to the WDNR in satisfaction of state well drilling codes. Details about the replacement well DN-1297 are presented below.

Suggestions for future work

DN-1297 was filled and sealed on November 6, 2022. No future work remains to be done.

DN-6212 (Dane County, WI) – replaces DN-1297

USGS Site Number: 430409089234601
USGS Site Name: DN-07/09E/23-6212
WGNHS Well ID: 13006212
WDNR Well Number: PX587

Well information

DN-6212 was drilled as a new WGLMN and NGWMN well on September 13, 2021, by Soils and Engineering Services, Inc. [1] The well is located on the southeastern University of Wisconsin-Madison campus in Madison, Wisconsin (fig. 24). A hollow stem auger was used to drill a 14-in.-diameter borehole to 80 ft bls, then a rotary drill was used to drill a 10-in.-diameter borehole to 88 ft bls, and a 6-in.-diameter borehole to 100 ft bls. The borehole was unintentionally backfilled by caved sandstone bedrock from 100 to 94.8 ft bls. A 2-in.-diameter PVC casing was installed to a reported depth of 89.6 ft blsd, below which is a mesh screen to 94.8 ft bls. Monitoring began in October 2021 [2] and the well is currently in good condition.

Latitude, longitude: 43°04'08.57", -89°23'45.79" (NAD83) [2]
Current land surface datum: 858.8 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 07090002 [2]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDSA (Sandstone Aquifer) [2]
Current well depth: 97.1 ft BTOC (94.8 ft blsd) [3]
Current depth of screened interval: 92.197.1 ft BTOC (89.894.8 ft blsd) [1,3]

[1] Well details obtained from the September 13, 2021 WDNR well construction report (form 4400-113A)
[2] Well details obtained from the USGS
[3] Well details obtained from October 22, 2021 USGS-UMWSC tape-down; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 6.

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***Figure 24**. Location of well DN-6212 (larger red marker), replacement well for DN-1297 (also shown) in Dane County, Wisconsin. The well is located next to the Kohl Center on the southeastern side of the University of Wisconsin-Madison campus, approximately 900 ft east of DN-1297 on W. Washington Ave.*

Initial work plan

DN-6212 was originally proposed under objective 5 for well drilling. Work planned to include drilling a replacement well for DN-1297 that was constructed as similarly as possible to DN-1297. The plan of work for this site also included characterization of the replacement well with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection. Borehole cuttings were planned to be collected, processed, used to generate a geologic log, and archived at the Core Repository in Mt. Horeb, Wisconsin. Concurrent operation of DN-1297 and its replacement was also planned to establish an overlapping water-level record.

Description of work completed

In 2019, the WGNHS worked closely with the University of Wisconsin-Madison to identify potential well drilling sites on university property.

Drilling of replacement well DN-6212 began in late August 2021 by Soils and Engineering Services, Inc. in compliance with Wisconsin Administrative Code NR141. A 16-in.-diameter hollow stem auger was used to drill through the top, approximately 80 ft blsd, of unconsolidated material (fig. 25, panel A). Then air rotary with a 10-in.-diameter drill bit (fig. 25, panel B). was used to extend the hole to approximately 88 ft blsd before a 6-in.-diameter steel casing was cemented in to 88 ft blsd. The borehole was then backfilled 9 ft using 3/8-in. bentonite chips. A 6-in.-diameter rotary hammer was used to complete the borehole to 100 ft blsd, the well was flushed with water.

***Figure 25**. Soils and Engineering Services, Inc. drilling well DN-6212 (replacement for well DN-1297) on the east side of the Kohl Center building on the University of Wisconsin-Madison campus. Panel A, hollow stem auger being used to bore through the unconsolidated material overlying bedrock. Note the eastern wall of the Kohl Center behind the driller. Panel B, 10-in.-diameter air rotary drill bit used to bore through bedrock from approximately 80 to 88 ft blsd. White cap in steel pipe located beneath the drill bit, is the DN-6212 borehole.*

Drill cuttings were collected every 5 ft and used to generate a lithologic description of the well borehole. Cuttings were archived at the Core Repository in Mt. Horeb, Wisconsin.

With the uncertainty in the local geology due to the lack of records from DN-1297, it was not clear at what depth bedrock would be encountered, which bedrock unit was underlying the Quaternary cover, or whether a bedrock contact would be encountered. Sparse records from DN-1297 indicated the well was installed in sand and gravel to a depth of 70 ft blsd; however nearby wells suggested bedrock should be at or near this depth. Based on analysis of the cuttings recovered from drilling DN-6212, the Tunnel City Group was reached at approximately 75 ft blsd and the Wonewoc Formation- Tunnel City Group contact is at approximately 80 to 83 ft blsd. This interpretation is largely based on the disappearance of glauconitic sand in the cuttings in this interval.

A 2-in.-diameter PVC casing was installed, complete with a 5-ft-long schedule-80 PVC screen from 89.8 to 94.8 ft blsd, open to the local sandstone bedrock aquifer. The well screen was filter-packed with red flint #40 and caved sandstone. DN-6212 was developed by WGNHS on September 16, 2021, using a surge and pump method. To fulfill reporting requirements with the WDNR, monitoring well construction form 4400-113A, soil boring log 4400-122, and monitoring well development form 4400-113B were completed and submitted to the WDNR.

The well was fixed with a locking, steal, protective well head and the installation of well DN-6212 was completed September 13, 2021 (figs. 26 and 27). The drill site was cleaned up and landscaping completed in October 2021.

No geophysical logs were collected for well DN-6212 due to 2-in.-diameter PVC casing and bentonite seal.

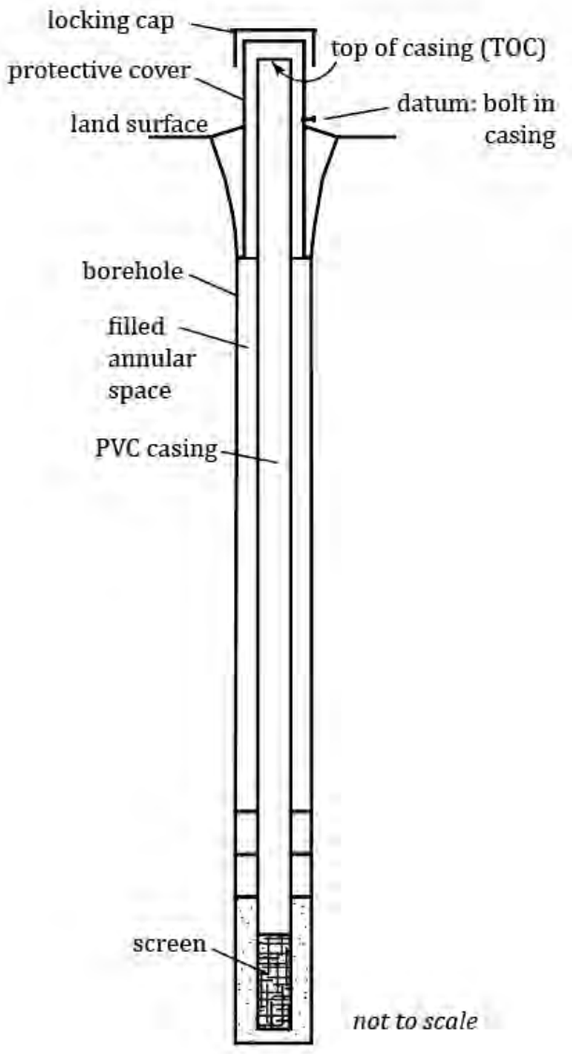

***Figure 26**. Simplified well construction diagram for DN-6212. The diagram is not to scale.*

***Figure 27**. Well DN-6212 (replacement for well DN-1297). Panel A, completed will DN-6212 with several inches of above-grade steel casing surrounding 2-in.-diameter PVC casing completed with a 5-ft-long well screen connected to the sandstone bedrock aquifer at the bottom. Panel B, locking steel protective well head cover installed around well DN-6212. Panel C, completed well DN-6212 west of the Kohl center after landscaping completed at the site.*

October 22, 2021, the USGS-UMWSC surveyed the well using RTN-GPS, completed a slug test to test the well-aquifer connection, and installed a pressure transducer to begin recording continuous water-level data. The slug test was performed using a 1 and 3/8-in.-diameter, 5-ft-long solid PVC slug. The slug was inserted and removed several times and the water level responded quickly (fig. 28) indicating a good connection the bedrock aquifer.

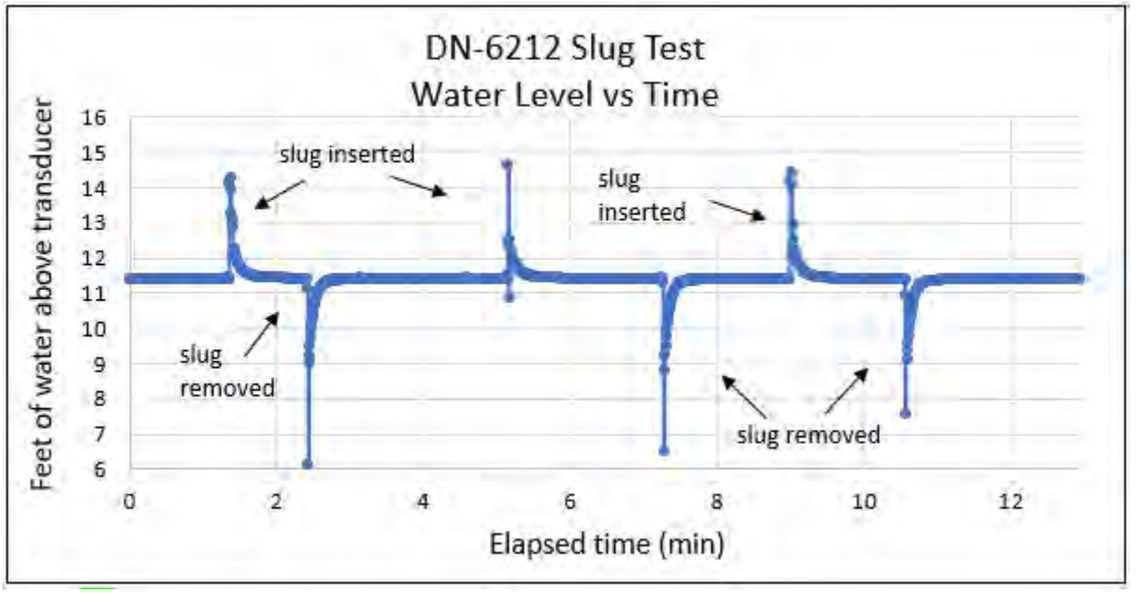

***Figure 28**. Slug test performed on well DN-6212 by the USGS-UMWSC on October 22, 2021. The rapid response of the water level indicates a good connection to the aquifer. Data courtesy of the U.S. Geological Survey.*

Monitoring for DN-6212 began October 22, 2021, and concurrent water-level data was collected with well DN-1297 until mid-April 2022 (fig. 29). Concurrent monitoring show that the response trend for replacement well DN-6212 closely resembles well DN-1297. The average difference in water level elevations (after accounting for the difference in datum elevations of the wells) is 0.34 ft over the duration of concurrent monitoring. Based on these results, DN-6212 provides excellent data continuity that can be combined with historical records for DN-1297.

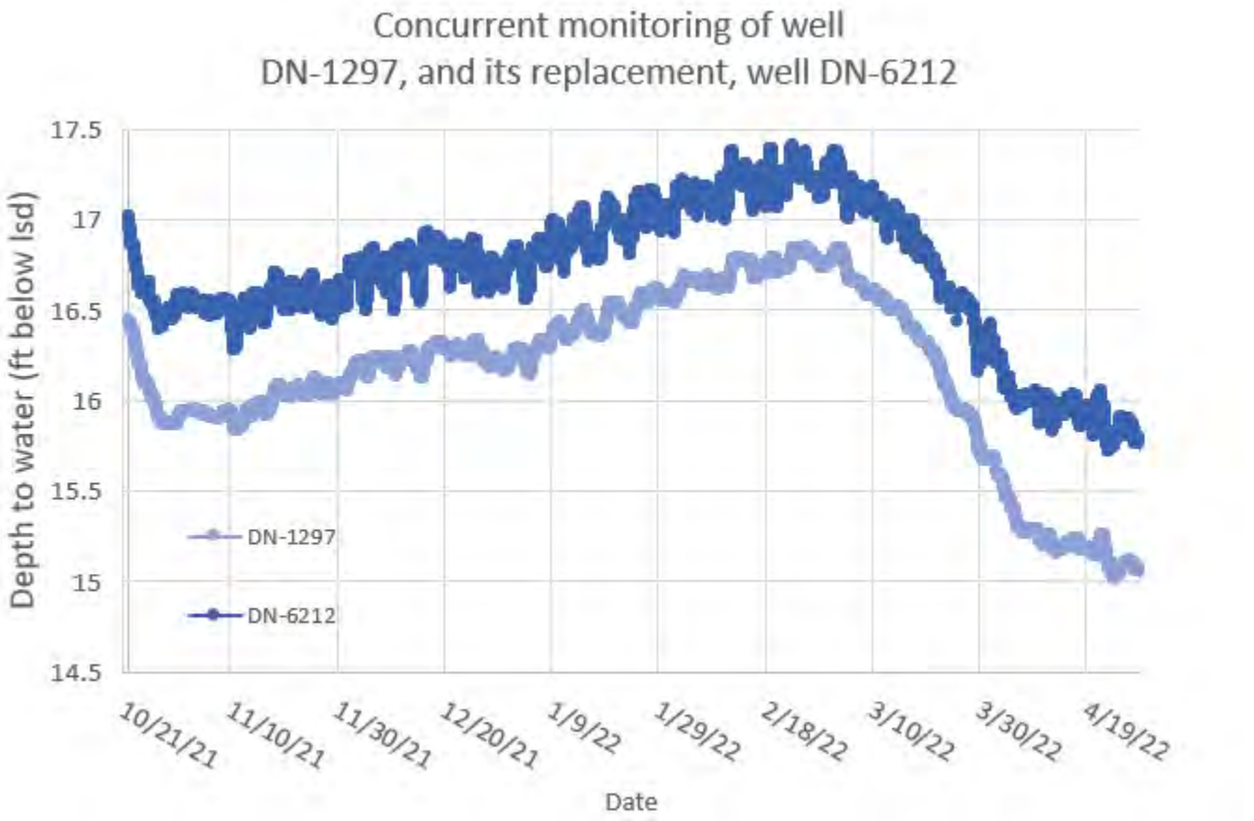

***Figure 29**. Concurrently recorded water levels for well DN-1297, and its replacement well, DN-6212, between October 21, 2021, and May 4, 2022. Accounting for the land surface datum of DN-1297 (859 ft msl) and DN-6212 (858.8 ft msl), the difference in water level elevation between the two wells averages 0.35 feet over this period. Data courtesy of the U.S. Geological Survey.*

Suggestions for future work

DN-6212 successfully replaced DN-1297. No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

DN-1355 (Dane County, WI) – well maintenance

USGS Site Number: 431233089103201
USGS Site Name: DN-09/11E/34-1355
WGNHS Well ID: 13001355
WDNR Well Number: DR401

Well information

DN-1355 was drilled by Sam's Rotary Drillers August 3, 1990 [1] as a replacement well for DN-04. DN-04 was filled July 17, 1990 [2]. DN-1355 was completed to a reported total depth of 70 feet below land surface (ft bls) [1]. A 12-in.-diameter borehole was drilled to 20 ft bls, below which a 6-in.-diameter borehole was drilled to 70 ft bls. A 6-in.-diameter casing was cemented in down to 20 ft bls. Bedrock was reported to start at 8 ft bls. Below the 6-in. casing, the 6-in. hole was left open to bedrock from 20 to 70 ft bls. The well is owned by the USGS and is located on the north side of U.S. Highway 151 near Sun Prairie, WI (fig. 30). Monitoring began in late August 1990 [3] and the well is currently in good condition.

Latitude, longitude: 43°12'32.33", -89°10'32.78" (NAD83) [3]
Current land surface datum: 950.7 feet above mean sea level (NAVD88) [3]
Hydrologic Unit (USGS Watershed Code): 07090002 [3]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 365STPR (St. Peter Sandstone) [3,4]
Current well depth: 67.7 ft-BTOC (65 ft blsd) [4]
Current casing depth: 23 ft-BTOC (20.3 ft blsd) [4]

[1] Well details obtained from 1990 well construction report
[2] Well details obtained from historical water-level records
[3] Well details obtained from the USGS
[4] Well details obtained from work completed for this funding opportunity. Casing interpreted from July 27, 2022 WGNHS geophysical logs); well depth interpreted from WGNHS geophysical logs and May 4, 2022 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 7.

Geophysical logs collected on July 27, 2022, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/13001355

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***Figure 30**. Location of well DN-1355 (red marker). The site is located approximately 80 feet north of U.S. Highway 151 across form the Wingra Stone quarry, 3 miles northeast of Sun Prairie, WI.*

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include a complete borehole evaluation. Borehole geophysics and video logging were last performed in the early 1990s (Dunning and others, 1996) and the well was last slug-tested in 2016. The borehole evaluation was also planned to help reconcile which aquifer the well is connected to. At the time this work began, the well was reported open to the Cambrian Jordan Formation sandstone aquifer. However, review of the well records turned up notes from a WGNHS staff member suggesting it's possible the well is open to the Ordovician St. Peter sandstone.

Description of work completed

May 4, 2022, the USGS-UMWSC surveyed well DN-1355 using RTN-GPS. On July 27, 2022, WGNHS collected a full suite of borehole geophysical logs and a borehole video. WGNHS geophysical logs and the USGS-UMWSC tapedown indicate the well depth is 65.1 ft blsd. Bottom of casing was measured at 20.3 ft blsd, consistent with the well construction report and the 1990 measurement of 20 ft blsd.

The borehole video shows that the casing is well seated on bedrock (fig. 31, panel A). Flakes of the casing can be seen on borehole wall ledges and at the bottom of the well (fig. 31, panel B), but it appears to be in good condition. The water column has low turbidity from the water table to the bottom of the well.

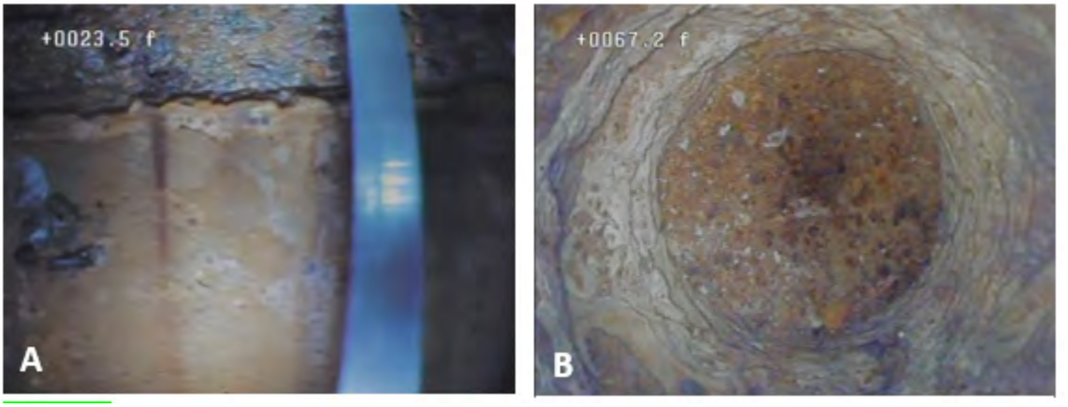

***Figure 31**. Screenshots from borehole video collected on well DN-1355 on July 17, 2022. Panel A, sideview of the bottom of casing well-seated on bedrock. Panel B, top-down view of the bottom of well DN-1355. The borehole wall is irregular and pitted; flakes of the steel casing are accumulated at the bottom of the borehole.*

Multiple faults and fractures are documented in the borehole walls (fig. 32). The faults are moderate to high angle and have less than a foot of offset. They are commonly marked by orange oxide mineral deposits in the sandstone.

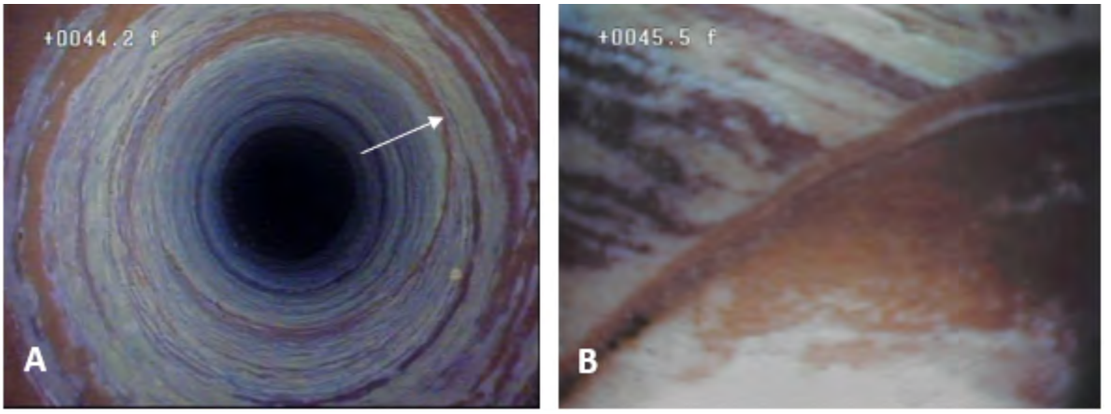

***Figure 32.** Screenshots of faults in sandstone aquifer documented with a borehole video from well DN-1355. Panel A, top-down view of multiple faults (white arrow is pointing to one of them) in the borehole wall at approximately 44 ft BTOC. Faults are associated with the iron-staining of the borehole wall. Panel B, close-up, side view of a fault in the borehole wall at approximately 45 ft BTOC. Offset is unknown for this fault.*

To verify the local aquifer geology, the WGNHS used the OBI log, borehole video, a preliminary geologic map of Dane County (Brown and others, 2013), and well cuttings archived at the Core Repository in Mt. Horeb, Wisconsin. This work indicates that DN-1355 is open to the Ordovician St. Peter sandstone, not the Cambrian Jordan sandstone. The USGS local aquifer code was updated from 372JRDN (Jordan sandstone) to 365STPR (St. Peter sandstone) on the USGS database and website late March, 2023.

DN-1355 was slug tested by the USGS-UMWSC on September 12, 2022, using two 3-in.-diameter, 5 ft long cylindrical solid PVC slugs. The water table response was quick and the water-level curve shows a good hydraulic connection to the aquifer (fig. 33).

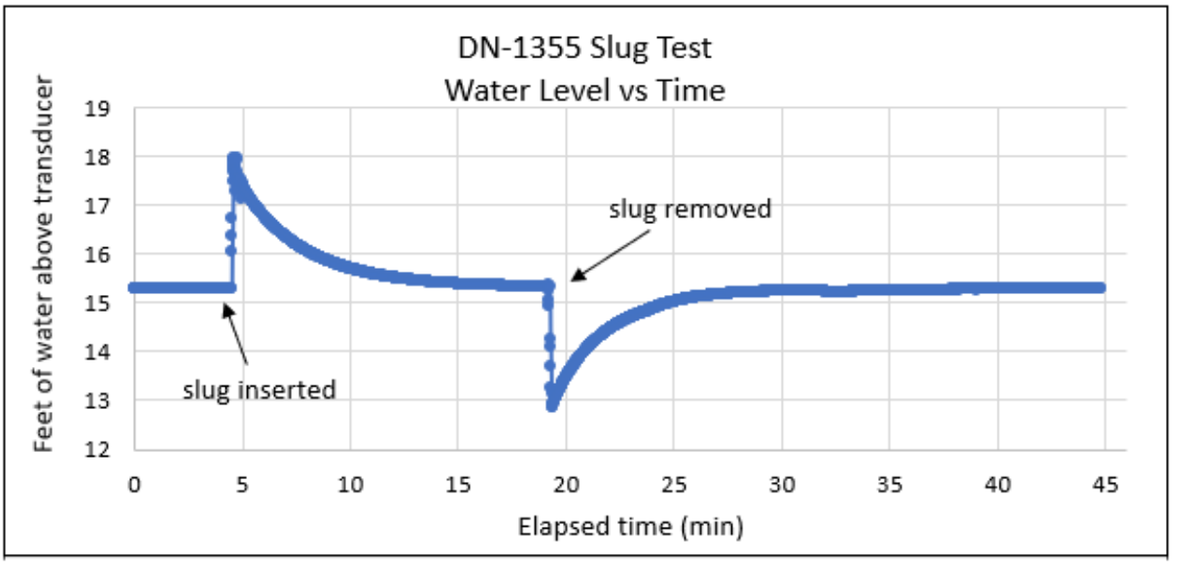

Figure 33. *Slug test performed on well DN-1355 by the USGS-UMWSC on September 12, 2022. The rapid response of the water level indicates a good connection to the aquifer. Data courtesy of the U.S. Geological Survey.*

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

DG-81 (Dodge County, WI) – well maintenance

USGS Site Number: 432415088552601
USGS Site Name: DG-11/13E/23-0081
WGNHS Well ID: 14000081
WDNR Well Number: BN742

Well information

DG-81 was drilled in 1961 as a Wisconsin Department of Transportation (WisDOT) wayside water supply well [1]. The well was completed to a reported total depth of 125 feet below land surface (ft bls). A 10-in.-diameter steel casing was cemented into bedrock to a reported depth of 59 ft bls, and a 6-in.-diameter steel casing was subsequently installed inside the 10-in. casing down to 59 ft bls. Below the 6-in. casing, the 6-in. borehole was left open to bedrock from 59 to 125 ft bls. The well is located on land owned by WisDOT, off U.S. Highway 151 between Columbus and Beaver Dam, WI (fig. 34). Monitoring began in 1964 [2] and the well is currently in good condition.

Latitude, longitude: 43°24'15.30",-88°55'26.20" (NAD83) [2]
Current land surface datum: 872.4 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 07090002 [2]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 365STPR (St. Peter Sandstone) [2]
Current well depth: 117.4 ft-BTOC (114.2 ft blsd) [3]
Current casing depth: 58.8 ft-BTOC (55.61 ft blsd) [3]

[1] Well details obtained from 1961 well construction report
[2] Well details obtained from the USGS
[3] Well details obtained from work completed for this funding opportunity. Casing interpreted from July 27, 2022 WGNHS geophysical logs; well depth interpreted from WGNHS geophysical logs and May 4, 2022 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 8.

Geophysical logs collected on July 27, 2022, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/14000081

***Figure 34**. Location of well DG-81 (red marker). The site is located approximately 95 feet north of U.S. Highway 151, 6.5 miles northeast of Columbus, WI and 5.6 miles southwest of Beaver Dam, WI.*

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include a complete borehole evaluation. Borehole geophysics and video logging were last performed in the early 1990s (Dunning and others, 1996) and the well was last slug-tested in 2016.

Description of work completed

On May 4, 2022, the USGS-UMWSC collected a tape-down measurement on well DG-81 and surveyed the well using RTN-GPS. On June 7, 2022, a slug test was collected by the USGS-UMWSC using a 3-in.-diameter, 5 ft long solid PVC slug. The rapid hydraulic response indicates DG-81 is well connected to the aquifer (fig. 35).

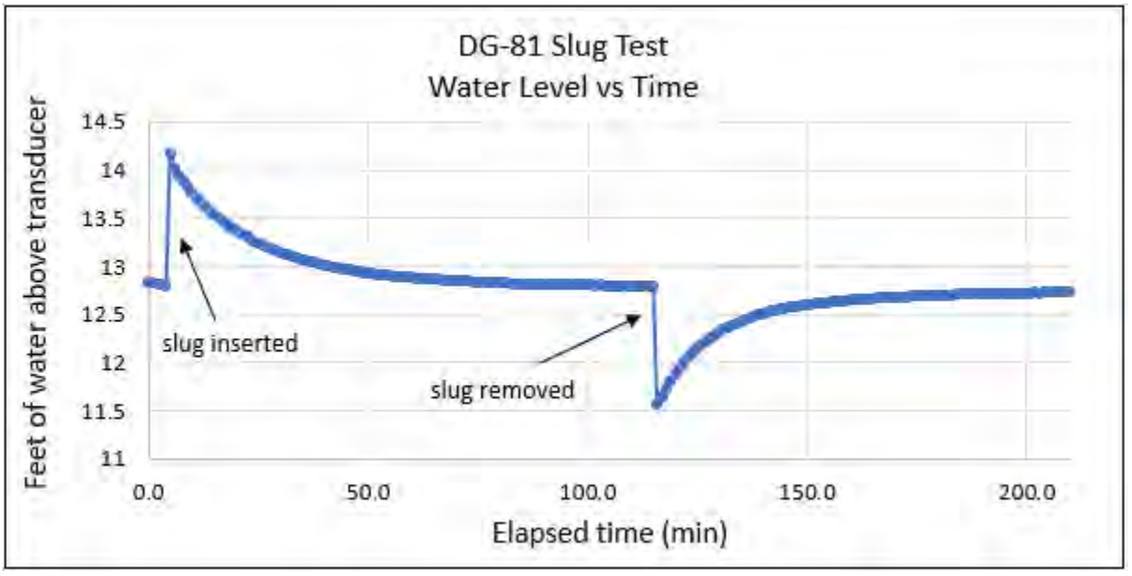

***Figure 35.** Slug test performed on well DG-81 by the USGS-UMWSC on June 7, 2022. The rapid response of the water level indicates a good connection to the aquifer. Data courtesy of the U.S. Geological Survey.*

July 27, 2022, WGNHS collect a full suite of geophysical logs and a borehole video. The depth of the well is confirmed to be 114.2 ft blsd. The bottom of casing was logged at 55.6 ft blsd; however, it was difficult to see due to high turbidity in the water column. The borehole video shows that the water column is very turbid through much of the well, particularly near the bottom of the well – here the borehole wall and bottom were completely obscured. The casing, although covered in a biofilm, appears to be in good condition. Multiple horizontal fractures are present in the bedrock borehole wall and a zone of vertical fractures, possibly faults, is noted around 88 ft BTOC (fig. 36).

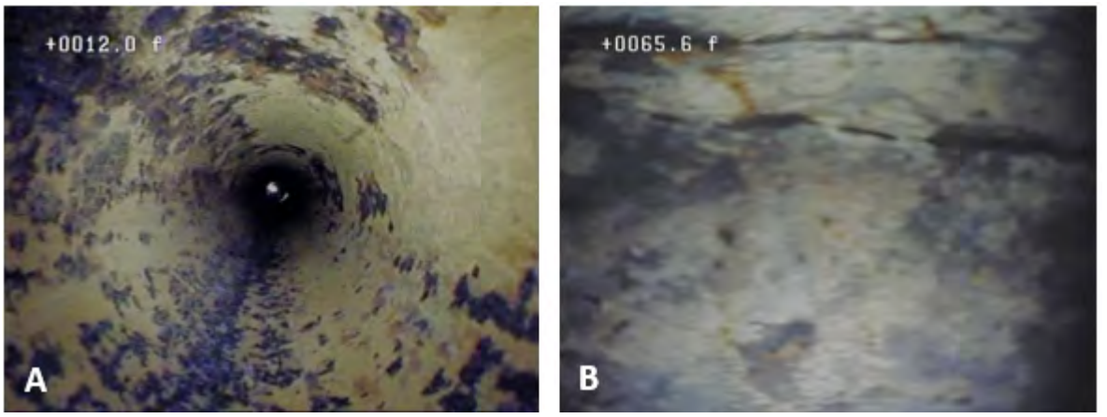

Figure 36*. Screenshots from a borehole video collected on well DG-81 July 27, 2022. Panel A, down-hole view of the steel casing covered in biofilm above the current water table. Panel B, side-view of a horizontal fracture in the borehole wall and possible mineralization (grey material).*

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

DU-743 and DU-744 (Dunn County, WI)

Initial work plan

DU-743 and DU-744 were originally proposed under objective 5 for well drilling. These wells were planned to be drilled at the same site, a shallow, approximately 50 feet below land surface, screened sand and gravel well (DU-743) and a deep, approximately 275 feet below land surface, open-borehole bedrock well (DU-744). These paired wells were designed to fill a data gap within a region of intensifying water use, which is also home to sensitive surface water features. Work planned to include collection of borehole cuttings. Cuttings would be used to generate geologic logs, then archived at the Core Repository in Mt. Horeb, Wisconsin. Following the completion of the drilling, the plan of work for this site also included characterization of the wells with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection.

Description of work completed

Coordination with involved parties was completed for this drill site; however, due to reduced well driller availability, equipment shortages, and increased costs of drilling in Wisconsin due to COVID-19, WGNHS was unable to drill DU-743 and DU-744. In the Summer of 2021, the wells were sited to be drilled on WDNR-owned property north of Cook's Pond Waterfowl Production Area (fig. 37).

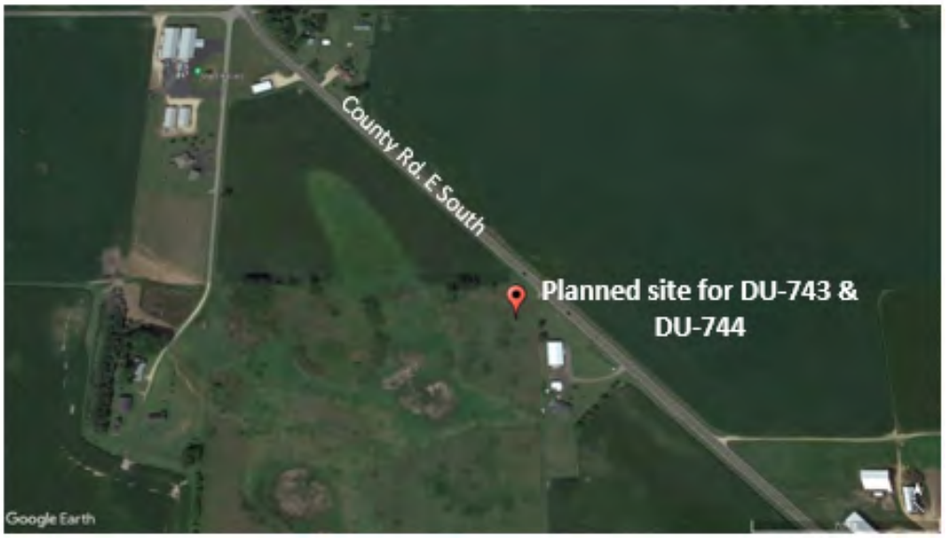

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***Figure 37**. Planned location of wells DU-743 and DU-744 (red markers) in part of the Otter Creek Wildlife Area approximately 230 ft south of County Rd. E South and 0.6 miles north of Cook's Pong Waterfowl Production Area, 4 miles east of Menomonie, WI.*

In February 2022, the WGNHS established a land access easement with the WDNR following diggers hotline approvals, background review and well construction design, and preparation of bid requests for well drilling. However, WGNHS did not obtain any bids from drillers in a time frame and at a cost that would be acceptable under the grant and wells DU-743 and DU-744 were not drilled.

Suggestions for future work

Complete the drilling of wells DU-743 and DU-744 following the work plan outlined above.

DU-745 (Dunn County, WI)

Initial work plan

DU-745 was originally proposed under objective 5 for well drilling. This well was designed to fill a data gap within a region of intensifying water-use, which is also home to sensitive surface water features.

Work planned to include drilling a new well approximately 50 feet below land surface into the shallow sand and gravel aquifer system. Borehole cuttings were to be collected, processed, used to generate a geologic log, and archived at the Core Repository in Mt. Horeb, Wisconsin. Following the completion of the drilling, the plan of work for this site also included characterization of the well with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection.

Description of work completed

Coordination with involved parties was completed for this drill site; however, due to reduced well driller availability, equipment shortages, and increased costs of drilling in Wisconsin due to COVID-19, WGNHS was unable to drill DU-745. In the Spring of 2021, the well was sited to be drilled on WDNR-owned property near Otter Creek (fig. 38) in Fall 2021.

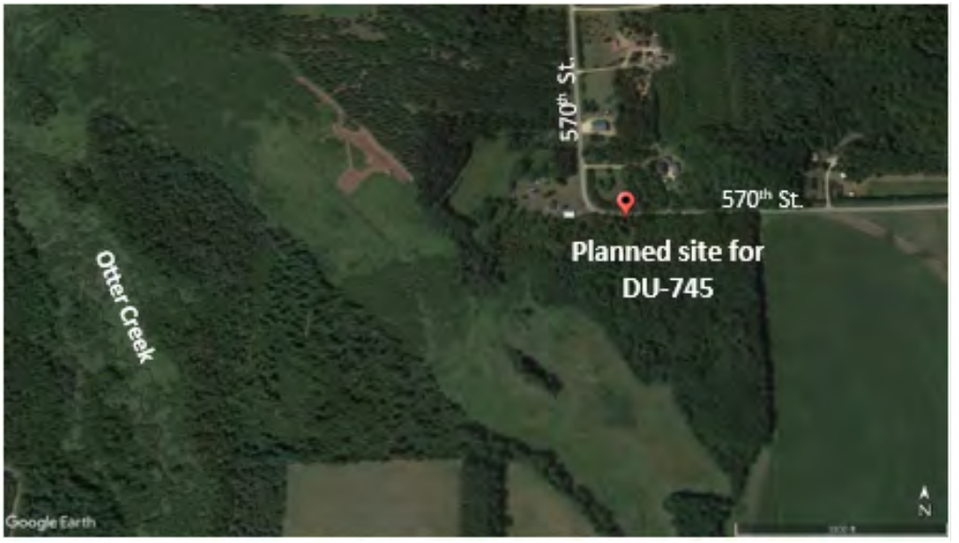

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***Figure 38**. Planned location of well DU-745 (red marker) in part of the Otter Creek Wildlife Area approximately 50 ft south of 570th St. and 0.5 miles east of Otter Creek near the Town of Otter Creek, WI.*

In February 2022, the WGNHS established a land access easement with the WDNR following diggers hotline approvals, background review and well construction design, and preparation of bid requests for well drilling. However, WGNHS did not obtain any bids from drillers in a time frame and at a cost that would be acceptable under the grant and well DU-745 was not drilled.

Suggestions for future work

Complete the drilling of well DU-745 following the work plan outlined above.

FL-659 (Fond du Lac County, WI) – well maintenance

USGS Site Number: 434231088311801
USGS Site Name: FL-14/17E/06-0659
WGNHS Well ID: 20000659
WDNR Well Number: Unknown

Well information

FL-659 was drilled by 1985 as an unused exploratory test well for the City of Fond du Lac[1]. The well was completed to a reported total depth of 506 feet below land surface (ft bls). A 6-in.-diameter [2] casing was installed to a reported depth of 122 ft blsd [1]. Below the 6-in. casing, the borehole was left open to bedrock from 122 to 506 ft bls. The well is located on property owned by the City of Fond du Lac, WI, southwest of the city (fig. 39). Monitoring began in 1995[3] and the well is currently in good condition. Based on the work performed for this grant period, the USGS aquifer codes were updated from the Silurian-Devonian to the Cambrian-Ordovician confined aquifer system [1,4].

Latitude, longitude: 43°42'30.97",-88°31'19.24" (NAD83) [2]
Current land surface datum: 847.5 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 04030203 [2]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 367OVCB (Cambrian-Ordovician Systems) [1,4]
Current well depth: 505.6 ft-BTOC (503.4 ft blsd) [4]
Current casing depth: 122.8 ft-BTOC (120.6 ft blsd) [4]U

[1] Well details obtained from 1985 geologic log
[2] Well details obtained from historically compiled documents by the WGNHS
[3] Well details obtained from the USGS
[4] Well details obtained from work completed for this funding opportunity. Casing and well depth interpreted from November 4, 2021 WGNHS geophysical logs); ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 9.

Geophysical logs collected on November 4, 2021, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/20000659

***Figure 39**. Location of well FL-659 (red marker). The site is located approximately 80 ft east of County Rd. D and 70 ft north of Lost Arrow Rd, 6 miles southwest of Fond du Lac, WI.*

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include a complete borehole evaluation. Borehole geophysics and video logging have not been completed and the well was last slug-tested in 2016 (fig. 40).

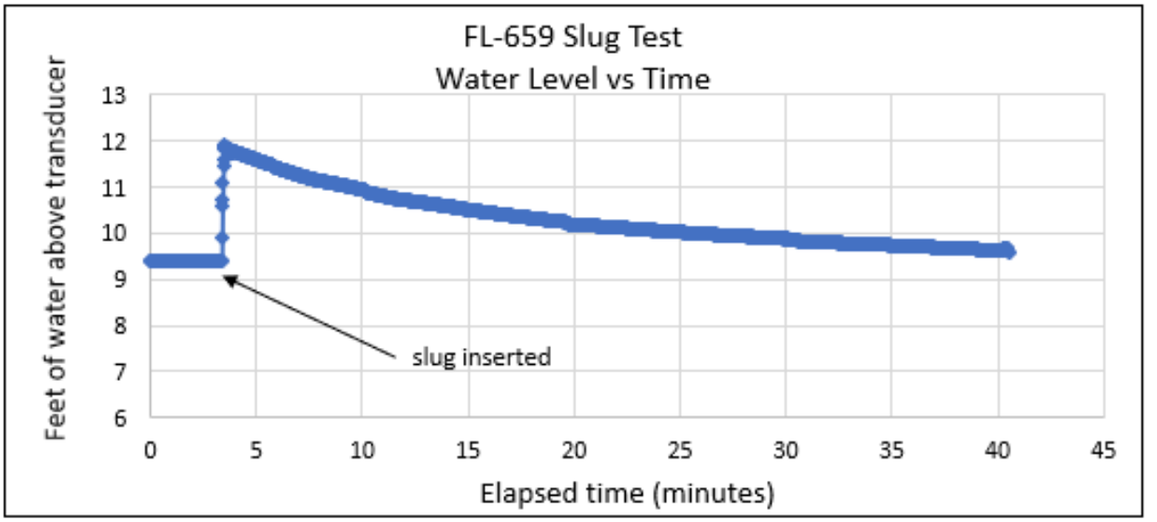

***Figure 40.** Slug test performed on well FL-659 by the USGS-UMWSC on April 13, 2016. The water table responded quickly with a very slow recovery time. Data courtesy of the U.S. Geological Survey.*

The borehole evaluation was also planned to help reconcile which aquifer the well is connected to. At the time this work began, the well was reported open to the Silurian dolomite aquifer. However, review of the well records turned up notes from a WGNHS staff member and a geologic log suggesting it's possible the well is open to the Ordovician Sinnipee Group through the Cambrian Trempealeau Group and just into Precambrian quartzite.

Description of work completed

On November 4, 2021, WGNHS collected a full suite of geophysical logs (fig. 41). The geophysical logs show that the well is cased to 120.6 ft blsd (122.8 ft BTOC) and the well depth is 503.4 ft blsd (505.6 ft BTOC).

***Figure 41**. WGNHS geophysical logging van parked next to well FL-659 in preparation to collect down-hole geophysical logs. The tripod, which suspends the geophysical logging tools, can be seen set up over the well behind the van.*

The WGNHS also collected an optical borehole image (fig. 42), which corroborates the 1985 geologic log, showing that the well is not open to the Silurian dolomite aquifer system but is instead cased through the Ordovician Maquoketa Formation and open to the Ordovician-Cambrian aquifer system. Interpretation of the OBI log shows the open interval consists of the lower Galena Formation of the Ordovician Sinnipee Group through the upper Jordan Formation of the Cambrian Trempealeau Group. This aquifer code was updated on the USGS database and website November 17th, 2022.

At approximately 480 ft blsd (482 ft BTOC), there is a prominent omission surface, below which the lithologic character changes from vuggy and cherty carbonate with shale intervals to alternating sandstone and carbonate deposits to approximately 490 ft blsd (492 ft BTOC), below which is sandstone. This interval is interpreted to be the transition from the carbonate of the Prairie du Chien Group to the sandstone of the Jordan Formation. The quartzite mentioned in the geologic log was not observed in the OBI log; however, cuttings for this well were located at the WGNHS samples repository, and quartzite was confirmed for the 505-506-ft interval.

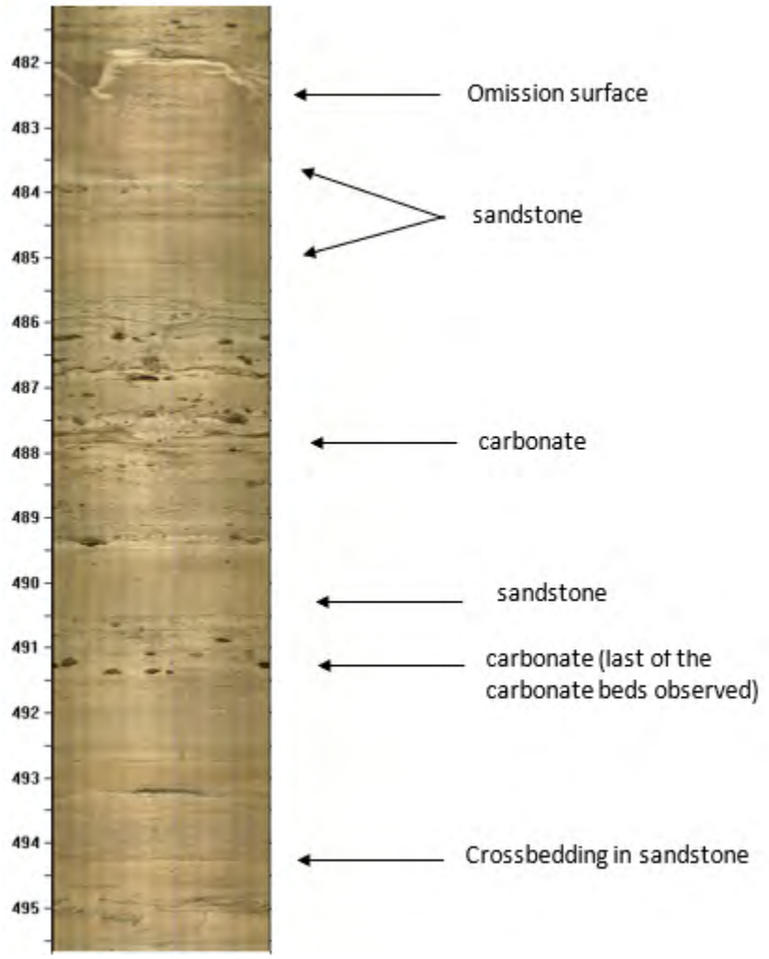

***Figure 42**. 481.5 to 500 ft BTOC interval from the geophysical logs at a scale of 1:20. Depth, relative to the top of casing is on the left in feet. Optical borehole image is on the right. Omission surface and cross-bedded interval are indicated with arrows. Omission surface is interpreted as the contact between the overlying Ordovician Prairie du Chien Dolomite and underlying Cambrian Jordan sandstone.*

This interpretation indicates well FL-659 is a multi-aquifer well. However, it remains unclear which formation(s) in the open borehole interval control the water table. The geophysical gamma log and OBI log show several prominent shale intervals in the open section.

On February 9, 2022, USGS-UMWSC surveyed the well using RTN-GPS. On April 15, 2022, WGNHS collected a borehole video log. The video log confirms the depth of casing and well depth interpreted from the geophysical logs and shows that the casing is in good condition and well seated on bedrock.

On July 13, 2022, a slug test was performed by the USGS-UMWSC using a 3-in.-diameter, 5 ft long solid cylindrical PVC slug (fig. 43). The water table responded quickly (approximately 2 ft rise in 2 minutes) and recovered very slowly (approximately 50 minutes); which is very similar to the slug test results of 2016. The slow response may be due to a tight aquifer high in carbonate with abundant shale seams. The hydrograph is similar to nearby wells (for example OU-1900 and DG-81; https://maps.waterdata.usgs.gov/mapper/index.html?state=wi) in the Cambrian-Ordovician aquifer system, indicating that it is still responsive to regional groundwater level trends.

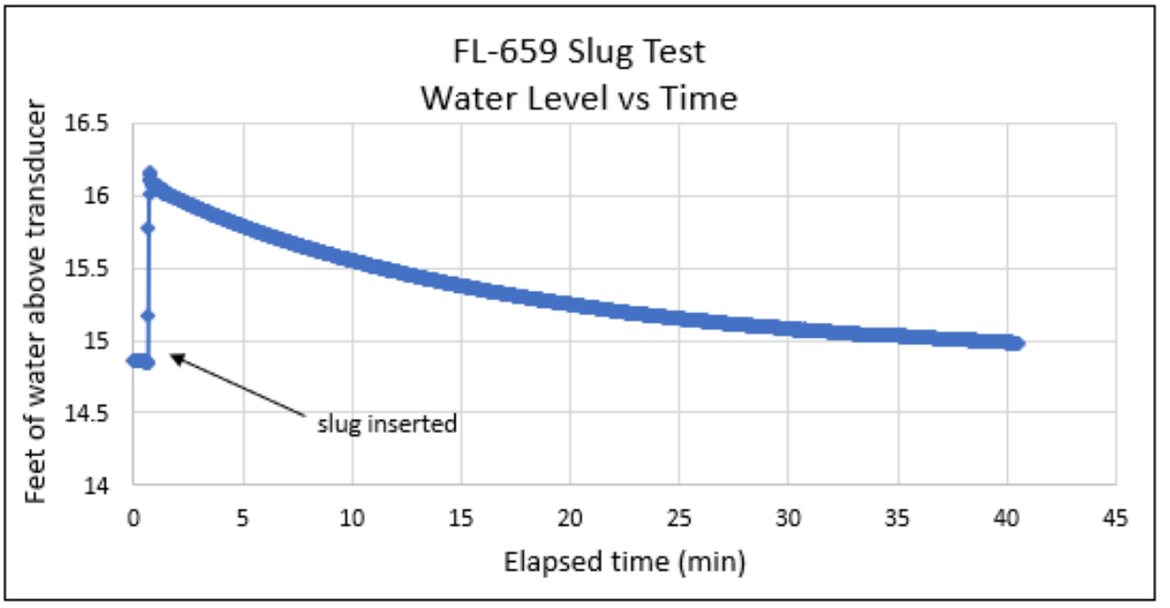

***Figure 43**. Slug test performed on well FL-659 by the USGS-UMWSC on July 13, 2022. The water table responded quickly with a very slow recovery time but appears well connected to the aquifer as it is responsive to regional groundwater level trends. Data courtesy of the U.S. Geological Survey.*

Suggestions for future work

In addition to routine monitoring and maintenance by the USGS-UMWSC, the WGNHS recommends collecting flow logs to characterize the Cambrian-Ordovician aquifer(s) controlling the water table measured by the well.

GN-02 (Green County, WI) – well maintenance

USGS Site Number: 424427089494701
USGS Site Name: GN-03/06E/18-0002
WGNHS Well ID: 23000002
WDNR Well Number: None

Well information

GN-02 was drilled by prior to 1946, the exact drill date is unknown. The well was completed to a reported total depth of 150 feet below land surface (ft bls) and a 6-in.-diameter casing was grouted into bedrock to an unknown reported depth [1]. Results from this work confirm that casing extends to 10.6 ft blsd [2] and the well is currently over 20 feet deeper than originally reported. Below the 6-in. casing, the hole was left open to bedrock. In March 2010, the hand pump was removed from the well and an 8-in.-diameter CPVC protective cover was cemented around the well casing [3]. The well is located on private property in Argyle, WI (fig. 44). Monitoring began in 1946. [1] Although the hydraulic connection is good for GN-02, it remains particularly inaccessible, and work completed for this report shows it is no longer to code. Repair or replacement is recommended.

Latitude, longitude: 42°44’21.85”, -89°49’52.50” (NAD83) [2]
Current land surface datum: 1022.8 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 07090003 [2]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer US55360ODVC (Ordovician System) [2]
Current well depth: 168 ft-BTOC (171 ft blsd) [3]
Current casing depth: 13.6 ft-BTOC (10.6 ft blsd) [3]

[1] Well details obtained from 1967 USGS well schedule
[2] Well details obtained from work completed for this funding opportunity. Casing and well depth interpreted from April 12, 2022 WGNHS geophysical logs and April 12, 2022 borehole video; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum
[3] Well details obtained from the USGS

Documentation for this well is included in appendix 10.

Geophysical logs collected on April 12, 2022, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/23000002

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***Figure 44**. Location of well GN-02 (red marker). Site is located 40 ft east of County Rd. A, and 600 ft north of White Oak Rd., approximately 3 miles northeast of Argyle, WI.*

Initial work plan

GN-02 was initially proposed under objective 4 for well maintenance. Work planned to include a complete borehole evaluation including a borehole video and full suite of geophysical logs to determine the current casing and well depth, and a slug test to evaluate the well-aquifer connection. Borehole geophysics and video logging were last performed in November 2009, with results indicating the well is deeper than the historical documents report.

Description of work completed

On April 12, 2022, the WGNHS completed geophysical logging of GN-02 and collected a borehole video. The geophysical logs, coupled with the borehole video indicate the well depth is 171 ft blsd, approximately 21 ft deeper than originally reported in the 1967 USGS well schedule. This work also shows that the original stove-top casing remains in place, extends to 10.6 ft blsd, and is in poor condition.

The original stove-top is covered by the CPVC protective well head cover installed by the USGS in March 2010. The rusted top of the stove-top casing was captured by the video log at approximately 3.6 ft below the top of the casing cover (BTOC) (fig. 45). Video footage also shows how thin the stove-top casing is.

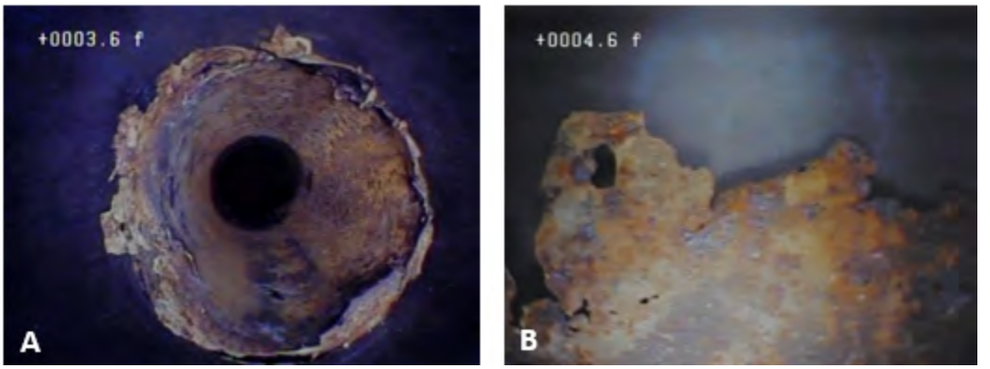

Figure 45. *Video screenshots from GN-02 borehole video collected on April 12, 2022; all footages are in depth below top of casing as recorded by the video logging equipment. Panel A, Down-hole view of the top of the old stove pipe casing inside the well head cover installed in 2010. Panel B, Side-view of the top of the old stove pipe casing in foreground with newer well head cover in background.*

The stove-top casing is heavily rusted and not well sealed. Several cracks in the casing were documented with the video log and in some places even rusted through to bedrock. At approximately 6.9 ft BTOC (122 ft above the water table), the borehole wall has a distinct water mark suggesting water is seeping into the borehole.

Below the distinct water mark, both the casing and open interval above the water table remain very wet and mineral growth was documented (fig. 46).

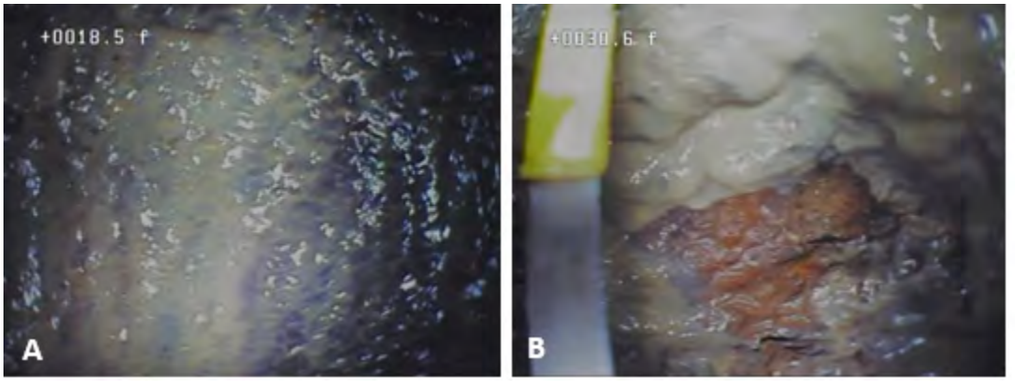

Figure 46*. Side -view screenshots of mineral growth in well GN-02 on borehole wall below casing and above the water table; all footages are in depth below top of casing as recorded by the video logging equipment. Panel A, smooth borehole wall coated in mineral growth. Panel B, Karst in borehole wall with abundant mineral growth.*

The video log and optical borehole image also show that GN-02 is open to the Ordovician Sinnipee Group as well as the Ordovician St. Peter Sandstone. On November 30, 2022, the USGS updated the local aquifer code from 365STPR (St. Peter Sandstone to US55360ODVC Ordovician System.

The USGS-UMWSC performed a slug test on GN-02 on July 26, 2022, using a 3-in.-diameter, 5-ft-long solid PVC cylindrical slug. The water column was displaced rapidly by approximately 0.5 ft and showed a good hydraulic response, suggesting GN-02 is well connected to the surrounding aquifer (fig. 47).

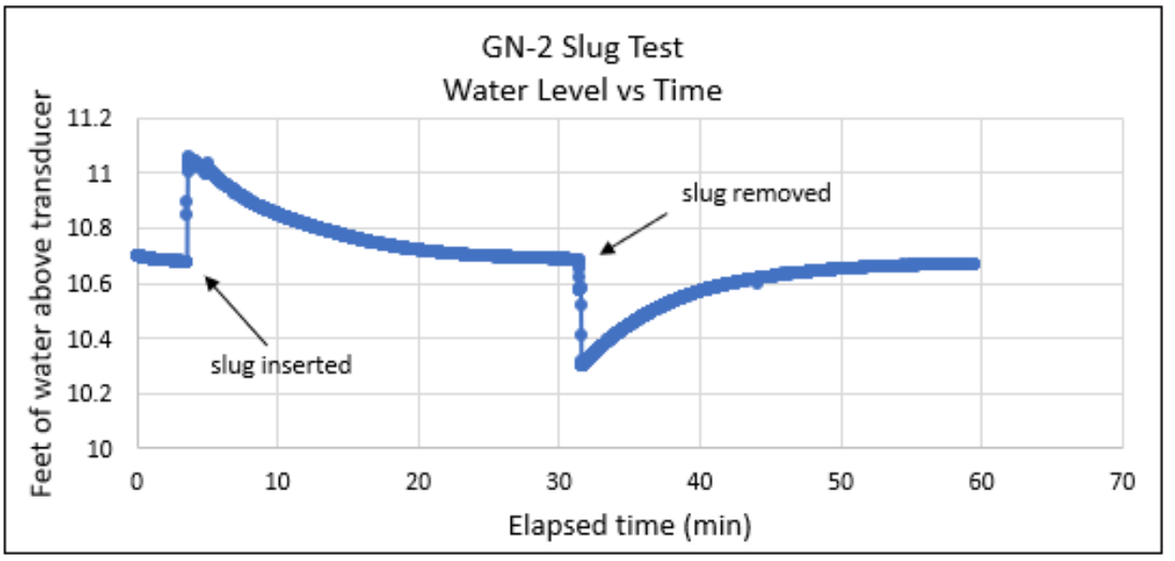

***Figure 47**. Slug test performed on well GN-02 by the USGS-UMWSC on July 26, 2022. The water table responded quickly and shows a good connection to the aquifer. Data courtesy of the U.S. Geological Survey.*

Suggestions for future work

Due to the poor condition of the casing in GN-02, which is no longer up to code, and the inaccessible location, we recommend either future replacement of GN-02 or retrofitting a 2-in.-diameter PVC well inside the existing well.

KE-46 (Kenosha County, WI) – well maintenance

USGS Site Number: 423214087503801
USGS Site Name: KE-01/22E/13-0046
WGNHS Well ID: 30000046
WDNR Well Number: None

Well information

KE-46 was drilled in August 1955 and completed to a reported total depth of 140 feet below land surface (ft bls) [1]. A 6-in.-diameter steel casing was grouted into bedrock to a reported depth of 103 ft bls. Below the casing, the borehole was left open to bedrock from 103 to 140 ft bls. In 2016, as part of the NGWMN Round II project (Guenther and others, 2017), the WGNHS and USGS-UMWSC installed a weather-proof flip-top well shelter. In February 2021, the flip-top shelter and shaft encoder was removed and the well was fitted with a locking cap. The well is located on property owned by St. Joesph's Home rehabilitation and assisted living facility in the city of South Kenosha, WI (fig. 48). Monitoring began in 1961 [2] and the well is currently in adequate condition.

Latitude, longitude: 42°32'13.76", -87°50'35.58" (NAD83) [2]
Current land surface datum: 641.9 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 04040002 [2]
Well completed in: USGS national aquifer N400SLRDVN (Silurian-Devonian aquifers) and local aquifer 355NGRN (Niagaran Series) [2]
Current well depth: 136 ft-BTOC (134.2 ft blsd) [3]
Current casing depth: 104.7 ft-BTOC (102.9 ft blsd) [3]

[1] Well details obtained from 1955 well construction report, published in appendix C of Guenther and others (2017)
[2] Well details obtained from the USGS
[3] Well details obtained from work completed for this funding opportunity. Casing interpreted from October 26, 2021 WGNHS geophysical logs; well depth interpreted from WGNHS geophysical logs and May 14, 2021 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Historical documentation for this well can be found in appendix C of WGNHS Open-File Report 2017-04 (Guenther and others, 2017).

Geophysical logs collected on October 26, 2021, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/30000046

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***Figure 48**. Location of well KE-46 (red marker). Site is located approximately 73 ft north of 93rd St. and 200 ft west of 29th Ave on property owned by St. Joseph's Home rehabilitation and assisted living facility in the city of South Kenosha, WI.*

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include a complete borehole evaluation including a borehole video, a full suite of geophysical logs, and a slug test to confirm the current casing and well depth, and evaluate the well-aquifer connection.

Description of work completed

On October 26, 2021, the WGNHS completed geophysical logging of the well and collected a borehole video. The video log shows that the casing is quite rusted and pitted from approximately 7 to 11 ft BTOC (fig. 49) with moderate amounts of biofilm buildup above and to approximately 15 to 20 ft below the water table, at which point the condition of the casing also improves. The casing is well seated to bedrock and the water column ranges from low to very turbid near the bottom of the well. The bottom of casing was confirmed at 102.9 ft blsd and the well depth at 134.2 ft blsd.

***Figure 49.** Screenshot from borehole video log collected October 26, 2021 on KE-46. Down-hole view of interval where casing condition changes from the smooth and relatively rust-free casing extension added in 1962, to the heavily rusted, lumpy and pitted original casing at approximately 7 ft BTOC. The bull's-eye like feature is camera lights reflecting off the water surface. Footage on image is in depth below top of casing as recorded by the video logging equipment.*

On September 9, 2021, the USGS-UMWSC performed a slug test on KE-46 using a 3-in.-diameter, 5-ft.-long solid cylindrical PVC slug. The water table level was rapidly displaced by 0.2 ft and took over four hours to recover (fig. 50). The slow recovery is likely reflective of a tight, dominantly carbonate, aquifer, and not a poor well-aquifer connection.

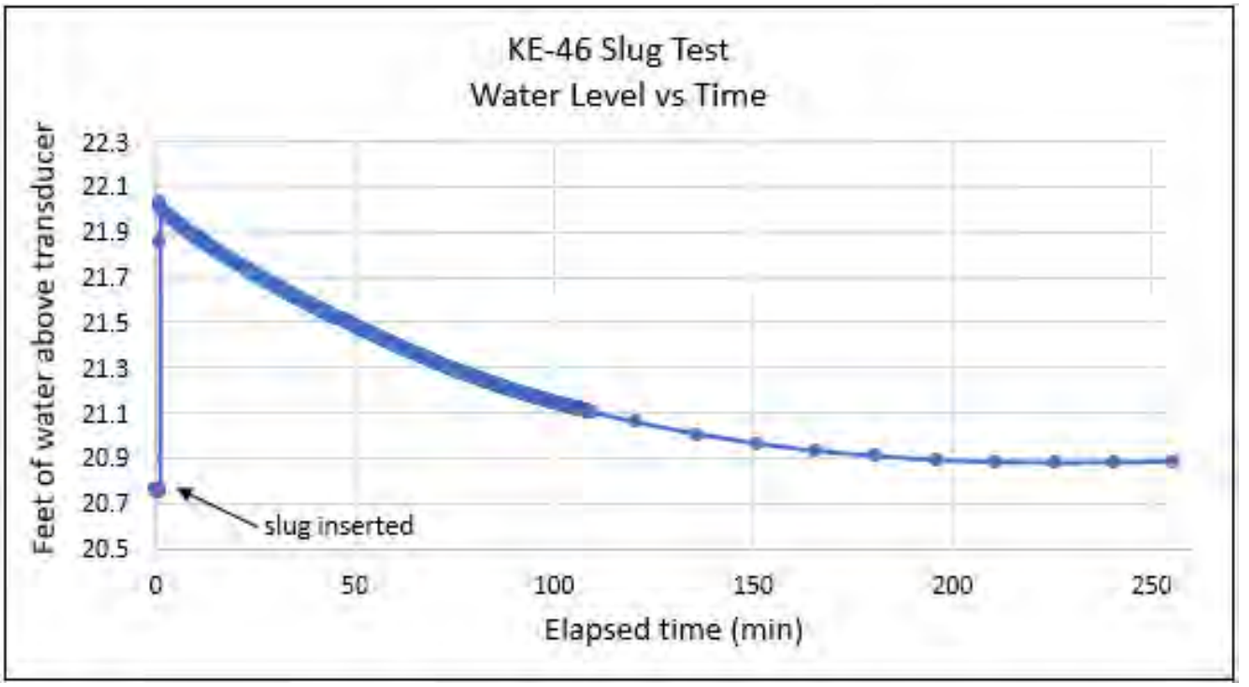

***Figure 50**. Slug test performed on well KE-46 by the USGS-UMWSC on September 9, 2021. The water table responded quickly and recovered slowly (over four hours) but appears to have a good connection to aquifer. The slow response is likely due a tight, carbonate aquifer. Data courtesy of the U.S. Geological Survey.*

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

MQ-26 (Marquette County, WI) – well maintenance

USGS Site Number: 433956089275601
USGS Site Name: MQ-14/09E/30-0026
WGNHS Well ID: 39000026
WDNR Well Number: None

Well information

MQ-26 was drilled in 1960 and completed to a reported total depth of 170 feet below land surface (ft bls) [1]. A 6-in.-diameter steel casing was grouted into bedrock to a reported depth of 145 ft bls. Below the casing, the 6-in. hole was left open to bedrock from 145 to 170 ft bls. The well is located on a former Wisconsin Department of Transportation wayside, which is now privately owned, about 3.5 miles south of the city of Endeavor, WI (fig. 51). Monitoring began in 1965 [2] and the original handpump and pipe were removed sometime after 1968 [3]. As part of this work, access was coordinated with the current property owner and permission granted for the well head to be replaced on May 26, 2022.The well is currently in good condition.

Latitude, longitude: 43°39’56.70”, -89°27’56.10 ” (NAD83) [2]
Current land surface datum: 799.9 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 04030201[2]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 372WNWC (Wonewoc Formation) [2]
Current well depth: 164.6 ft-BTOC (166.5 ft blsd) [4]
Current casing depth: 144 ft-BTOC (145.9 ft blsd) [4]

[1] Well details obtained from 1965 well construction report
[2] Well details obtained from the USGS
[3] Well details obtained from 1968 USGS well schedule, which mentions removing a 1/4" plug for measurements
[4] Well details from work completed for this funding opportunity. Casing and well depths are interpreted from August 10, 2021 geophysical logs; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum. ***NOTE*** *that the well head was replaced May 26, 2022, changing the well head stick up from 0.64 feet (reported on the geophysical log) to 1.86 feet.*

Documentation for this well is included in appendix 11.

Geophysical logs collected on August 10, 2021, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/39000026

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***Figure 51**. Location of well MQ-26 (red marker). The site is located approximately 0.2 miles east of U.S. Interstate 39, 210 feet west of County Rd. CX, and 0.4 miles south of County Rd. O, 3.5 miles south of the city of Endeavor, WI.*

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include a complete borehole evaluation. Borehole geophysics was last collected in 1996 (Dunning and others, 1996) and no older video logging was discovered during the historical records search. Work also planned to include the replacement of the well head cover. An air gap between the well cover plate and the well cover has allowed bugs and debris to enter the well, posing a well-head protection concern.

Description of work completed

On August 10, 2021, WGNHS collected a full suite of geophysical logs on MQ-26 and collected a borehole video on September 2, 2021. The geophysical logs and borehole video measured the depth of casing at 145.9 ft blsd and the well depth at 166.5 ft blsd, approximately 4.5 ft shallower than originally reported. The casing is in good condition and is well seated on bedrock. Low to moderate amounts of biofilm were documented on the borehole wall with the video log and turbidity is primarily low with the exception of a few intervals, one near the water table surface and at approximately 122 ft BTOC. Well logs also document several bedrock fractures in the open interval (fig. 52).

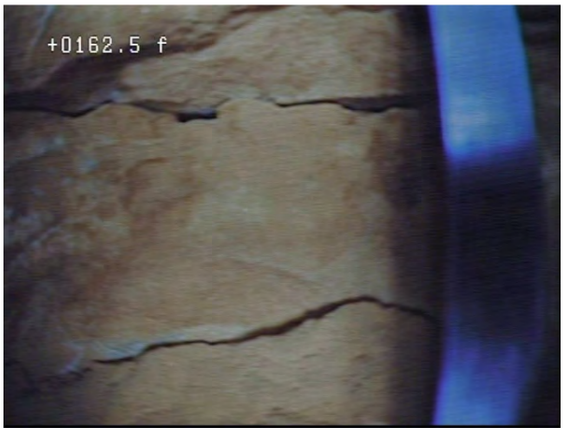

Figure 52. *Screenshot from borehole video log collected September 2, 2021, on MQ-26 showing a side-view of several open horizontal fractures in the bedrock borehole wall at approximately 162 ft BTOC. Footage on image is depth below top of casing (BTOC) as recorded by the video logging equipment.*

On May 26, 2022, Roos Well Drilling successfully installed a new locking well head on MQ-26, removing the old well head that allowed bugs and debris into the well (fig. 53).

Figure 53. *Well MQ-26. Panel A, old well head with square, steel cover plate, photo courtesy of U.S. Geological Survey. Panel B, new well head with extended protective cover pipe and locking cap installed May 26, 2022.*

The USGS-UMWSC performed a slug test on June 6, 2022, using two 3-in.-diameter, 5-ft-long solid cylindrical PVC slugs. The water level was rapidly displaced by approximately 2 ft each time the slug was inserted, and the water level recovered quickly- within 5 minutes (fig. 54). The slug test results show a good well-aquifer connection.

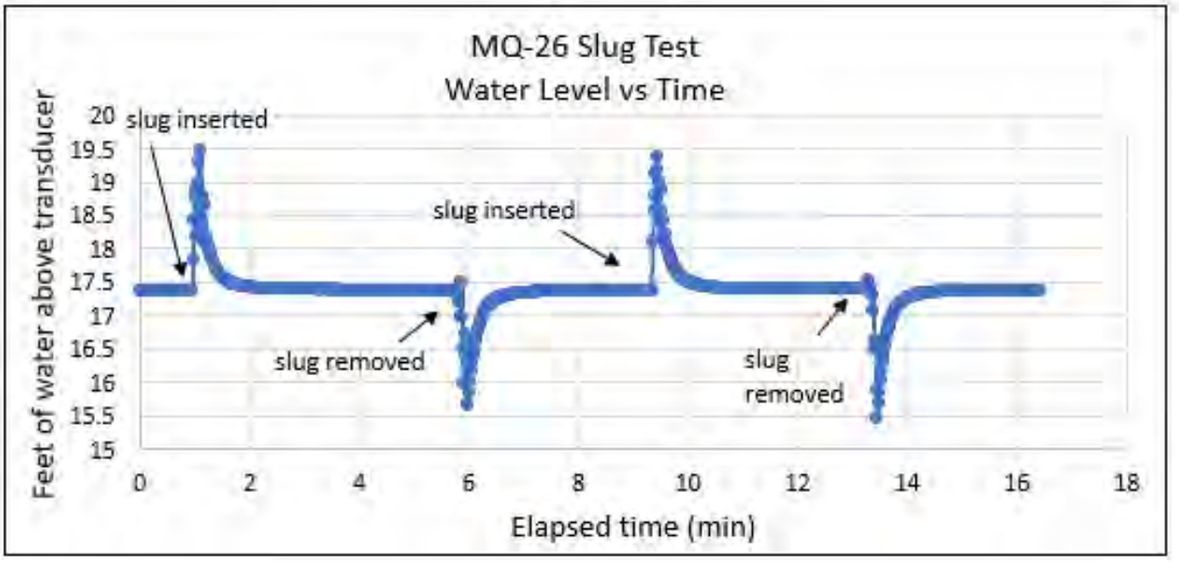

Figure 54. *Slug test performed on well MQ-26 by the USGS-UMWSC on June 6, 2022. The water table responded quickly and shows a good connection to the aquifer. Data courtesy of the U.S. Geological Survey.*

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC

OU-416 (Outagamie County, WI) – well maintenance

USGS Site Number: 443353088194201
USGS Site Name: OU-24/18E/08-0416
WGNHS Well ID: 45000416
WDNR Well Number: None

Well information

OU-416 was drilled in 1992 and completed to a reported total depth of 740 ft bls [1]. The well was originally constructed with 6-in-diameter steel casing, grouted into bedrock to a reported depth of approximately 20 ft bls. Concerns of arsenic mobilization, due to the construction of this well, led WGNHS to install a 3-in.-diameter PVC pipe to a depth of 148 ft bls (Guenther and others, 2017; W.G. Batten, oral commun., 2016). This inner PVC pipe was grouted into place and the well remained open to bedrock from 148 ft bls to 740 ft bls. Well evaluation and rehabilitation completed by WGNHS under USGS Award #G16AC00302, documented by Guenther and others in WGNHS Open-File Report 2017-04, resulted in several repairs to OU-416. A blockage was removed at the base of the 3-in-diameter PVC pipe and borehole video logging identified clay fouling at depth within the well. To isolate the clay fouling, the well was backfilled with layers of pea gravel and bentonite chips to a depth of 261 ft bls. Guenther and others, 2017, document the well's reconstruction and confirmed that OU-416 was well connected to the surrounding aquifer based on a series of slug tests performed both before and after backfilling. Due to backfilling, OU-416 was effectively converted from a multi-aquifer well, spanning the St. Peter Formation to the Elk Mound Group, to a single aquifer well open exclusively to the St. Peter Formation. The well is located on private land, approximately 700 feet west of State Highway 55 and north of County Rd. VV, roughly 6.5 miles north of Black Creek, WI (fig. 55). Monitoring began in September 1992[2] and the well is currently in good condition.

Latitude, longitude: 44°33'52.71", -88°19'42.57" (NAD83) [2]
Current land surface datum: 905.9 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 04030201[2]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 365STPR (St. Peter Sandstone) [2]
Current well depth: 262.1 ft-BTOC (260 ft blsd) [3]
Current casing depth: 146.4 ft-BTOC (144.3 ft blsd) [3]

[1] *Well details obtained from NGWMN Round II report* (Guenther and others, 2017)
[2] *Well details obtained from the USGS*
[3] *Well details from work completed for this funding opportunity. Casing interpreted from November 1, 2021 WGNHS geophysical logs; well depth interpreted from WGNHS geophysical logs and July 5, 2021 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface*

Documentation for this well is included in appendix 12.

Some historical documentation for this well can be found in appendix F of WGNHS Open-File Report 2017-04 (Guenther and others, 2017).

Geophysical logs collected on November 1, 2021, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/45000416

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***Figure 55**. Location of well OU-416 (red marker). Site is located approximately 560 ft west of State Highway 55 and 0.4 miles north of County Rd. VV, 6.5 miles north of the city of Black Creek, WI.*

Initial work plan

Well OU-416 was initially proposed under objective 4 for well maintenance. Although a borehole video log and slug tests were performed in 2016 and 2017, as documented by Guenther and others (2017), WGNHS decided to complete a full characterization, including a new borehole video, full suite of geophysical logs, and slug test to evaluate the well-aquifer connection.

Description of work completed

The WGNHS collected a full suite of geophysical logs on November 1, 2021, confirming a well depth of 260 ft blsd and bottom of casing at 144.3 ft blsd, both consistent with previous measurements in 2017 (Guenther and others, 2017). The WGNHS attempted to collect a video as well, however, large amounts of floating debris in the water column obscured visibility significantly, not allowing for a video log to be collected.

Due to the significant amounts of floating debris in OU-416, the USGS-UMWSC pumped the well for 30 minutes prior to performing the slug test on June 8, 2022, and the water level recovered quickly. However, the pump did not reach below the casing. The slug test was performed using a 1 and 3/8th -in.-diameter, 5-ft-long solid cylindrical PVC slug. The water column was rapidly displaced by approximately 1 ft when the slug was inserted and the water level recovered quickly – within a minute – indicating a good well-aquifer connection (fig. 56).

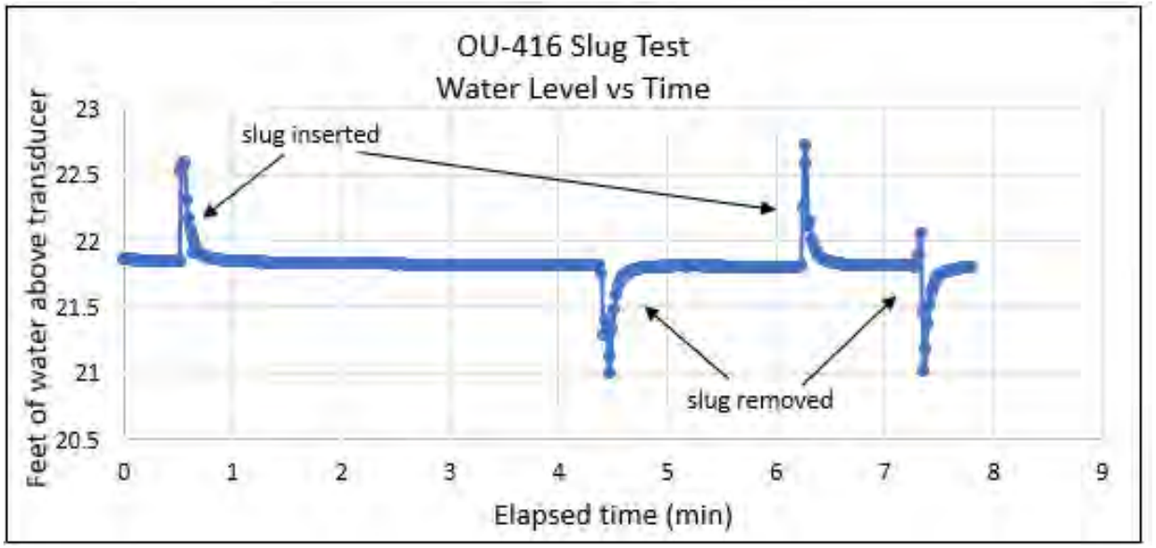

***Figure 56**. Slug test performed on well OU-416 by the USGS-UMWSC on June 8, 2022. The water table responded quickly and shows a good connection to the aquifer. Data courtesy of the U.S. Geological Survey.*

The WGNHS again tried to video log well OU-416 several times, the final time on June 21, 2021. No biofilm and only minor rust was observed on the casing above the water table. Below the water table, the casing remains in good condition and appears well seated to bedrock. Below the casing, moderate amounts of biofilm is observed on the borehole wall and the water column becomes increasingly turbid with abundant flaky particles of biofilm. The video logging equipment was unable to descend below approximately 245 ft due to complete loss of visibility in the well.

Suggestions for future work

Redevelopment of the OU-416 to remove the biofilm and reduce turbidity, followed by a video log of the full depth of the well is recommended. OU-416 is easily accessible and the well is well positioned nicely high on the landscape measuring heads in the St. Peter sandstone aquifer in the recharge area for much of Brown County. Development by non-aggressive pumping is suggested due to the reduction in well diameter from 6- to 3-in, and in order to not compromise the integrity of the PVC casing insert.

OU-1900 (Outagamie County, WI) – new well

USGS Site Number: 441642088163801
USGS Site Name: OU-21/18E/23-1900
WGNHS Well ID: 45001900
WDNR Well Number: AAJ872

Well information

OU-1900 was drilled as a new WGLMN and NGWMN well in 2021 by Ground Source Inc. Drilling began October 28, 2021, and was completed November 1, 2021.The well is located on City of Kaukauna, WI -owned property (fig. 57). A 9 -in. borehole was drilled to a reported total depth of 277 feet below land surface datum (ft blsd) [1], then narrows to a 6-in borehole to 320 ft blsd. A 6 -in.-diameter steel casing was cemented in, to a reported depth of 277 ft blsd, below which the borehole was left open to carbonate bedrock aquifer from 277 to 320 ft blsd. Monitoring began in January 2022 [2].

Latitude, longitude: 44°16’42.30”, -88°16’37.87” (NAD83) [2]
Current land surface datum: 711.8 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 04030204[2]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 368PRDC (Prairie du Chien Group) [2]
Current well depth: 323.9 ft-BTOC (321.4 ft blsd) [1,3]
Current casing depth: 280.1 ft-BTOC (277.6 ft blsd) [1,3]

[1] Well details obtained from 2021 WDNR well construction report (form 2200-077A)
[2] Well details obtained from the USGS
[3] Well details from work completed for this funding opportunity. Casing interpreted from June 9, 2022 WGNHS geophysical logs); well depth interpreted from WGNHS geophysical logs and January 3, 2022 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 13.

Geophysical logs collected on June 9, 2022, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/45001900

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***Figure 57**. Location of well OU-1900 (red marker). The site is located in the southeastern corner of La Follette Park in the City of Kaukauna, WI, approximately 1200 ft from the Fox River.*

Initial work plan

OU-1900 was initially proposed under objective 5 for well drilling. Work originally planned to include drilling a new well approximately 300 ft blsd into the underlying Paleozoic bedrock and open to the St. Peter sandstone aquifer. However, due to metal-leaching concerns in the St. Peter sandstone, a new plan was developed to case through the St. Peter sandstone, if present, and complete the well into the upper 30 to 40 ft of the Prairie du Chien Group, which underlies the St. Peter sandstone. During drilling, plans included collecting borehole cuttings to be processed, used to generate a geologic log, and archived at the Core Repository in Mt. Horeb, Wisconsin. Following the completion of the drilling, the plan of work for this site also included characterization of the well with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection. This new well is designed to fill a data gap within a region of long-standing water use and regional drawdown, which has been identified as a Wisconsin Groundwater Management Area (GMA).

Description of work completed

WGNHS worked with the City of Kaukauna to find a suitable drill site for OU-1900. The southeast corner of La Follette Park was chosen because the site is open and easily accessible, gets plenty of sun should the USGS decide to add solar-powered telemetry, and is high on the landscape. In May 2021, the WGNHS established a written land-access agreement with the City of Kaukauna.

On October 28, 2021, Ground Source Inc. began drilling OU-1900. Ground Source Inc. used mud-rotary for the 9-in.-diameter upper enlarged borehole that extends from 0 to 277 ft blsd, then set and cemented in a 6-in. steel casing to 277 ft blsd, leaving a 3-ft casing stick up above grade. The casing was installed using the Bradenhead method. On November 1, 2021, Ground Source Inc. used air-rotary to complete the lower 6-in.-diameter borehole that extends from 277 to 321 ft blsd; this interval was left open to bedrock. Drill cuttings were collected every 5 ft and used to generate a lithologic description of the well borehole. Cuttings were archived at the Core Repository in Mt. Horeb, Wisconsin. The well was then developed, disinfected, and capped with a locking well head protective cover (fig. 58). To fulfill reporting requirements with the WDNR, a soil boring log (from 4400-122) was completed and submitted to the WDNR. Ground source Inc. submitted the completed well construction report.

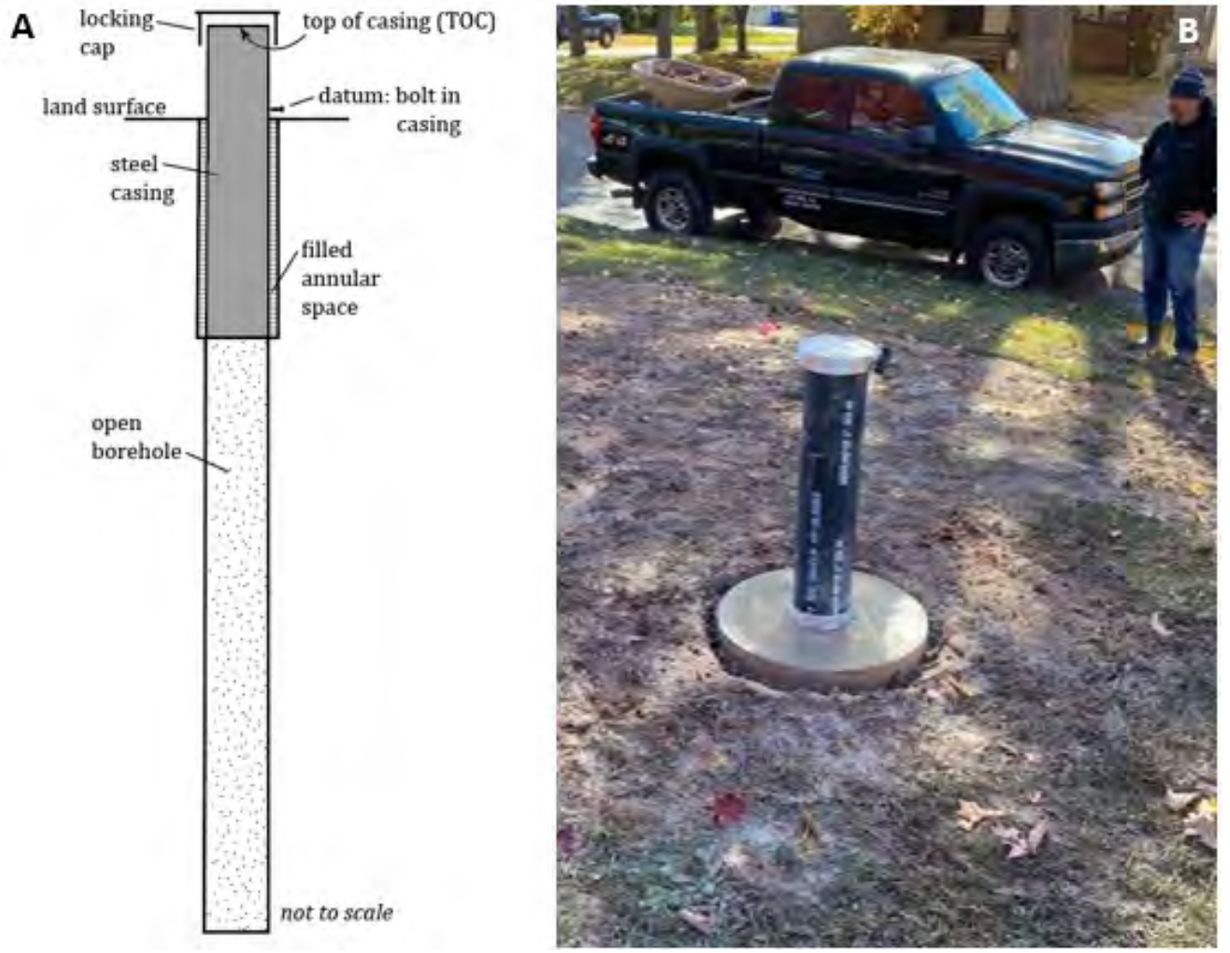

Figure 58. *Panel A, Simplified well construction diagram for OU-1900. The diagram is not to scale. Panel B, Completed well OU-1900 located in La Follette Park, Kaukauna, WI. Well drilling was completed November 1, 2021.*

Due to a concern with metals in the St. Peter Formation sandstone, the plan was to case through the St. Peter, if present, and complete the well into the upper 30 to 40 ft of the Prairie du Chien Group. Initial inspection of borehole cuttings did not identify any St. Peter sandstone, but a detailed look at the cuttings under microscope and geochemical analysis indicate that there is a 5 ft interval shale and quartz sand from 215 to 220 ft blsd, which may represent the Ancell Group (the Ancell Group consists of the Glenwood and St. Peter Formations). Geologic logs from other wells in the surrounding area document between 0 and 56 ft of St. Peter Formation present; however, many logs describe the St. Peter Formation as shale to shaley sandstone. These logs likely document another formation or member within the Ancell Group, but not the St. Peter Formation. The variation in thickness and lithology of the Ancell Group in this area is interpreted as a result of paleotopography on the underlying Prairie du Chien Group, recognized as a major unconformity in Wisconsin.

A slug test was performed on OU-1900 by the USGS-UMWSC on January 19, 2022, using two 3-in.-diameter, 5-ft-long solid cylindrical PVC slugs. The water table responded quickly with an approximate 2.5 ft rise. Water levels were slow to recover (approximately an hour and a half) and the slug test data show a change in baseline levels over the course of the slug test recovery period of approximately 1 ft (fig. 59).

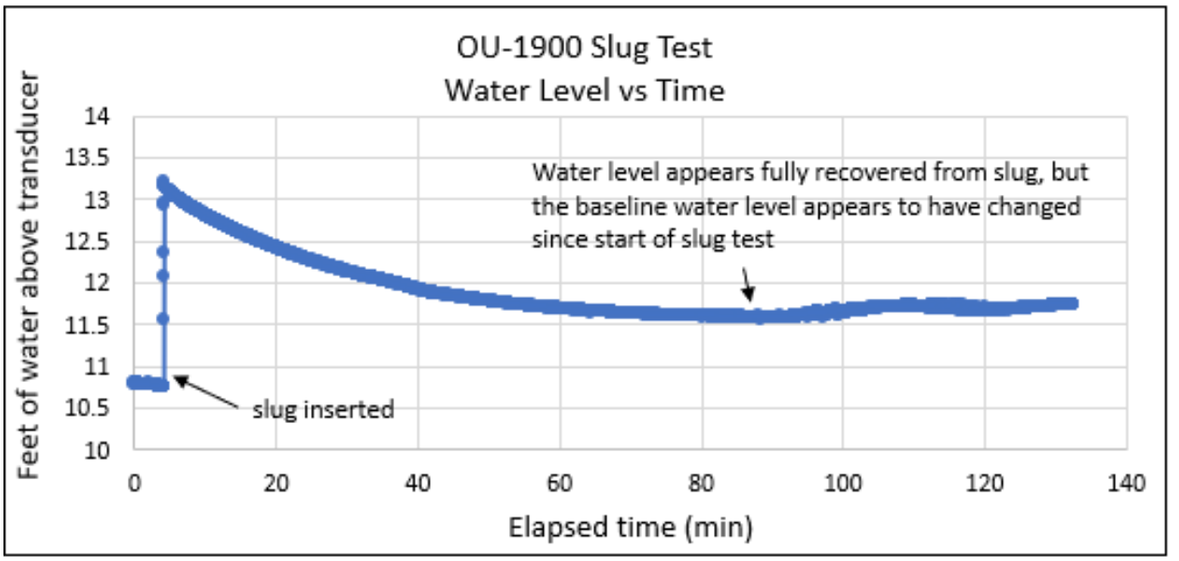

***Figure 59**. Slug test performed on well OU-1900 by the USGS-UMWSC on January 19, 2022. The water table responded slowly but shows a good connection to the aquifer. Data courtesy of the U.S. Geological Survey.*

The slow recovery time is attributed to the open-interval lithology of the Prairie du Chien Group, which largely consists of carbonates and shales with interbedded sandstones. Additionally, the interval OU-1900 is open to is a tightly confined system and water level records record gravitational pressures from the moon's cycle in addition to drawdown from cycling of nearby high-capacity wells (fig. 60).

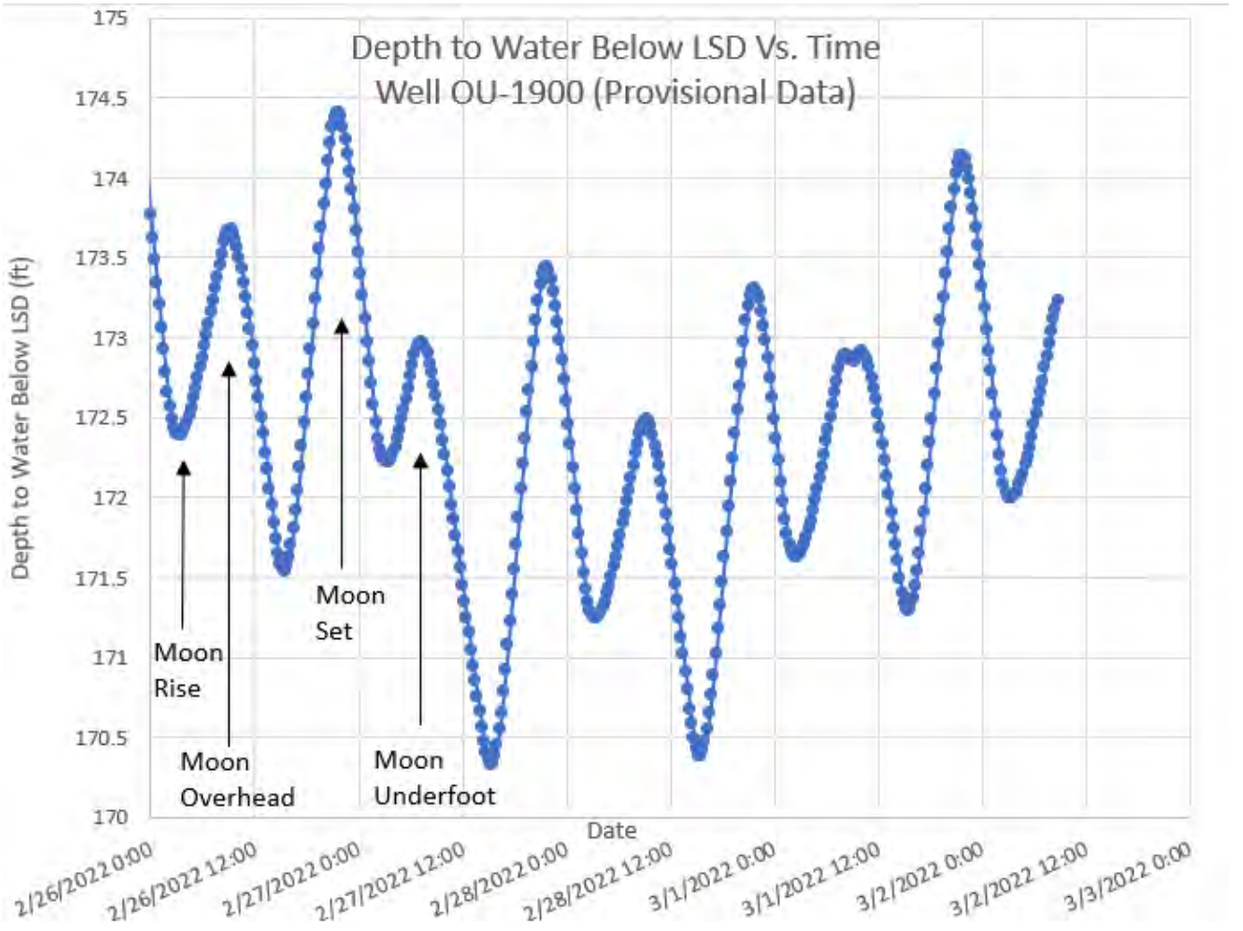

Figure 60. *Depth to water below land surface datum (LSD) over a six-day period at the end of February, 2022. The secondary, smaller-scale cyclical signature is representative of gravitational pressures from the moon's cycle, captured in this well as a result of the tightly confined system. The primary, larger scale cyclical signature is capturing the cycling of nearby high-capacity wells.*

A full suite of geophysical logs were collected by the WGNHS on June 9, 2022, followed by a borehole video on August 10, 2022 (fig. 61). The geophysical logs and borehole video show that the casing is in good condition and well seated into bedrock. Bottom of casing was confirmed at 277.6 ft blsd, and the well depth is 321.4 ft blsd.

Figure 61. *WGNHS video logging equipment set up to collect a borehole video from OU-1900 on August 10, 2022.*

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

RO-1180 (Rock County, WI) – new well

USGS Site Number: 423717089120901
USGS Site Name: RO-02/11E/21-1180
WGNHS Well ID: 54001180
WDNR Well Number: AAO328

Well information

RO-1180 was drilled as a new WGLMN and NGWMN well on December 10, 2021, by Sams Well Drilling Inc [1]. The well is located on WDNR-owned property southeast of Orfordville, Wisconsin (fig. 62). The 6-in.-diameter borehole was drilled with dual rotary to a reported total depth of 99.3 feet below land surface datum (ft blsd) [1,2]. A 6 -in.-diameter steel casing was installed to a reported depth of 76.5 ft blsd, below which, the borehole was left open to bedrock from 76.5 to 99.3 ft-blsd [1,2] Monitoring began in December 2021 and indicated artesian conditions [3]. In September 2022, the water level in RO-1180 rose above ground surface, but below the top of casing, and continued to rise (fig. 65). On February 23, 2023, the USGS-UMWSC installed a 3-ft well head extension, a water tight cap on March 22, 2023, and a 5-ft PVC extension on May 31, 2023.

Latitude, longitude: 42°37’16.57 ”, -89°12’08.92 ” (NAD83) [3]
Current land surface datum: 841.1 feet above mean sea level (NAVD88) [3]
Hydrologic Unit (USGS Watershed Code): 070900021201[3]
Well completed in: USGS national aquifer S300CAMORD (Cambrian Ordovician aquifers) and local aquifer 365STPR (St. Peter Sandstone) [3]
Current well depth: 101.4 ft-BTOC (99.3 ft blsd) [2]
Current casing depth: 78.6 ft-BTOC (76.5 ft blsd) [2]

[1] Well details obtained from 2021 WDNR well construction report (form 3300-077A)
[2] Casing interpreted from December 13, 2021 WGNHS geophysical logs; well depth interpreted from WGNHS geophysical logs and December 13, 2021 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum
[3] Well details obtained from the USGS

Documentation for this well is included in appendix 14.

Geophysical logs collected on December 13, 2021, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/54001180

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Figure 62. *Location of well RO-1180 (red marker). The site is located in the Footville Wildlife Area approximately 60 ft south of W. Orfordville Hanover Rd., 375 ft east of S. Carver Rd in the Town of Plymouth, WI, 2.5 mi southeast of Orfordville, WI.*

Initial work plan

This well was initially proposed under objective 5 for well drilling. Work planned to include drilling a new well approximately 100 ft blsd into the local sandstone aquifer. Borehole cuttings were to be collected, processed, used to generate a geologic log, and archived at the Core Repository in Mt. Horeb, Wisconsin. Following the completion of the drilling, the plan of work for this site also included characterization of the well with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection. This new well is designed to fill a data gap within a region of intensifying water use, which is also home to sensitive surface water features.

Description of work completed

WGNHS worked with the WDNR to find a suitable drill site for RO-1180 and in November 2021, the WGNHS established a written land-access agreement to install the well. On December 10, 2021, Sam's Well Drilling Inc. completed the drilling of RO-1180 using dual rotary (fig. 63). A 6-in.-diameter borehole was drilled from 0 to 99.3 ft blsd, and a 6-in. steel casing was sealed into the borehole from 0 to 76.5 ft blsd using bentonite. A 2-ft casing stick up was left above grade. The borehole was left open to the local sandstone bedrock aquifer from 76.5 to 99.3 ft blsd. Drill cuttings were collected every 5 ft and used to generate a lithologic description of the well borehole. Cuttings were archived at the Core Repository in Mt. Horeb, Wisconsin.

The well was developed by Sam's Well Drilling Inc., using an airlift method, disinfected, and capped with a locking well head protective cover. Three protective bollards were installed around the well head. To fulfill reporting requirements with the WDNR, a soil boring log (form 4400-122) was completed and submitted to the WDNR. Sam's Well Drilling Inc. submitted the completed well construction report.

***Figure 63**. Sam's Well Drilling Inc. installed RO-1180 on December 10, 2021.*

A full suite of geophysical logs were collected by the WGNHS on December 12, 2021, followed by a borehole video on December 13, 2021. The geophysical logs and borehole video show that the casing is in good condition and well seated into bedrock. Bottom of casing was confirmed at 76.5 ft blsd and the well depth is 99.3 ft blsd. Analysis of cuttings and geophysical logs indicate that the Platteville Formation-St. Peter Formation contact is at approximately 58 to 62 ft blsd. Cuttings did not indicate the presence of the Glenwood Formation. Both the cuttings and the geophysical log suggest the St. Peter Formation contains iron oxides in the open interval that are largely fracture bound, based on the orange coloration of the rock that coincides with increased caliper measurements. The OBI log also shows minor faulting in the open interval.

Multiple horizontal- to sub-horizontal fractures were recorded on the borehole video log and caliper log in the open interval, suggesting a good connection to the aquifer, which was confirmed with the slug test collected December 12, 2021, by the USGS-UWMSC (fig. 64). The slug test was performed using two 3-in.-diameter, 5-ft-long solid cylindrical PVC slugs. The water table responded quickly with an approximate 2.5 ft rise. Water levels were quick to recover and the well appears to be in good connection with the sandstone aquifer. In December 2021, the USGS-UMWSC surveyed the well using RTN-GPS and installed a pressure transducer to begin recording continuous water-level data.

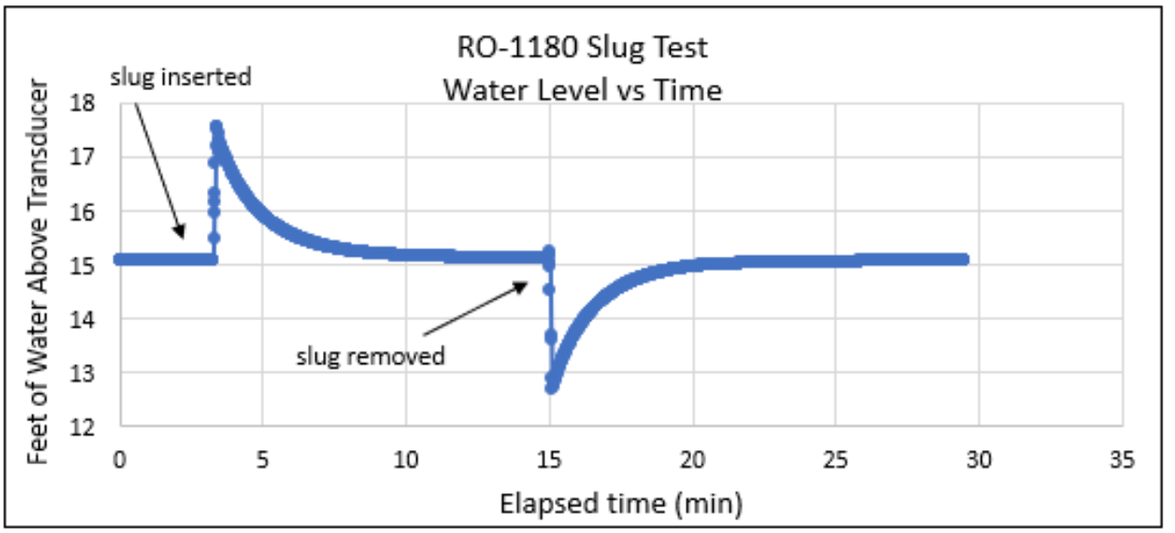

***Figure 64**. Slug test performed on well RO-1180 by the USGS-UMWSC on December 13, 2021. The water table responded quickly and shows a good connection to the aquifer. Data courtesy of the U.S. Geological Survey.*

In September 2022, the water level in RO-1180 rose above ground surface, but below the top of casing, and continued to rise (fig. 65).

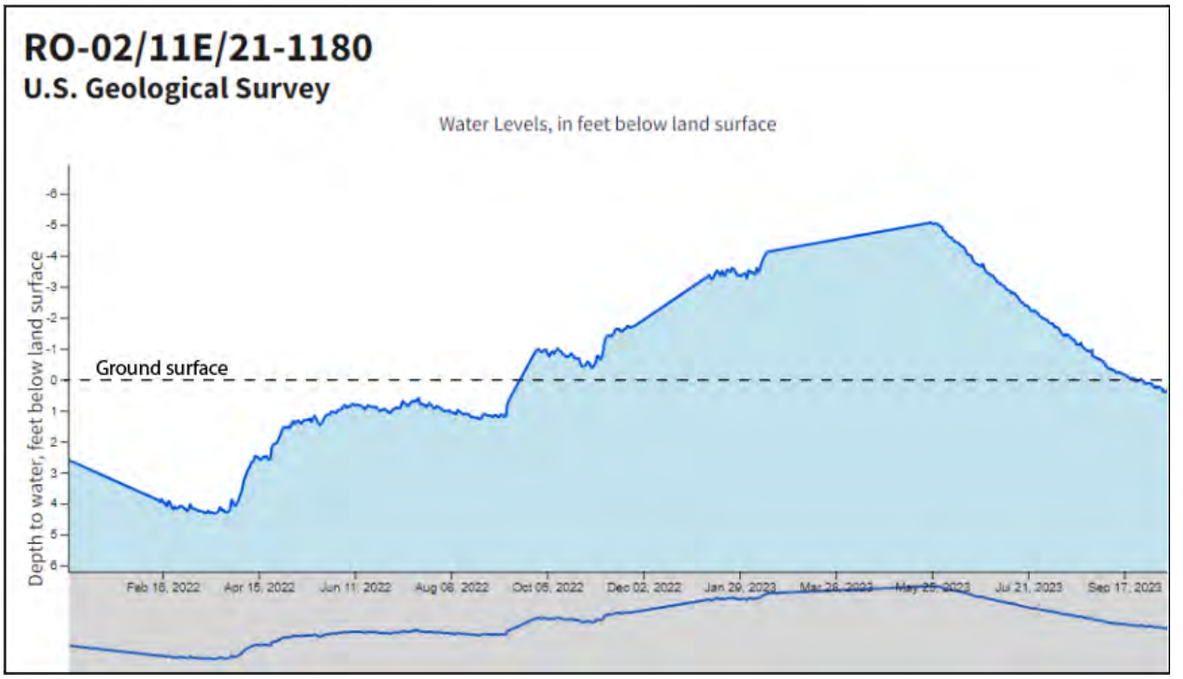

***Figure 65**. Depth to water level record (in feet below land surface datum) for RO-1180 spanning December 21, 2021 to October 11, 2023. Data courtesy of USGS. https://cida.usgs.gov/ngwmn/provider/USGS/site/423717089120901/. Data pulled November 10, 2023.*

On January 11, 2023, the USGS-UMWSC extended the well head by 3 feet using a reinforced rubber pipe fitting and metal casing.

Water levels continued to rise and over-topped the casing extension in February or March 2023 (fig. 65) and a temporary water-tight rubber cap was installed by the USGS on March 22, 2023. On May 31, 2023, the USGS-UMWSC added an additional 5-ft long PVC casing extension (fig. 66). USGS will weld on a permanent extension.

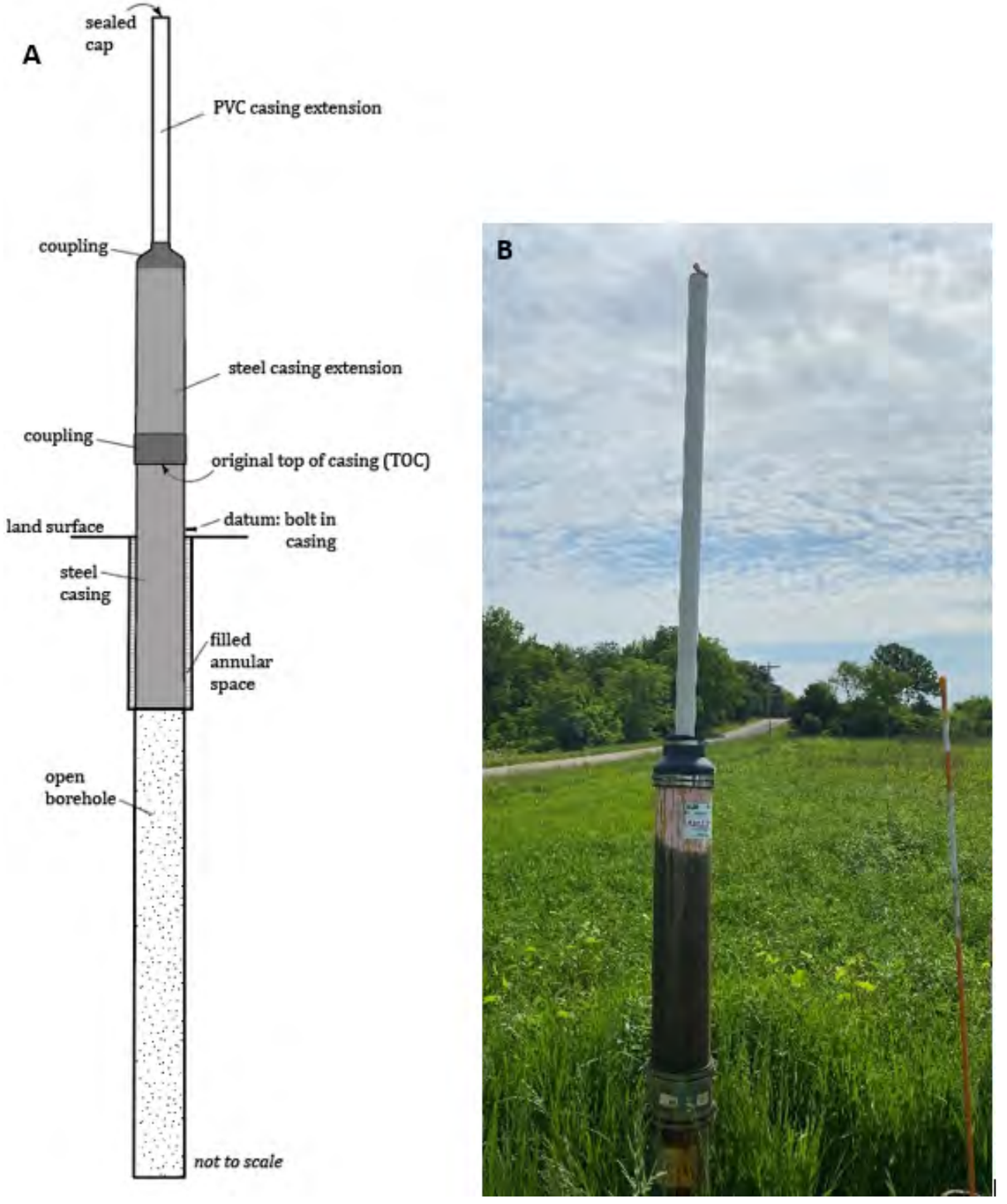

***Figure 66**. Panel A, Simplified well construction diagram for RO-1180. The diagram is not to scale. Panel B, Well head extensions installed on RO-1180 by USGS-UMWSC on January 11, 2023 and May 31, 2023 due to continued water-level rise. Photo courtesy of U.S. Geological Survey.*

Suggestions for future work

After the USGS installs the permanent well-head extension and water-tight cap, no future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

SC-4072 (St. Croix County, WI) – new well

USGS Site Number: 450353092235701
USGS Site Name: SC-30/17W/23-4072
WGNHS Well ID: 56004072
WDNR Well Number: ABA896

Well information

SC-4072 was drilled as a new WGLMN and NGWMN well on June 13, 2023, by DMB Drilling Company Inc. The well is located on public property owned by the U.S. Fish and Wildlife Service south of New Richmond, Wisconsin (fig. 67). The well was drilled using mud rotary [1]. A 10-in. borehole was drilled to a reported total depth of 40 feet below land surface datum (ft blsd) and a 6-in. borehole was drilled from 40 to approximately 100 ft bls. A 6 -in.-diameter steel casing was installed and cemented-in to a reported depth of 40 ft blsd, below which, the borehole is left open to the local carbonate bedrock. Monitoring began on July 26, 2023[2] and the well is currently in good condition.

Latitude, longitude: 45°03’53.33”, -92°23’57.00” (NAD83) [2]
Current land surface datum: 983.61 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 070300051002 [2]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 368PRDC (Prairie du Chien Group) [2]
Current well depth: 100.7 ft-BTOC (98 ft blsd) [3]
Current casing depth: 39.8 ft-BTOC (37.1 ft blsd) [3]

[1] Well details obtained from the June 13, 2023 WDNR well construction report completed by the driller
[2] Well details obtained from the USGS
[3] Well details from work completed for this funding opportunity. Casing and well depths are interpreted from geophysical logs); well depth incorporates July 16, 2023 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 15.

Geophysical logs collected on June 13, 2023, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/56004072

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***Figure 67**. Location of well SC-4072 (red marker). The site is located 105 ft north of 140th Ave., 0.6 miles west of Highway 65, 0.2 miles south of Lundy Pond, 4 miles south of New Richmond, WI on public land owned by the U.S. Fish and Wildlife Service.*

Initial work plan

This well was initially proposed under objective 5 for well drilling. Work planned to include drilling a new well approximately 100 ft blsd into the local Ordovician carbonate aquifer. Borehole cuttings were to be collected, processed, used to generate a geologic log, and archived at the Core Repository in Mt. Horeb, Wisconsin. Following the completion of the drilling, the plan of work for this site also included characterization of the well with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection. This new well is designed to fill a data gap within a region of intensifying water use, which is also home to sensitive surface water features.

Description of work completed

In April 2021, the WGNHS established a written land-access agreement with the U.S. Fish and Wildlife Service, St. Croix Wetland Management District to place a new well on their property. Drilling of SC-4072 was completed on June 13, 2023, by DMB Drilling Company Inc. using mud rotary. The 6-in borehole was completed to a total depth of 98 ft blsd. Drill cuttings were collected every 5 ft and used to generate a lithologic description of the well borehole. Cuttings were archived at the Core Repository in Mt. Horeb, Wisconsin. A 6-in.-diameter steel casing was subsequently installed to a reported depth of 37.1 ft blsd, below which the borehole was left open, from 37.1 to 98 ft blsd, to the local Ordovician carbonate bedrock aquifer. The well was finished with a locking protective well cover (fig. 68). The well was completed in compliance with Wisconsin Administrative Code NR812. SC-4072 was developed on June 13, 2023, by DMB drilling using compressed air. To fulfill reporting requirements with the WDNR, a soil boring log (from 4400-122) was completed and submitted to the WDNR. DMB Drilling submitted the completed well construction report.

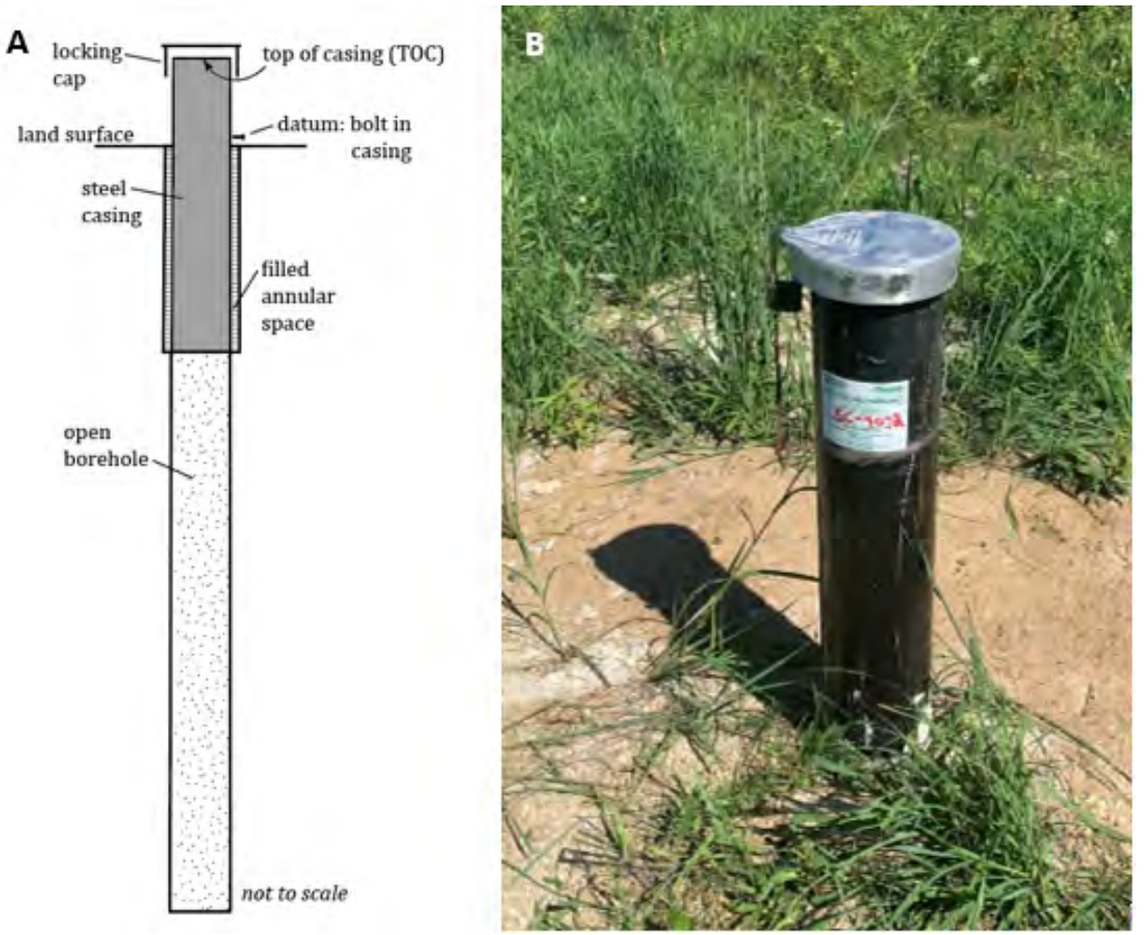

Figure 68. *Panel A, Simplified well construction diagram for SC-4072. The diagram is not to scale. Panel B, Newly completed well SC-4072 with locking well head protector. Photo courtesy of USGS-UMWSC.*

On June 14, 2023, the WGNHS completed geophysical logging of the well and collected an optical borehole image. The WGNHS was unable to collect a video log due to broken equipment. The geophysical logs and borehole image show that the casing is in good condition, well seated into bedrock. Cutting descriptions and the OBI log indicate the well is open to a sandy interval of the Prairie du Chien Group dolomite that has abundant green shale beds. This well will be useful for monitoring water levels fluctuations in the dolomite aquifer in this area where scattered wetland properties managed by the U.S. Fish and Wildlife Service may be impacted by increasing local water demands from rural residential developments and irrigation.

In July 2023, the USGS-UMWSC surveyed the well using RTN-GPS, completed a slug test to test the well-aquifer connection, and installed a pressure transducer to begin recording continuous water-level data. The slug test was completed using a 1 and 3/8th in.-diameter by 5 ft. long cylindrical solid PVC slug and the results show a good connection to the aquifer (fig 69). The water column was displaced by approximately 1 ft and showed a rapid hydraulic response suggesting it is well connected to the surrounding aquifer.

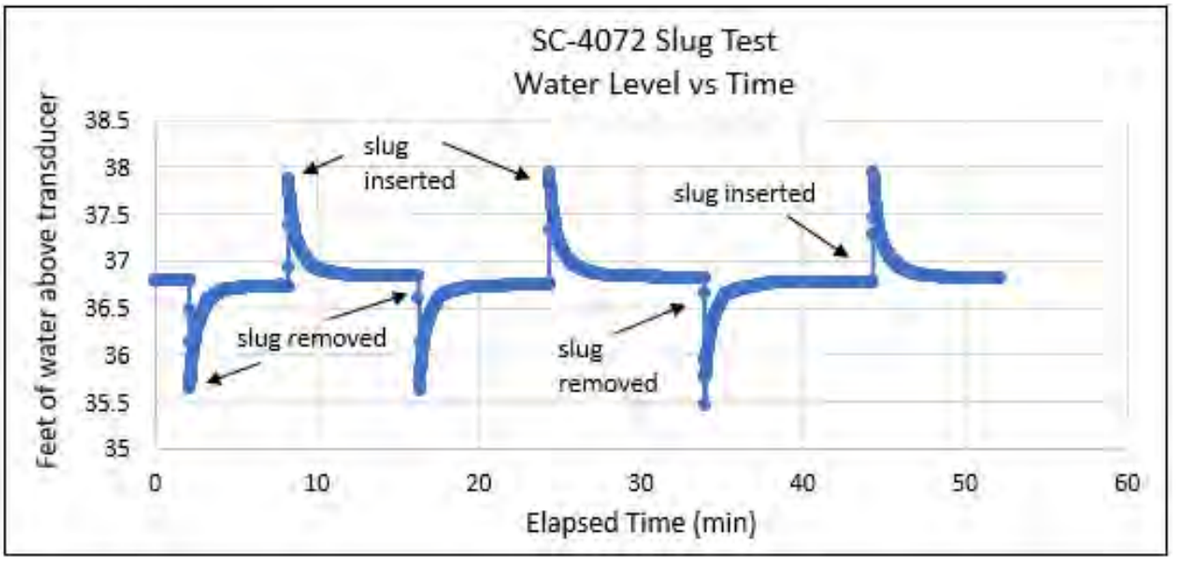

***Figure 69**. Slug test results for BR-751. Slug testing was performed on July 26, 2023, and shows a rapid hydraulic response. Data courtesy of USGS-UMWSC.*

Monitoring for SC-4072 began July 26, 2023.

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

VE-08 (Vernon County, WI) – replaced by VE-410

USGS Site Number: 433928901102501
USGS Site Name: VE-14/07W/26-0008
WGNHS Well ID: 63000008
WDNR Well Number:

Well information

VE-08 was hand-dug in April 1934 as a 30-in.-diameter private well completed at 53 feet below land surface (ft bls) [1]; however, no original well construction records are found. Historical records indicate that in June 1962, a 4-in.-diameter casing was installed through a flat well cover to a reported depth of 53 ft bls, leaving the hole open through the alluvium aquifer at 53 ft blsd [1,2]. The well is located on private property east of Stoddard, WI (fig. 70). Monitoring began in 1934 [2]. After a routine site visit from the USGS-UMWSC in June of 2019, concerns were raised that the smaller-diameter casing is likely only a few feet deep and that a significant void space may compromise the integrity of the well and represent a safety hazard. Additional concerns were raised that the well may be failing and filling with sediment. VE-08 was found to be compromised, unrepairable, and relatively inaccessible. VE-08 was effectively replaced in both the WGLMN and NGWMN by VE-410 in September 2021. Monitoring for well VE-08 ended in July 2022.

Latitude, longitude: 43°39’30.64”, -91°10’37.76” (NAD83) [2]
Land surface datum: 704 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 070600010104 [2]
Well completed in: USGS national aquifer N100GLCIAL (Sand and gravel aquifers (glaciated regions)) and local aquifer 111ALVM (Alluvium Aquifer) [2]
Last well depth before abandonment: 51.7 ft-BTOC (51.7 ft blsd) [3]
Last casing depth before abandonment: 1.4 ft-BTOC (1.4 ft blsd) [4]

[1] Well details obtained from 1967 USGS well schedule
[2] Well details obtained from the USGS
[3] Well depth from April 15, 2020 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum
[4] Casing depth from November 17, 2021 WGNHS borehole video log; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 16.

Figure 70. *Location of well VE-08 (red marker). The site is located on private property approximately 30 ft north of Cedar Valley Rd., 600 feet west-southwest of Cedar Valley Estates Rd., 2 miles east of Stoddard WI and the Mississippi River.*

Initial work plan

VE-08 was initially proposed under objective 5 for well replacement. VE-08 was deemed unrepairable. The well is inaccessibly located within a decorative well house on private property (fig. 71) and its integrity is compromised, retaining its original hand-dug structure with a shallow 4-in.-diameter retrofitted casing. Work planned to include drilling a replacement well nearby in the same aquifer. Prior to the filling and sealing of VE-08 concurrent operation of the well and its replacement was also planned to establish an overlapping water-level record.

Figure 71. *VE-08 located inside a decorative well house on private property. Panel A, Decorative well house surrounding the well head. Panel B, Birds-eye view into the decorative well house with well head in center of image. Photos courtesy of USGS-UMWSC.*

Description of work completed

WGNHS obtained approval to drill a replacement well for VE-08 and continue monitoring at this site until appropriate concurrent water level data was collected to establish an adequate replacement.

On November 17, 2021, the WGNHS collected a borehole video log to document the condition of VE-08. The video log shows that the 4-in. diameter casing extends only to 1.4 ft blsd within the original hand-dug well (fig. 72), not 53 ft bls, as reported by historical records. The original rock-lined wall does not appear to be collapsing; however, the video log documented much debris at the bottom of the well, including rocks, metal, and sediment. The rock wall extends to the bottom of the well, recorded at approximately 52 ft blsd, indicating that the original well was hand dug to at least this depth, which is approximately 8 ft deeper than original records document.

***Figure 72**. Video screenshot from VE-08 borehole video collected on November 17, 2021; footage on image is in depth below top of casing (also the land surface datum) as recorded by the video logging equipment. Side-hole view of the bottom of the 4-in.-diameter casing and original rock-lined wall of the hand-dug well.*

Replacement well VE-410 was drilled September 10, 2021. VE-410 was monitored concurrently with VE-08, to ensure continuity in the water-level record, from January 2022 to July 2022. VE-08 was filled and sealed on August 30, 2023. The upper 5 ft of the rock lining was knocked into the well, and nearly 14 yards of clean silty sand was used to fill the remainder of the well. The fill had settled about 9 inches after 4 weeks, so was regraded to the original grade. The WGNHS completed a fill and seal report for VE-08, and submitted a copy to the WDNR in satisfaction of state well drilling codes. Details about replacement well VE-410 are presented below.

Suggestions for future work

VE-08 was filled and sealed on August 30, 2023. No future work remains to be done.

VE-410 (Vernon County, WI) – replaces VE-08

USGS Site Number: 433931091103501
USGS Site Name: VE-14/07W/26-410
WGNHS Well ID: 63000410
WDNR Well Number: WA234

Well information

VE-410 was drilled as a new WGLMN and NGWMN well on September 10, 2021, by On-site Environmental Services, Inc [1]. The well is located on private property east of Stoddard, Wisconsin (fig. 73). The 8.3 -in. borehole was drilled using a hollow stem auger to a reported total depth of 51 feet below land surface datum (ft blsd) [1,2]. A 2 -in.-diameter PVC casing was installed to a reported depth of 36 ft blsd, below which is PVC screened interval from 36 to 51 ft blsd. Monitoring began in January 2022 [3] and the well is currently in good condition.

Latitude, longitude: 43°39'31.47", -91°10'34.86" (NAD83) [2]
Current land surface datum: 701.2 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 070600010104 [2]
Well completed in: USGS national aquifer N100GLCIAL (Sand and gravel aquifers (glaciated regions)) and local aquifer 111ALVM (Alluvium Aquifer) [2]
Current well depth: 53.2 ft-BTOC (51 ft blsd) [2]
Current depth of screened interval: 38.2 to 53.2 ft-BTOC (36 to 51 ft blsd) [1,2]

[1] Well details obtained from 2021 WDNR well construction report (form 4400-113A)
[2] Well depth from December 13, 2021 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum
[3] Well details from the USGS

Documentation for this well is included in appendix 16.

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***Figure 73**. Location of well VE-410 (larger red marker), which replaced well VE-08 (also shown approximately 230 ft southwest of VE-410). The site is located on private property approximately 85 ft north of Cedar Valley Rd., 400 feet west of Cedar Valley Estates Rd., 2 miles east of Stoddard WI and the Mississippi River.*

Initial work plan

VE-410 was originally proposed under objective 5 for well drilling. Work planned to include drilling a replacement well for VE-08 that was constructed as similarly as possible to VE-08 in the same aquifer system. The plan of work for this site also included characterization of the replacement well with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection. Borehole cuttings were planned to be collected, processed, used to generate a geologic log, and archived at the Core Repository in Mt. Horeb, Wisconsin. Concurrent operation of VE-08 its replacement was also planned to establish an overlapping water-level record.

Description of work completed

In early 2021, the WGNHS worked with a private land owner to site replacement well VE-410 on the same property as VE-08 and established a written land-access agreement in July 2021. On September 10, 2021, On-site Environmental Services, Inc. completed the drilling of VE-410 using a hollow stem auger. An 8.3-in. borehole was drilled to a total depth of 51 ft blsd. Drill cuttings were collected every 5 ft and used to generate a lithologic description of the well borehole. Cuttings were archived at the Core Repository in Mt. Horeb, Wisconsin.

A 2-in.-diameter PVC casing was subsequently installed to a reported depth of 36 ft blsd, below which a schedule-40 PVC screen was installed from 36 to 51 ft blsd, open to the local unconsolidated glacial sand and gravel aquifer. The well was filter-packed with red flint sand and gravel around the screened interval and finished with a locking protective well cover (fig. 74). The well was completed in compliance with Wisconsin Administrative Code NR141.

VE-410 was developed on December 13, 2021, by the USGS-UMWSC using a surge block and a bailer. The well was surged repeatedly then bailed dry three times, a water level after development was not recorded. To fulfill reporting requirements with the WDNR, monitoring well construction form 4400-113A, soil boring log 4400-122, and monitoring well development form 4400-113B completed and submitted to the WDNR.

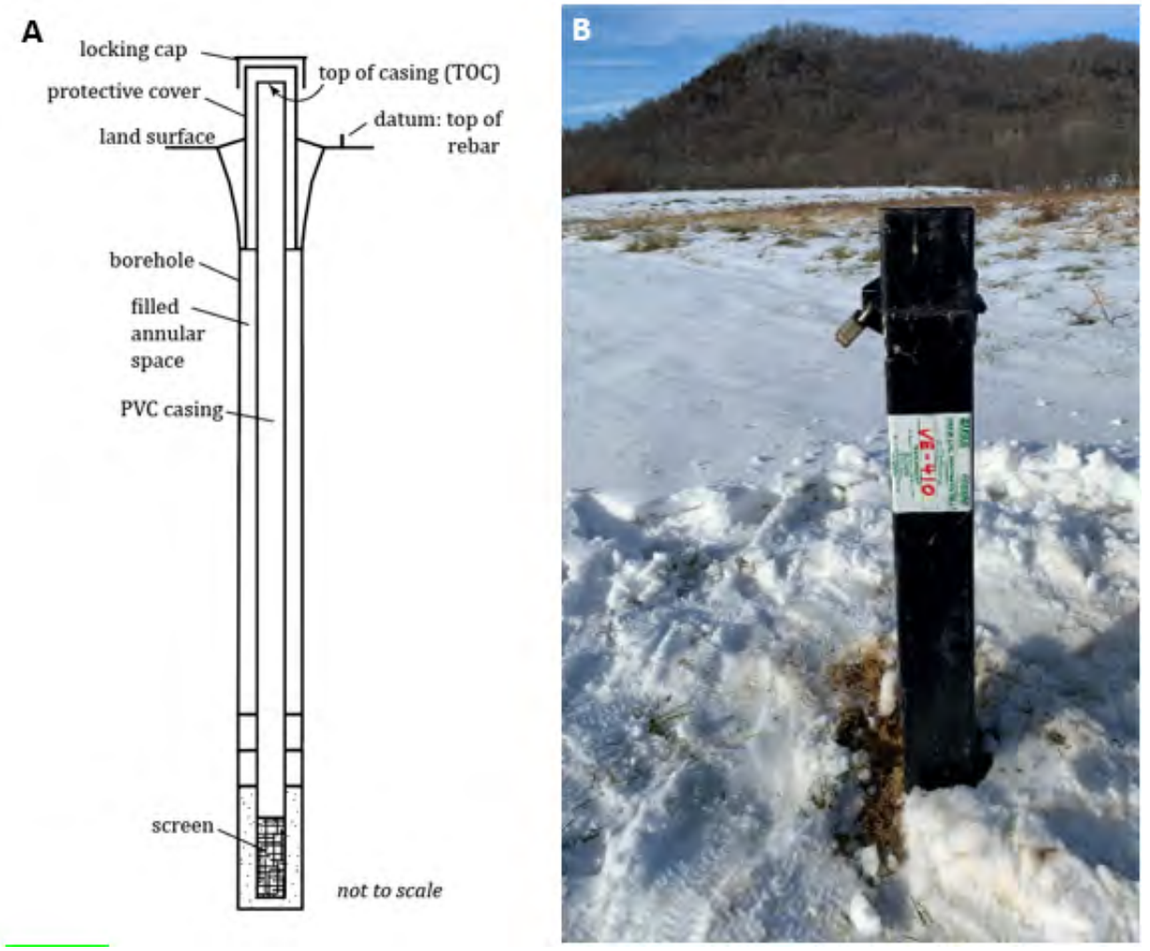

Figure 74. *Panel A, Simplified well construction diagram for VE-410. The diagram is not to scale. Panel B, Newly completed replacement well VE-410 with locking well head protector. Photo courtesy of USGS-UMWSC.*

In January 2022, the USGS-UMWSC surveyed VE-410 using RTN-GPS, completed a slug test to test the well-aquifer connection, and installed a pressure transducer to begin recording continuous water-level data.

The slug test was completed using a 1 and 3/8th in.-diameter by 5 ft. long cylindrical solid PVC slug. The water column was displaced quickly by approximately 1 foot and recovered slowly (fig 75). The initial quick response is most likely due to the sand pack absorbing the displaced slug water. After the sand pack absorbed all the water it could, then the local fine-grained unconsolidated aquifer responds more slowly. The results show a good connection to the silty unconsolidated aquifer.

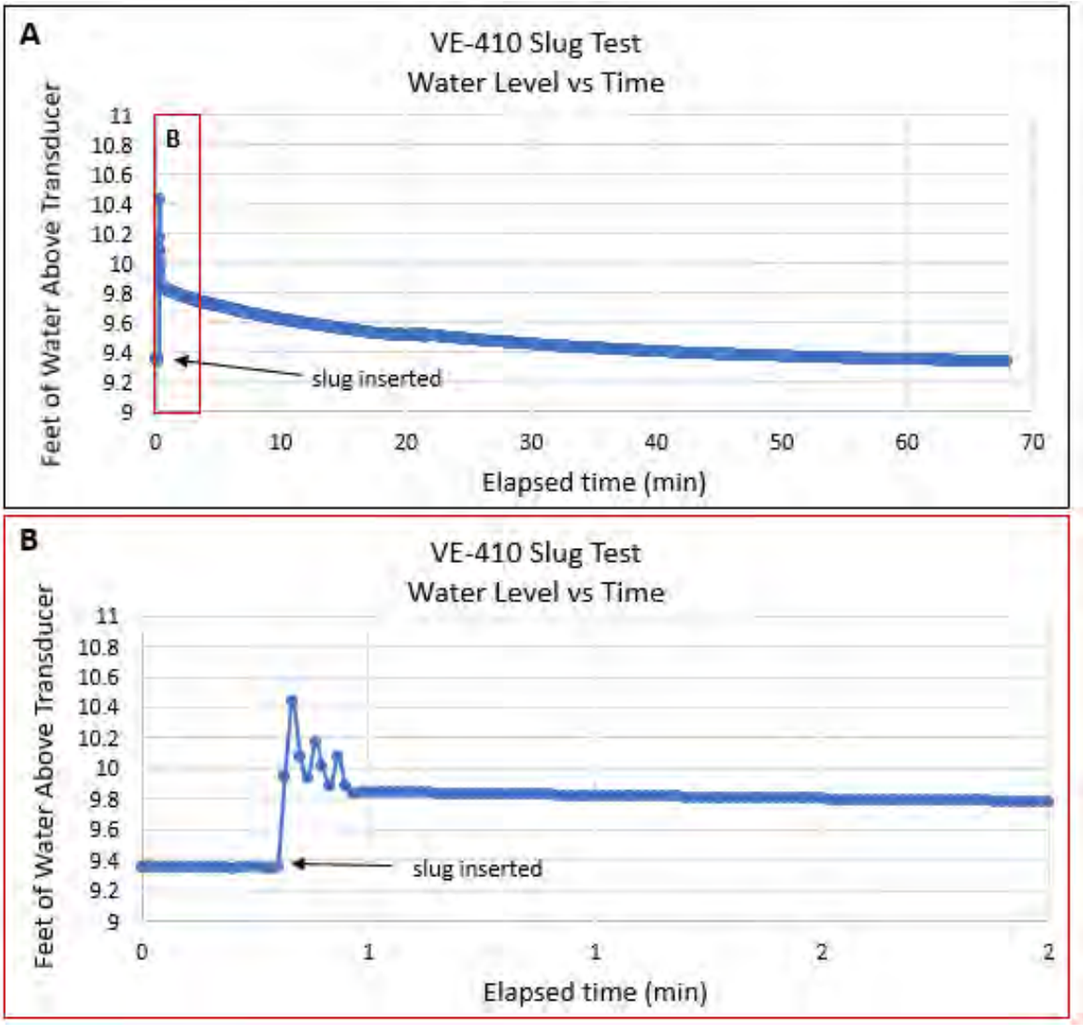

Figure 75. *Slug test results for VE-410. Slug testing was performed on January 17, 2022, and shows a fast hydraulic response by the sand pack and a slow hydraulic response by the finer-grained aquifer. Panel A, Entire duration of slug test (68 minutes) with red box showing location of panel B. Panel B, Water level response to first two minutes of slug test. Data courtesy of USGS-UMWSC.*

Monitoring for VE-410 began in January 2022, and concurrent water-level data were collected with well VE-08 until mid-July 2022 (fig. 76). Concurrent monitoring shows that the response trend for replacement well VE-410 closely resembles well VE-08. The average difference in water level elevations (after accounting for the difference in datum elevations of the wells) is 0.38 feet over the duration of concurrent monitoring. Based on these results, VE-410 provides excellent data continuity that can be combined with historical records for VE-08.

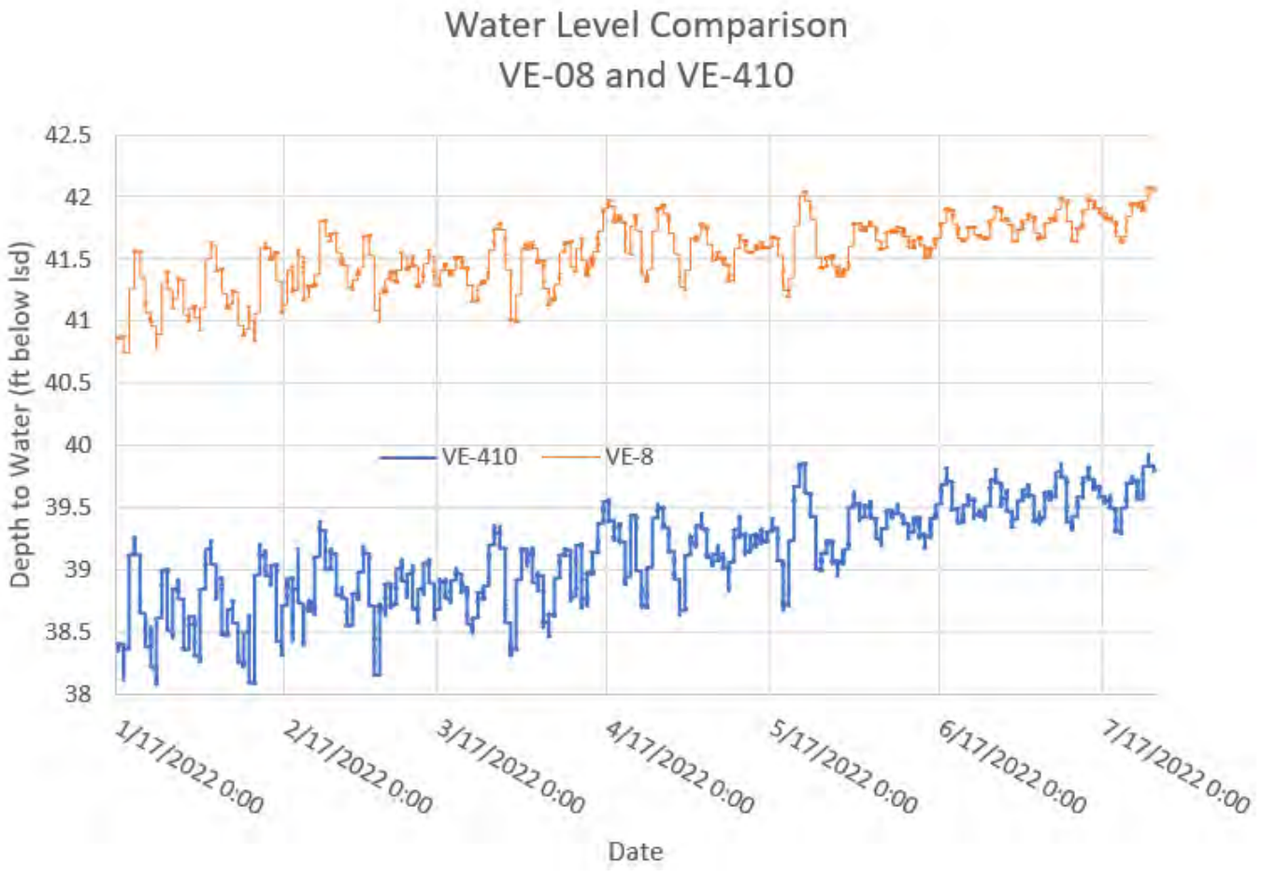

***Figure 76**. Concurrently recorded water levels for well VE-08 (orange), and its replacement well, VE-410 (blue), between January 17, 2022 and July 26, 2022. Accounting for the land surface datum of VE-08 (704 ft msl) and VE-410 (701.2 ft msl), the difference in water level elevation between the two wells averages 0.38 feet over this period. Data courtesy of the U.S. Geological Survey.*

The WGNHS did not collect geophysical logs, a video log, or an optical borehole image because this well was completed with a 2-in.-diameter PVC casing and with a bentonite seal.

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

WS-105 (Waushara County, WI) – replaced by WS-2372

USGS Site Number: 440345089151701
USGS Site Name: WS-18/10E/01-0105
WGNHS Well ID: 70000105
WDNR Well Number: unknown

Well information

Although no well construction report was found for WS-105, it is assumed to have been drilled in April 1956, as water-level monitoring data has been collected since that year [1,2]. The well was completed to a total depth between 13.5 and 14 feet below land surface (ft bls) [1,2]. A 4-in.-diameter steel casing was installed to a reported depth between 13.5 and 14 ft bls, below which, the hole was left open to the sand and gravel aquifer. Both historic and recent site visits indicate the well is poorly connected to the aquifer. The well began to flood in approximately 2008 and consequently would fill with sediment. Repeated attempts to redevelop WS-105 were unsuccessful. On July 8, 2022, WS-105 was filled and abandoned. WS-2372 effectively replaced WS-105 in both the WGLMN and NGWMN in September 2021. Prior to abandonment, the well was located on private property in Wautoma, WI near Silver Lake (fig. 77).

Latitude, longitude: 44°03’45.74”, -89°15’16.69” (NAD83) [3]
Land surface datum: 869.7 feet above mean sea level (NAVD88) [3]
Hydrologic Unit (USGS Watershed Code): 4030202 [3]
Well completed in: USGS national aquifer N100GLCIAL (Sand and gravel aquifers (glaciated regions)) and local aquifer 100SDGV (Sand and Gravel Aquifer) [3]
Well depth prior to abandonment: 8.8 ft-BTOC (7.8 ft blsd) [4]
Casing depth prior to abandonment: unknown [4]

[1] Well details obtained from 1978 USGS site schedule
[2] Historically compiled water level records
[3] Well details obtained from the USGS
[4] Well details from work completed for this funding opportunity. Well depth is from 2021 WGNHS borehole video; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum. Bottom of casing was not visible in video due to sediment accumulation at bottom of well.

Documentation for this well is included in appendix 17.

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Figure 77. *Location of well WS-105 (red marker) prior to abandonment in September 2021. The site was located on private property approximately 50 ft south of State Rd. 21/ State Rd. 73 in Wautoma, WI, 0.5 miles northwest of Silver Lake.*

Initial work plan

WS-105 was originally proposed under objective 5 for well drilling. Since approximately 1999, well records indicate the well is compromised. A 1999 slug test showed poor connectivity to the aquifer (Rauman and others, 1999). Additionally, USGS well measurements over the last several years show the well is continually filling with sediment. In 2019, the USGS-UMWSC attempted to redevelop the well with a 5 ft by 3 in. bailer, but it was unsuccessful despite removing a large amount of material from the bottom of the well. A post-redevelopment slug test was performed, still showing a poor connection to the aquifer. Work planned to include drilling a replacement well nearby in the same aquifer as WS-105. Concurrent operation of WS-105 and its replacement was also planned to establish an overlapping water-level record prior to abandonment of WS-105.

Description of work completed

On September 13, 2021, WGNHS collected a borehole video. The video shows abundant biofilm on the casing and borehole wall and shows abundant sediment accumulation at the bottom of the well. Bottom of casing was buried by sediment and the well depth was recorded at 7.8 ft blsd. The well depth measured in 2019 was 11.6 ft blsd, confirming the rapid infilling of the well and a poor connection to the aquifer. Due to the inadequate aquifer connection and poor condition of WS-105, concurrent monitoring with a replacement well was determined as not viable. WS-105 was abandoned on June 8, 2022 by WGNHS. A copy of the abandonment form was submitted to WDNR in satisfaction of state well drilling codes. In early 2021, WGNHS worked closely with WDNR and USGS to site a replacement well nearby. Replacement well WS-2372 was drilled in September 2022. Details about WS-2372 are presented below.

Suggestions for future work

WS-105 was filled and abandoned on June 8, 2022. No future work remains to be done.

WS-2372 (Waushara County, WI) – replaces WS-105

USGS Site Number: 440356089152201
USGS Site Name: WS-18/10E/01-2372
WGNHS Well ID: 70002372
WDNR Well Number: WA237

Well information

WS-2372 was drilled as a new WGLMN and NGWMN well on September 13, 2021, by On-site Environmental Services, Inc. [1] The well is located on private property in Wautoma, Wisconsin (fig. 78). The 8.2-in. borehole was drilled with a hollow stem auger to a reported total depth of 25.5 feet below land surface datum (ft blsd) [1,2]. A 2-in.-diameter PVC casing was installed to a reported depth of 10.5 ft blsd, below which is a PVC screened interval from 10.5 to 25.5 ft blsd. Monitoring began in December 2021 [3] and the well is currently in good condition.

Latitude, longitude: 44°03'55.88", -89°15'22.04" (NAD83) [3]
Current land surface datum: 879.9 feet above mean sea level (NAVD88) [3]
Hydrologic Unit (USGS Watershed Code): 040302010804 [3]
Well completed in: USGS national aquifer N100GLCIAL (Sand and gravel aquifers (glaciated regions)) and local aquifer 100SDGV (Sand and Gravel Aquifer) [3]
Current well depth: 27.2 ft-BTOC (25.5 ft blsd) [2]
Current depth of screened interval: 12.2 to 27.2 ft-BTOC (10.5 to 25.5 ft blsd) [1,2]

[1] Well details obtained from 2021 WDNR monitoring well construction report (form 4400-113A)
[2] Well depth from December 14, 2021 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum
[3] Well details from the USGS

Documentation for this well is included in appendix 17.

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***Figure 78**. Location of well 2372 (larger red marker), the replacement well for WS-105 (also shown, approximately 1100 ft so the southeast). The site is located on property owned by the Waushara County Country Club approximately 665 ft north of State Rd. 23/ State Rd. 73 in Wautoma, WI.*

Initial work plan

WS-2372 was originally proposed under objective 5 for well drilling. Work planned to include drilling a nearby replacement well for WS-105 in the same aquifer system. The plan of work for this site also included

characterization of the replacement well with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection. Borehole cuttings were planned to be collected, processed, used to generate a geologic log, and archived at the Core Repository in Mt. Horeb, Wisconsin. Concurrent operation of WS-105 was not planned, as WS-105 was compromised and poorly connected to the aquifer.

Description of work completed

In late 2020 and early 2021, the WGNHS worked with Waushara County Country Club to site replacement well WS-2372 on the same property as (1100 ft northwest of) WS-1015. A land-access agreement was established in July 2021. On December 13, 2021, On-site Environmental Services, Inc. drilled and installed WS-2372 using a Geoprobe and hollow-stem auger. An 8.2-in borehole was drilled to 25.5 ft blsd using a hollow stem auger. Drill cuttings were collected every 5 feet and used to generate a lithologic description of the well borehole. Cuttings were archived at the Core Repository in Mt. Horeb, Wisconsin. A 2-in.-diameter PVC casing was subsequently installed to a reported depth of 10.5 ft blsd, below which a schedule-40 PVC screen was installed from 10.5 to 25.5 ft blsd, open to the local unconsolidated glacial sand and gravel aquifer. The well was filter-packed with red flint sand and gravel around the screened interval and finished with a locking protective well cover and three protective bollards (fig. 79). The well was completed in compliance with Wisconsin Administrative Code NR141.

WS-2372 was developed on December 13, 2021, by WGNHS using a surge block and a bailer. To fulfill reporting requirements with the WDNR, monitoring well construction form 4400-113A, monitoring well development form 4400-113B, and soil boring log 4400-122 were completed and submitted to the WDNR.

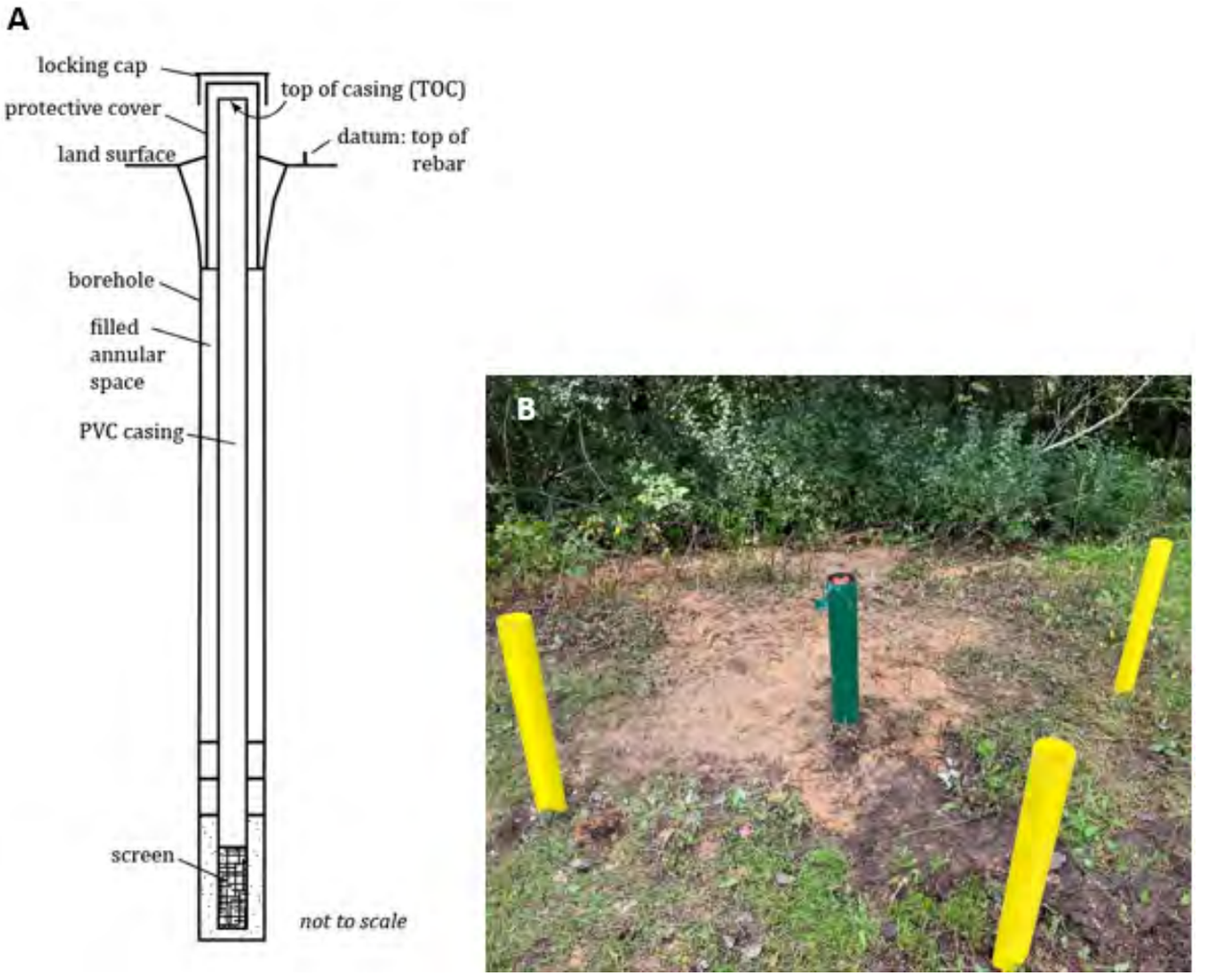

Figure 79. *Panel A, Simplified well construction diagram WS-2372. The diagram is not to scale. Panel B, Newly completed replacement well WS-2372 with locking well head protector and three protective bollards.*

In December 2021, the USGS-UMWSC surveyed WS-2372 using RTN-GPS, completed a slug test to test the well-aquifer connection, and installed a pressure transducer to begin recording continuous water-level data. The slug test was completed using a 1 and 3/8th in.-diameter by 5 ft. long cylindrical solid PVC slug. The water column was displaced quickly by approximately 1.5 ft and recovered quickly (fig. 80). The results show a good connection to the unconsolidated aquifer.

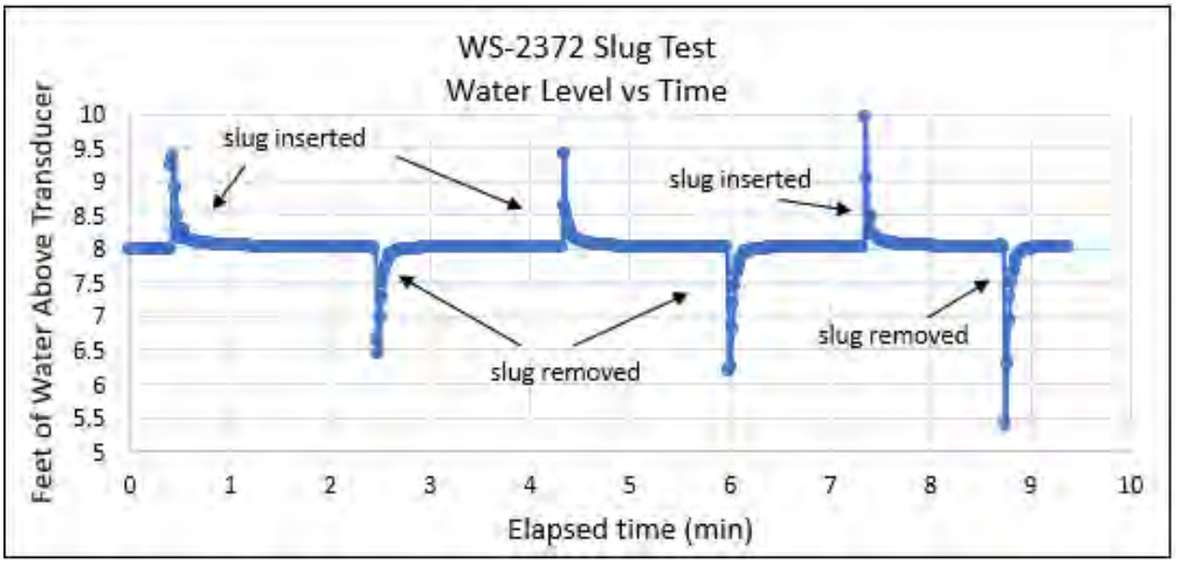

Figure 80. *Slug test results for WS-2372. Slug testing was performed on December 14, 2021, and shows a good connection to the aquifer. Data courtesy of USGS-UMWSC.*

The WGNHS did not collect geophysical logs, a video log, or an optical borehole image because this well was completed with a 2-in.-diameter PVC casing and bentonite seal.

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

WW-09 (Walworth County, WI)

USGS Site Number: 424004088440601
USGS Site Name: WW-03/15E/33-0009
WGNHS Well ID: 65000009
WDNR Well Number: None

Well information

WW-09 was drilled in 1920 [1]. Original reports state the well was drilled to a total depth of 287 feet below land surface (ft bls) and a 6-in.-diameter steel casing was installed to 287 ft blsd [1]; however, work done as part of the NGWMN Round II project (Guenther and others, 2017) indicates these values were mis-reported [2]. In 2017, the WGNHS collected a borehole video log showing that the steel casing extends to 202 ft blsd and is 5 in. in diameter. Below the steel casing, the borehole was left open to carbonate bedrock. Work completed in 2017 also included the installation of a new protective well head cover and well redevelopment. Development removed only 3.7 ft of accumulated sediment, leaving the well at approximately 261 ft blsd (as measured on the video log), indicating that perhaps the well was not originally drilled as deep as 287 ft bls. The well is located on private property northwest of Delavan, WI (fig. 81). Monitoring began in 1947 [3] and the well is currently in good condition.

Latitude, longitude: 42°40’04.10”, -88°44’04.56” (NAD83) [2]
Current land surface datum: 967.5 feet above mean sea level (NAVD88) [2]
Hydrologic Unit (USGS Watershed Code): 07090001 [2]
Well completed in: USGS national aquifer N400SLRDVN (Silurian-Devonian aquifer system) and local aquifer 365SNNP (Sinnipee Group Aquifer) [2]
Current well depth: 258 ft-BTOC (258 ft blsd) [3]
Current casing depth: 199.7 ft-BTOC (199.7 ft blsd) [3]

[1] Well details obtained from 1947 USGS well schedule. A copy can be found in Guenther and others (2017)
[2] Well details obtained from Guenther and others (2017)
[3] Well details obtained from the USGS
[4] Well details from work completed for this funding opportunity. Casing is interpreted from October 27, 2021 geophysical logs; well depth incorporates March 8, 2022 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Documentation for this well is included in appendix 18.

Historical documentation for this well can be found in appendix G of WGNHS Open-File Report 2017-04 (Guenther and others, 2017).

Geophysical logs collected on October 27, 2021, for this grant period can be viewed and downloaded from: https://data.wgnhs.wisc.edu/data-viewer/view/65000009

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***Figure 81**. Location of well WW-09 (red marker). The site is located approximately 50 ft. north of R and D Town Line Rd. and 780 ft east of State Rd. 89, 5 miles northwest of Delavan, WI.*

Initial work plan

WW-09 was initially proposed under objective 4 for well maintenance. Although a borehole video log and slug test were performed in 2017, as documented by Guenther and others (2017), WGNHS planned to complete the full well characterization started in 2017. This plan included collection full a suite of geophysical logs and performing a new slug test to confirm the well-aquifer connection.

Description of work completed

On April 14, 2021, the USGS-UMWSC completed a slug test to test the well-aquifer connection using two 3 in.-diameter by 5 ft. long cylindrical solid PVC slugs. The water column was displaced quickly by approximately 1.5 ft and recovered rapidly (fig. 82), likely due to the fractured and vuggy character of the carbonate bedrock aquifer. The results show a good well-aquifer connection.

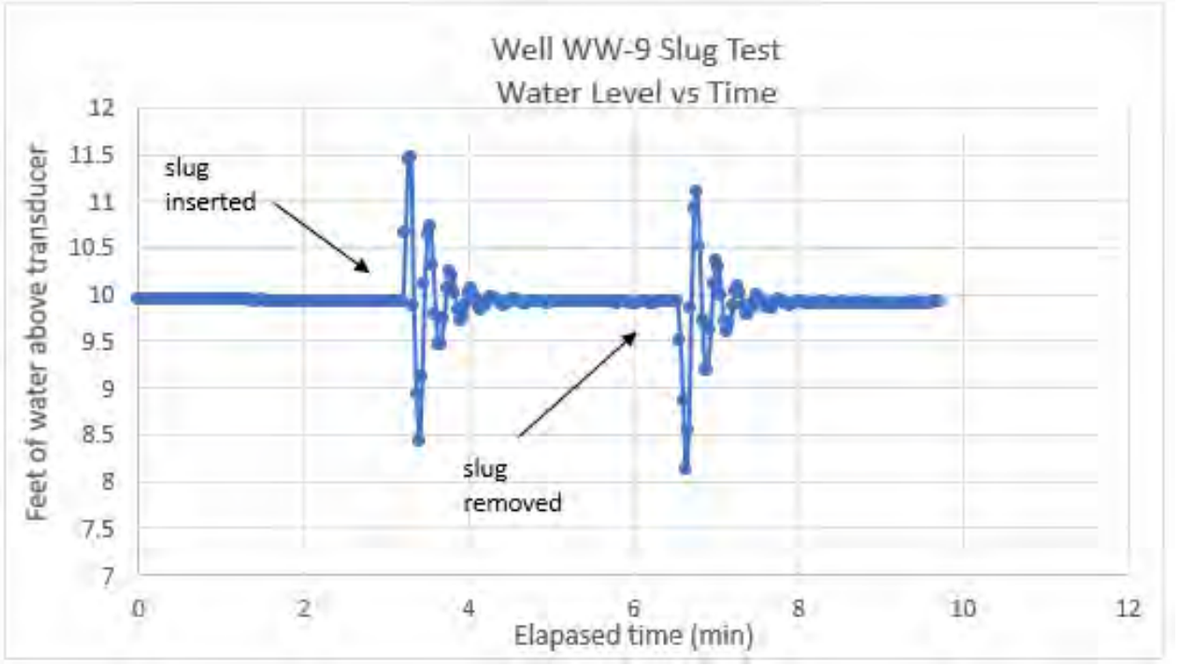

***Figure 82**. Slug test results for WW-09. Slug testing was performed on April 14, 2021, and shows a good connection to the aquifer. Data courtesy of USGS-UMWSC.*

A full suite of geophysical logs were collected by the WGNHS on October 27, 2021 (fig. 83). The geophysical logs show that the casing is in good condition and well seated into bedrock. Bottom of casing was confirmed at 199.7 ft blsd and the well depth at 258 ft blsd.

***Figure 83**. WGNHS collecting geophysical logs at well WW-09. Tripod is set up over well head, lowering the geophysical logging equipment into the well.*

Suggestions for future work

No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

Acknowledgments

We are indebted to many individuals and agencies for their cooperation, technical assistance, and input in helping guide this multi-year project to completion. The authors would particularly like to thank the U.S. Geological Survey's National Groundwater Monitoring Network (USGS-MGWMN) program for funding this project and Jason Fine, Daryll Pope and Sara Roser for remaining a steadfast partner. In executing the well evaluations, repairs, replacements, and new well drilling, the authors would also like to acknowledge the contributions of several staff at the USGS Upper Midwest Water Science Center (USGS-UMWSC). Lucas Stevens provided support at multiple monitoring well sites; Rob Waschbusch aided in planning and site-access arrangements; and especially Jason Smith who coordinated and performed myriad fieldwork activities and ensured the authors had access to USGS documentation and historical records for each monitoring station. In providing feedback on well repair and drilling priorities along with site access support, the authors would like to recognize the efforts of multiple Wisconsin Department of Natural Resources (WDNR) staff. Adam Freihoefer and Aaron Pruitt gave input regarding repair and well drilling priorities, while Nicki Clayton and Renee Kerska led the effort to establish easements for multiple WDNR properties.

A big thank you to all the land owners and property managers throughout the state that graciously provided site access to their properties. Specifically, we would like to thank the following: Near Rice Lake in Barron County, Norswiss Farms Inc.; in Buffalo County the Catholic Tri- Parish, caretakers of the Sacred Heart Cemetery near Mondovi; in Dane County, Wisconsin Department of Administrative staff at the State Capitol, WDNR staff, the Wisconsin Department of Transportation (WisDOT), and the Wisconsin Cooperative Housing Association. Near Beaver Dam in Dodge County, the Dodge County Highway Department and the WisDOT; in Fond du Lac County, the City of Fond du Lac; in Kenosha County, staff at the Legacy at Saint Joseph's in Kenosha; in Outagamie County, the City of Kaukauna; in Rock County, WDNR staff; in St. Croix County, United States Fish and Wildlife staff; and in Waushara Co, the Waushara Country Club near Wautoma. Lastly, private landowners in Green, Marquette, Vernon and Walworth Counties help by hosting wells on their properties.

The authors would like to acknowledge the following Wisconsin based contractors for their efforts to evaluate, repair, and drill wells as part of this project: DMB Drilling, Inc., of Shell Lake; Ground Source Drilling, Inc., of De Pere; On-Site Environmental Services, Inc., of Sun Prairie; Roos Well Drilling, Inc., of Oxford; Sam's Well Drilling, Inc., of Randolph; Soils & Engineering Services, Inc., of Madison and Water Wells Inc., of Windsor.

Pamela Frederick Daniel Langer and Brent Lloyd with the Division of Business Services at UW-Madison, lent their expertise to facilitate the development and signing of easements and access agreements for multiple monitoring wells. Ken Bradbury, Marlene Flannery, Brad Gottschalk, Dave Hart, Sushmita Lotlikar, Pete Schoephoester, and Sue Swanson of the WGNHS contributed to project design, data management, contractor bidding, and grant administration. Amber Boudreau and especially Irene Lippelt facilitated project completion through their mastery of geophysical log production and tireless sleuthing of archival documents and well records. Matt Waldron (Natural Resources Institute), Ian Orland and Liz Ceperley (WGNHS), served as editors, and Jason Smith, USGS, made important contributions to the manuscript review.

Special thank you to Shayla Barrera-Skibinski, former WGNHS student employee, for an incredible amount of work assembling the appendices for this report.

Thank you to all others that helped along the way and are not specifically listed. There were too many to comprehensively list and we are more than appreciative for your efforts and hard work.

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Appendix 1: Well BR-751 documents

Documentation of work done for this report

BR-751 WDNR monitoring well construction report, 2022-
Form 4400-113A, 1 page

BR-751 Well owner document, 2021
Property access agreement, 2 pages

BR-751 WDNR soil boring form, 2022
Form 4400-122, 1 page

BR-751 Monitoring well development form, 2022
Form 4400-113B, 1 page

BR-751 WDNR monitoring well construction report, 2022

Form 4400-113A, page 1 of 1

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Wisconsin Groundwater Level Monitoring Network	Local Grid Location of Well: _____ ft. ☐ N. ☐ S. _____ ft. ☐ E. ☐ W.	Well Name: 03000751 aka BR-751
New well	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 45°29'04.28" Long. -91°48'21.11" (45.484522, -91.805864)	Wis. Unique Well No.: VU539 DNR Well ID No.:
Type of Well: Well Code 12 / pz		Date Well Installed: 06 / 30 / 2022 (m m d d y y y y)
Distance from Waste/Source _____ ft. Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:
		Well Installed By: Name (first, last) and Firm: David Beecroft / DMB Drilling

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation 1234.23 ft. MSL
C. Land surface elevation 1232.2 ft. MSL
D. Surface seal, bottom _____ ft. MSL or _____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis performed? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒ 50 Hollow Stem Auger ☐ 41 Other ☐ _____

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe _____

17. Source of water (attach analysis, if required):
DMB Drilling shop well

E. Bentonite seal, top 1114.3 ft. MSL or 117.9 ft.
F. Fine sand, top 1103.8 ft. MSL or 128.4 ft.
G. Filter pack, top 1101.3 ft. MSL or 130.9 ft.
H. Screen joint, top 1096.3 ft. MSL or 135.9 ft.
I. Well bottom 1081.3 ft. MSL or 150.9 ft.
J. Filter pack, bottom _____ ft. MSL or _____ ft.
K. Borehole, bottom 1081.3 ft. MSL or 150.9 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.2 in.
N. I.D. well casing 2.0 in.

All depths are in feet below land surface datum

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 6.0 in.
b. Length: 6.0 ft.
c. Material: Steel ☒ 04 Other ☐ _____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☒ 30 Other ☐ _____
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☒ 31
d. _____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☒ 02 Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☒3/8 in. ☐1/2 in. Bentonite chips ☒ 32
c. _____ Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Red Flint #40
b. Volume added 50 # ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. Red Flint #15
b. Volume added 600# ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23 Flush threaded PVC schedule 80 ☒ 24 Other ☐ _____
10. Screen material: Sch 80 PVC
a. Screen type: Factory cut ☒ 11 Continuous slot ☐ 01 Other ☐ _____
b. Manufacturer Cambell-Monoflex
c. Slot size: 0.010 in.
d. Slotted length: 15 ft.
11. Backfill material (below filter pack): None ☒ 14 Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Sarah Brown Firm: Wisconsin Geological and Natural History Survey

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

BR-751 Well owner document, 2021

Property access agreement, page 1 of 2

Wisconsin Geological and Natural History Survey
DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN–MADISON

December 7, 2021

Wisconsin Groundwater-Level Monitoring Network – Well Owner Document

Re: Landowner Property Access

Dear (Norswiss Farms)

As part of the Wisconsin Groundwater-Level Monitoring Network (WGLMN), the Wisconsin Geological and Natural History Survey (WGNHS) looks forward to working with you to collect geological and groundwater data on your property. Collaboration by property owners such as yourself is essential to maintaining and strengthening the WGLMN for generations to come and we greatly appreciate your willingness to participate as a partner.

The WGLMN is collaboratively operated, maintained, and managed by the WGNHS, Wisconsin Department of Natural Resources (WDNR), and U.S. Geological Survey's Upper Midwest Water Science Center (USGS). The WGLMN dates back to 1946 when the Wisconsin State Legislature formally established a groundwater-monitoring network. Water levels collected from the network help scientists and managers evaluate effects of well pumping, the response of groundwater levels to drought or increased precipitation, and effects of land-use change on groundwater resources. These data are also routinely used in the development of regional groundwater flow models, because long-term water-level measurements serve as reliable model calibration targets. More information about the WGLMN, including a link to an interactive map of network wells and a short video about the network can be found here: *https://wgnhs.wisc.edu/water-environment/groundwater-monitoring-network/*

This document seeks to establish clear lines of communication between you and the WGNHS (as well as our partners at the WDNR and USGS) and clarify the mutual responsibilities and expectations for well installation and data collection on your property. While not every situation can be anticipated, the following section provides an outline of joint responsibility and mutual expectation.

Wisconsin Geological and Natural History Survey
3817 Mineral Point Road Madison, WI 53705 608-262-1705 WGNHS.org
Kenneth R. Bradbury, Director and State Geologist

BR-751 Well owner document, 2021

Property access agreement, page 2 of 2

The WGNHS acknowledges that we (in coordination with the USGS) will:

- Inform you of site visits and serve as a point of contact regarding on-site activities and ongoing monitoring.
- Strive to clearly communicate the status of on-site activities and ongoing monitoring.
  - On-site activities may include basic reconnaissance, well drilling and installation, well maintenance, and data collection.
  - Routine visits will be performed on an as-needed basis but typically not more than monthly.
  - The most intensive activity occurs during the initial phase when the well is sited, Diggers Hotline confirms the location of utility lines, and the monitoring well and water level monitoring equipment is installed.
- Ensure ongoing operation and maintenance of the new monitoring well in coordination with the USGS.

As hosting property owner, you acknowledge that you:

- Have received information about the WGLMN and wish to volunteer your well for the collection of geologic and hydrogeologic data.
- Are the owner / operator of the property and, as such, have the authority to allow for the described activities on your land.
- Will not tamper with the well and any of the equipment installed as part of ongoing monitoring efforts.
- Will not be responsible for any costs associated with well installation or ongoing operation and maintenance of the new well.
- Will facilitate on-site activities to the best of your ability and communicate any specific requests or concerns directly to WGNHS and USGS staff.

If you have any questions or concerns, feel free to contact us directly by email or phone.

Sincerely,

Mike Parsen
Hydrogeologist
3817 Mineral Point Rd.
Madison, WI 53705
mike.parsen@wisc.edu
(608) 262-9419 (direct)

Pete Chase
Geotechnician
3817 Mineral Point Rd
Madison, WI 53705
pete.chase@wisc.edu
(608) 265-6003

Sarah Bremmer
Geoscientist
3817 Mineral Point Rd
Madison, WI 53705
sarah.bremmer@wisc.edu
(608) 265-5323

P.s. Contact information for our partners at WDNR and USGS is as follows:

Rob Waschbusch
USGS
Hydrologist
8505 Research Way
Middleton, WI 53562
rjwaschb@usgs.gov
608-821-3868

Nicole Clayton
WDNR
Water Supply Specialist
PO Box 7921
Madison, WI 53707
nicole.clayton@wisconsin.gov
(608) 266-9254

Page 2 of 2

Wisconsin Geological and Natural History Survey
DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN-MADISON

BR-751 WDNR soil boring form, 2022

Form 4400-122, page 1 of 1

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐ _____

Page 1 of 1

Facility/Project Name: Wisconsin Groundwater Level Monitoring Network **New Well**	License/Permit/Monitoring Number	Well name: 03000751 aka BR-751	
Boring Drilled By: Name of crew chief (first, last) and Firm First Name: David Last Name: Beecroft Firm: DMB Drilling	Date Drilling Started: 06 / 29 / 2022	Date Drilling Completed: 06 / 30 / 2022	Drilling Method: Mud rotary with tricone bit
WI Unique Well No.: VU539	DNR Well ID No.:	Well Name: BR751	Final Static Water Level: 1158.28 Feet MSL
Surface Elevation: 1232.2 Feet MSL	Borehole Diameter: 6 inches		
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒	Lat 45°29'04.28" Long 91°48'21.11"	Local Grid Location: _____ Feet ☐ N ☐ S _____ Feet ☐ E ☐ W	
Facility ID	County: Barron	County Code: 03	Civil Town/City/ or Village: Town of Stanford

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
Grab each 5'			0-5	SILT- 90% fines,10% sand, trace gravel Brown 7.5 YR5/3, moist, Loess										
			5-50	SILTY SAND W/ GRAVEL- 60% sand, 20% fines 20% gravel, Brown to red brown, moist										
			50-75	GRAVELY LEAN CLAY-80% fines, 20% gravel Brown to red brown, grey near 75', plastic										
			75-120	SILTY SAND W/ GRAVEL -60% sand, 25% gravel 15% fines, Reddish brown- brown										
			120-155	SHALEY SANDSTONE -Very fine grained yellow sandstone with abundent thin gray and green shale layers, glauconitic										
				END OF BORING 155 ft. Set 2" sch 80 PVC well with 15ft. long factory cut 0.010" slot well screen from 155-140 ft.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Sarah Brown Firm: Wis. Geological and Natural History Survey

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

BR-751 Monitoring well development form, 2022

Form 4400-113B, page 1 of 1

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Wisconsin Groundwater Level Monitoring Network New well	Barron	03000751 aka BR-751

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well ID Number
	03	VU539	

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☒ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other pumped after compressed air	☒ [illegible]

3. Time spent developing well 120 min.

4. Depth of well (below land surface datum) 150.9 ft.

5. Inside diameter of well 2.0 in.

6. Volume of water in filter pack and well casing 5 gal.

7. Volume of water removed from well 150 gal.

8. Volume of water added (if any) 0 gal.

9. Source of water added N/A

10. Analysis performed on water added? (If yes, attach results) ☐ Yes ☒ No

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 76.17 ft.	75.95 ft.
Date	b. 06/30/2022 (m m d d y y y y)	07/23/2022 (m m d d y y y y)
Time	c. 04:25 ☐ a.m. ☒ p.m.	01:40 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	4 inches	0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)
	red/brown	
	opaque	
14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

Fill in if drilling fluids were used and well is at solid waste facility:

16. Well developed by: Name (first, last) and Firm
First Name: David Last Name: Beecroft
Firm: DMB Drilling

17. Additional comments on development: Well developed w/ compressed air, subsequently pumped with submersible pump

Name and Address of Facility Contact/Owner/Responsible Party
First Name: Peter Last Name: Chase
Facility/Firm: WGNHS
Street: 3817 Mineral Point Rd.
City/State/Zip: Madison, WI 53705

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: Sarah Bremmer
Print Name: Sarah Bremmer
Firm: WGNHS

NOTE: See instructions for more information including a list of county codes and well type codes.

Appendix 2: Well BF-188 documents

Documentation of work done for this report

BF-188 WDNR well construction report, 2023
Form 3300-077A, 2 pages

BF-188 Well owner document, 2021
Property access agreement, 2 pages

BF-188 WDNR soil boring form, 2023
Form 4400-122, 1 page

BF-188 WDNR well construction report, 2023

Form 3300-077A, page 1 of 2

Well Construction Report
WISCONSIN UNIQUE WELL NUMBER **ABA923**

Drinking Water and Groundwater - DG/5 Form 3300-077A
Department of Natural Resources, Box 7921
Madison WI 53707

Property Owner: WISCONSIN GEOLOGICAL & NATURAL HISTORY — Phone #
Mailing Address: 3817 MINERAL POINT ROAD
City: MADISON — State: WI — Zip Code: 53705

County	Co. Permit #	Notification #	Completed
Buffalo		9050863402	06-14-2023

Well Constructor (Business Name): D M B DRILLING CO INC — Lic. #: 6749 — Facility ID # (Public Wells):
Address: W8760 CTY HWY J, SHELL LAKE WI 54871
Well Plan Approval #:
Approval Date (mm-dd-yyyy):
Hicap Permanent Well #:
Common Well #:
Specific Capacity: 6.7

1. Well Location
Fire # (if avail.): 1262
Town of CANTON
Street Address or Road Name and Number: CO HWY A
Subdivision Name: Lot #: Block #:
Latitude / Longitude in Decimal Degree (DD): 44.5721 °N -91.7829 °W — Method Code: GPS008

NE	SW	Section	Township	Range
or Govt Lot #		12	24 N	12 W

2. Well Type New Well
of previous unique well #: constructed in
Reason for replaced or reconstructed well ?
Construction Type: Drilled

3. Well serves 1 # of OBSERVATION WELL
Private, non-potable
Heat Exchange____# of drillholes
Hicap Well ? No
Hicap Property ? No
Hicap Potable ? No

4. Potential Contamination Sources - ON REVERSE SIDE

5. Drillhole Dimensions and Construction Method

Dia. (in.)	From (ft.)	To (ft.)
10	Surface	40
6	40	80

Upper Enlarged Drillhole		Lower Open Bedrock
Yes	Rotary - Mud Circulation	No
No	Rotary - Air	Yes
No	Rotary - Air & Foam	No
No	Drill-Through Casing Hammer	
No	Reverse Rotary	
No	Cable-tool Bit ____in. dia...	No
No	Dual Rotary	No
No	Temp. Outer Casing ____in. dia	
No	Removed? ____depth ft. (If NO explain on back side)	

8. Geology

Geology Codes	8. Geology Type, Caving/Noncaving, Color, Hardness, etc...	From (ft.)	To (ft.)
R V C C	R-RED V-NON-CAVING C-CLAY C-CLAYEY	Surface	18
Y V N N	Y-YELLOW V-NON-CAVING N-SANDSTONE N-W/SANDSTONE	18	80

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6	WHEATLAND STEEL ASTM A53 18.99 280 WALL WELDED JOINTS	Surface	40

Dia. (in.) Screen type, material & slot size — From (ft.) — To (ft.)

9. Static Water Level
35 ft. below ground surface

10. Pump Test
Pumping level 38 ft. below surface
Pumping at 20 GP M for 1 Hrs.
Pumping Method ? Airlift

11. Well Is
24 In. above grade
Developed ? Yes
Disinfected ? Yes
Capped ? Yes

7. Grout or Other Sealing Material
Method: TREMIE PIPE - PUMPED

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT GROUT	Surface	40	15 S

12. Notified Owner of need to fill & seal ? No
Filled & Sealed Well(s) as needed? No

13. Constructor / Supervisory Driller — Lic # — Date Signed
DMB — 6242 — 06-14-2023
Drill Rig Operator — Lic or Reg # — Date Signed

WISCONSIN UNIQUE WELL NUMBER ABA923

BF-188 WDNR well construction report, 2023

Form 3300-077A, page 2 of 2

4a. Potential Contamination Sources Is the well located in floodplain ? No

Comment:

Water Quality Text:

Water Quantity Text:

Difficulty Text:

Created On: 06-14-2023 Created by: DMBDRILLINGINC Updated On: 06-14-2023 Updated by: DMBDRILLINGINC

WISCONSIN UNIQUE WELL NUMBER **ABA923**

BF-188 Well owner document, 2021

Property access agreement, page 1 of 2

Wisconsin Geological
and Natural History Survey
DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN–MADISON

November 23, 2021

Wisconsin Groundwater-Level Monitoring Network – Well Owner Document

Re: Landowner Property Access

Dear Mr. and Ms.

As part of the Wisconsin Groundwater-Level Monitoring Network (WGLMN), the Wisconsin Geological and Natural History Survey (WGNHS) looks forward to working with you to collect geological and groundwater data at St. Patrick's Cemetery (a.k.a., Canton Cemetery), owned by Tri-Parish. Collaboration by property owners such as Tri-Parish is essential to maintaining and strengthening the WGLMN for generations to come and we greatly appreciate your organization's willingness to participate as a partner.

The WGLMN is collaboratively operated, maintained, and managed by the WGNHS, Wisconsin Department of Natural Resources (WDNR), and U.S. Geological Survey's Upper Midwest Water Science Center (USGS). The WGLMN dates back to 1946 when the Wisconsin State Legislature formally established a groundwater-monitoring network. Water levels collected from the network help scientists and managers evaluate effects of well pumping, the response of groundwater levels to drought or increased precipitation, and effects of land-use change on groundwater resources. These data are also routinely used in the development of regional groundwater flow models, because long-term water-level measurements serve as reliable model calibration targets. More information about the WGLMN, including a link to an interactive map of network wells and a short video about the network can be found here: *https://wgnhs.wisc.edu/water-environment/groundwater-monitoring-network/*

This document seeks to establish clear lines of communication between Tri-Parish and the WGNHS (as well as our partners at the WDNR and USGS) and clarify the mutual responsibilities and expectations for well installation and data collection at St. Patrick's Cemetery. While not every situation can be anticipated, the following section provides an outline of joint responsibility and mutual expectation.

Wisconsin Geological and Natural History Survey
3817 Mineral Point Road Madison, WI 53705 608-262-1705 WGNHS.org
Kenneth R. Bradbury, Director and State Geologist

BF-188 Well owner document, 2021

Property access agreement, page 2 of 2

The WGNHS acknowledges that we (in coordination with the USGS) will:

- Inform you of site visits and serve as a point of contact regarding on-site activities and ongoing monitoring.
- Strive to clearly communicate the status of on-site activities and ongoing monitoring.
    - On-site activities may include basic reconnaissance, well drilling and installation, well maintenance, and data collection.
    - Routine visits will be performed on an as-needed basis but typically not more than monthly.
    - The most intensive activity occurs during the initial phase when the well is sited, Diggers Hotline confirms the location of utility lines, and the monitoring well and water level monitoring equipment is installed.
- Ensure ongoing operation and maintenance of the new monitoring well in coordination with the USGS.

As hosting property owner, you acknowledge that you:

- Have received information about the WGLMN and wish to volunteer your well for the collection of geologic and hydrogeologic data.
- Are the owner / operator of the property and, as such, have the authority to allow for the described activities on your land.
- Will not tamper with the well and any of the equipment installed as part of ongoing monitoring efforts.
- Will not be responsible for any costs associated with well installation or ongoing operation and maintenance of the new well.
- Will facilitate on-site activities to the best of your ability and communicate any specific requests or concerns directly to WGNHS and USGS staff.

If you have any questions or concerns, feel free to contact us directly by email or phone.

Sincerely,

Mike Parsen
Hydrogeologist
3817 Mineral Point Rd.
Madison, WI 53705
mike.parsen@wisc.edu
(608) 262-9419 (direct)

Pete Chase
Geotechnician
3817 Mineral Point Rd
Madison, WI 53705
pete.chase@wisc.edu
(608) 265-6003

Sarah Bremmer
Geoscientist
3817 Mineral Point Rd
Madison, WI 53705
sarah.bremmer@wisc.edu
(608) 265-5323

P.s. Contact information for our partners at WDNR and USGS is as follows:

Rob Waschbusch
USGS
Hydrologist
8505 Research Way
Middleton, WI 53562
rjwaschb@usgs.gov
608-821-3868

Nicole Clayton
WDNR
Water Supply Specialist
PO Box 7921
Madison, WI 53707
nicole.clayton@wisconsin.gov
(608) 266-9254

Page 2 of 2

Wisconsin Geological and Natural History Survey
DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN–MADISON

BF-188 WDNR soil boring form, 2023

Form 4400-122, page 1 of 1

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐ _____

Page 1 of 1

Facility/Project Name: Wisconsin Groundwater Monitoring Network	License/Permit/Monitoring Number: Notification# 9050863402	Boring Number: BF-188 6000188 New well	
Boring Drilled By: Name of crew chief (first, last) and Firm — First Name: David Last Name: Beecroft — Firm: DMB Drilling Co. Inc.	Date Drilling Started: 06/14/2023	Date Drilling Completed: 06/14/2023	Drilling Method: 10" Mud rotary to 40' 6" Air rotary to TD
WI Unique Well No.: ABA923	DNR Well ID No.:	Well Name:	Final Static Water Level: 35'/TOC Feet MSL	Surface Elevation: (land) 884.27 Feet MSL	Borehole Diameter: 10/6 inches
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒ — 44.5721 N, -91.7829	Lat	Long	Local Grid Location: _____ Feet ☐ N ☐ S _____ Feet ☐ E ☐ W		
Facility ID	County: Buffalo	County Code: 06	Civil Town/City/ or Village: Tn. of Canton		

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
Grab Each 5ft 16 total samples			0-17	SANDY SILT 85% fines 15% f-m sand, slightly plastic, moist, brown to red-brown ALLUVIUM										
			17-82.7	SANDSTONE,w/shale layers, soft, non caving, f-c sand, yellow brown Shaley 65-70 ft. ELK MOUND GRP										
				END OF BORING 80' 82.7 ft./Top of Casing										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Peter M. Chase P.G. Firm: Wisconsin Geological and Natrual History Survey

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

Appendix 3: Well DN-05 documents

Historical Documents

DN-05 Geologic log, pre-1875
1 page

DN-05 Basic well information, 1981
Well information historically compiled by WGNHS**,** 1 page

DN-05 Well location map, date unknown
Well information historically compiled by WGNHS, 1 page

DN-05 Well image, date unknown
Well information historically compiled by WGNHS, 1 page

DN-05 Water-level data, 1986-2005
Well information historically compiled by WGNHS, 2 pages

DN-05 Geologic log, pre-1875

Dn-5

State Capitol Well

pre-1875

SE¼, NE¼, NE¼, NE¼, NE¼, NE¼, sec. 23, T7N, R9E

Elevation = 930'ETM

[from page 50, Geology of Wisconsin, Vol. II.]

REGISTER OF THE ARTESIAN WELL IN THE CAPITOL PARK, MADISON.

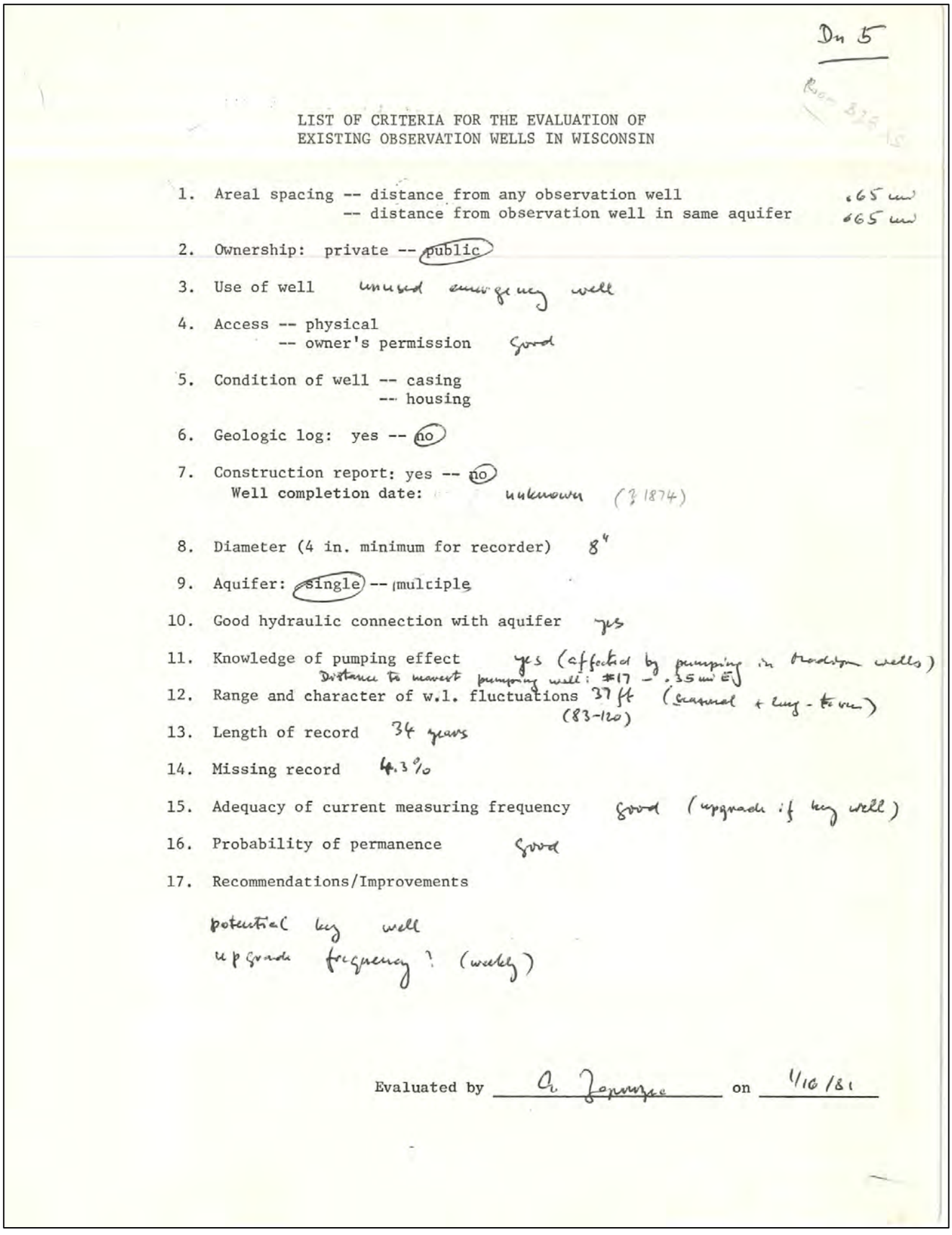
Above level of the Ocean.		Thickness.	Depth from Surface.	Above level of Lake Michigan.
	SOIL.			
926	Top of well			348
918	Soil and clay	8	8	340
	DRIFT.			
858	Sand and boulders	60	68	280
846	Gravel	12	80	268
829	Clay and laminated rock	17	97	251
824	Grayish-brown rock (boulder?)	5	102	246
804	Indurated clay (quite compact)	20	122	226
800	Rock (boulder?)	4	126	222
	POTSDAM SANDSTONE.*			
745	Sandstone gravel, quite loose, white and yellow, no cement or coherence	55	181	167
671	Loose, white, uncemented sand, with layers of yellow sand	74	255	93
661	Bottom of tubing	10	265	83
166	White sandrock, grains sharp, but always somewhat rounded, with occasional layers of grayish color, the whole cemented sufficiently to preserve the sides of the well. Sample from 700 feet below surface showed under microscope very much rounded grains of limpid quartz, some perfectly pure, some stained in spots with oxide of iron	495	760	—412
131	White quartz sandrock of finer grain, mixed with a substance resembling porcelain	35	795	—447
122	Red clay-like powder, very slightly gritty, under highest power appears to be mostly very fine quartz sand.	9	804	—456
120½	Coarse, dark, reddish-brown powder, mostly very much rounded quartz grains, but mingled with some dark, opaque grains also rounded, belonging therefore with the mechanical rocks	1½	805½	—457½
	ARCHÆAN.			
98	Dark gravish mixed rock, very hard to drill, coming up in quite large fragments all angular; carries patches of a greenish cleavable mineral; sp. gr. of rock, 2.76; hardness, 5; fuses at about 3 to a black bead. The included mineral (prehnite) is cleavable and semi-translucent, and fusible at 3.5 to 4 to a white enamel	22½	828	—480
—89	Crystalline rocks (work suspended)	187	1015	—667

* Possibly this should stand next before the gravel, depth 80 feet

Well is located in Room 43S of the State Capitol.

DN-05 Basic well information, 1981

Well information historically compiled by WGNHS, page 1 of 1



Dn 5

LIST OF CRITERIA FOR THE EVALUATION OF
EXISTING OBSERVATION WELLS IN WISCONSIN

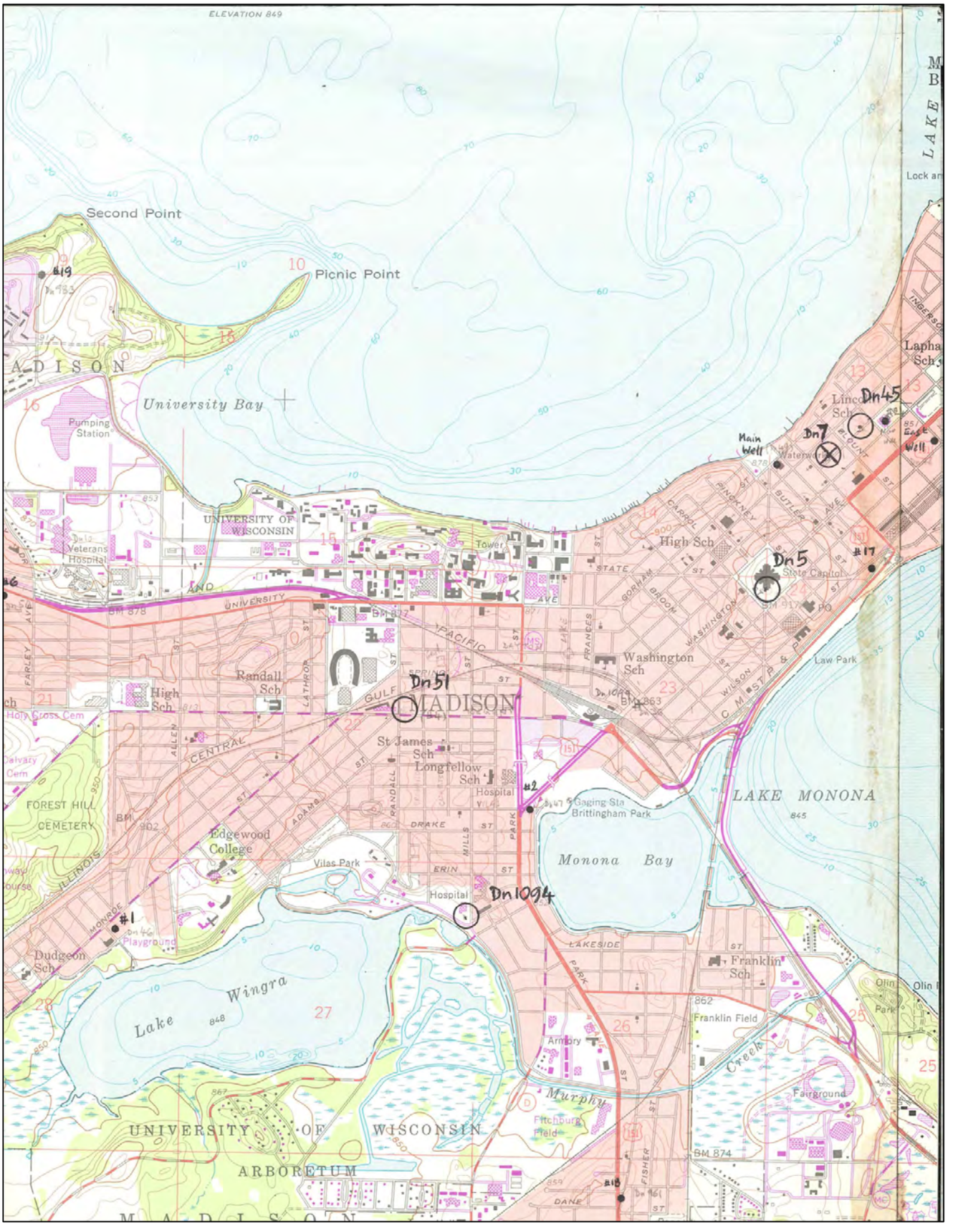
1. Areal spacing -- distance from any observation well .65 mi
   -- distance from observation well in same aquifer .65 mi
2. Ownership: private -- (public)
3. Use of well unused emergency well
4. Access -- physical
   -- owner's permission Good
5. Condition of well -- casing
   -- housing
6. Geologic log: yes -- (no)
7. Construction report: yes -- (no)
   Well completion date: unknown (? 1874)
8. Diameter (4 in. minimum for recorder) 8"
9. Aquifer: (single) -- multiple
10. Good hydraulic connection with aquifer yes
11. Knowledge of pumping effect yes (affected by pumping in Brookfield wells)
    Distance to nearest pumping well: #17 - .35 mi E
12. Range and character of w.l. fluctuations 37 ft (Seasonal + long-term)
    (83-120)
13. Length of record 34 years
14. Missing record 4.3%
15. Adequacy of current measuring frequency Good (upgrade if key well)
16. Probability of permanence Good
17. Recommendations/Improvements

potential key well
upgrade frequency? (weekly)

Evaluated by A. Zaporozec on 1/16/81

DN-05 Well location map, date unknown

Well information historically compiled by WGNHS, page 1 of 1

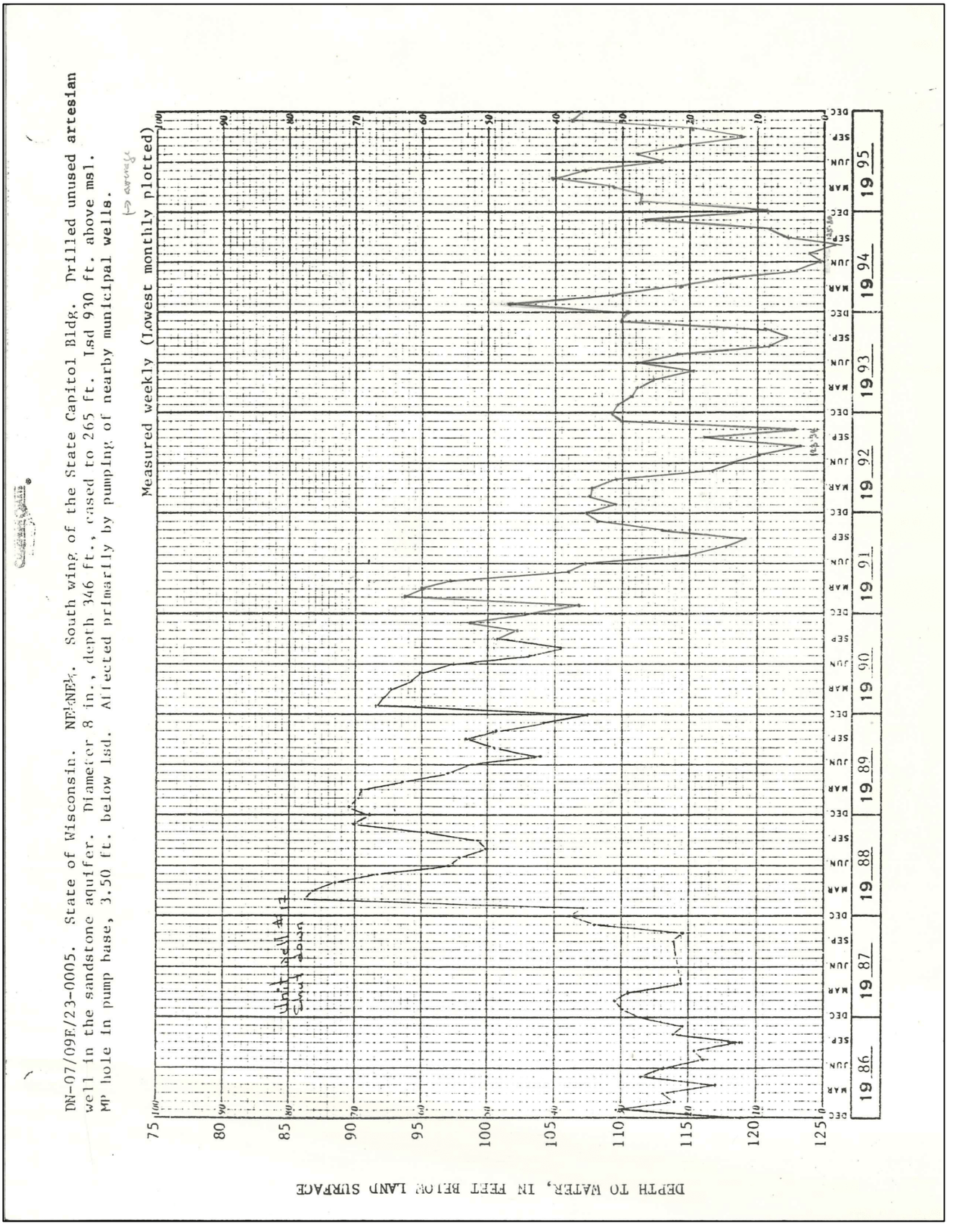


DN-05 Well image, date unknown

Well information historically compiled by WGNHS, page 1 of 1

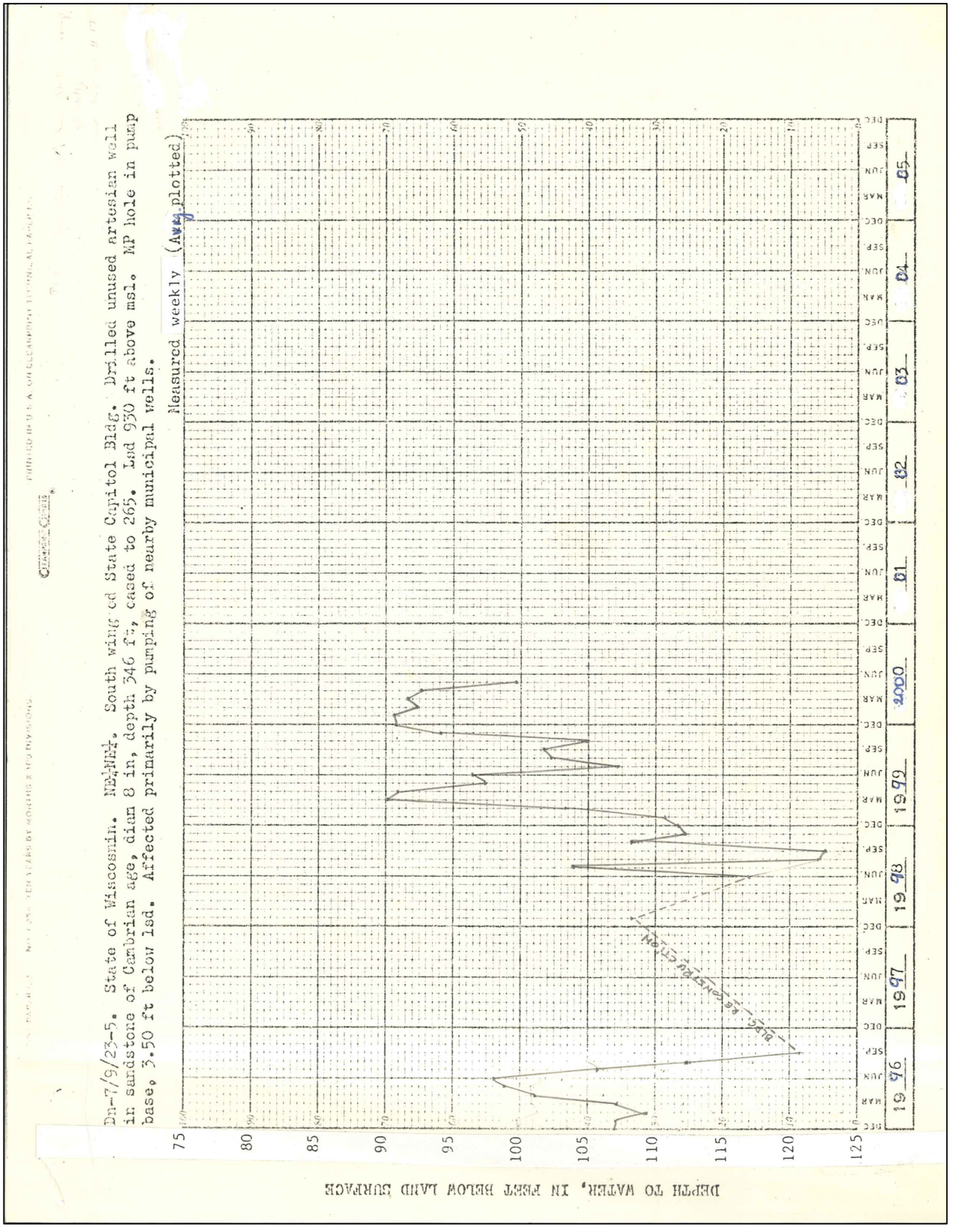
DN-05 Water-level data, 1986-2005

Well information historically compiled by WGNHS, page 1 of 2



DN-05 Water-level data, 1986-2005

Well information historically compiled by WGNHS, page 2 of 2



Appendix 4: Well DN-64 documents

Historical Documents

DN-64 Basic well information, 1981
Well information historically compiled by WGNHS, 1 page

DN-64 Well location maps, date unknown
Well information historically compiled by WGNHS, 2 pages

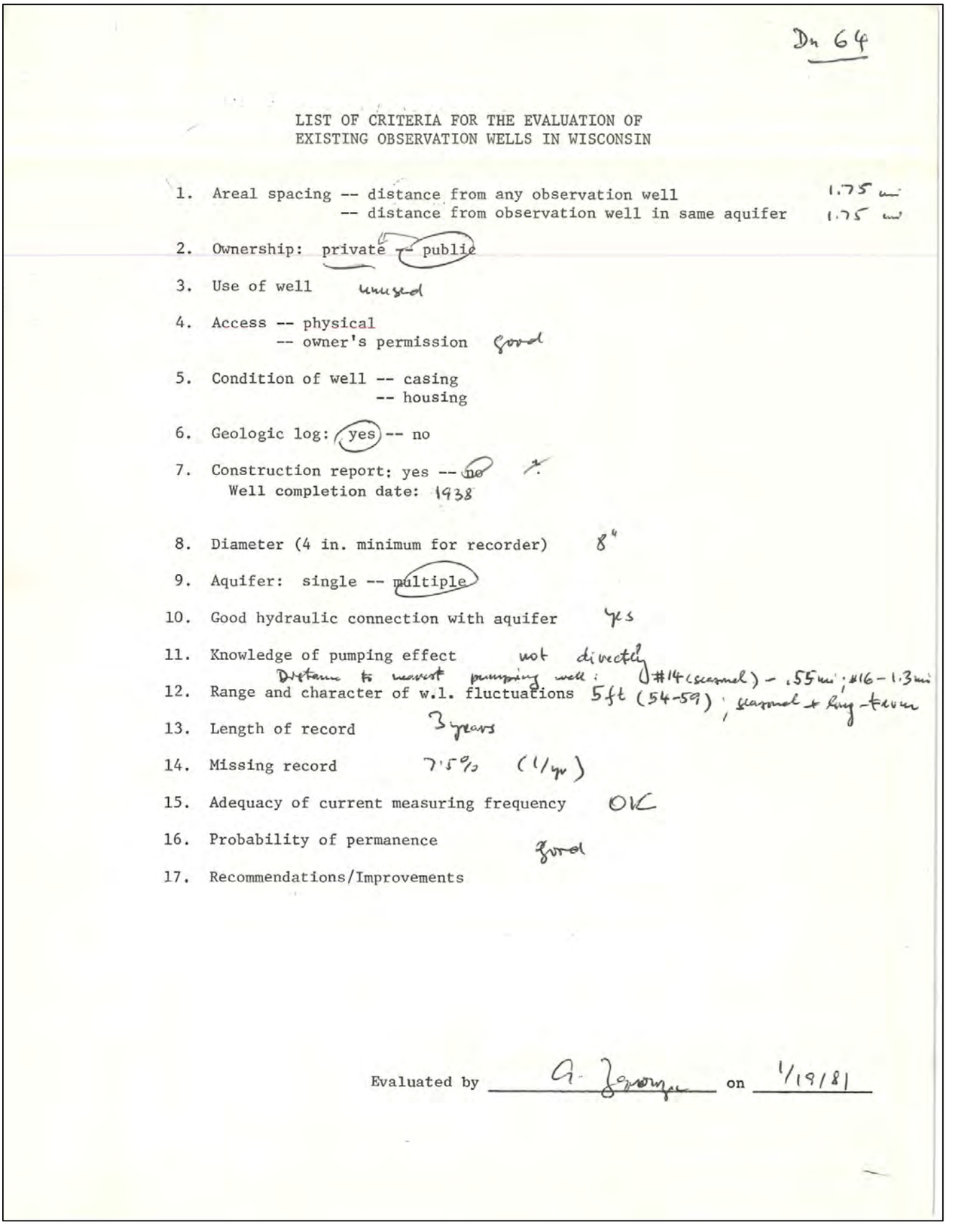
DN-64 Water-level data, 1971-1980
Well information historically compiled by WGNHS, 1 page

DN-64 Water-level data, 1981-1990
Well information historically compiled by WGNHS, 1 page

DN-64 Geologic log and report, 1938
3 pages

DN-64 Basic well information, 1981

Well information historically compiled by WGNHS, page 1 of 1



Dn 64

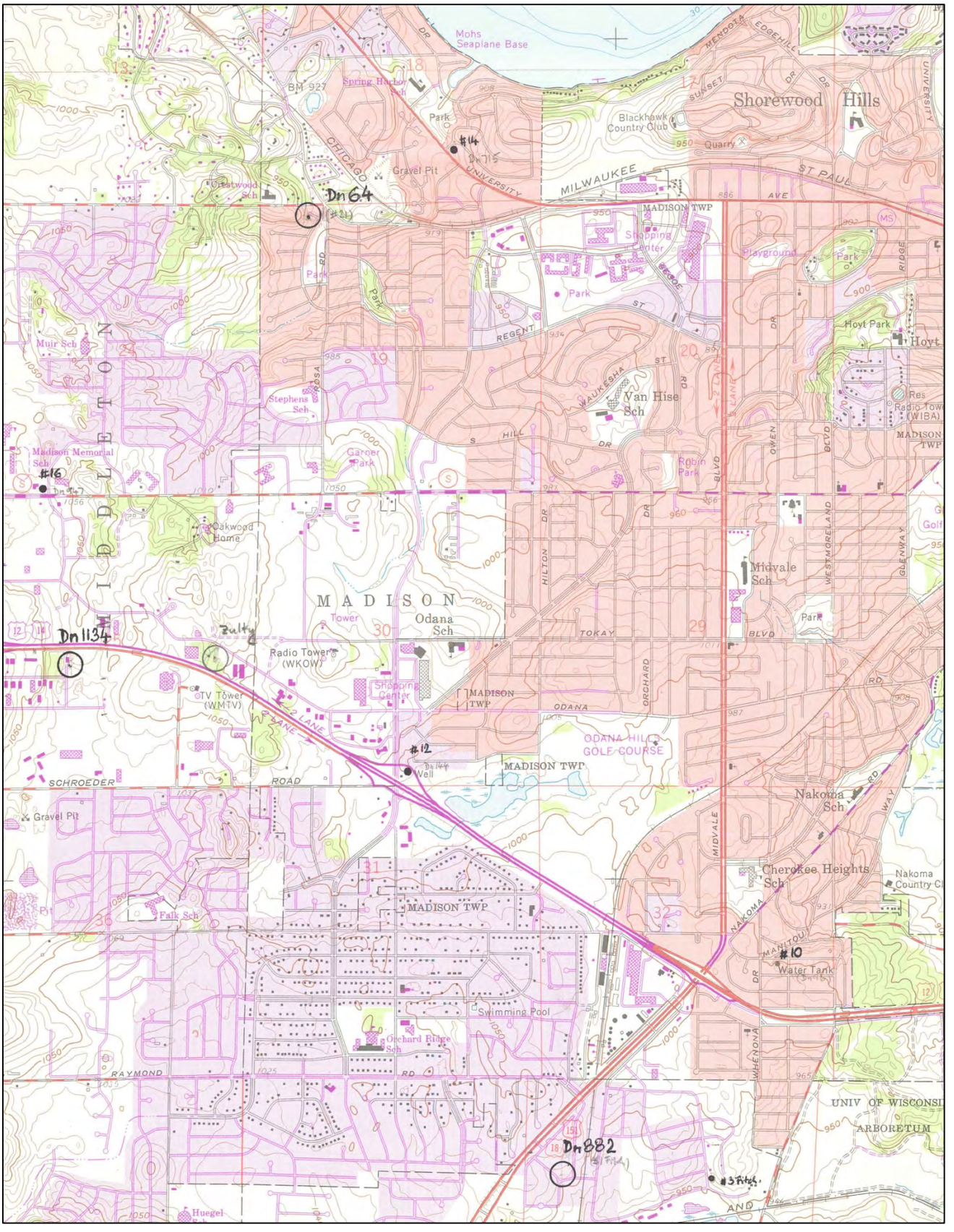
LIST OF CRITERIA FOR THE EVALUATION OF
EXISTING OBSERVATION WELLS IN WISCONSIN

1. Areal spacing -- distance from any observation well 1.75 mi
   -- distance from observation well in same aquifer 1.75 mi
2. Ownership: private -- public
3. Use of well unused
4. Access -- physical
   -- owner's permission good
5. Condition of well -- casing
   -- housing
6. Geologic log: yes -- no
7. Construction report: yes -- no *
   Well completion date: 1938
8. Diameter (4 in. minimum for recorder) 8"
9. Aquifer: single -- multiple
10. Good hydraulic connection with aquifer yes
11. Knowledge of pumping effect not directly
    Distance to nearest pumping well: #14 (seasonal) - .55 mi; #16 - 1.3 mi
12. Range and character of w.l. fluctuations 5 ft (54-59); seasonal + long-term
13. Length of record 3 years
14. Missing record 7.5% (1/yr)
15. Adequacy of current measuring frequency OK
16. Probability of permanence good
17. Recommendations/Improvements

Evaluated by G. Jorgensen on 1/19/81

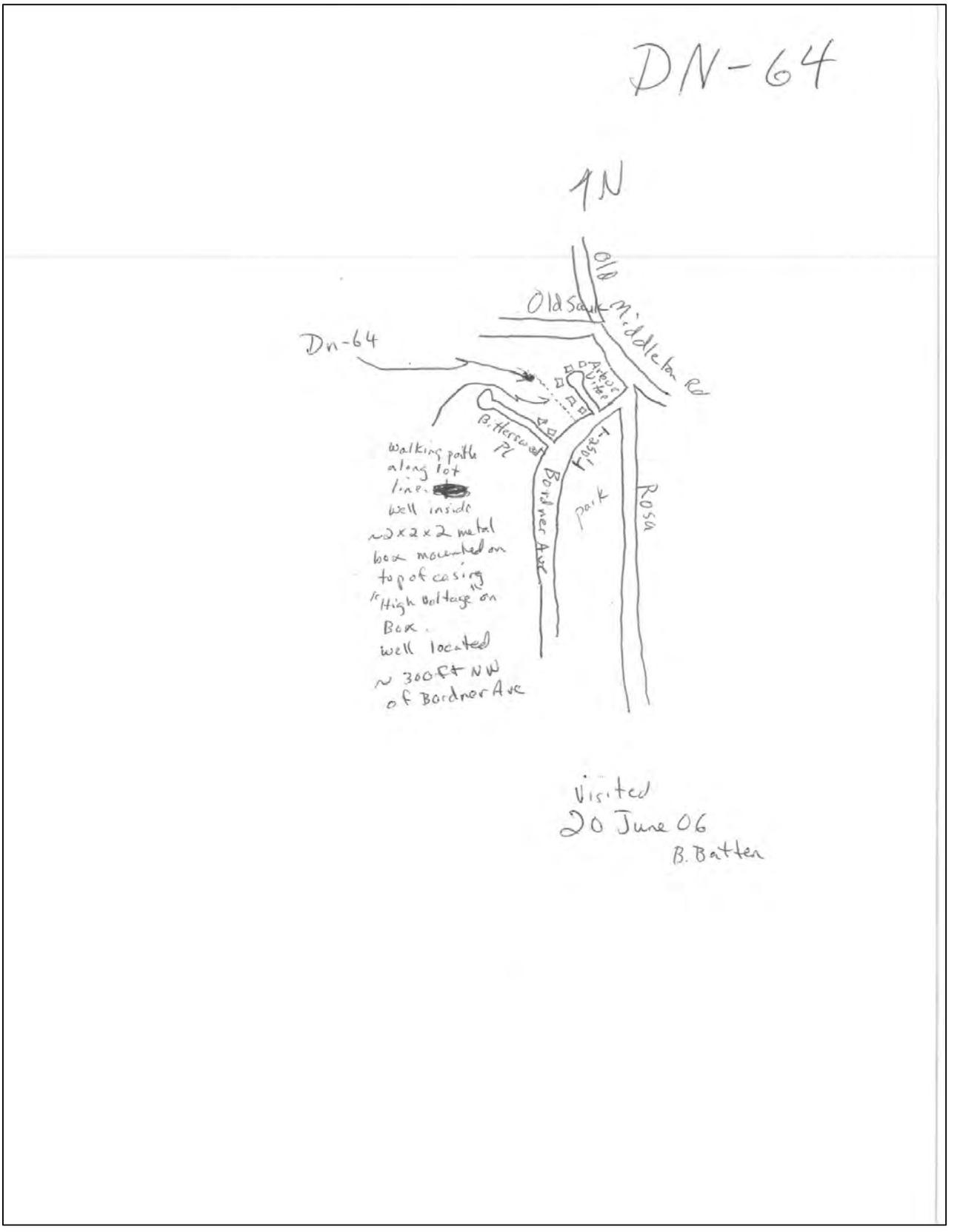
DN-64 Well location maps, date unknown

Well information historically compiled by WGNHS, page 1 of 2



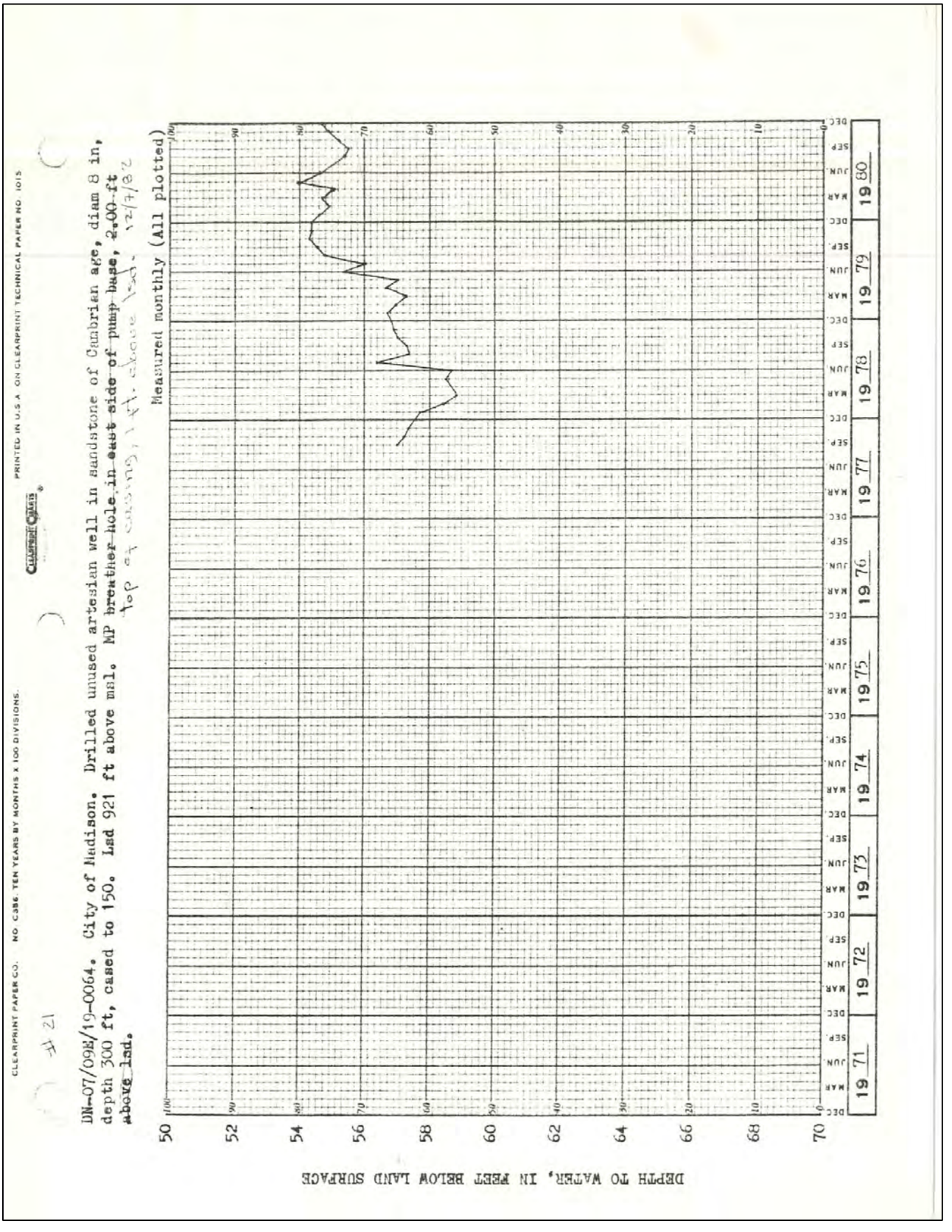
DN-64 Well location maps, date unknown

Well information historically compiled by WGNHS, page 2 of 2



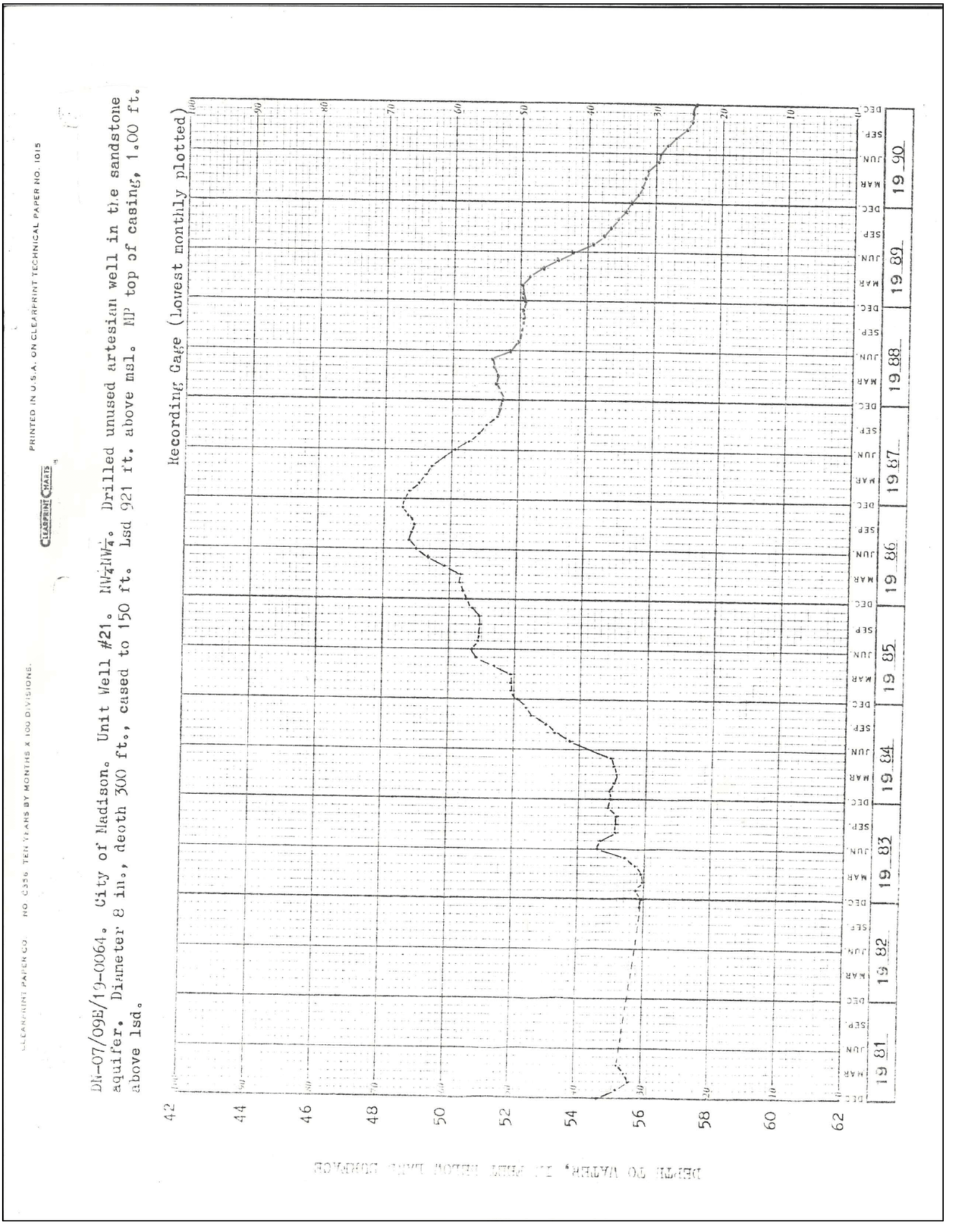
DN-64 Water-level data, 1971-1980

Well information historically compiled by WGNHS, page 1 of 1



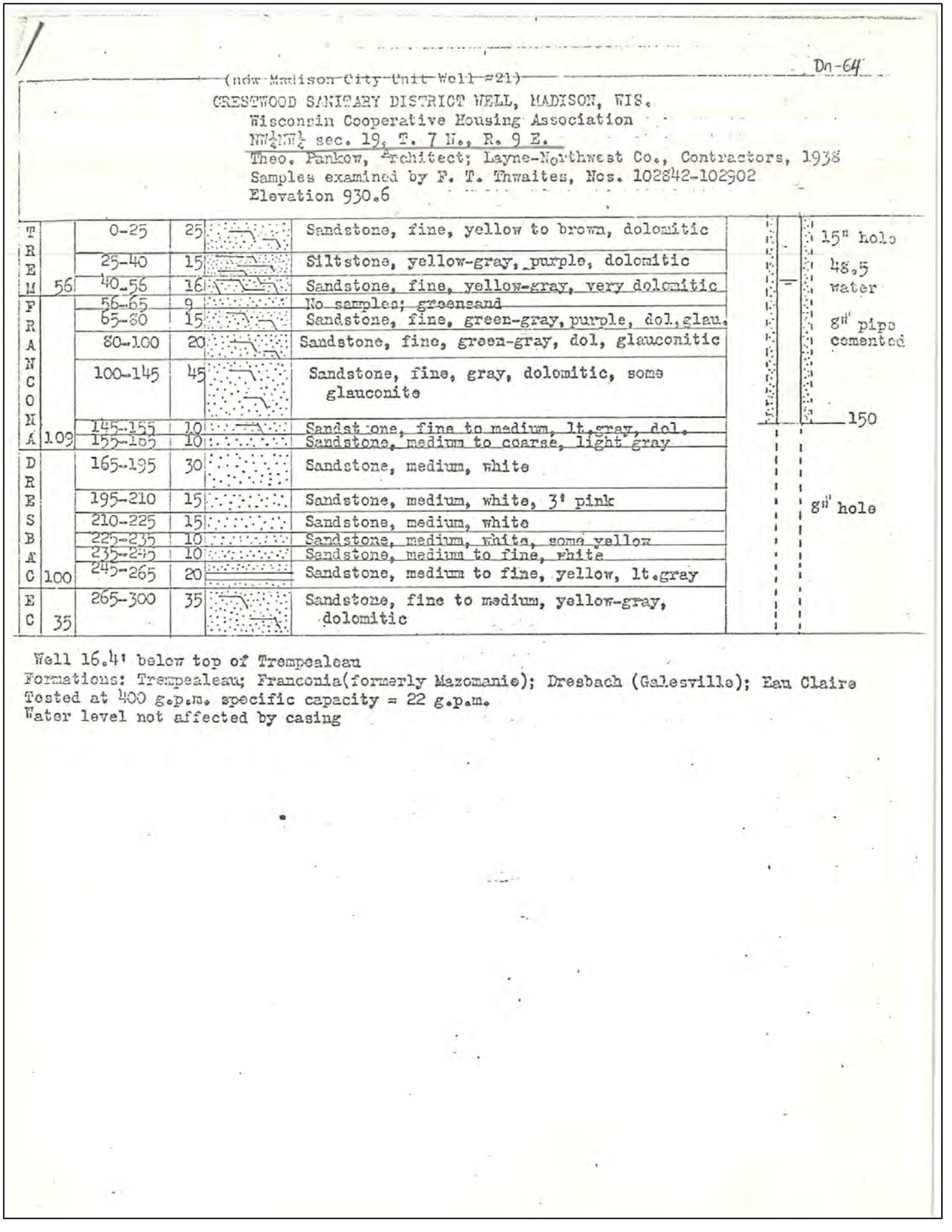
DN-64 Water-level data, 1981-1990

Well information historically compiled by WGNHS, page 1 of 1



DN-64 Geologic log and report, 1938

Page 1 of 3



Dn-64

(now Madison City Unit Well #21)

CRESTWOOD SANITARY DISTRICT WELL, MADISON, WIS.
Wisconsin Cooperative Housing Association
NW¼NW¼ sec. 19, T. 7 N., R. 9 E.
Theo. Pankow, Architect; Layne-Northwest Co., Contractors, 1938
Samples examined by F. T. Thwaites, Nos. 102842-102902
Elevation 930.6

TREMPEALEAU	56	0-25	25		Sandstone, fine, yellow to brown, dolomitic
		25-40	15		Siltstone, yellow-gray, purple, dolomitic
		40-56	16		Sandstone, fine, yellow-gray, very dolomitic
FRANCONIA	109	56-65	9		No samples; greensand
		65-80	15		Sandstone, fine, green-gray, purple, dol., glau.
		80-100	20		Sandstone, fine, green-gray, dol, glauconitic
		100-145	45		Sandstone, fine, gray, dolomitic, some glauconite
		145-155	10		Sandstone, fine to medium, lt.gray, dol.
		155-165	10		Sandstone, medium to coarse, light gray
DRESBACH	100	165-195	30		Sandstone, medium, white
		195-210	15		Sandstone, medium, white, 3' pink
		210-225	15		Sandstone, medium, white
		225-235	10		Sandstone, medium, white, some yellow
		235-245	10		Sandstone, medium to fine, white
		245-265	20		Sandstone, medium to fine, yellow, lt.gray
EC	35	265-300	35		Sandstone, fine to medium, yellow-gray, dolomitic

15" hole
48.5 water
8" pipe cemented
150
8" hole

Well 16.4' below top of Trempealeau
Formations: Trempealeau; Franconia(formerly Mazomanie); Dresbach (Galesville); Eau Claire
Tested at 400 g.p.m. specific capacity = 22 g.p.m.
Water level not affected by casing

DN-64 Geologic log and report, date unknown

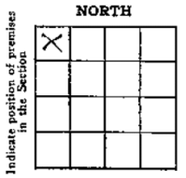
Page 2 of 3

PREMISES DIAGRAM

(See Rules)

Draw a representative sketch of the premises on which this well is located, showing the location of the well with reference to buildings and possible sources of pollution. Indicate the condition of the surroundings by printing descriptive words like high, low, level, slope, lake, river, swamp, forest meadow, barnyard, cesspool, privy, sewer, etc., at their respective locations and show distance from the well on the sketch. Also show direction of the compass. See Part III for specimen Diagram.

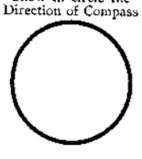
REMARKS:



This well is drilled in an old quarry bed — elev 930.6
Top of well 16.4' below top of Trempealeau

Sec 12 T 7N R 9 (E) [redacted] (Each division equals 10') (If more or less indicate: .....)

Show in circle the Direction of Compass

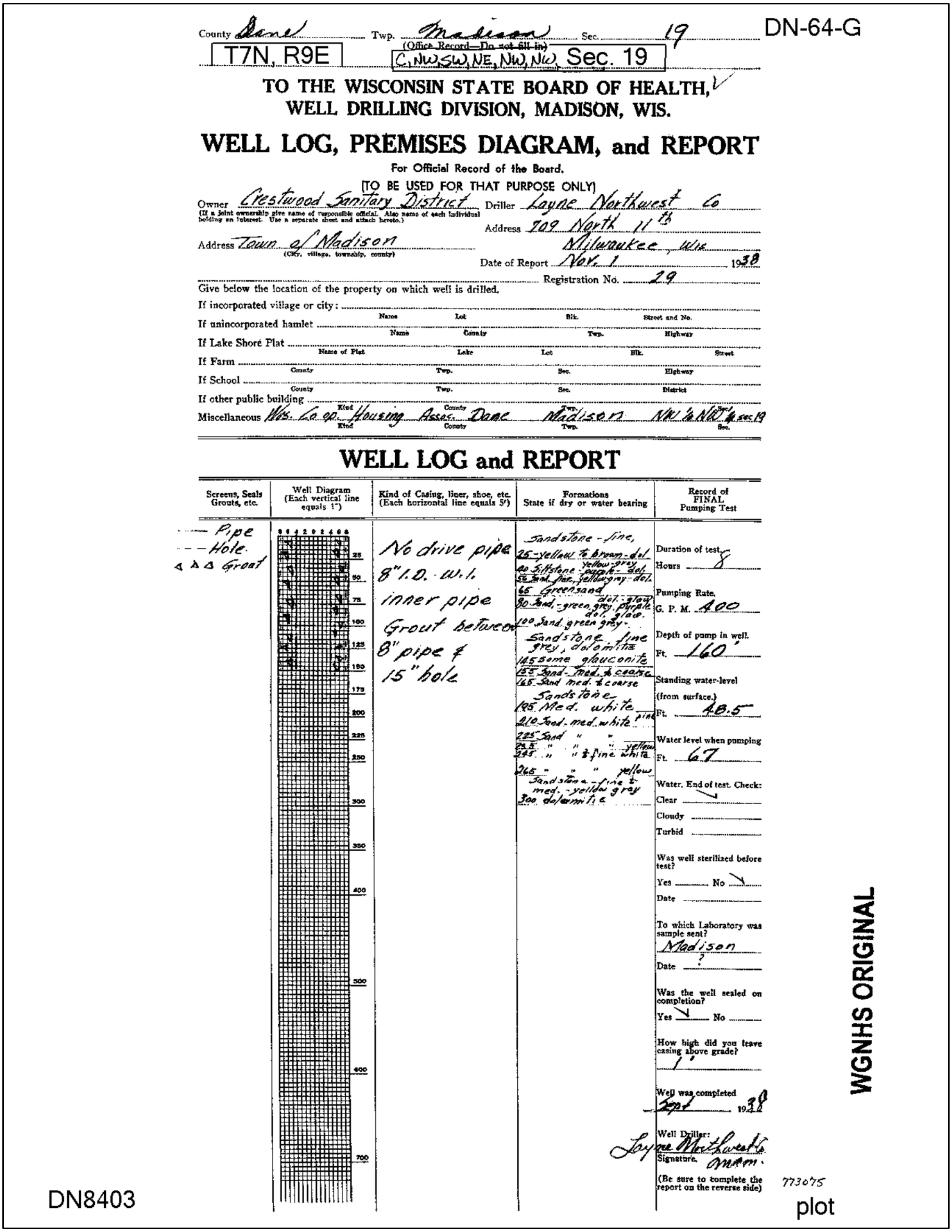


Note: Additional copies of this form may be obtained at 5c per copy in lots of 10 or more. Send remittance with order to State Board of Health, Well Drilling Division, Madison.

DN8403_2

DN-64 Geologic log and report, 1938

Page 3 of 3



County Dane Twp. Madison Sec. 19 DN-64-G

T7N, R9E (Office Record—Do not fill in) C, NW, SW, NE, NW, NW, Sec. 19

TO THE WISCONSIN STATE BOARD OF HEALTH,
WELL DRILLING DIVISION, MADISON, WIS.

WELL LOG, PREMISES DIAGRAM, and REPORT

For Official Record of the Board.
(TO BE USED FOR THAT PURPOSE ONLY)

Owner Crestwood Sanitary District (If a joint ownership give name of responsible official. Also name of each individual holding an interest. Use a separate sheet and attach hereto.)
Driller Layne Northwest Co
Address 709 North 11th Milwaukee, Wis
Address Town of Madison (City, village, township, county)
Date of Report Nov. 1 1938
Registration No. 29

Give below the location of the property on which well is drilled.
If incorporated village or city: Name Lot Blk. Street and No.
If unincorporated hamlet Name County Twp. Highway
If Lake Shore Plat Name of Plat Lake Lot Blk. Street
If Farm County Twp. Sec. Highway
If School County Twp. Sec. District
If other public building Kind County Twp.
Miscellaneous Wis. Co op. Housing Assoc. Dane Madison NW ¼ NW ¼ sec 19 (Kind, County, Twp., Sec.)

WELL LOG and REPORT

Screens, Seals Grouts, etc.	Well Diagram (Each vertical line equals 1")	Kind of Casing, liner, shoe, etc. (Each horizontal line equals 5')	Formations State if dry or water bearing	Record of FINAL Pumping Test
--- Pipe --- Hole ΔΔΔ Grout	25, 50, 75, 100, 125, 150, 175, 200, 225, 250, 300, 350, 400, 500, 600, 700	No drive pipe 8" I.D. w.i. inner pipe Grout between 8" pipe & 15" hole	Sandstone - fine, 25 - yellow to brown - dol. 40 Siltstone yellow-grey purple - dol. 50 Sand fine, yellow-grey - dol. 65 Greensand 80 Sand, - green, grey, purple dol. - glau. dol. glau. 100 Sand green grey. Sandstone fine grey, dolomitic 145 some glauconite 155 Sand - med. & coarse 165 Sand med. & coarse Sandstone 195 Med. white 210 Sand - med. white pink 225 Sand " " 235 " " " yellow 245 " " & fine white 265 " " " yellow Sandstone - fine & med. - yellow grey 300 dolomitic	Duration of test, Hours 8 Pumping Rate, G. P. M. 400 Depth of pump in well. Ft. 160' Standing water-level (from surface.) Ft. 48.5 Water level when pumping Ft. 67 Water. End of test. Check: Clear ✓ Cloudy Turbid Was well sterilized before test? Yes No ✓ Date To which Laboratory was sample sent? Madison Date ? Was the well sealed on completion? Yes ✓ No How high did you leave casing above grade? 1' Well was completed Sept 1938 Well Driller: Layne Northwest Co Signature. mam. (Be sure to complete the report on the reverse side)

WGNHS ORIGINAL

DN8403

773075

plot

Appendix 5: Well DN-83 documents

Historical Documents

DN-83 Well construction report, 1948
Two copies submitted by driller that are slightly different, 2 pages

DN-83 Well evaluation, 1981
Well information historically compiled by WGNHS, 1 page

DN-83 Well location map, date unknown
Well information historically compiled by WGNHS, 1 page

DN-83 Historic water-level data 1983-1992
well information historically compiled by WGNHS, 1 page

DN-83 Geologic log, 1948
Well information historically compiled by WGNHS, 1 page

Documentation of work done for this report

DN-83 WDNR groundwater monitoring station easement, 2021
Form 2200-118, 9 pages

DN-83 Well construction report, 1948

Two copies submitted by driller that are slightly different, page 1 of 2

DN-83-G

RECEIVED
JAN 5 1948
BUREAU
SAN. ENG.

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH
See Instructions on Reverse Side

DN-83-G

1. County Dane — Town ☒ / Village ☐ / City ☐ Mazomanie (Check one and give name)

2. Location T 9 N R 6 E. NE,SE,SE, Sec. 29
Name of street and number of premise or Sec. Tn. and R. numbers

3. Owner ☐ or Agent ☒ Wisc. Conservation Dept.
Name of individual, partnership or firm

4. Mail Address Poynette Wisc.
Complete address required

5. From well to nearest: Building 6 ft; sewer ____ ft; drain ____ ft; septic tank ____ ft; dry well or filter bed ____ ft; abandoned well ____ ft.

6. Well is intended to supply water for: Game Farm

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)
6	0	146

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind	From (ft.)	To (ft.)
6	Steel	0	136

9. GROUT:

Kind	From (ft.)	To (ft.)

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Topsoil	0	4
Sand & Gravel	4	146
6" Johnson Everdur Screen		
10 ' set 136 - 146		

11. MISCELLANEOUS DATA:

Yield test: ____ Hrs. at ____ GPM.

Depth from surface to water: 8 ft.

Water-level when pumping: 8 ft.

Water sample sent to laboratory at ____ on ____ 19____

Uncompleted

Signature Geo. Reynolds & Son
Registered Well Driller
Clayton L Reynolds

Construction of the well was completed on Oct. 10 19 48

The well is terminated ____ inches ☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion? Yes X No ____

Was the well sealed watertight upon completion? Yes X No ____

Portage Wisc.
Complete Mail Address

DN12548

870014 plot

DN-83 Well construction report, 1948

Two copies submitted by driller that are slightly different, page 2 of 2

Dn 83

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH
See Instructions on Reverse Side

1. County Dane { Town ☒ / Village ☐ / City ☐ } Mazomanie
Check one and give name

2. Location _____
Name of street and number of premise or Sec. Tn. and R. numbers

3. Owner ☐ or Agent ☒ Wisc. Conservation Dept.
Name of individual, partnership or firm

4. Mail Address Poynette Wisc.
Complete address required

5. From well to nearest: Building 6 ft; sewer ____ ft; drain ____ ft; septic tank ____ ft; dry well or filter bed ____ ft; abandoned well ____ ft.

6. Well is intended to supply water for: Game Farm

RECEIVED 1948 OCT 26 AM 8 28 PUBLIC SERVICE COMM. OF WISCONSIN

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)
6	0	146

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind	From (ft.)	To (ft.)
6	Steel	0	136

9. GROUT:

Kind	From (ft.)	To (ft.)

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Topsoil	0	4
Sand & Gravel	4	146
6" Johnson Everdur Screen		
10 ' set 136 - 146		

11. MISCELLANEOUS DATA:

Yield test: ____ Hrs. at 8 GPM.

Depth from surface to water: 8 ft.

Water-level when pumping: ____ ft.

Water sample sent to laboratory at Uncompleted on ____ 19__

Construction of the well was completed on Oct. 10 19 48

The well is terminated ____ inches ☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion? X Yes ____ No ____

Was the well sealed watertight upon completion? X Yes ____ No ____

Signature Registered Well Drillers & Son

Portage
Complete Mail Address

(Owner's Copy)

DN-83 Well evaluation, 1981

Well information historically compiled by WGNHS, page 1 of 1

Dn 83

LIST OF CRITERIA FOR THE EVALUATION OF
EXISTING OBSERVATION WELLS IN WISCONSIN

1. Areal spacing -- distance from any observation well 8.5 mi
   -- distance from observation well in same aquifer 34.0 mi
2. Ownership: private -- (public)
3. Use of well unused domestic well
4. Access -- physical
   -- owner's permission
5. Condition of well -- casing
   -- housing
6. Geologic log: (yes) -- no
7. Construction report: (yes) -- no
   Well completion date: 10/10/48
8. Diameter (4 in. minimum for recorder) 6"
9. Aquifer: (single) -- multiple
10. Good hydraulic connection with aquifer yes
11. Knowledge of pumping effect no
12. Range and character of w.l. fluctuations 5ft (7-12); large fluct.
13. Length of record 24 years
14. Missing record 29% — very poor record, measured only 8 times
15. Adequacy of current measuring frequency improve !! 4 year!
16. Probability of permanence good
17. Recommendations/Improvements

— improve the regularity of measurements
— install recorder (from Dn 143)

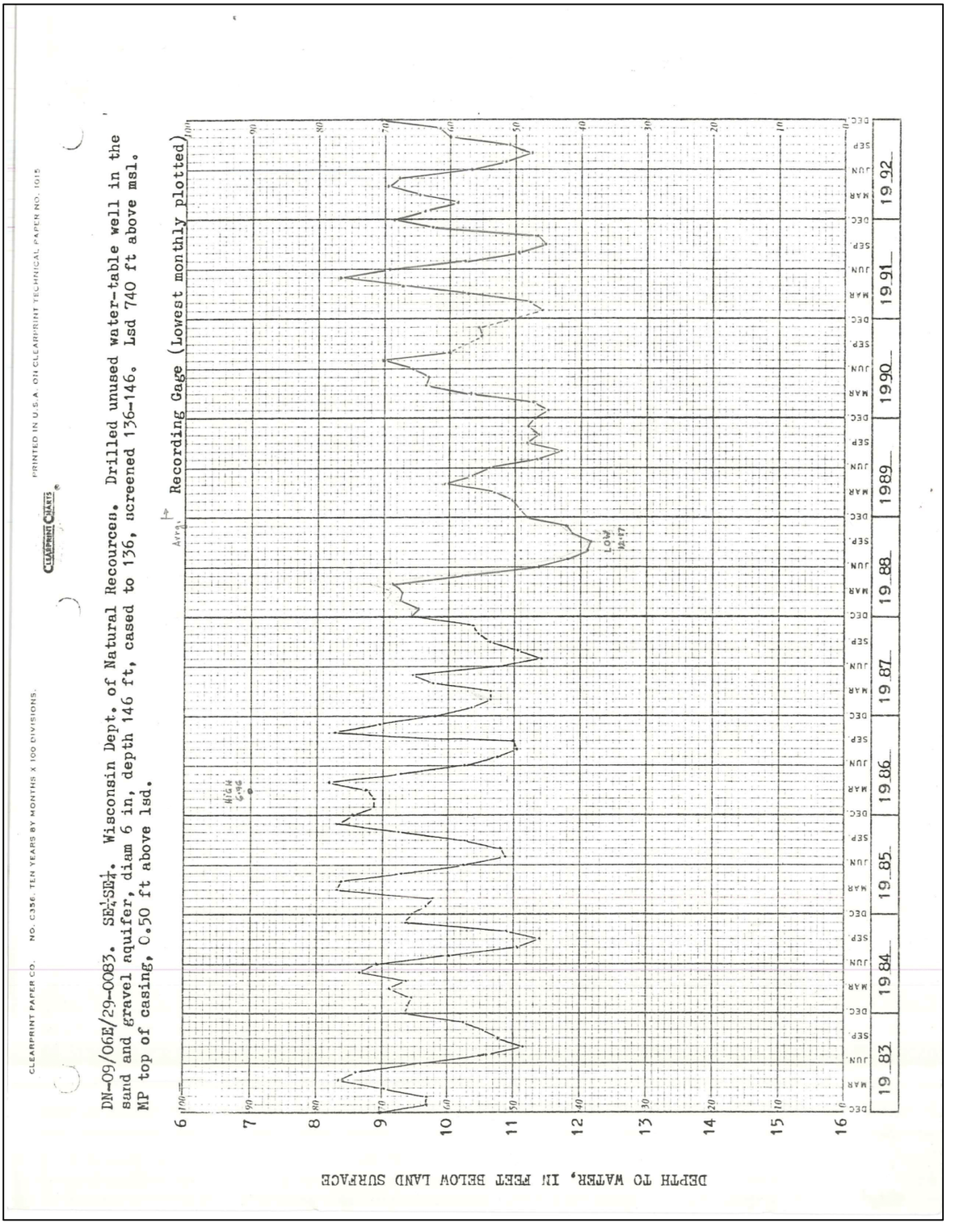
Evaluated by A. Zaporozec on 2/27/81

DN-83 Well location map, date unknown

Page 1 of 1

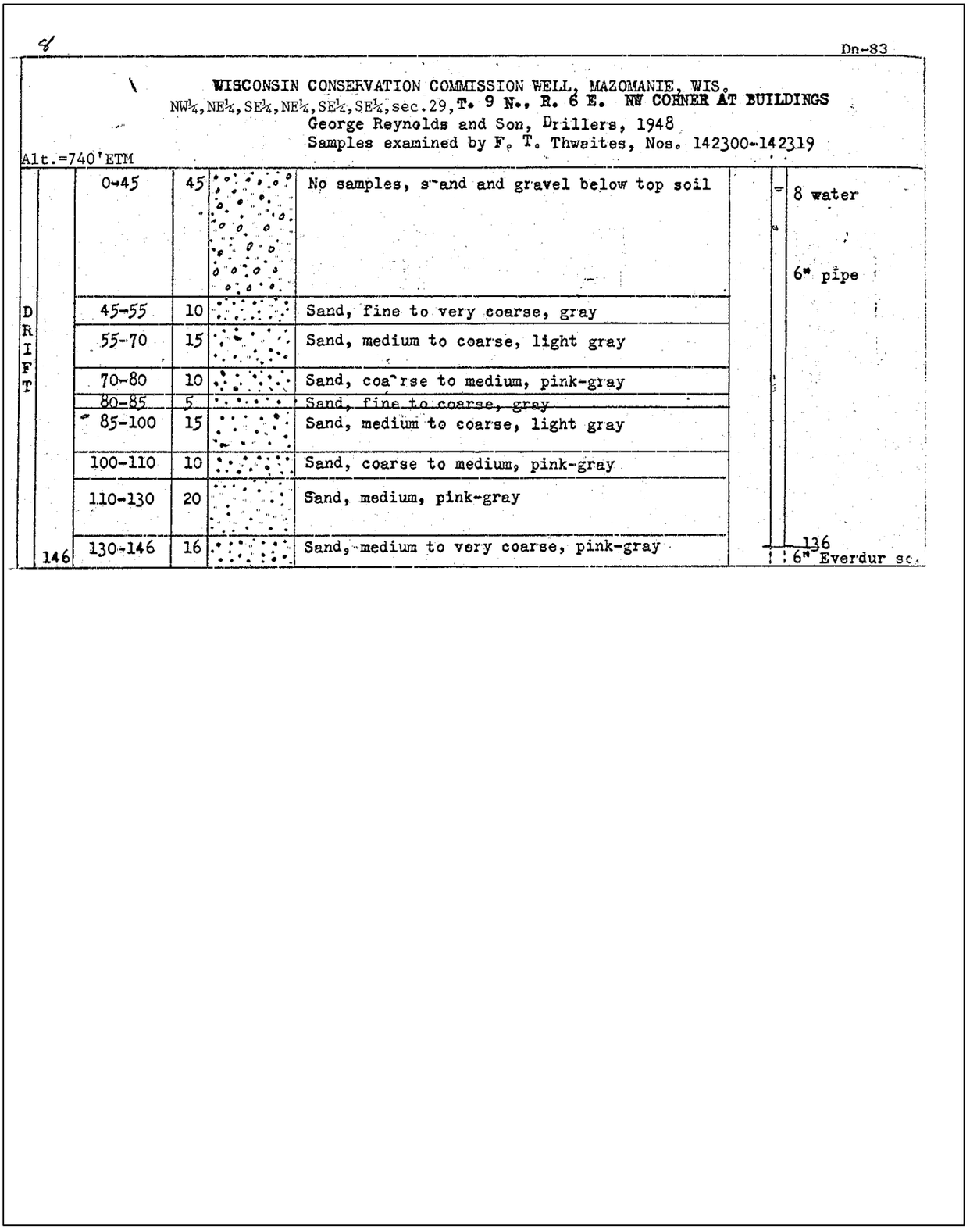
DN-83 Historic water-level data, 1983-1992

Well information historically compiled by WGNHS, page 1 of 1



DN-83 Geologic log, 1948

Well information historically compiled by WGNHS, page 1 of 1



4

Dn-83

WISCONSIN CONSERVATION COMMISSION WELL, MAZOMANIE, WIS.
NW¼,NE¼,SE¼,NE¼,SE¼,SE¼,sec.29,T. 9 N., R. 6 E. NW CORNER AT BUILDINGS
George Reynolds and Son, Drillers, 1948
Samples examined by F. T. Thwaites, Nos. 142300-142319

Alt.=740'ETM

DRIFT		0-45	45	No samples, sand and gravel below top soil	8 water; 6" pipe
		45-55	10	Sand, fine to very coarse, gray	
		55-70	15	Sand, medium to coarse, light gray	
		70-80	10	Sand, coarse to medium, pink-gray	
		80-85	5	Sand, fine to coarse, gray	
		85-100	15	Sand, medium to coarse, light gray	
		100-110	10	Sand, coarse to medium, pink-gray	
		110-130	20	Sand, medium, pink-gray	
	146	130-146	16	Sand, medium to very coarse, pink-gray	136; 6" Everdur sc.

DN-83 WDNR groundwater monitoring station easement, 2021

Form 2200-118, page 1 of 9

Document Number	Document Title

State of Wisconsin
Department of Natural Resources
Box 7921
Madison, WI 53707

GROUNDWATER MONITORING STATION EASEMENT
Section 23.09(2), Wis. Stats.
Form 2200-118

KRISTI CHLEBOWSKI
DANE COUNTY
REGISTER OF DEEDS

DOCUMENT #
5697615
02/23/2021 12:01 PM
Trans Fee:
Exempt #:
Rec. Fee: 30.00
Pages: 9
The above recording information verifies that this document has been electronically recorded and returned to the submitter.

Recording Area
Return: Department of Natural Resources
Bureau of Facilities & Land - LF/6
P.O. Box 7921
Madison, WI 53707-7921
Attn: Bill Peterson (CE 9925)

Parcel Identification Number (PIN):
034/0906-294-95003

THIS GROUNDWATER MONITORING STATION EASEMENT ("Easement") made by and between the State of Wisconsin Department of Natural Resources ("Grantor"), and the U.S. Department of the Interior, U.S. Department of Geological Survey and Wisconsin Geological and Natural History Survey – University of Wisconsin - Madison ("Collectively Grantee").

RECITALS

WHEREAS, the Grantor and Grantee are entering into an agreement to cooperatively collect long-term groundwater levels in order to fulfill the Grantor's requirement to regulate high-capacity wells under s. 281.34, Wis. Stats., and Chapter NR 820, Wis. Adm. Code, and its responsibility to implement the Great Lake Compact under s. 281.343(4)(a), Wis. Stats.;

WHEREAS, the Grantee desires to install monitoring station in order to collect said data;

WHEREAS, the Grantee requests an Easement allowing it to access Grantor's property in order to collect groundwater data by constructing, installing, operating and maintaining, removing and replacing a monitoring station containing one groundwater well; and

WHEREAS, the portion of Grantor's property subject to this Easement ("Premises") is described below and more particularly shown on Exhibit "A":

> Part of the SE ¼ of the SE ¼ of Section 29, Township 9 North, Range 6 East, Town of Mazomanie, Dane County, Wisconsin. Monitoring Well location in Lower Wisconsin State Riverway being a 30-foot-wide radius around Lat: 43.222953; Long: 89.799917

NOW, THEREFORE, the Grantor hereby agrees to convey to the Grantee, its assigns, a non-exclusive perpetual easement to access, construct, install, operate, maintain, repair, remove and replace monitoring stations drilled and/or placed on the above described Premises, along with duties related to water sampling as deemed necessary.

It is understood by the Grantor and the Grantee that this Easement is subject to the following conditions:

1. The Grantor and Grantee hereto confirm and agree that the recitals set forth above are true and correct and incorporate the same herein for all purposes.

2. The Grantor grants and conveys to the Grantee this non-exclusive Easement for the construction, installation, operation, maintenance, repair, replacement and removal of monitoring stations consisting of, but not limited to a drilled well which shall be constructed in compliance with Ch. NR 141 and Ch. NR 812, Wis. Adm.

DN-83 WDNR groundwater monitoring station easement, 2021
Form 2200-118, page 2 of 9

Codes, along with vehicle and walk in access to the Premises, as is reasonably deemed necessary for installation and collecting data including, but not limited to water-level measurements, geophysical measurements and /or water quality sampling purposes. The Grantee shall share all information gained from said monitoring upon request of the Grantor.

3. This Easement is limited to the Grantee, its assigns and is not transferrable to any other third party, except after prior written notification to Grantor. The Grantee will not have the right to allow additional co-location of other facilities in the Easement.

4. The Easement shall be non-exclusive and the Grantor may use the Premises and shall have the right to lease or convey other easements to one or more other person(s), company(ies) or other entity(ies); provided that any such subsequent use, lease or conveyance shall not interfere with the Grantee's rights.

5. Grantee shall submit a written notification of project commencement to the Grantor's Project Manager identified in Paragraph 18 herein at least thirty (30) days prior to the initiation of any well construction work on the Premises. The Grantee may commence said work unless the Grantor informs the Grantee not to proceed ten (10) days prior to commencing work. If an emergency situation arises within the Premises requiring immediate action by the Grantee, the Grantee shall immediately notify the Grantor's project manager that an emergency exists, and that the Grantee is proceeding to correct the emergency situation.

6. If approved in writing in advance by Grantor's Property Manager, Grantee may enter upon the Premises at a specified location outside of the Easement Area to gain access to the Easement Area in order to construct, install, operate, maintain, repair, remove and replace an underground electric line and to do any and all other such work as is reasonably necessary in accordance with the rights granted under this Easement.

7. Grantee may cut, trim and remove any brush, trees, logs, stumps or branches within the Premises which by reason of their proximity may interfere with the installation, repair, maintenance, operation, removal and replacement of the station. Grantee's representative (employee or contractor) will communicate in writing, the planned vegetative activities with Grantor's project manager prior to vegetation work commencing. The Grantee may commence said work unless the Grantor informs the Grantee not to proceed five (5) working days prior to commencing work. Accepted arborist pruning/removal and equipment practices must be adhered to and all waste debris, stumps and slash must be removed and disposed of by the Grantee off site before project completion in accordance with all applicable federal, state and local statutes, rules, regulations and ordinances. When the removal of a tree is permitted, the stump shall be cut flush with the ground or be removed. All trees having a commercial value, including firewood, shall be cut in 100-inch lengths and piled conveniently by the Grantee, for disposal, by sale or otherwise, by the Grantor.

8. Use of pesticides and herbicides shall only be allowed with the prior written approval of the Grantor, Any pesticides or herbicides used as part of a management plan must conform to the Forest Stewardship Council list found at https://ic.fsc.org/en/our-impact/program-areas/forest-program/pesticides. Grantee shall report to the Grantor (i.e. property manager), prior to December 1 of each year chemicals are applied, the chemicals that are applied on the Premises including the date, product trade name, active ingredient(s) and corresponding CAS number(s), purpose, rate, location with a map, total area treated, and total amount of chemical used.

9. Any signage placed by the Grantee for purposes of project activities shall have prior written approval from the Grantor.

DN-83 WDNR groundwater monitoring station easement, 2021

Form 2200-118, page 3 of 9

10. The Grantee shall maintain the Premises in a decent, sanitary, and safe condition during construction, repair, maintenance, removal and replacement, and at no time shall the Grantee allow its work to cause a hazard or unsafe conditions.

11. The Grantee is responsible for identifying any existing utility lines located within the Premises and for any and all damages, costs or liabilities that result caused by the Grantee that result from any damages to any exiting utilities within the Premises.

12. Grantor does not warrant that title to the Premises is free and clear of all encumbrances or that it has sole ownership or that it will defend the Grantee in its peaceful use and occupancy of the Premises. The Grantee assumes all liability in determining the sufficiency of the Grantor's right to convey this Easement.

13. The Grantee shall obtain all necessary permits, approvals, and licenses and comply with all applicable federal, state, and local statutes, regulations and ordinances affecting the design, materials or performance of exercising any and all rights granted by this Easement.

14. The Grantee shall properly abandon the monitoring well and restore the Premises to pre-existing conditions prior to installation of the monitoring station when its monitoring work has been completed unless Grantor agrees in writing to take over operation and maintenance of the well. Upon removal and proper abandonment, this Easement shall terminate.

15. The Easement shall automatically terminate upon Grantee's abandonment of the Premises and shall automatically revert to and re-vest in the Grantor without reentry upon the abandonment of the use of the same for groundwater data collection purposes, or upon non-use of the same for a period of 2 years. The Grantee's duties as reflected in paragraph 14 shall survive the reversion.

16. The Grantee agrees to hold harmless Grantor, its officers, agents and employees from any and all liability, including claims, demands, losses, costs, damages, and expenses of every kind and description (including death), or damages to persons or property arising out of or in connection with or occurring during the course of this Easement where such liability is founded upon or grows out of the acts or omissions of any of the officers, employees or agents of the Grantee while acting within the scope of their employment where protection is afforded by secs. 893.82 and 895.46(1), Wis. Stats.

17. The Grantor retains management, supervision and control over the Premises for the purpose of enforcing pertinent state laws needed to protect the Premises, its natural resources or the general public, including Chapter NR 45, Wis. Admin. Code, which governs the conduct of visitors to state lands.

18. All notices or other writings this Easement requires to be given, or which may be given, to either party by the other shall be deemed to have been fully given when made in writing and deposited in the United States mail, prepaid and addressed as follows:
    a. To the Grantor: Department of Natural Resources, Bureau of Facilities and Lands PO Box 7921, Madison, WI 53707-7921
    b. To the Grantee: U.S. Department of the Interior, U.S. Geological Survey, c/o Robert Waschbusch, 8505 Research Way, Middleton, WI 53562-3581
    c. The address to which any notice, demand, or other writing may be given, made or sent to either party to this Easement may be changed by written notice.

19. This Easement shall be binding on the Grantor and Grantee, their successors and assigns.

20. This Easement shall be construed and enforced in accordance with the internal laws of the State of Wisconsin.

DN-83 WDNR groundwater monitoring station easement, 2021

Form 2200-118, page 4 of 9

21. This Easement sets forth the entire understanding of the parties and may not be changed except by a written document executed and acknowledged the Grantor and the Grantee.

22. If any term or condition of this Easement shall be deemed invalid or unenforceable, the remainder of this Easement shall not be affected thereby, and each term and condition shall be valid and enforceable to the fullest extent permitted by law.

23. Enforcement of this Easement may be by proceedings at law or in equity against any person or persons violating or attempting or threatening to violate any term or condition in this Easement, either to restrain or prevent the violation or to obtain any other relief.

END OF CONDITIONS

DN-83 WDNR groundwater monitoring station easement, 2021

Form 2200-118, page 5 of 9

- 5 -

IN WITNESS WHEREOF, the Grantor grants this Easement and has caused this instrument to be executed on its behalf this 22 day Feb, 2021.

State of Wisconsin
Department of Natural Resources
For the Secretary

By Terry H. Bay (SEAL)
Terry H. Bay
Bureau Director, Facilities and Lands

State of Wisconsin)
) ss.
County of Dane)

Personally came before me this 22 day of Feb, 2021, the above named Terry H. Bay, Facilities and Lands Bureau Director, State of Wisconsin Department of Natural Resources, to me known to be the person who executed the foregoing instrument and acknowledged that he executed and delivered the same as for the act and deed of said Department of Natural Resources.

Aubrey F. Johnson
Notary Public, State of Wisconsin
My Commission (expires)(is) 11/6/24

NOTARY PUBLIC AUBREY F. JOHNSON STATE OF WISCONSIN

DN-83 WDNR groundwater monitoring station easement, 2021

Form 2200-118, page 6 of 9

IN WITNESS WHEREOF, U.S. Department of the Interior, U.S. Geological Survey, c/o Hydrologist, 8505 Research Way, Middleton, WI 53562 hereby accepts and consents to the terms and conditions of this Easement this 3 day February, 2021.

U.S. Department of the Interior,
U.S. Geological Survey

By Robert Waschbusch (SEAL)
Robert Waschbusch, Hydrologist
Midwest Region

State of Wisconsin)
) ss.
County of Dane)

Personally came before me this 3 day of February, 2021, the above named, Robert Waschbusch, Hydrologist, U.S. Department of the Interior, U.S. Geological Survey, to me known to be the person who executed the foregoing instrument and acknowledged that he executed and delivered the same as and for the act and deed of the Grantee.

JEANNA PIPITONE
Notary Public
State of Wisconsin

Jeanna Pipitone

Notary Public, State of Wisconsin
My Commission (expires)(is) My Commission Expires September 10, 2024.

DN-83 WDNR groundwater monitoring station easement, 2021
Form 2200-118, page 7 of 9

- 7 -

IN WITNESS WHEREOF, Wisconsin Geological and Natural History Survey – UW Madison, c/o hydrologist, 3817 Mineral Point Road, Madison, WI 53705 hereby accepts and consents to the terms and conditions of this Easement this 24 day NOVEMBER, 2020.

Wisconsin Geological and Natural History Survey,
University of Wisconsin - Madison

By _____ (SEAL)
Dan Langer
Assistant Vice Chancellor/Controller

State of Wisconsin)
) ss.
County of Dane)

Personally came before me this 24th day of November, 2020, the above named, Dan Langer Assistant Vice Chancellor/Controller for UW-Madison, to me known to be the person who executed the foregoing instrument and acknowledged that he executed and delivered the same as and for the act and deed of the Grantee.

_____
*
Notary Public, State of Wisconsin
My Commission (~~expires~~)(is) permanent.

This instrument drafted by:
State of Wisconsin
Department of Natural Resources

DN-83 WDNR groundwater monitoring station easement, 2021

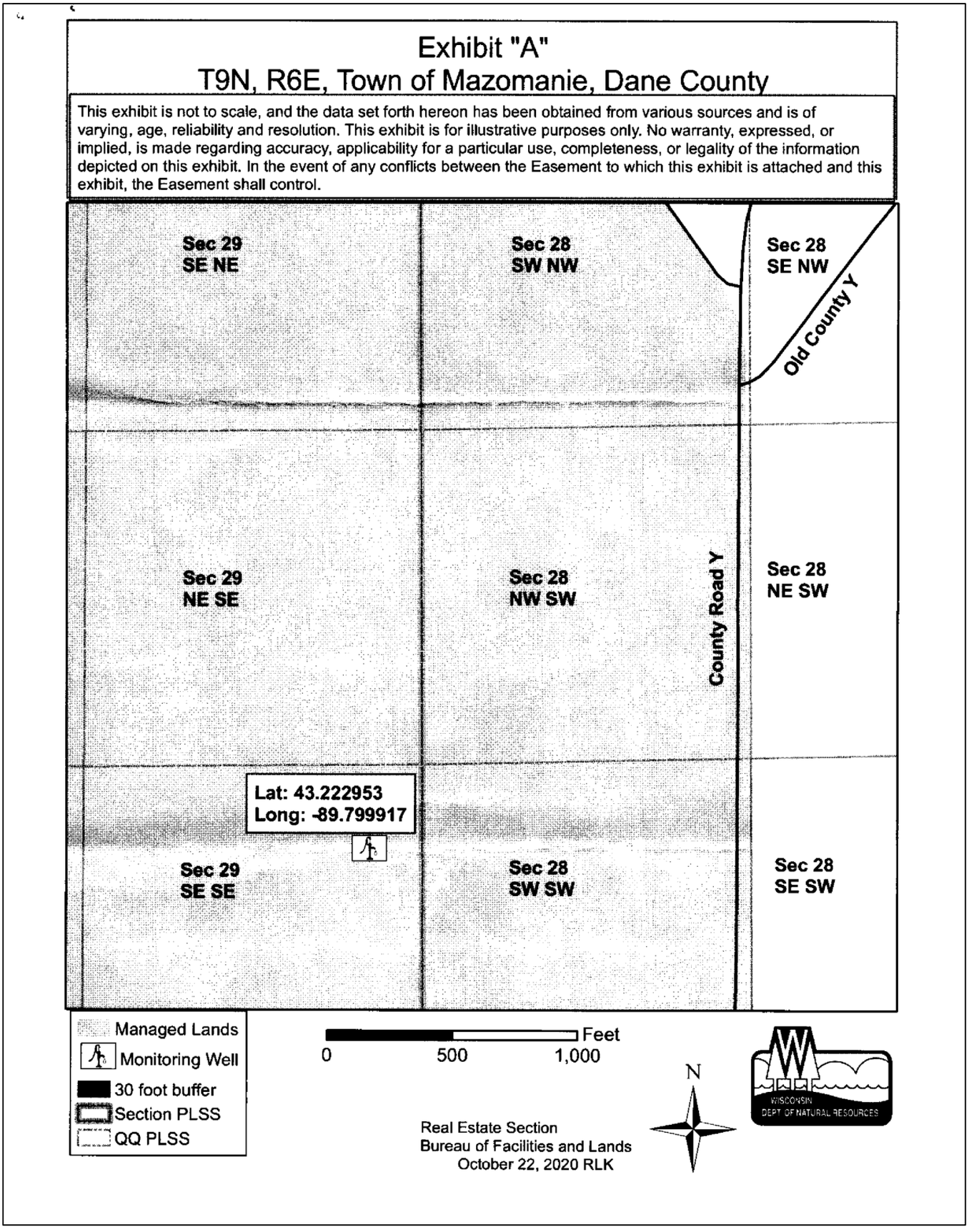
Form 2200-118, page 8 of 9

EXHIBIT A

(Map of monitoring station)

DN-83 WDNR groundwater monitoring station easement, 2021

Form 2200-118, page 9 of 9



Appendix 6: Wells DN-1297 and DN-6212 documents

Well DN-6216 replaced well DN-1297

Documentation of work done for this report: DN-1297

DN-1297 WDNR fill & seal report, 2022
Form 3300-005, 1 page

Documentation of work done for this report: DN-6212

DN-6212 Memorandum of understanding, 2021
3 pages

DN-6212 WDNR well construction report, 2021
Form 4400-113A, 1 page

DN-6212 WDNR soil boring form, 2021
Form 4400-122, 2 pages

DN-6212 WDNR monitoring well development form, date unknown
Form 4400-113B, 1 page

DN-1297 WDNR fill & seal report, 2022

Form 3300-005, page 1 of 1

13001297 (aka DN-1297)

State of Wis., Dept. of Natural Resources
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing Report
Form 3300-005 (R 4/2015) Page 1 of 2

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and chs. NR 141 and 812, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

☐ **Verification Only of Fill and Seal**

Route to DNR Bureau:
☐ Drinking Water ☐ Watershed/Wastewater ☐ Remediation/Redevelopment
☐ Waste Management ☐ Other: _____

1. Well Location Information

County	WI Unique Well # of Removed Well	Hicap #
DANE	NA	

Latitude / Longitude (see instructions)	Format Code	Method Code
43.06839 N	☒ DD	☒ GPS008
-89.39281 W	☐ DDM	☐ SCR002
		☐ OTH001

¼ ¼ NW	¼ SE	Section	Township	Range
or Gov't Lot #		23	7 N	9 ☒ E ☐ W

Well Street Address: 615 W. Washington Ave
Well City, Village or Town: Madison
Well ZIP Code:
Subdivision Name:
Lot #:

Reason for Removal from Service: Bridged
WI Unique Well # of Replacement Well: PX587 (13006212)

2. Facility / Owner Information

Facility Name: USGS Statewide Network
License/Permit/Monitoring #:
Original Well Owner: Unknown
Present Well Owner: USGS
Mailing Address of Present Owner: 6 Gifford Pinchot Dr
City of Present Owner: Madison
State: WI
ZIP Code: 53726

3. Filled & Sealed Well / Drillhole / Borehole Information

☒ Monitoring Well ☐ Water Well ☐ Borehole / Drillhole

Original Construction Date (mm/dd/yyyy): Unknown
If a Well Construction Report is available, please attach.

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (specify): _____

Formation Type:
☐ Unconsolidated Formation ☒ Bedrock

Total Well Depth From Ground Surface (ft.)	Casing Diameter (in.)
66	6
Lower Drillhole Diameter (in.)	**Casing Depth (ft.)**
6	66

Was well annular space grouted? ☐ Yes ☐ No ☒ Unknown

If yes, to what depth (feet)?	Depth to Water (feet)
	18.1'

4. Pump, Liner, Screen, Casing & Sealing Material

Pump and piping removed?	☐ Yes	☐ No	☒ N/A
Liner(s) removed?	☐ Yes	☐ No	☒ N/A
Liner(s) perforated?	☐ Yes	☐ No	☒ N/A
Screen removed?	☐ Yes	☐ No	☒ N/A
Casing left in place?	☒ Yes	☐ No	☐ N/A
Was casing cut off below surface?	☒ Yes	☐ No	☐ N/A
Did sealing material rise to surface?	☒ Yes	☐ No	☐ N/A
Did material settle after 24 hours?	☐ Yes	☒ No	☐ N/A
If yes, was hole retopped?	☐ Yes	☐ No	☒ N/A
If bentonite chips were used, were they hydrated with water from a known safe source?	☒ Yes	☐ No	☐ N/A

Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
☒ Screened & Poured (Bentonite Chips) ☐ Other (Explain): _____

Sealing Materials
☐ Neat Cement Grout ☐ Concrete
☐ Sand-Cement (Concrete) Grout ☒ Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only:
☒ Bentonite Chips ☐ Bentonite - Cement Grout
☐ Granular Bentonite ☐ Bentonite - Sand Slurry

5. Material Used to Fill Well / Drillhole

	From (ft.)	To (ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
3/8" bentonite chips	Surface	66	17.5 bags	

6. Comments

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing	License #	Date of Filling & Sealing or Verification (mm/dd/yyyy)
Peter M Chase		11/03/2022

Street or Route	Telephone Number
3817 Mineral Pt Rd	(608) 333 3785

City	State	ZIP Code	Signature of Person Doing Work	Date Signed
Madison	WI	53705	PC MC	11/23/22

DNR Use Only

Date Received	Noted By
Comments	

DN-6212 Memorandum of understanding, 2021

Page 1 of 3

UNIVERSITY OF WISCONSIN – MADISON

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU) is between the Wisconsin Geological and Natural History Survey (WGNHS), part of the Natural Resources Institute (Division of Extension, UW-Madison), and the UW-Madison Division of Facilities Planning & Management (FP&M). The WGNHS partners with the U.S. Geological Survey's Upper Midwest Water Science Center (USGS) to operate, maintain, and manage the Wisconsin Groundwater-Level Monitoring Network (WGLMN). The WGNHS also closely coordinates with the Wisconsin Department of Natural Resources (WDNR) regarding the WGLMN.

Following construction of a long-term monitoring well located along North Frances Street between the Kohl Center and the Arts Lofts, as shown on the attached Exhibit A, FP&M will allow WGNHS, USGS, and WDNR personal access to this monitoring station for the purposes of (1) routine monitoring and maintenance and (2) well evaluations. As a long-term monitoring station within the WGLMN, the stated goal (as outlined by WGNHS and understood by FP&M) is to maintain and operate this well indefinitely. This North Frances Street well was designed to replace a nearby monitoring well (located along the 600 block of West Washington Avenue), which has been part of the WGLMN since 1978 (42 years), and serves as a critical groundwater monitoring station in south-central Wisconsin. The siting and construction of this North Frances Street well represents an important investment by the WGLMN management team and is intended to provide high-quality groundwater-monitoring data for decades to come.

This agreement is to memorialize the use of land on University of Wisconsin Board of Regents property, as shown on the attached Exhibit A, and shall include the following elements:

1. The effective date of the land access will be upon mutual agreement and execution of this MOU by the WGNHS and the Division of Facilities Planning & Management (FP&M).

2. Should the WGNHS discontinue use of this monitoring station, all equipment will be removed from this location and the site restored at the sole expense of the WGNHS.

3. The use of the monitoring station shall continue unless terminated by FP&M upon 180 days written notice. FP&M agrees to provide assistance in identifying an alternative location for a monitoring well if this MOU is terminated.

4. Well evaluations may consist of borehole geophysical logging, the establishment of elevation datum benchmarks, packer testing, or other hydrogeological well evaluations. WGNHS staff may perform this work in coordination with the USGS or delegate these activities to the USGS who serves as a partner in operating, maintaining, and managing the WGLMN.

5. Monitoring and maintenance consist of the deployment of water-level monitoring equipment inside the well, visits by WGNHS and/or USGS personnel to perform water-level measurements and retrieve water-level data. These visits may also include the performance of small repairs to the well such as replacing padlocks, repainting the exterior of the monitoring well, or replacing/repairing in-well monitoring equipment. WGNHS staff may perform this work in coordination with the USGS or delegate these activities to the USGS serves as a partner in operating, maintaining, and managing the WGLMN.

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DN-6212 Memorandum of understanding, 2021

Page 2 of 3

6. The WGNHS shall be mindful of the UW-Madison personnel working in the vicinity of the monitoring well and work with FP&M staff in cooperation with maintenance and security staff as needed.

7. The WGNHS commits to maintaining the premises in a decent, sanitary, and safe condition and will at no time allow its work to cause a hazard or unsafe conditions.

8. The WGNHS commits to locking or securing the monitoring well to ensure that the installation is only accessible by approved personnel.

9. Well drilling, well construction, major repairs, and well decommissioning and abandonment (as needed) will be covered under a temporary construction easement for the time period the contractor will be on site.

10. Upon final decommissioning of this monitoring station (not anticipated), this MOU shall terminate.

This MOU constitutes the entire agreement between the parties defined in this document and no oral statement shall supersede or modify any of the agreement provisions.

Signed _____
Print Name: Kenneth R Bradbury Date 12/17/2020
WGNHS

Signed _____ 6/30/21
Print Name: Margaret Tennessen Date
FP&M

Signed before me this 30th day of June, 2021

Pam Zander
Notary Public, STATE of Wisconsin

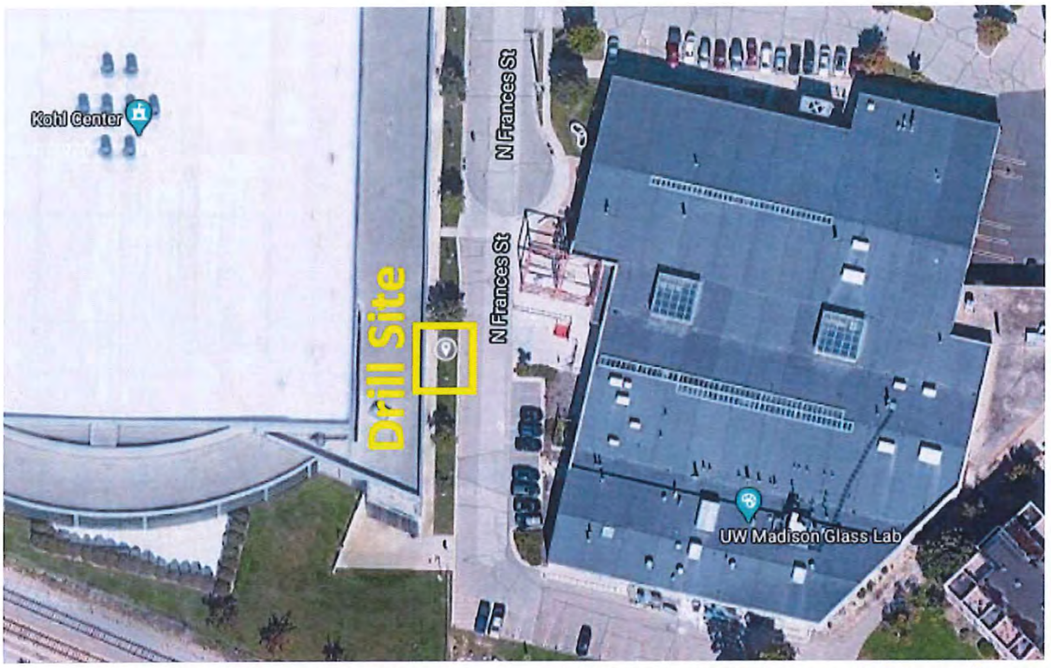
My Commission expires: 10/18/22

2

DN-6212 Memorandum of understanding, 2021

Page 3 of 3

Exhibit A



The yellow box identifies the planned location of well drilling activities and the monitoring well.

3

DN-6212 WDNR well construction report, 2021

Form 4400-113A, page 1 of 1

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Remediation/Redevelopment ☐ Waste Management ☐ Other ☐ ______

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

SES Project Number

Field	Entry
Facility/Project Name	WI Groundwater-Level Monitoring Network — *DN-1297 replacement well*
Local Grid Location of Well	______ ft. ☐ N. ☐ S. ______ ft. ☐ E. ☐ W.
Grid Origin Location ☐ (estimated: ☐) Well Location ■	Lat. 43.069047 Long. -89.396053 or
St. Plane	______ ft. N, ______ ft. E. S/C/N
Section Location of Waste/Source	____1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W
Well Name	13006212 (AKA: DN-6212)
Wis. Unique Well No.	PX587
DNR Well Number	
Date Well Installed	09/13/2021 (m m / d d / y y y y)
Well Installed By: Name (first, last) and Firm	Robert Rector — Soils & Engineering Services, Inc.
Type of Well — Well Code	12 / pz
Distance From Waste/Source	______ ft.
Enf. Stds. Apply	☐
Location of Well Relative to Waste/Source	u ☐ Upgradient; s ☐ Sidegradient; d ☐ Downgradient; n ☐ Not Known
Gov. Lot Number	

A. Protective pipe, top elevation 861.35 ft. MSL
B. Well casing, top elevation 861.07 ft. MSL
C. Land surface elevation 858.80 ft. MSL
D. Surface seal, bottom 851.8 ft. MSL or 7.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ■

13. Sieve analysis attached? ☐ Yes ■ No

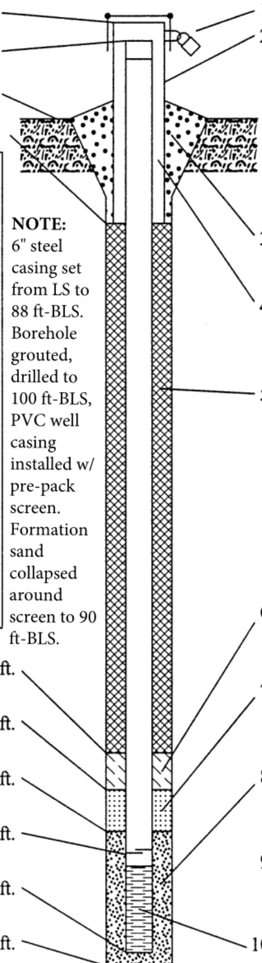
14. Drilling method used: Rotary ■ 5 0; Hollow Stem Auger ■ 4 1; ______ Other ☐

15. Drilling fluid used: Water ☐ 0 2; Air ■ 0 1; Drilling Mud ☐ 0 3; None ☐ 9 9

16. Drilling additives used? ☐ Yes ■ No

Describe ______

17. Source of water (attach analysis): ______



NOTE: 6" steel casing set from LS to 88 ft-BLS. Borehole grouted, drilled to 100 ft-BLS, PVC well casing installed w/ pre-pack screen. Formation sand collapsed around screen to 90 ft-BLS.

E. Bentonite seal, top ______ ft. MSL or 7.0 ft.
F. Fine sand, top ______ ft. MSL or 80.6 ft.
G. Filter pack, top ______ ft. MSL or 83.5 ft.
H. Screen joint, top ______ ft. MSL or 89.6 ft.
I. Well bottom ______ ft. MSL or 94.8 ft.
J. Filter pack, bottom ______ ft. MSL or 100.0 ft.
K. Borehole, bottom 758.8 ft. MSL or 100.0 ft.

(If multiple diameters, note diameters and to what depth for each diameter)

L. Borehole, diameter ______ in. — 14": 0' to 80'; 10": 80' to 88'; 6": 88' to 100'
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.91 in.

1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 8 in.
   b. Length: 5 ft.
   c. Material: Steel ■ 0 4; Other ☐
   d. Additional protection? Yes ☐ (No) — If yes, describe: ______
3. Surface seal: Bentonite ☐ 3 0; Concrete ☐ 0 1; Soil — Other ■
4. Material between well casing and protective pipe: Bentonite ☐ 3 0; Filter sand — Other
5. Annular space seal: a. Granular/Chipped Bentonite ■ 3 3
   b. ____ Lbs/gal mud weight . . . . Bentonite-sand slurry ☐ 3 5
   c. ____ Lbs/gal mud weight . . . . Bentonite slurry ☐ 3 1
   d. ____ % Bentonite . . . . Bentonite-cement grout ☐ 5 0
   e. 12.8 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ 0 1; Tremie pumped ☐ 0 2; Gravity ■ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
   b. ☐ 1/4 in. ■ 3/8 in. ☐ 1/2 in. Bentonite chips ■ 3 2
   c. ______ Other ☐
7. Fine sand material: Manufacturer, product name and mesh size
   a. Red Flint #15
   b. Volume added 0.5 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
   a. Red Flint #40 & caved sandstone
   b. Volume added 2.9 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 2 3; Flush threaded PVC schedule 80 ■ 2 4; ______ Other ☐
10. Screen material: Sch. 80 PVC + S.S. mesh
   a. Screen Type: Factory cut ■ 1 1; Continuous slot ☐ 0 1; Pre-pack screen — Other ☐
   b. Manufacturer Johnson
   c. Slot size: 0.010 in.
   d. Slotted length: 4.7 ft.
11. Backfill material (below filter pack): None ☐ 1 4; Caved bedrock (sandstone) — Other ■

all depths are in feet below land surface

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature]

Firm Soils & Engineering Services, Inc. 1102 Stewart Street, Madison, Wisconsin 53713-4648 Tel: (608) 274-7600 Fax: (608) 274-7511

Please complete both Forms 4400-113A and 4400-113B and return to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

DN-6212 WDNR soil boring form, 2021

Form 4400-122, page 1 of 2

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐ ______________

Page 1 of 2

Facility/Project Name: WI Groundwater-Level Monitoring Network	License/Permit/Monitoring Number	Boring Number: 130006212 (aka DN-6212)	
Boring Drilled By: Name of crew chief (first, last) and Firm — First Name: Robert, Last Name: Rector, Firm: Soils + Engineering Services, Inc.	Date Drilling Started: 08/23/2021 (mm dd yyyy)	Date Drilling Completed: 09/10/2021 (mm dd yyyy)	Drilling Method: HSA to 80, Rotary to 99.8
WI Unique Well No.: PX587 / DNR Well ID No.: ___ / Well Name: 13006212	Final Static Water Level: ______ Feet MSL	Surface Elevation: ______ Feet MSL	Borehole Diameter: ______ inches (14.0 to 80'; 10.0 to 88'; 6.0 to 100')
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒; State Plane ______ N, ______ E; ____ 1/4 of ____ 1/4 of Section ____, T ____ N, R ____	Lat 43.069047; Long -89.396053	Local Grid Location: ______ Feet ☐ N ☐ S; ______ Feet ☐ E ☐ W	
Facility ID / County: Dane	County Code: 13	Civil Town/City/ or Village: Madison (City circled)	

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	WGNHS lithology notes
			0–5	Blind-drilled with 10¼-inch inside-diameter hollow-stem augers to 80.0 feet. Air rotary drilled from 80.0 to 88 feet with 10-inch diameter bit. Set 6-inch steel casing to 88 feet and grouted the casing with 100 gallons of cement grout on 9/9/2021. Removed augers and backfilled the				Light brown, fine-grained silty sand with coarse sand and small gravel; dry (0-5').
			5					Light brown, fine-grained silty sand with coarse sand and small gravel; moist (5-10')
			10					Light brown, fine-grained clayey, silty, sand with trace gravel; moist (10-20').
			15					
			20					* * No Recovery * * (20-25')
			25					Olive gray, fat clay with sand; saturated (25-30').
			30					Olive gray, lean clay with sand; saturated (30-35').
			35					* * No Recovery * * (35-40')
			40					Olive gray, lean clay with sand; saturated (40-45').
			45					* * Recovered sample not considered representative; sample not kept nor described * * (45-50')
			50					

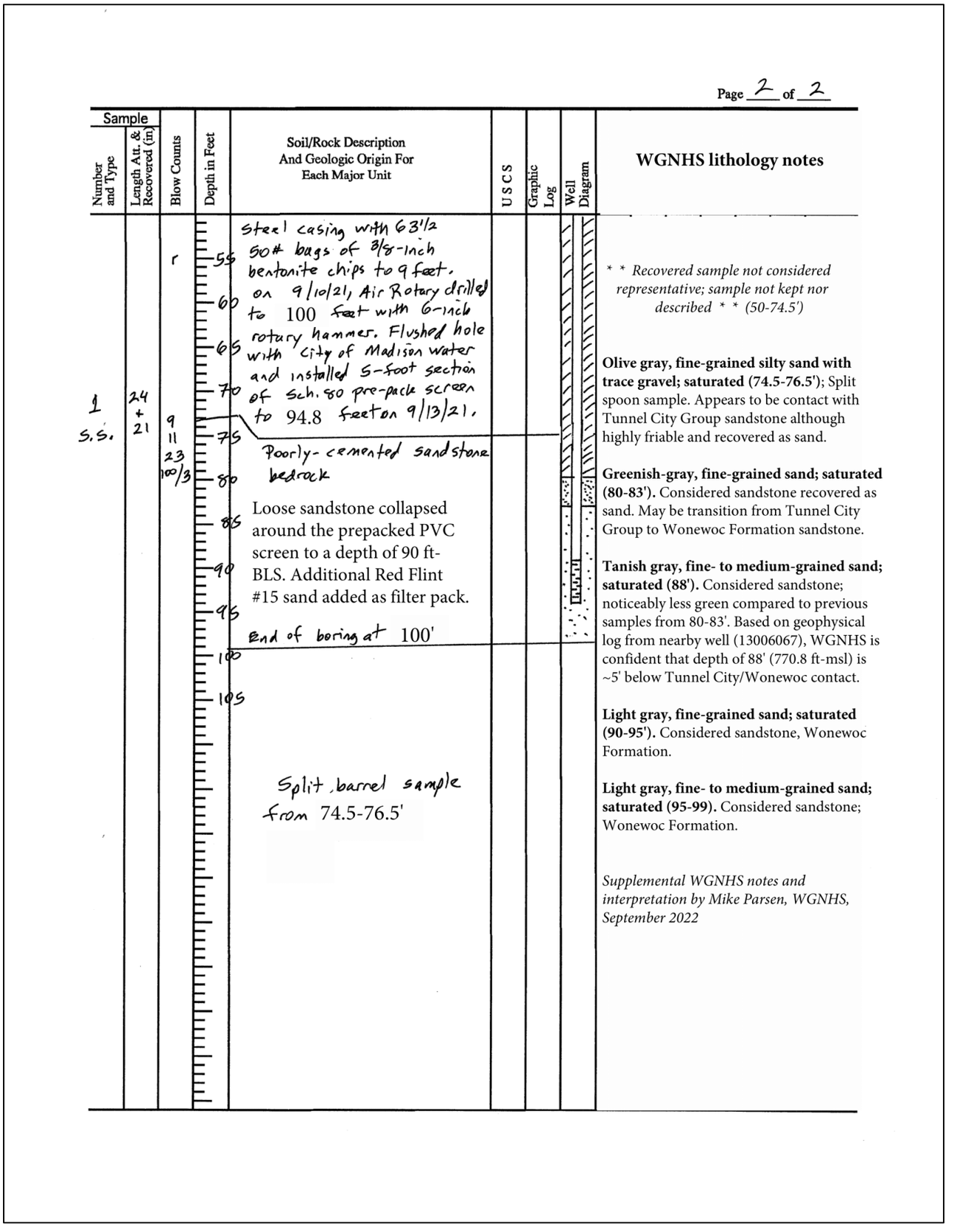
I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] | Firm: Soils + Engineering Services, Inc.

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

DN-6212 WDNR soil boring form, 2021

Form 4400-122, page 2 of 2



Page 2 of 2

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	WGNHS lithology notes
1 S.S.	24 + 21	r 9 11 23 100/3	55 60 65 70 75 80 85 90 95 100 105	Steel casing with 6 3/4 50# bags of 3/8-inch bentonite chips to 9 feet. on 9/10/21, Air Rotary drilled to 100 feet with 6-inch rotary hammer. Flushed hole with City of Madison water and installed 5-foot section of Sch. 80 pre-pack screen to 94.8 feet on 9/13/21. Poorly-cemented sandstone bedrock Loose sandstone collapsed around the prepacked PVC screen to a depth of 90 ft-BLS. Additional Red Flint #15 sand added as filter pack. End of boring at 100' Split barrel sample from 74.5-76.5'				* * Recovered sample not considered representative; sample not kept nor described * * (50-74.5') **Olive gray, fine-grained silty sand with trace gravel; saturated (74.5-76.5')**; Split spoon sample. Appears to be contact with Tunnel City Group sandstone although highly friable and recovered as sand. **Greenish-gray, fine-grained sand; saturated (80-83').** Considered sandstone recovered as sand. May be transition from Tunnel City Group to Wonewoc Formation sandstone. **Tanish gray, fine- to medium-grained sand; saturated (88').** Considered sandstone; noticeably less green compared to previous samples from 80-83'. Based on geophysical log from nearby well (13006067), WGNHS is confident that depth of 88' (770.8 ft-msl) is ~5' below Tunnel City/Wonewoc contact. **Light gray, fine-grained sand; saturated (90-95').** Considered sandstone, Wonewoc Formation. **Light gray, fine- to medium-grained sand; saturated (95-99).** Considered sandstone; Wonewoc Formation. *Supplemental WGNHS notes and interpretation by Mike Parsen, WGNHS, September 2022*

DN-6212 WDNR monitoring well development form, date unknown

Form 4400-113B, page 1 of 1

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
WI Groundwater-Level Monitoring Network *DN-1297 replacement well*		13006212 (AKA: DN-6212)
	County Code: 13	Wis. Unique Well Number: PX587
		DNR Well ID Number: ___

1. Can this well be purged dry? ☐ Yes ■ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	■ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well: 45 min.

4. Depth of well (from top of well casisng): 97.07 ft.

5. Inside diameter of well: 2.0 in.

6. Volume of water in filter pack and well casing: 67. gal.

7. Volume of water removed from well: 75. gal.

8. Volume of water added (if any): None gal.

9. Source of water added: N/A

10. Analysis performed on water added? (If yes, attach results) ☐ Yes ■ No

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 19.11 ft.	19.21 ft.
Date	b. 09/16/2021 (mm/dd/yyyy)	09/16/2021
Time	c. 09:45 ■ a.m. ☐ p.m.	11:20 ■ a.m. ☐ p.m.
12. Sediment in well bottom	___. inches	___. inches
13. Water clarity	Clear ■ 10 Turbid ☐ 15 (Describe) v. light gray color clear after 5-10 min	Clear ■ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	N/A mg/l	____. mg/l
15. COD	N/A mg/l	____. mg/l

16. Well developed by: Name (first, last) and Firm
First Name: Michael Last Name: Parsen
Firm: WGNHS

17. Additional comments on development:

Name and Address of Facility Contact /Owner/Responsible Party
First Name: Michael Last Name: Parsen
Facility/Firm: WGNHS
Street: 3817 Mineral Point Rd
City/State/Zip: Madison, WI 53705

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: Michael J. Parsen
Print Name: Michael Parsen
Firm: WGNHS

NOTE: See instructions for more information including a list of county codes and well type codes.

Appendix 7: Wells DN-1355 documents

During the historical records review, it was found that Well DN-1355 replaced Well DN-04 in 1990

Historical Documents

DN-1355 Basic well information, 1980
Well information historically compiled by WGNHS, 1 page

DN-1355 Well evaluation, 1981
Well information historically compiled by WGNHS, 1 page

DN-1355 Well location map, date unknown
Well information historically compiled by WGNHS, 2 page

DN-1355 Historic water-level data, 1986-1995
Well information historically compiled by WGNHS, 1 page

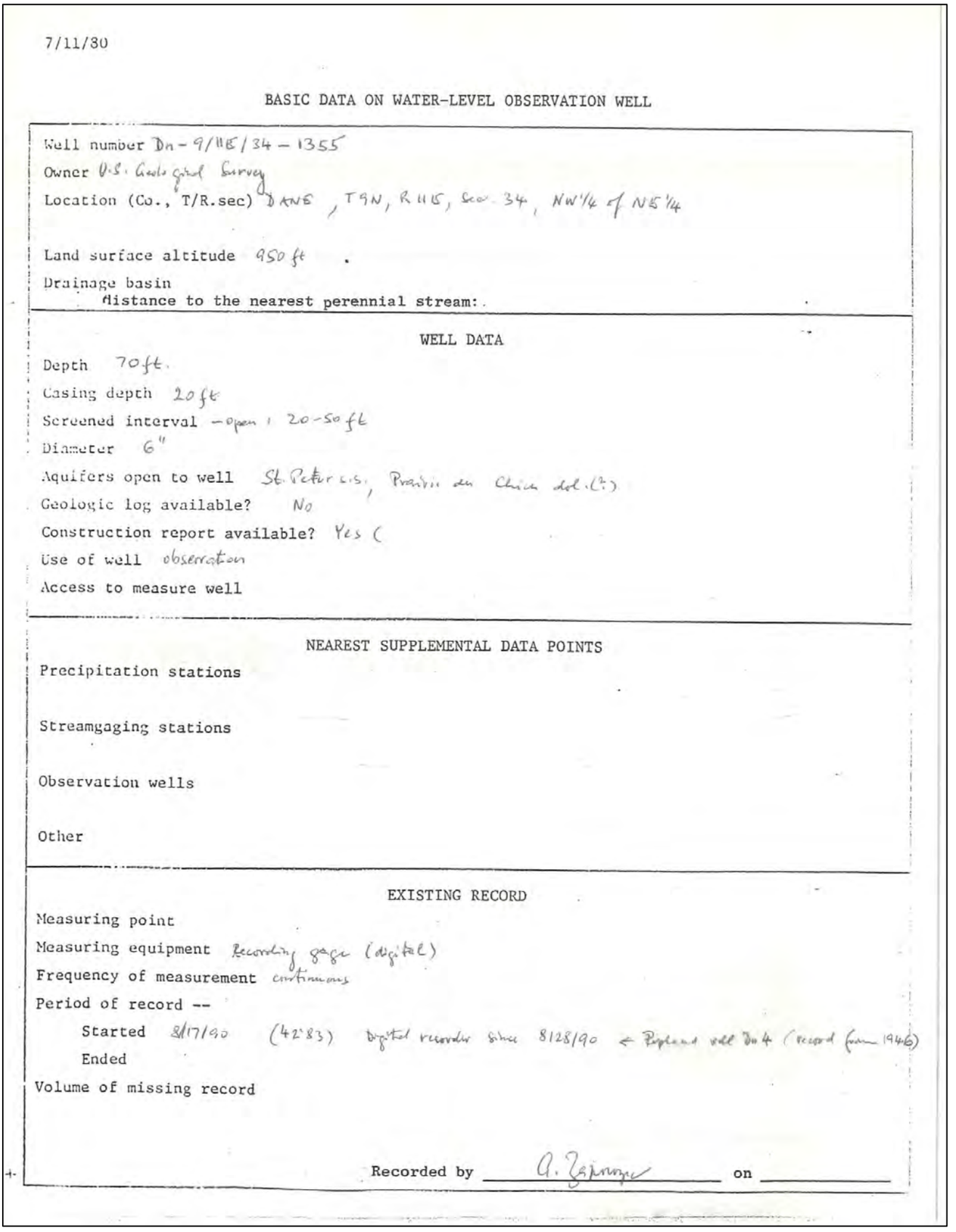
DN-1355 USGS water-level data, 1946-1990
4 pages

DN-1355 WDNR historic well construction report, 1990
1 page

DN-1355 WDNR well construction report, 1992
Form 3300-077A, 2 pages

DN-1355 Basic well information, 1980

Well information historically compiled by WGNHS, page 1 of 1



7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number Dn-9/11E/34-1355
Owner U.S. Geological Survey
Location (Co., T/R.sec) DANE, T9N, R11E, Sec. 34, NW1/4 of NE1/4

Land surface altitude 950 ft.
Drainage basin
distance to the nearest perennial stream:

WELL DATA

Depth 70 ft.
Casing depth 20 ft
Screened interval - open : 20-50 ft
Diameter 6"
Aquifers open to well St. Peter s.s., Prairie du Chien dol. (?)
Geologic log available? No
Construction report available? Yes (
Use of well observation
Access to measure well

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations

Streamgaging stations

Observation wells

Other

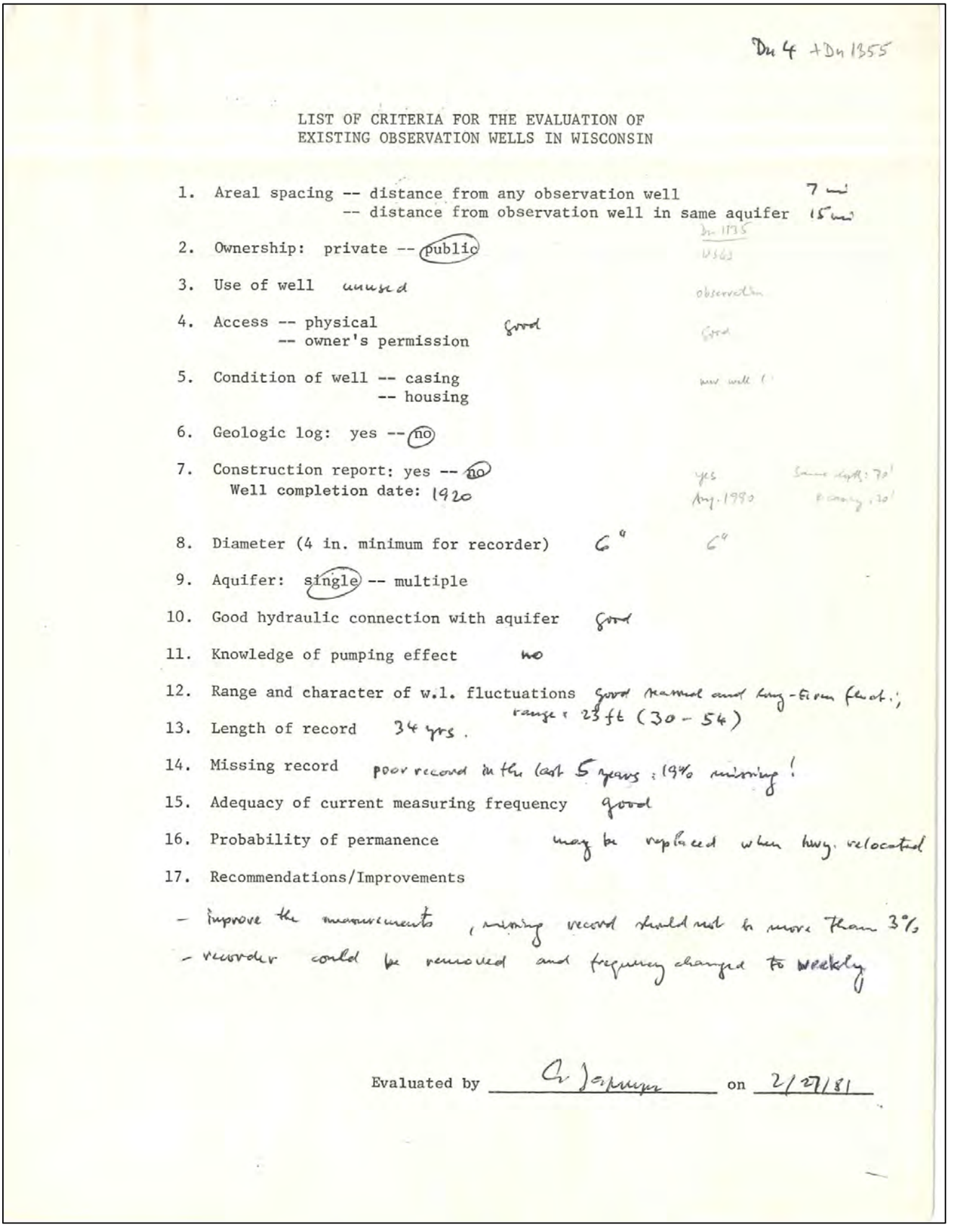
EXISTING RECORD

Measuring point
Measuring equipment Recording gage (digital)
Frequency of measurement continuous
Period of record --
Started 8/17/90 (42'83) Digital recorder since 8/28/90 ← Replaced well Dn 4 (record from 1946)
Ended
Volume of missing record

Recorded by A. Zaporozec on

DN-1355 Well evaluation, 1981

Well information historically compiled by WGNHS, page 1 of 1



Dn 4 +Dn 1355

LIST OF CRITERIA FOR THE EVALUATION OF
EXISTING OBSERVATION WELLS IN WISCONSIN

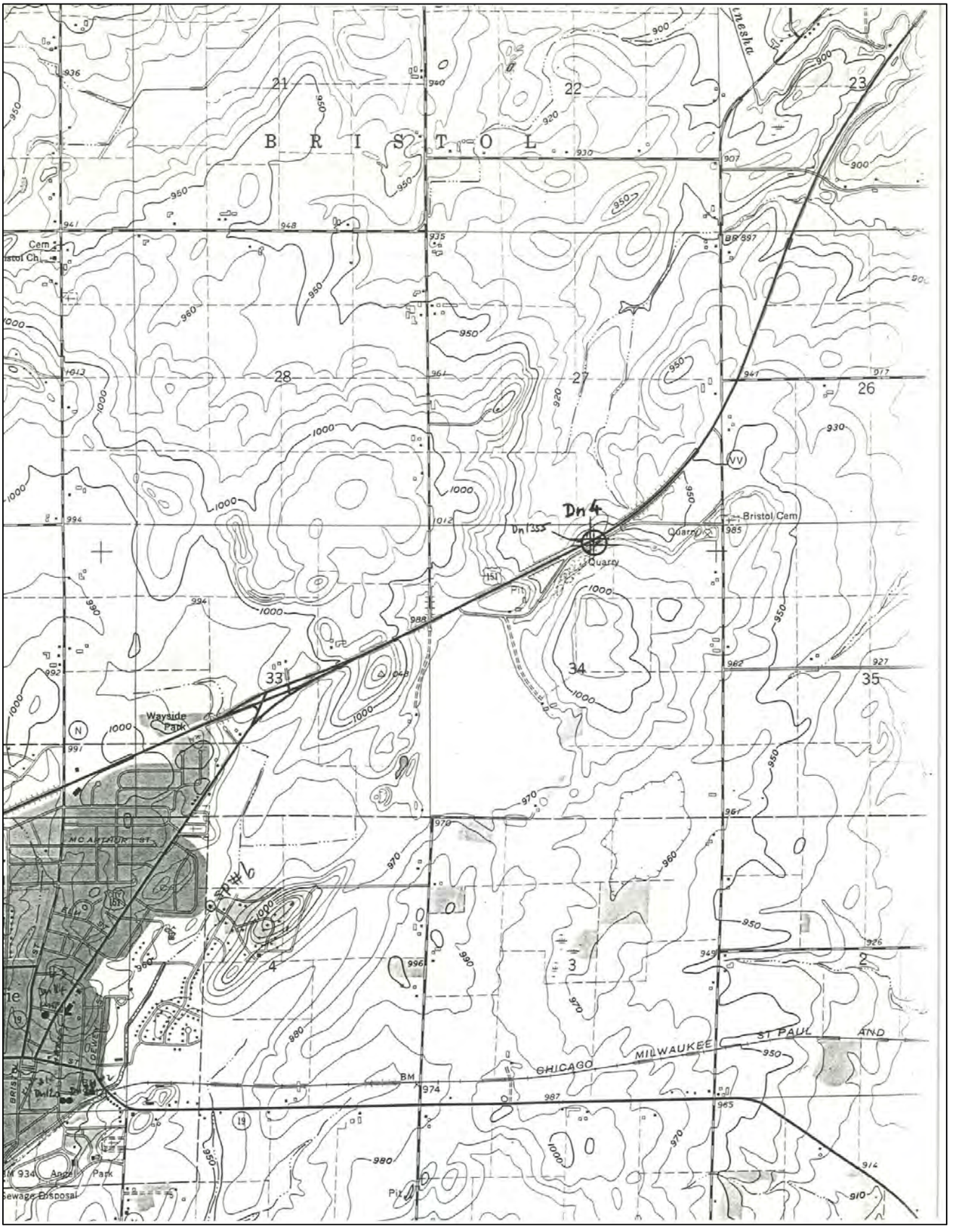
1. Areal spacing -- distance from any observation well 7 mi
   -- distance from observation well in same aquifer 15 mi
2. Ownership: private -- (public) Dn 1355 USGS
3. Use of well unused observation
4. Access -- physical Good Good
   -- owner's permission
5. Condition of well -- casing new well
   -- housing
6. Geologic log: yes -- (no)
7. Construction report: yes -- (no) yes Same depth: 70'
   Well completion date: 1920 Aug. 1980 Casing: 70'
8. Diameter (4 in. minimum for recorder) 6" 6"
9. Aquifer: (single) -- multiple
10. Good hydraulic connection with aquifer Good
11. Knowledge of pumping effect no
12. Range and character of w.l. fluctuations Good seasonal and long-term fluct.; range = 23 ft (30 - 54)
13. Length of record 34 yrs.
14. Missing record poor record in the last 5 years: 19% missing!
15. Adequacy of current measuring frequency good
16. Probability of permanence may be replaced when hwy. relocated
17. Recommendations/Improvements

- Improve the measurements, missing record should not be more than 3%
- recorder could be removed and frequency changed to weekly

Evaluated by G. Jaquays on 2/27/81

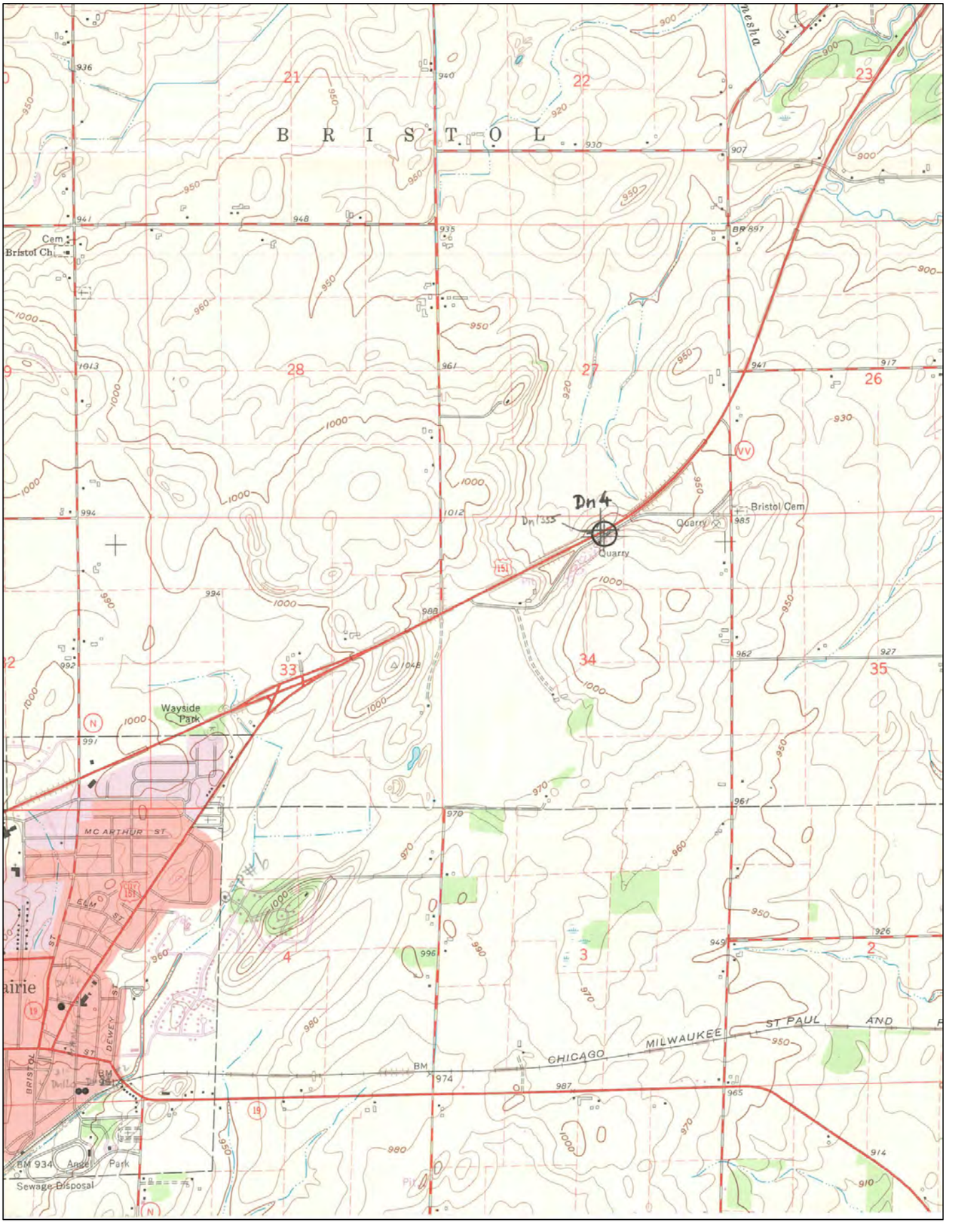
DN-1355 Well location map, date unknown

Well information historically compiled by WGNHS, page 1 of 2



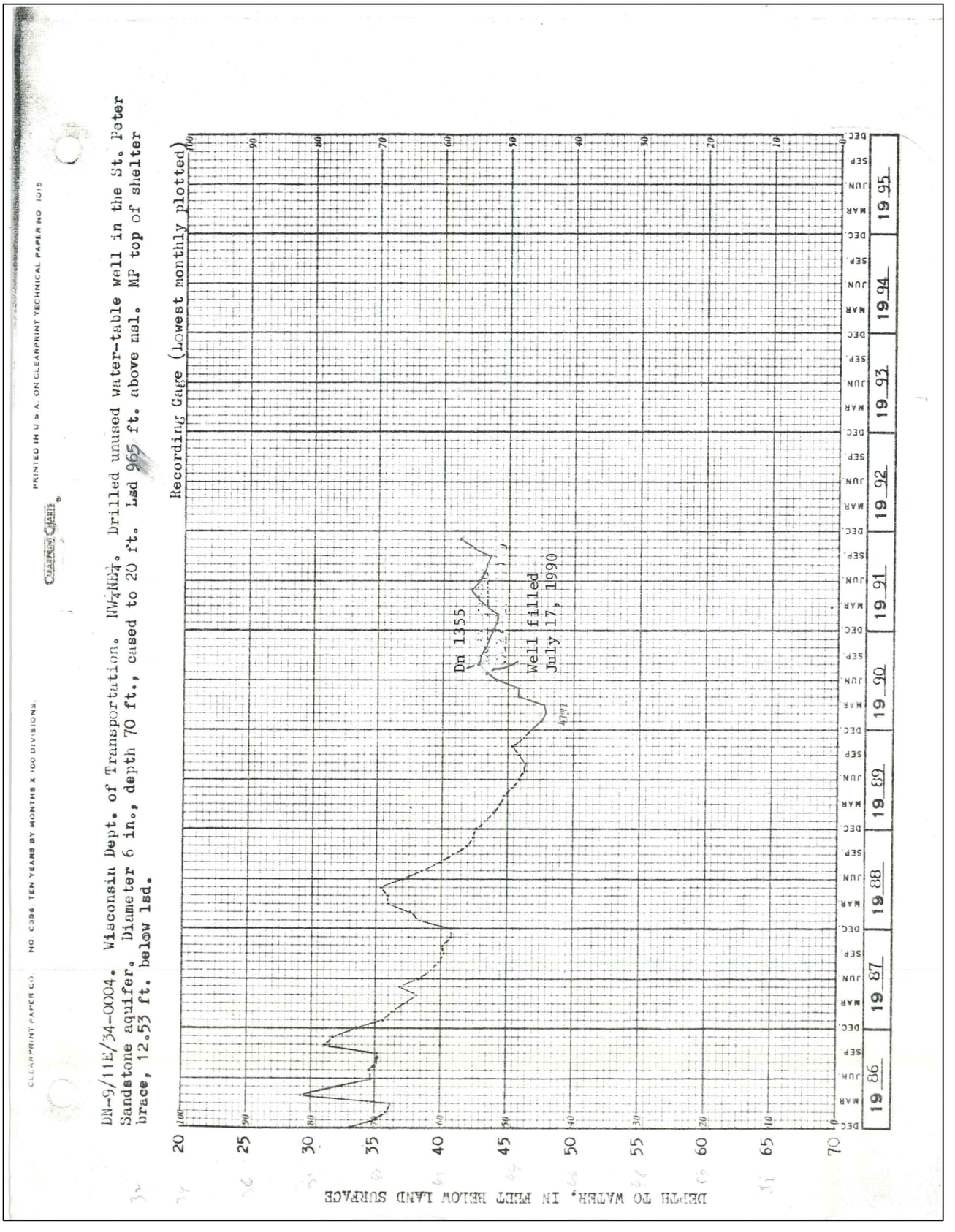
DN-1355 Well location map, date unknown

Well information historically compiled by WGNHS, page 2 of 2



DN-1355 Historic water-level data, 1986-1995

Well information historically compiled by WGNHS, page 1 of 1



WRD/Mad-29 DN-0004 (1990)

Site Ident. No. 4 3 1 2 3 2 0 8 9 1 0 3 1 0 1

U.S. DEPT. OF INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

HIGHEST WATER LEVEL 26.64 Mar. 19, 1962

LOWEST WATER LEVEL 53.36 Feb. 8, 1965

R - 234 * T - A *

WATER LEVELS IN OBSERVATION WELLS

RECORDS AVAILABLE 1946-90

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	46.92	47.44	47.71	45.61	45.78	44.07	43.46					
2	46.83	47.47	47.63	45.79	45.82	43.86	43.35					
3	46.76	47.44	47.73	45.78	45.85	44.02	43.15					
4	46.95	47.43	47.71	45.56	45.76	44.06	43.10					
5	46.93	47.38	47.84	45.67	45.68	43.90	43.11					
6	46.96	47.44	47.91	45.71	45.70	43.87	43.14					
7	46.81	47.50	47.89	45.75	45.62	43.86	43.04					
8	46.80	47.38	47.71	45.70	45.68	43.71	42.86					
9	46.96	47.46	47.67	45.62	45.68	43.80	42.90					
10	47.01	47.45	47.67	45.68	45.75	43.85	42.88					
11	46.95	47.53	47.64	45.71	45.83	43.81	42.86					
12	47.25	47.53	47.51	45.71	45.75	43.62	42.95					
13	47.25	47.65	47.55	45.67	45.68	43.65	42.95					
14	47.05	47.68	47.16	45.57	45.65	43.66	42.77					
15	47.15	47.45	46.76	45.62	45.55	43.65	42.74					
16	47.16	47.73	46.57	45.65	45.35	43.62	42.79					
17	47.17	47.81	46.32	45.81	45.40	43.55	Recorder					
18	47.35	47.57	46.39	45.85	45.47	43.62	removed					
19	47.34	47.72	46.43	45.72	45.38	43.65	for highway					
20	47.11	47.72	46.33	45.66	45.29	43.55	construction					
21	47.10	47.57	46.09	45.73	45.29	43.60	Replaced by newly drilled					
22	47.21	47.46	46.15	45.65	45.16	43.54	well # DN-1355 directly					
23	47.21	47.52	46.29	45.57	44.92	43.61	across Hwy. 151. Digital					
24	47.25	47.91	46.13	45.59	44.76	43.65	recorder installed on					
25	47.28	47.97	45.93	45.65	44.66	43.64	8/28/90.					
26	47.33	47.80	46.06	45.60	44.47	43.57						
27	47.53	47.83	45.94	45.55	44.37	43.59						
28	47.53	47.82	45.84	45.60	44.29	43.59						
29	47.30		45.79	45.65	44.27	43.52						
30	47.50		45.73	45.75	44.26	43.48						
31	47.52		45.67		44.16							

Report Page No. _____

DN-09/11E/34-0004.
+12.53 ft. to lsd.

WRD/Mad-29 DN-1355 (1990)

Site Ident. No. 430123308910320101 (5–19)

R = 234 * T = A *

U.S. DEPT. OF INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

WATER LEVELS IN OBSERVATION WELLS

HIGHEST WATER LEVEL 42.52 Aug. 31, 1990
LOWEST WATER LEVEL 43.74 Dec. 31, 1990
RECORDS AVAILABLE 1990–

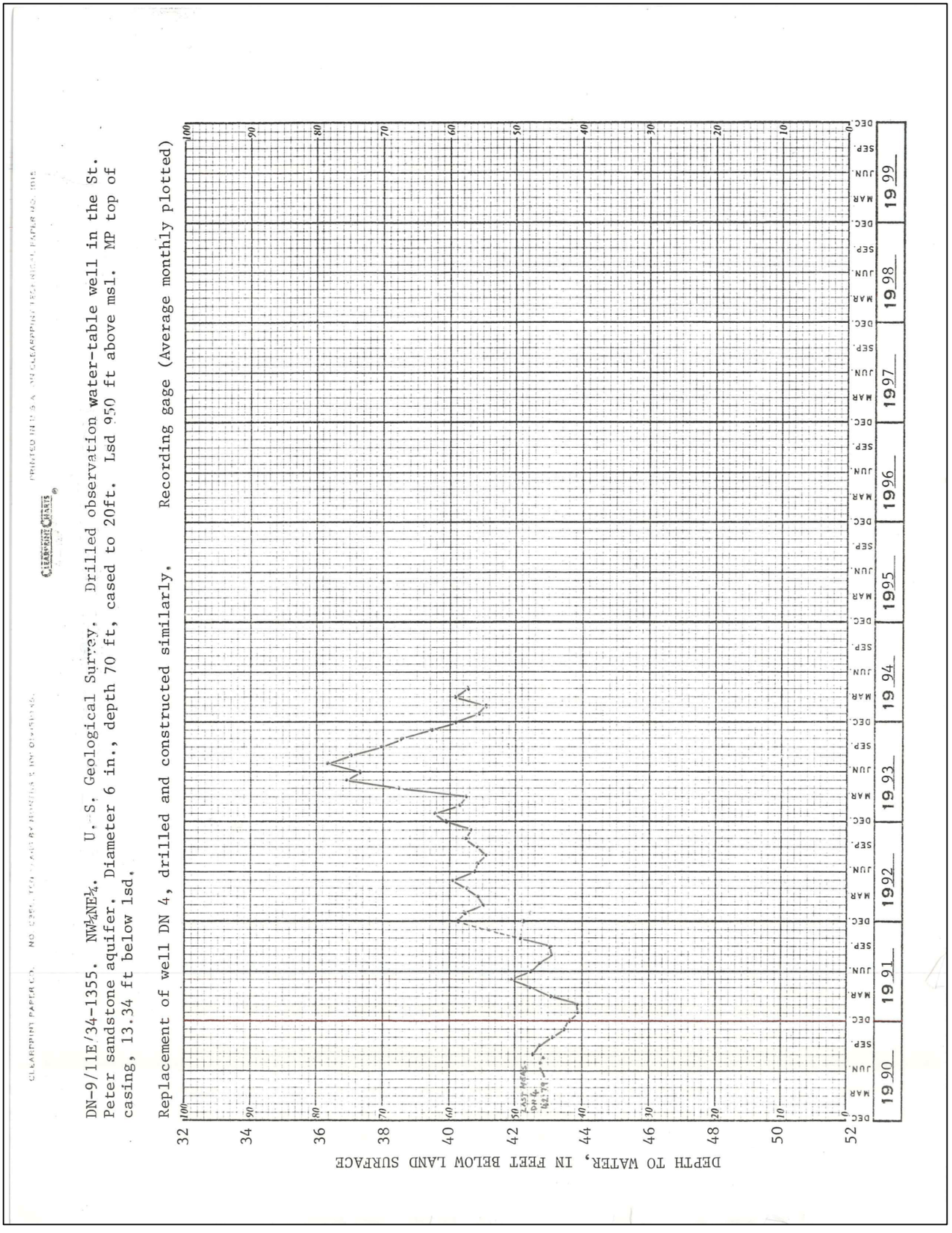
Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1									42.55	42.99	43.39	43.60
2									42.57	43.00	43.41	43.60
3									42.58	43.01	43.42	43.60
4									42.59	43.03	43.43	43.62
5									42.60	43.04	43.43	43.61
6									42.62	43.06	43.43	43.63
7									42.68	43.08	43.43	43.64
8									42.69	43.10.	43.42	43.65
9									42.72	43.11	43.42	43.66
10									42.77	43.12	43.44	43.67
11									42.78	43.13	43.44	43.64
12									42.78	43.14	43.45 E	43.64
13									42.79	43.15	43.45	43.64
14									42.81	43.17	43.45	43.61
15									42.81	43.19	43.45	43.58
16									42.84	43.21	43.48	43.58
17								42.83	42.85	43.22	43.48	43.56
18									42.85	43.23	43.49	43.58
19									42.85	43.24	43.50	43.60
20								42.85 ✓	42.85	43.25	43.51	43.60
21									42.87	43.26	43.53	43.60
22									42.86	43.27	43.52	43.62
23								42.70	42.89	43.29	43.53	43.62
24								42.70	42.88	43.31 E	43.54	43.63
25								42.67	42.89	43.32	43.55	43.67
26								42.68	42.90	43.33	43.55	43.69
27								42.62 E	42.92	43.35	43.57	43.69
28								42.57	42.94	43.36	43.58 ✓	43.70
29								42.55	42.96	43.36	43.58	43.72
30								42.55	42.98 ✓	43.38	43.56	43.74
31								42.54		43.38 ✓		43.74 ✓ E

Report Page No. _____

DN-09/11E/34-1355. U. S. Geological Survey. NW¼NE¼. Drilled observation water-table well in the Sandstone aquifer. Diameter 6 in., depth 70 ft., cased to 20 ft. Lsd 950 ft. above msl. MP top of casing, 13.34 ft. below lsd.

DN-1355 USGS water-level data, 1946-1990

Page 3 of 4



WRD/Mad-29 DN-0004 (1990)

Site Ident. No. 4 3 1 2 3 2 0 8 9 1 0 3 1 0 1 (5 … 19)

U.S. DEPT. OF INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

HIGHEST WATER LEVEL 26.64 Mar. 19, 1962

LOWEST WATER LEVEL 53.36 Feb. 8, 1965

RECORDS AVAILABLE 1946-90

R - 234 | T - A

WATER LEVELS IN OBSERVATION WELLS

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
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2	46.83	47.47	47.63	45.79	45.82	43.86	43.35					
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7	46.81	47.50	47.89	45.75	45.62	43.86	43.04					
8	46.80	47.38	47.71	45.70	45.68	43.71	42.86					
9	46.96	47.46	47.67	45.62	45.68	43.80	42.90					
10	47.01	47.45	47.67	45.68	45.75	43.85	42.88					
11	46.95	47.53	47.64	45.71	45.83	43.81	42.86					
12	47.25	47.53	47.51	45.71	45.75	43.62	42.95					
13	47.25	47.65	47.55	45.67	45.68	43.65	42.95					
14	47.05	47.68	47.16	45.57	45.65	43.66	42.77					
15	47.15	47.45	46.76	45.62	45.55	43.65	42.74					
16	47.16	47.73	46.57	45.65	45.35	43.62	42.79					
17	47.17	47.81	46.32	45.81	45.40	43.55	Recorder					
18	47.35	47.57	46.39	45.85	45.47	43.62	removed					
19	47.24	47.72	46.43	45.72	45.38	43.65	for highway					
20	47.11	47.72	46.33	45.66	45.29	43.55	construction					
21	47.10	47.57	46.09	45.73	45.29	43.60	Replaced by newly drilled					
22	47.21	47.46	46.15	45.65	45.16	43.54	well # DN-1355 directly					
23	47.21	47.52	46.29	45.57	44.92	43.61	across Hwy. 151. Digital					
24	47.25	47.91	46.13	45.59	44.76	43.65	recorder installed on					
25	47.28	47.97	45.93	45.65	44.66	43.64	8/28/90.					
26	47.33	47.80	46.06	45.60	44.47	43.57						
27	47.53	47.83	45.94	45.55	44.37	43.59						
28	47.53	47.82	45.84	45.60	44.29	43.59						
29	47.30		45.79	45.65	44.27	43.52						
30	47.50		45.73	45.75	44.26	43.48						
31	47.52		45.67		44.16							

Report Page No. _____

DN-09/11E/34-0004.
+12.53 ft. to lsd.

DN-1355 WDNR historic well construction report, 1990

Page 1 of 1

DANE CO.

DN 1355

State of Wisconsin
Department of Natural Resources
Private Water Supply — WS/2
Box 7921
Madison, WI 53707

SEP 24 1990

Well Construction Report For WISCONSIN UNIQUE WELL NUMBER DR 401

Property Owner: Mashuda Contractors Telephone Number: NA
Mailing Address: Rt 1
City: Princeton State: WI Zip Code: 54968
County of Well Location: Dane County Well Location Permit No. W — Well Completion Date: 8/3/90 (M M D D Y Y)

(13) Well Constructor (Business Name): Sam Rotary Drillers Registration #: 370
Address: P.O. Box 150
City: Randolph State: WI Zip Code: 53956

XM

1. Location (Please type or print using a black pen.)
☒ Town ☐ City ☐ Village of Bristol Fire # (if available)
Grid or Street Address or Road Name and Number (if available): Wilburn - Mueller
Subdivision Name Lot # Block #
Gov't Lot # ___ or NE ¼ of NW ¼ of Section 34; T 9 N; R 11 ☒ E ☐ W

2. Mark well location in correct 40-acre parcel of section. (N / S / E / W)

3. Well Type ☒ New ☐ Replacement ☐ Reconstruction
of unique well # ________ constructed in 19____.
Reason for new, replaced or reconstructed well? monitoring
☒ Drilled ☐ Driven Point ☐ Jetted ☐ Other

4. Well serves 1 # of homes and/or monitoring (ex: barn, restaurant, church, school, industry, etc.)
High Capacity Well? ☐ Yes ☒ No
High Capacity Property? ☐ Yes ☒ No

5. Well Located on Highest Point of Property, Consistent with the General Layout and Surroundings? ☒ Yes ☐ No If no, explain on back side.
Well Located in Floodplain? ☐ Yes ☒ No
Distance In Feet From Well To Nearest: (written across: NONE)

1. Landfill
2. Building Overhang
3. Septic or Holding Tank
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. Shoreline/Swimming Pool
9. Downspout/Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain ☐ Cast Iron or Plastic ☐ Other
14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
15. Collector or Street Sewer
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo — Type
21. Barn Gutter
22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
23. Other Manure Storage
24. Other NR 112 Waste Source

6. Drillhole Dimensions

Dia. (in.)	From (ft.)	To (ft.)
12	surface	20
6	20	70

Method of constructing upper enlarged drillhole only.
☒ 1. Rotary — Mud Circulation
☐ 2. Rotary — Air
☐ 3. Rotary — Foam
☐ 4. Reverse Rotary
☐ 5. Cable-tool Bit ____ in. dia.
☐ 6. Temp. Outer Casing ____ in. dia. Removed? ☐ Yes ☐ No If no, explain
☐ 7. Other

9. Geology

DNR USE ONLY	Type, Caving/Noncaving, Color, Hardness, Etc.	From (ft.)	To (ft.)
C	Clay	surface	3
S	Sand	3	8
N	Sand rock	8	60
H	Shale	60	63
L	lime rock	63	70

7. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Mfg. & Method of Assembly	From (ft.)	To (ft.)
6	Std black pipe .280 wall, weld jts, A-53, KHC	surface	20
Dia. (in.)	screen type and material	From	To

8. Grout or Other Sealing Material

Method: tremie

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
mud + cuttings	surface	8	
cement	8	20	10

Make additional comments on reverse side about geology, etc.

10. Static Water Level ___ ft. above ground level; 29 ft. below ground surface

11. Pump Test: Pumping Level N/A ft. below surface; Pumping at ___ GPM for ___ hours

12. Well Is: 18 in. ☒ Above ☐ Below Grade
Developed? ☒ Yes ☐ No
Disinfected? ☒ Yes ☐ No
Capped? ☒ Yes ☐ No

13. Did you permanently seal all unused, noncomplying, or unsafe wells? ☐ Yes ☒ No If no, explain

14. Signature of Point Driver or Registered Driller: [signature] SVG Date Signed 9-17-90
Signature of Drill Rig Operator: [signature] JVG Date Signed 9-19-90

DNR WELL CONSTRUCTION REPORT Form 3300-77A Rev. 9-88

DN-1355 WDNR well construction report, 1992

Form 3300-077A, page 1 of 2

Well Construction Report — ***WISCONSIN UNIQUE WELL NUMBER*** **DR401**

Drinking Water and Groundwater - DG/5, Department of Natural Resources, Box 7921, Madison WI 53707 — Form 3300-077A

Property Owner: MASHUDA CONTRACTORS — Phone #:

Mailing Address: RT 1

City: PRINCETON — State: WI — Zip Code: 54968

County: Dane — Co. Permit #: — Notification #: — Completed: 08-03-1990

Well Constructor (Business Name): SAMS ROTARY DRILLERS — Lic. #: 370 — Facility ID # (Public Wells):

Address: PO BOX 150, RANDOLPH WI 53956-0150

Well Plan Approval #:

Approval Date (mm-dd-yyyy):

Hicap Permanent Well # — Common Well # — Specific Capacity

1. Well Location: Town of BRISTOL — Fire # (if avail.):

Subdivision Name — Lot # — Block #

Method Code: GPS008

or Govt Lot # — Section: 34 — Township: 9 N — Range: 11 E

2. Well Type: New Well

of previous unique well # — constructed in

Reason for replaced or reconstructed well ?: MONITORING

Construction Type: Drilled

3. Well serves: 1 # of MONITORING

Heat Exchange ____ # of drillholes

Hicap Well ? No

Hicap Property ? No

Hicap Potable ?

4. Potential Contamination Sources - ON REVERSE SIDE

5. Drillhole Dimensions and Construction Method

Dia. (in.)	From (ft.)	To (ft.)
12	Surface	20
6	20	70

Upper Enlarged Drillhole / Lower Open Bedrock

Yes — Rotary - Mud Circulation .....
Rotary - Air .....
Rotary - Air & Foam .....
Drill-Through Casing Hammer
Reverse Rotary
Cable-tool Bit ____in. dia...
Dual Rotary .....
Temp. Outer Casing ____in. dia
Removed? ____depth ft. (If NO explain on back side)

Geology Codes	8. Geology Type, Caving/Noncaving, Color, Hardness, etc...	From (ft.)	To (ft.)
C	CLAY	Surface	3
S	SAND	3	8
N	SAND ROCK	8	60
H	SHALE	60	63
L	LIME ROCK	63	70

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6	STD BLACK PIPE .280 WALL, WELD JTS, A-53, KHC	Surface	20
Dia. (in.)	Screen type, material & slot size	From (ft.)	To (ft.)

9. Static Water Level: 29 ft. below ground surface

10. Pump Test

Pumping level _____ ft. below surface

Pumping at _____ GP for _____ Hrs.

Pumping Method ?

11. Well Is

18 in. above grade

Developed ? Yes

Disinfected ? Yes

Capped ? Yes

7. Grout or Other Sealing Material

Method: TREMIE

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
MUD @ CUTTINGS	Surface	8	
CEMENT	8	20	10

12. Notified Owner of need to fill & seal ?

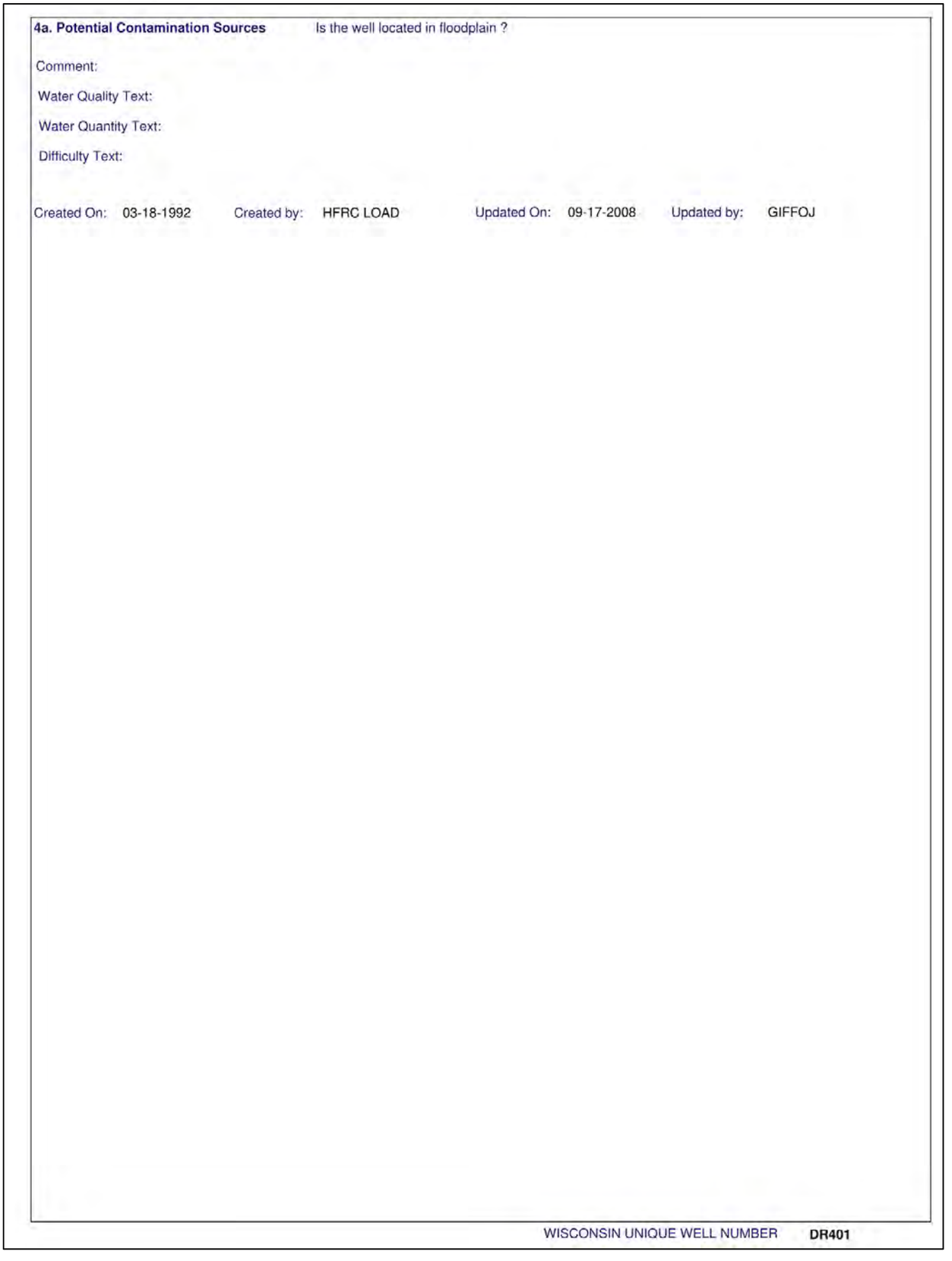
Filled & Sealed Well(s) as needed?

13. Constructor / Supervisory Driller	Lic #	Date Signed
SVG		09-17-1990
Drill Rig Operator	Lic or Reg #	Date Signed
JVG		09-19-1990

WISCONSIN UNIQUE WELL NUMBER **DR401**

DN-1355 WDNR well construction report, 1992

Form 3300-077A, page 2 of 2



4a. Potential Contamination Sources Is the well located in floodplain ?

Comment:

Water Quality Text:

Water Quantity Text:

Difficulty Text:

Created On: 03-18-1992 Created by: HFRC LOAD Updated On: 09-17-2008 Updated by: GIFFOJ

WISCONSIN UNIQUE WELL NUMBER **DR401**

Appendix 8: Well DG-81 documents

Historical Documents

DG-81 Basic well information, 1980
Well information historically compiled by WGNHS, 1 page

DG-81 Well evaluation, 1980
Well information historically compiled by WGNHS, 1 page

DG-81 Well location maps, date unknown
Well information historically compiled by WGNHS, 2 pages

DG-81 Water-level data, 1981-1983
Well information historically compiled by WGNHS, 1 page

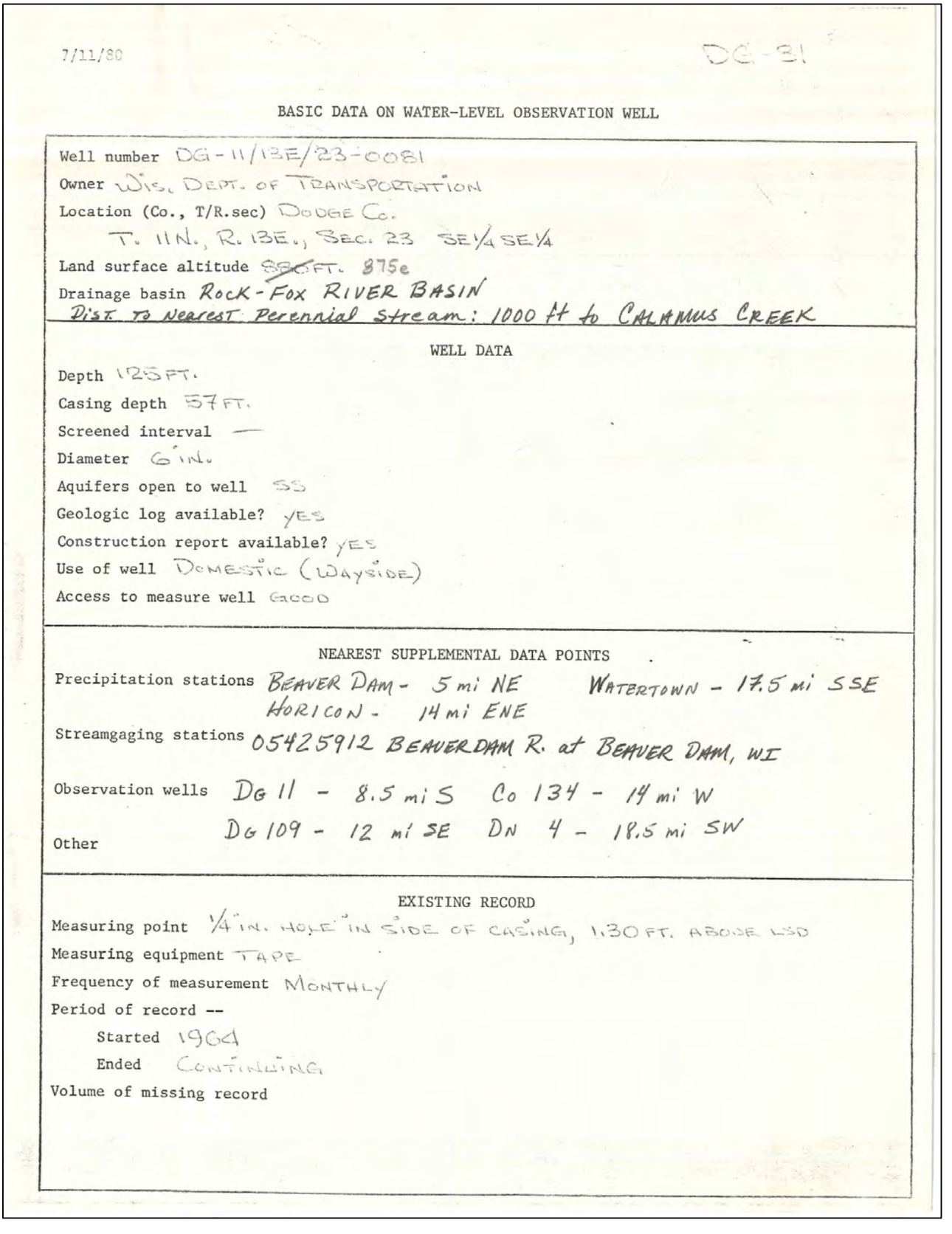
DG-81 USGS site schedule, 1978
Form 9-1904-A, 2 pages

DG-81 Updated WGNHS boring log, 1961
1 page; modified by WGNHS to correct well location

DG-81 Well construction report, 1961
1 page

DG-81 Basic well information, 1980

Well information historically compiled by WGNHS, 1 page



7/11/80 DG-81

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number DG-11/13E/23-0081
Owner Wis. Dept. of Transportation
Location (Co., T/R.sec) Dodge Co.
T. 11N., R. 13E., Sec. 23 SE¼ SE¼
Land surface altitude ~~880~~ FT. 875e
Drainage basin Rock-Fox River Basin
Dist to Nearest Perennial Stream: 1000 ft to Calamus Creek

WELL DATA

Depth 125 FT.
Casing depth 57 FT.
Screened interval —
Diameter 6 IN.
Aquifers open to well SS
Geologic log available? YES
Construction report available? YES
Use of well Domestic (Wayside)
Access to measure well Good

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Beaver Dam - 5 mi NE Watertown - 17.5 mi SSE
Horicon - 14 mi ENE
Streamgaging stations 05425912 Beaver Dam R. at Beaver Dam, WI
Observation wells DG 11 - 8.5 mi S Co 134 - 14 mi W
DG 109 - 12 mi SE DN 4 - 18.5 mi SW
Other

EXISTING RECORD

Measuring point ¼ in. hole in side of casing, 1.30 ft. above LSD
Measuring equipment Tape
Frequency of measurement Monthly
Period of record --
Started 1964
Ended Continuing
Volume of missing record

DG-81 Well evaluation, 1980

Well information historically compiled by WGNHS, page 1 of 1

DG-81

July 1980
R. D. Cotter

CRITERIA FOR EVALUATION OF WATER–LEVEL OBSERVATION WELLS IN WISCONSIN

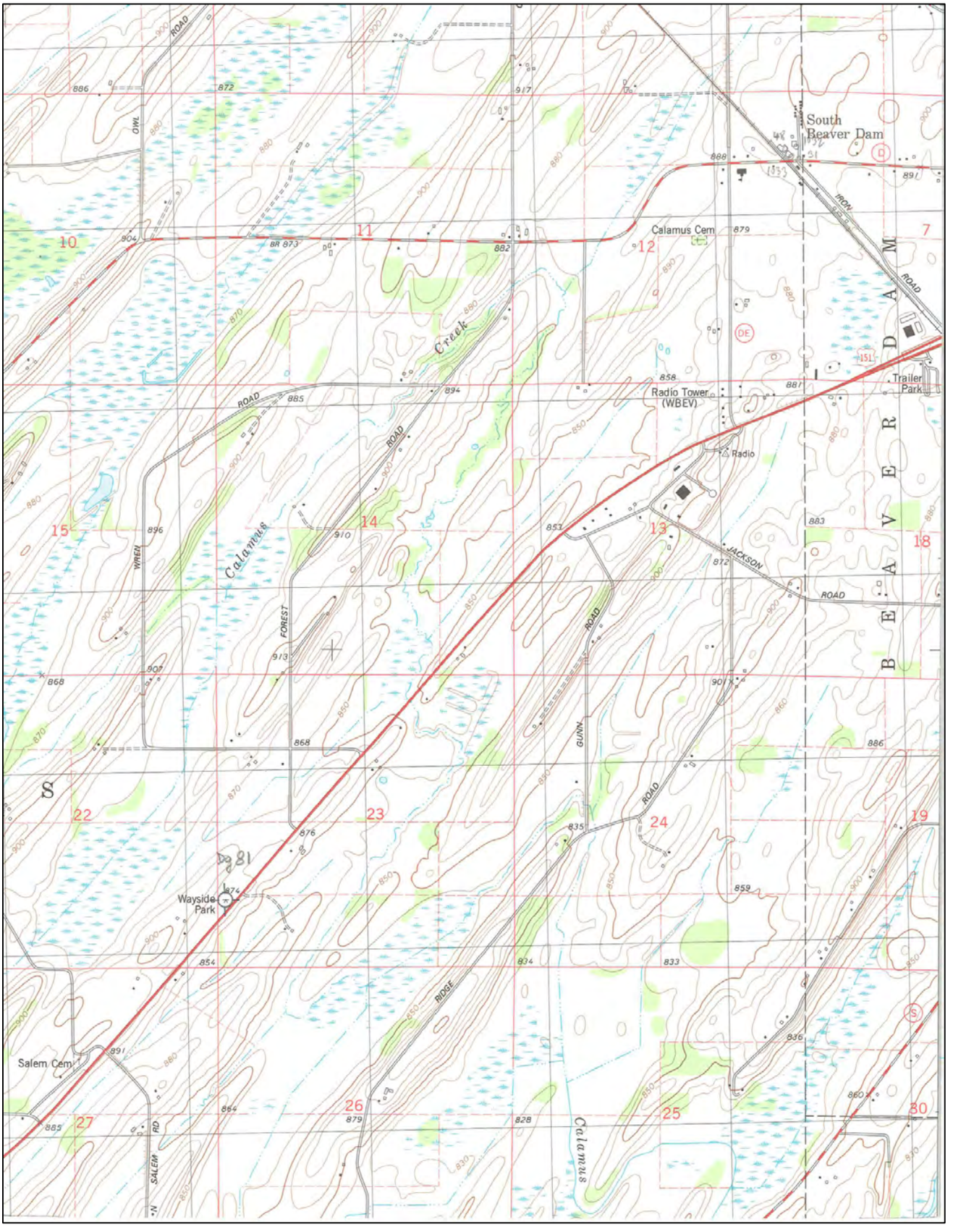
1. Areal spacing -- distance from any observation well 12Mi.
   -- distance from observation well in same aquifer 12Mi.
2. Ownership -- private
   -- (public)
3. Use of well DOMESTIC (WAYSIDE)
4. Access -- physical OK
   -- owner's permission OK
5. Condition of well -- (casing) GOOD
   -- housing
6. Geologic log -- (yes)
   -- no
7. Construction report -- (yes)
   -- no
8. Diameter (4 inch minimum for recorder) 6IN
9. Aquifer -- (single)
   -- multiple
10. Hydraulic connection with aquifer
11. Knowledge of pumping effects
12. Range and character of water level fluctuations 10FT.
13. Length of record 16 yrs.
14. Missing record
15. Adequacy of current measuring frequency OK
16. Probability of permanance GOOD

NOTES

Recommendations

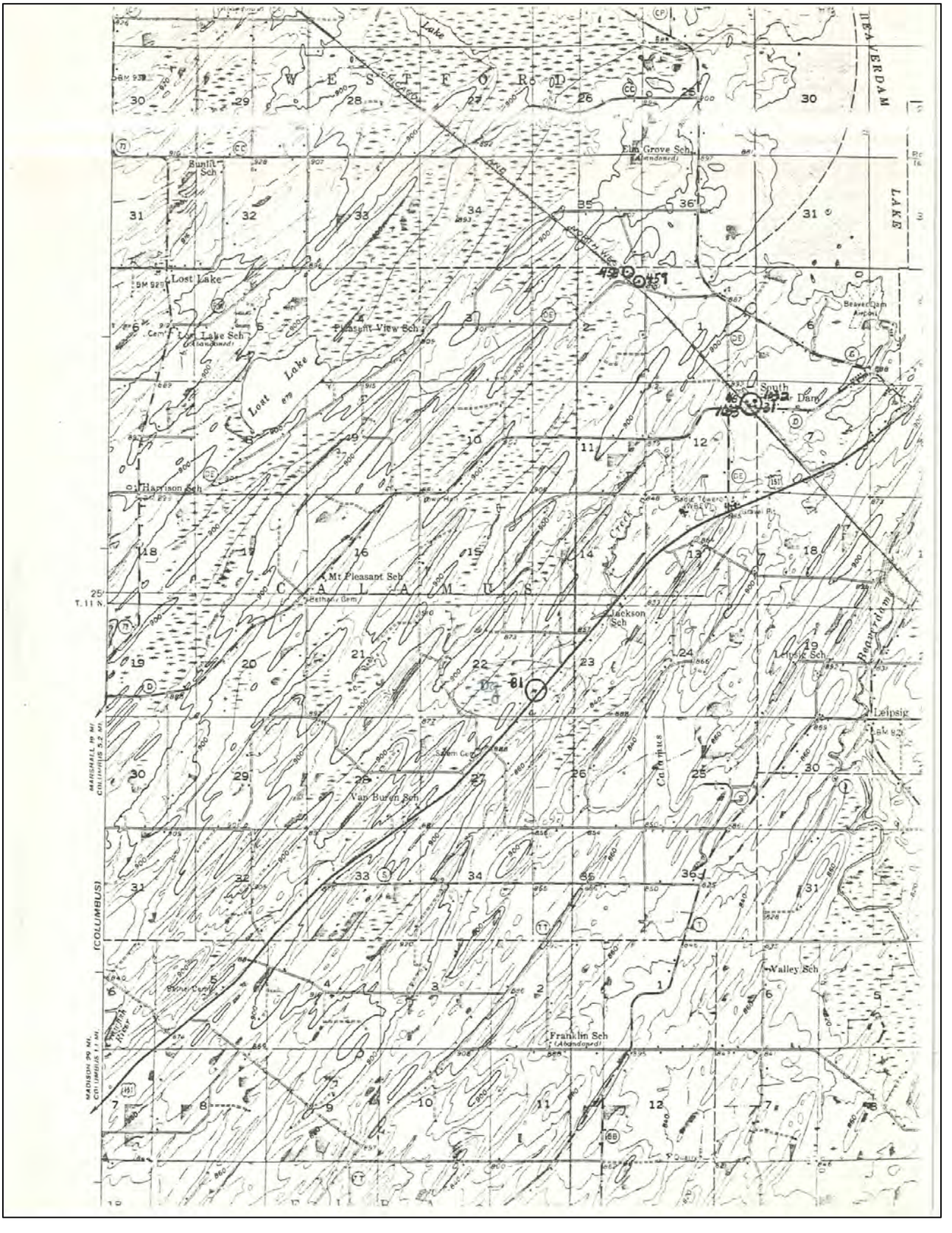
DG-81 Well location maps, date unknown

Well information historically compiled by WGNHS, page 1 of 2



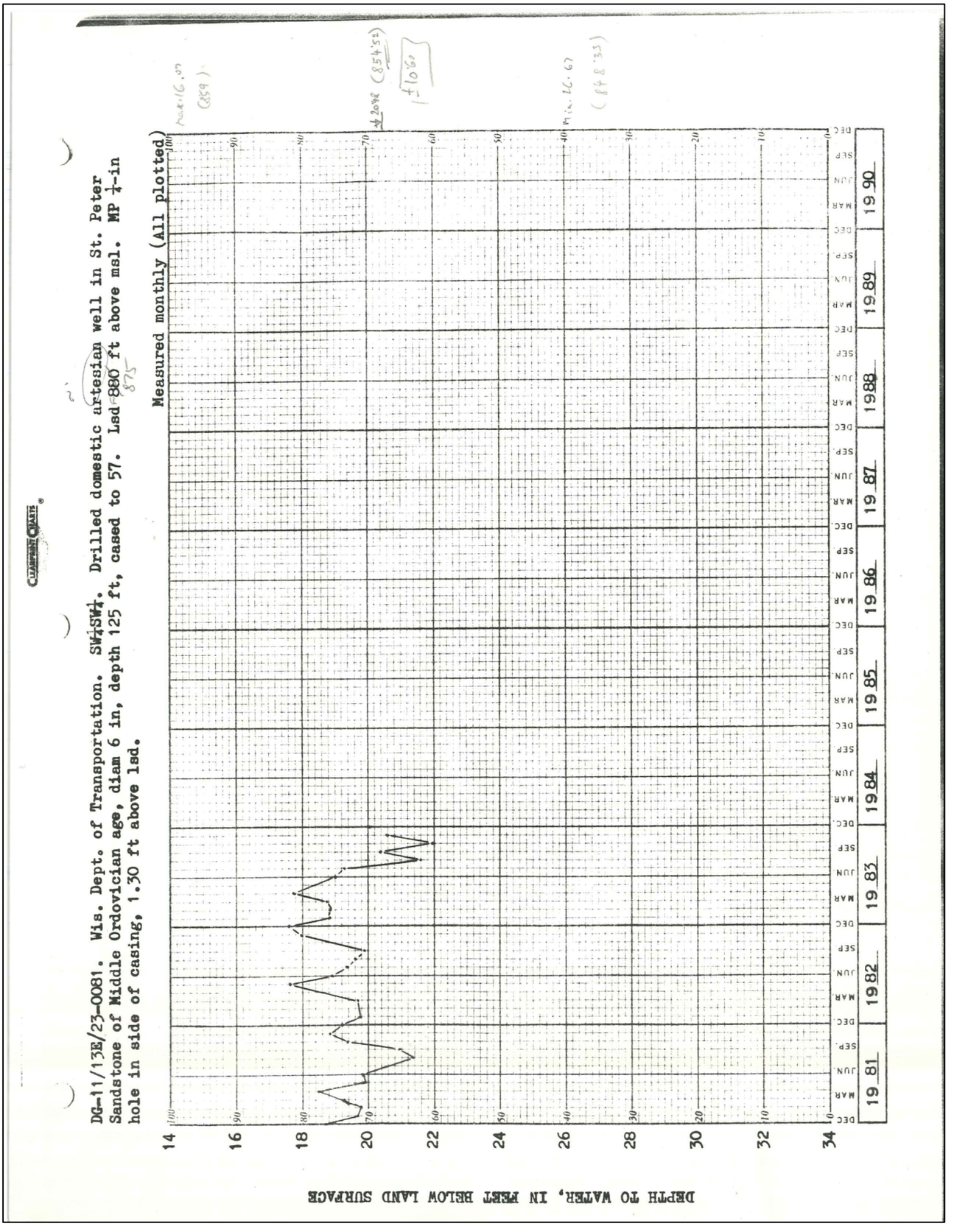
DG-81 Well location maps, date unknown

Well information historically compiled by WGNHS, page 2 of 2



DG-81 Water-level data, 1981-1983

Well information historically compiled by WGNHS, page 1 of 1



DG-81 USGS site schedule, 1978

Form 9-1904-A, page 1 of 2

FORM NO 9-1904-A

SITE NO. DG-11/13E/23-0081

U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
GROUND WATER SITE INVENTORY
SITE SCHEDULE

Recorded by R.M. ERICKSØN

Date 03/15/78

Check One ✓ English — Metric Units

GENERAL SITE DATA (0)

Site Ident No 432415088552601

RG Number R=0 *

Transaction T= (A) D M V * (add, delete, modify, verified)

Site-Type 2= C D H I M P T (W) * (collector, drain, sinkhole, connector, multiple well, pond, tunnel or shaft, well)

Data Reliability 3= (C) U L M * (field checked, unchecked, location not accurate, minimal data)

Reporting Agency 4= USGS *

Project No. 5= 445517200 *

District 6= 55 *

State 7= 55 *

County (or town) DØDGE 8= 027 *

Latitude 9= 432415 * (deg min sec)

Longitude 10= 0885526 * (deg min sec)

Lat-Long Accuracy 11= S (F) T M * (sec, 5 sec, 10 sec, Min)

Local Number 12= DG-11/13E/23-0081 *

Land Net Loc. 13= NWSWSW S 23 T 11N R 13E 4 * (1/4 1/4 1/4 section, township, range, merid)

Location Map 14= BEAVER DAM NW *

Scale 15= 24000 *

Altitude 16= 880. *

Method of Measurement 17= A L (M) * (altimeter, level, map)

Accuracy 18= 5 *

Topo Setting 19= D C E F H K L Ø P S T U V W * (depression, stream channel, dunes, flat, hilltop, sink, swamp, offshore, pediment, hillside, terrace, undulating, valley flat, upland draw)

Hydrologic Unit (OWDC) 20= *

Date of First Construction/Completion 21= 08/00/1961 * (month day year)

Use of Site 23= A D E G H Ø M P R S T U (W) X Z * (anode, drain, geothermal, seismic, heat reservoir, observation, mine, oil or gas, recharge, repressure, test, unused, withdrawal, waste, destroyed)

Use of Water 24= A B C D E F (H) I M N P R S T U Y Z * (air cond., bottling, commercial, dewater, power, fire, domestic, irrigation, medicinal, industrial, public supply, recreation, stock, institution, unused, desal, other)

Secondary Water Use 25= *

Tertiary Use of Water 26= *

Depth of Hole 27= 125. *

Depth of Well 28= 125. *

Source of Depth Data ① 29= A *

Alt = 853

Water Level 30= 27.43 *

Date Measured 31= 11/10/1964 * (month day year)

Source ① 33= S *

Method of Measurement 34= A C E G H L M R (S) T V Z * (airline, calibrated airline, estimated, pressure gage, calibrated pressure gage, geophysical logs, manometer, reported, steel tape, electric tape, calibrated electric tape, other)

Site Status 37= D F G H Ø P R S T V X Z * (dry, flowing, nearby flowing, nearby recently flowing, obstruction, pumping, recently pumped, nearby pumping, nearby recently pumped, foreign substance, surface water affects, other)

Source of Geohydrologic Data ① 36= S *

Pump Used 35= * (no)

Measuring Point 266= 1.30 *

Measuring Point Date 267= 11/10/1964 * (month day year)

OWNER IDENTIFICATION (1)

R=158 * T= (A) D M * (add, delete, modify)

Date of Ownership 159 # 08/00/1961 * (month day year)

Name: Last 161= TRANSPØRTATIØN *

First 162= WIS. DEP. ØF *

Middle Initial 163= *

OTHER SITE IDENTIFICATION NUMBERS (1)

R=189 * T= (A) D M * (add, delete, modify)

New Card Same R & T

Ident 190 # DG-0081 * Assigner 191= USGS *

Ident 190 # WAYSIDE * Assigner 191= OWNER *

SITE VISIT DATA (1)

R=186 * T= (A) D M * (add, delete, modify)

Date of Visit 187 # 11/10/1964 * (month day year)

Name of Person 188= ERICKSØN R *

FIELD WATER QUALITY MEASUREMENTS (1)

R=192 * T= A D M * (add, delete, modify)

Date 193 # / / * (month day year)

Geohydrologic Unit 195 # *

New Card Same R thru 195

Temperature 196 # 00010 * Degrees C 197= *

Conductance 196 # 00095 * μ Mhos 197= *

Other (STORET) Parameter 196 # * Value 197= *

Other (STORET) Parameter 196 # * Value 197= *

FOOT NOTES:

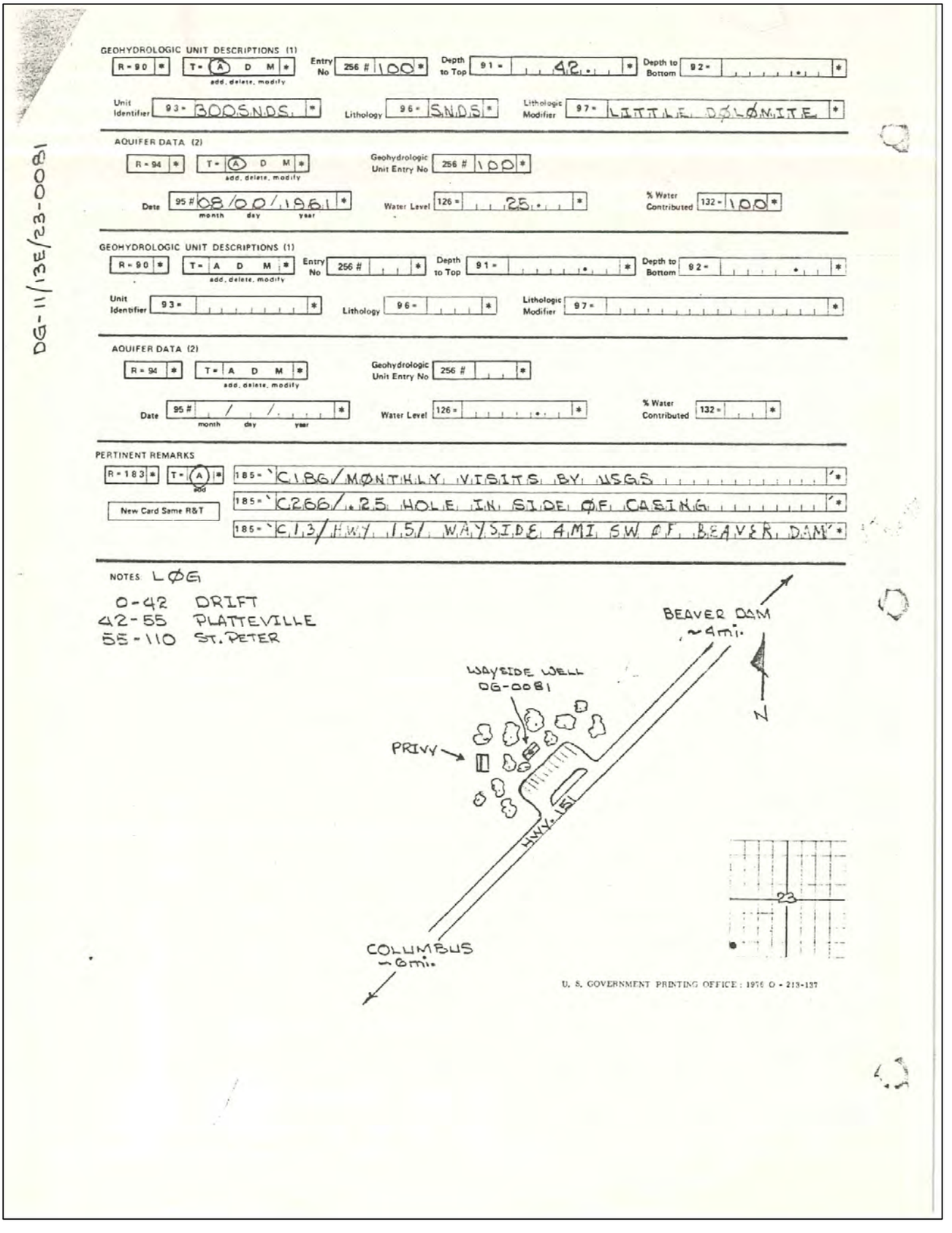
① Source of Data Codes: S D Ø A R L G Z (reporting agency, driller, owner, other gov't., other reported, logs, geologist, other)

In SK Data Base verified

DG-11/13E/23-0081

DG-81 USGS site schedule, 1978

Form 9-1904-A, page 2 of 2



DG-11/13E/23-0081

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * | T = (A) D M * (add, delete, modify) | Entry No 256 # 100 * | Depth to Top 91 = 42. * | Depth to Bottom 92 = * |

Unit Identifier 93 = BOOSNDS. * | Lithology 96 = SNDS * | Lithologic Modifier 97 = LITTLE DOLOMITE *

AQUIFER DATA (2)

R = 94 * | T = (A) D M * (add, delete, modify) | Geohydrologic Unit Entry No 256 # 100 *

Date 95 # 08 / 00 / 1961 * (month / day / year) | Water Level 126 = 25. * | % Water Contributed 132 = 100 *

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * | T = A D M * (add, delete, modify) | Entry No 256 # * | Depth to Top 91 = * | Depth to Bottom 92 = *

Unit Identifier 93 = * | Lithology 96 = * | Lithologic Modifier 97 = *

AQUIFER DATA (2)

R = 94 * | T = A D M * (add, delete, modify) | Geohydrologic Unit Entry No 256 # *

Date 95 # / / * (month / day / year) | Water Level 126 = * | % Water Contributed 132 = *

PERTINENT REMARKS

R = 183 * | T = (A) * (add) | 185 = C186/MONTHLY VISITS BY USGS *

New Card Same R&T | 185 = C266/.25 HOLE IN SIDE OF CASING *

185 = C13/HWY. 151 WAYSIDE 4MI SW OF BEAVER DAM *

NOTES LOG

0-42 DRIFT
42-55 PLATTEVILLE
55-110 ST. PETER

U. S. GOVERNMENT PRINTING OFFICE : 1976 O - 213-137

DG-81 Updated WGNHS boring log, 1961

Page 1 of 1; modified by WGNHS to correct well location

WISCONSIN GEOLOGICAL SURVEY, Science Hall, 500 block N. Park St., Madison, Wis. Log No. Dg-81

Wisconsin State Highway Commission, Project No. T-017-2 (30) Aux. 4.1, Beaver Dam, Wis.
~~SE¼, SE¼, Sec. 22~~, T 11N, R 13E, Calamus Township NW,SW,SW, Sec. 23
E. Sperling & Son, Driller, August 1961
Sample Nos. 226931-226952 - Examined by M. E. Ostrom
980' ETM

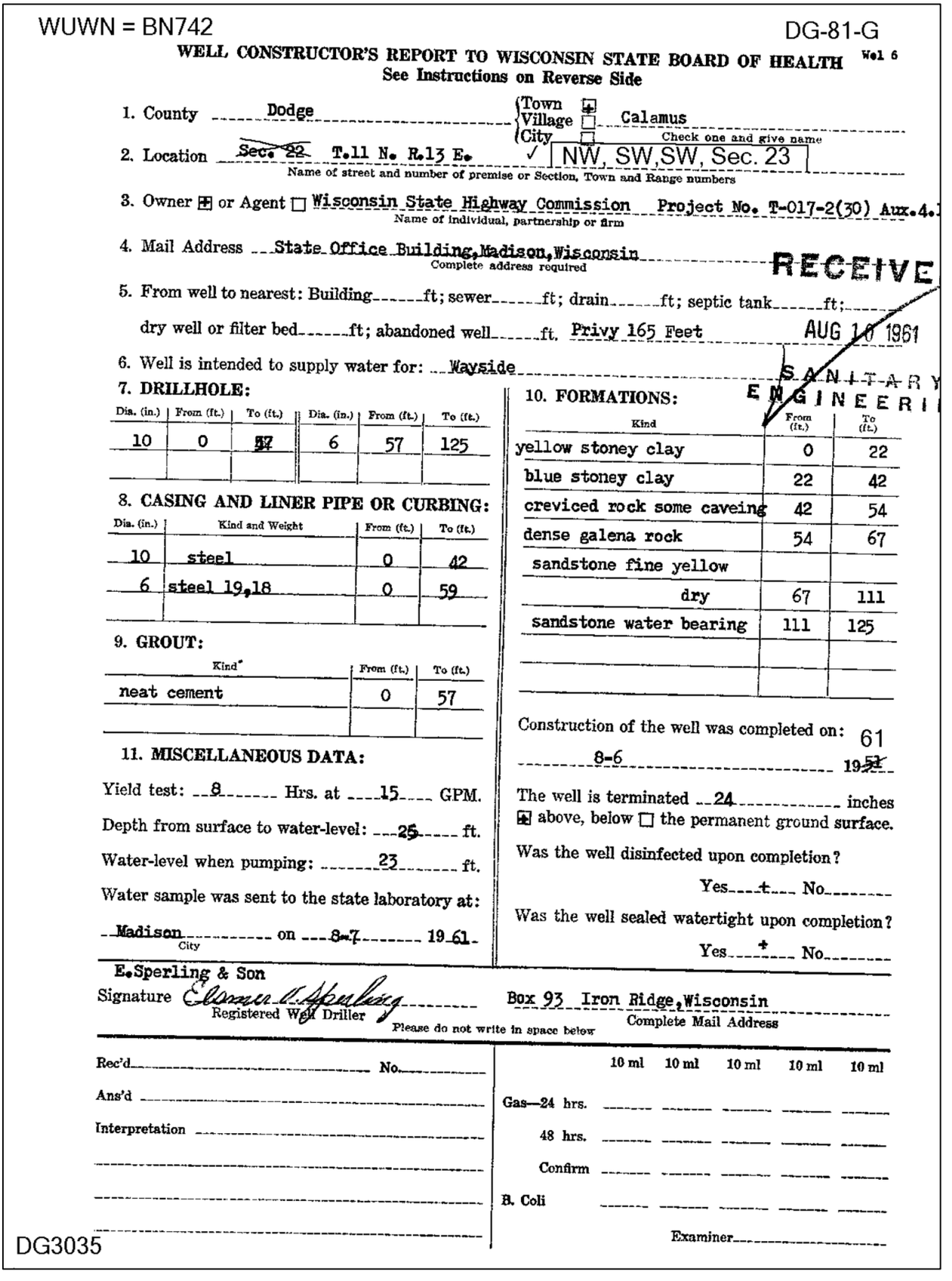
DRIFT	42	0- 5	5		St&Cl, yl bn, dolic cem; sndy
		5- 15	10		St&Cl, lt yl bn, dolic cem; sndy; ltl dol gvl
		15- 25	10		St&Cl, Vlt ol gry, dolic cem; sndy; ltl dol gvl
		25- 30	5		St&Cl, Vlt ol gry, dolic cem; sndy; tr dol gvl
		30- 42	12		St&Cl, Vlt ol gry, dolic cem; sndy; ltl dol gvl
PL	13	42- 55	13		Dol, gry mot lt ol gry, M & fn, dns; tr pyr; mch st & snd
STPETER	55	55- 65	10		Dol, yl bn, M&fn, dns; mch ss cem with Fe
		65- 75	10		Ss, lt yl bn, M&fn, Srnd, F srtg, ltl Vfn; tr st
		75- 80	5		Ss, lt yl bn, M&fn, ltl C&Vfn; ltl st; tr cl
		80- 85	5		Ss, yl bn, M&fn, Srnd, F srtg, ltl C, tr Vfn
		85- 90	5		Ss, yl bn, M&fn, Srnd, F srtg, ltl C, tr Vfn & VC
		90- 95	5		Ss, yl gry, M&C, Srnd, ltl fn, tr VC & Vfn; tr st
		95-100	5		Ss, pl bn, M&fn, Srnd, F srtg, tr C & Vfn
		100-110	10		Ss, gry or pnk, M&fn, Srnd, F srtg, tr C & Vfn

+24"
neat cement grout
6"pipe
10"hole
25'
10"hole
42'
57'
6"hole
125'

Formations: Drift, Platteville, St. Peter
Well tested for 8 hrs. at 15 gpm with 2' of drawdown. Specific capacity = 7.5 gpm per ft. of drawdown.

DG-81 Well construction report, 1961

Page 1 of 1



WUWN = BN742

DG-81-G

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH Wel 6

See Instructions on Reverse Side

1. County Dodge — Town ☐ Village ☐ City ☐ Calamus (Check one and give name)

2. Location ~~Sec. 22~~ T.11 N. R.13 E. ✓ NW, SW, SW, Sec. 23
Name of street and number of premise or Section, Town and Range numbers

3. Owner ☒ or Agent ☐ Wisconsin State Highway Commission Project No. T-017-2(30) Aux.4.
Name of individual, partnership or firm

4. Mail Address State Office Building, Madison, Wisconsin
Complete address required

RECEIVED
AUG 10 1961
SANITARY ENGINEERI

5. From well to nearest: Building ____ ft; sewer ____ ft; drain ____ ft; septic tank ____ ft; dry well or filter bed ____ ft; abandoned well ____ ft. Privy 165 Feet

6. Well is intended to supply water for: Wayside

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
10	0	~~57~~	6	57	125

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
10	steel	0	42
6	steel 19,18	0	59

9. GROUT:

Kind	From (ft.)	To (ft.)
neat cement	0	57

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
yellow stoney clay	0	22
blue stoney clay	22	42
creviced rock some caveing	42	54
dense galena rock	54	67
sandstone fine yellow dry	67	111
sandstone water bearing	111	125

11. MISCELLANEOUS DATA:

Yield test: 8 Hrs. at 15 GPM.

Depth from surface to water-level: 25 ft.

Water-level when pumping: 23 ft.

Water sample was sent to the state laboratory at: Madison City on 8-7 19 61

Construction of the well was completed on: 8-6 19 ~~51~~ 61

The well is terminated 24 inches ☒ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion? Yes + No

Was the well sealed watertight upon completion? Yes + No

E. Sperling & Son

Signature Elmer A. Sperling
Registered Well Driller

Box 93 Iron Ridge, Wisconsin
Complete Mail Address

Please do not write in space below

Rec'd ____ No. ____

Ans'd ____

Interpretation ____

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ____

DG3035

Appendix 9: Well FL-659 documents

Historical Documents

FL-659 WGNHS geologic log, 1985
Well information historically compiled by WGNHS, 3 pages

FL-659 Basic well information, 1985
Well information historically compiled by WGNHS, 1 page

FL-659 Basic well information, 1996
Well information historically compiled by WGNHS, 1 page

FL-659 Well location map, date unknown
Well information historically compiled by WGNHS, 1 page

FL-659 Water-level data, 1995-2000
Well information historically compiled by WGNHS, 1 page

FL-659 WGNHS geologic log, 1985

Well information historically compiled by WGNHS, page 1 of 3

WISCONSIN GEOLOGICAL and NATURAL HISTORY SURVEY
3817 Mineral Point Road • Madison, WI 53705

Geologic Log No. P119-FL-659

Well name Fond du Lac City Exploratory Well EW-2
Town of Byron
Owner..... City of Fond du Lac
Address.. 160 S. Macy Street
Fond du Lac, WI 54935
Driller.. Layne-Northwest Co.
Engineer. Robert E. Lee & Associates, Inc.
Green Bay, Wisconsin

County: Fond du Lac
Completed... 1985
Field check.
Altitude..... 848' ETM
Use..... Test Well
Static w.l... 68' (1/87)
Spec. cap.... 1.67 GPM/ft

R.17 E.
T. 14 N.
Sec. 6

Quad. Oakfield 7½'

Drill Hole						Casing & Liner Pipe or Curbing							
Dia.	from	to	Dia.	from	to	Dia.	Wgt.& Kind	from	to	Dia.	Wgt.& Kind	from	to
10"	0	120'				6"	steel casing 18.97 #/ft 0.280" wall	+2'	120'				
6"	120'	506'											

Drilling method: rotary
Samples from 0 to 506' Rec'd: 8/12/85

Studied by: Kathleen Massie

Grout	from	to
neat cement	0	120'

Formations: Drift, Maquoketa Formation, Sinnipee Group, Glenwood Formation, St. Peter Sandstone (Tonti & Readstown Mbrs), Prairie du Chien Gp, Jordan Formation (Coon Valley Member), Precambrian.

Issued: 1/8/86

Remarks: Well drilled at site 'D'.

LOG OF WELL:

	Depths	Graphic Section	Rock Type	Color	Grain Size Mode	Grain Size Range	Miscellaneous Characteristics
0ft	0-5		Clay & Silt	Yl brown	—	—	Dolomitic. Much gravel(Gran/M peb),sand. Little black soil.
10'	5-10		"	"	—	—	Limy. Much gravel(Gran/L peb). Little sand,gray clay/shale.
MAQUOKETA	10-15		Shale	Gray	—	—	Dolic. Mch dol st. Tr clear dol xtls,yl bn cl,bk lath & disk
	15-20		"	"	—	—	Dolic. Mch dol st. Tr bk lath & disk fos frags. \fos frags.
	20-25		"	"	—	—	Same.
	25-30		"	"	—	—	"
	30-35		"	"	—	—	"
	35-40		"	"	—	—	"
	40-45		"	"	—	—	Same but little caved silt & clay w/some gravel.
	45-50		"	"	—	—	Siliceous. Much silt(tr dolic). Tr bk lath & disk fossil frags.
	50-55		"	"	—	—	Same plus trace calcite.
	55-60		"	"	—	—	Siliceous. Much silt(tr dolic). Tr bk lath & disk fossil frags.
	60-65		NO SAMPLE.				
	65-70		Shale	Gray	—	—	Siliceous. Much silt(tr dolic). Tr bk lath & disk fossil frags.
	70-75		"	"	—	—	Same plus trace weathered pyrite.
	75-80		"	"	—	—	Same.
	80-85		"	"	—	—	Siliceous. Much silt(tr dolic). Tr bk lath & disk fossil frags.
	85-90		"	"	—	—	Same minus gravel. \cvd dol gvl(Gr/MP).
	90-95		"	"	—	—	Same.
	95-100		"	"	—	—	Siliceous. Mch silt(tr dolic). Tr bk lath & disk fos frags,wee
	100-105		"	"	—	—	Same. \pyrite.
	105-110		Shale & Dol	Gy & gy bn	M	Fn/M	Sh as abv. Dol: Tr bk lath fos frags,dk yl bn to dk bn sh matx
	110-115		"	"	"	"	Same. \(in lyr),pyr.
110'	115-120		NO SAMPLE.				
SINNIPEE	120-125B		Dolomite	Gy brown	M	Fn/M	Limy. Tr bk fos frags,fos molds,pyr,dk bn sh matx,rd bn spklg.
	125-130		"	"	"	"	Same.
	130-135		Limestone	"	"	"	Tr calc xtls,bk fos frags,pyr,dk bn sh matx,rd bn spklg.
	135-140		"	"	"	"	Tr bk fos frags,pyr,fos molds,dk bn sh matrix,rd bn speckling.
	140-145		"	"	"	"	Same.
	145-150		"	"	"	"	"
	150-155		Dolomite	Pl brown	"	"	Same but limy.
	155-160		"	"	"	"	Same.

Page 1 of 3

FL-659 WGNHS geologic log, 1985

Well information historically compiled by WGNHS, page 2 of 3

WISCONSIN GEOLOGICAL and NATURAL HISTORY SURVEY
3817 Mineral Point Road • Madison, WI 53705

Log No. P119-FL-659

Well name: Fond du Lac City Exploratory Well EW-2

	Depths	Graphic Section	Rock Type	Color	Grain Size Mode	Grain Size Range	Miscellaneous Characteristics
SINNIPEE GROUP	160-165		Dolomite	Pl brown	M	Fn/M	Tr bk fos frags,pyr,fos molds,dk bn sh matrix,rd bn spklg.Limy.
	165-170		"	"	"	"	Tr bk fos frags,pyr,fos molds,dk bn sh matrix.
	170-175		"	"	"	"	Same.
	175-180		"	"	"	"	Same plus trace red brown speckling.
	180-185		"	Brown	"	"	Limy. Few bk fos frags(conc). Tr fos molds,pyr,calc xtls,rd bn
	185-190		"	"	"	"	Limy. Tr bk fos frags,fos molds,pyr,calc \ spklg,dk bn sh matx.
	190-195		"	"	"	"	Limy. Tr pyrite,calc xtls,dk bn sh prtg. \ xtls,dk bn shale prtg.
	195-200		"	"	"	"	Limy. Tr pyr,bk fos frags,dk bn sh prtg,fos molds,dk gy stng
	200-205		"	"	"	"	Limy. Few bk fos frags(conc). Tr dk bn sh prtg,fos \ from pyr.
	205-210		"	Gray	"	"	Limy. Mny bk fos frags. Ltl bl gy \ molds,dk gy stng from pyr,pyr.
	210-215		"	Gy brown	"	"	Ltl gy dol as abv. Tr fos frags, \ shale matrix. Trace pyrite.
	215-220		"	"	"	"	Few bk fos frags(conc). Tr \ fos molds,dk bn sh partings,pyr.
	220-225		NO SAMPLE. Driller reports dolomite.				\ fos molds,bl gy sh matx,dk bn sh prtg,pyr.
	225-230		Dolomite	Pl brown	M	Fn/M	Tr dk bn sh prtg,stylolites,pyrite,fossil frags,white chert.
	230-235		"	"	"	"	Tr calc xtls,dk bn sh prtgs,pyr,fos frags,wh cht,dk gy stng from
	235-240		"	"	"	"	Same minus chert. \ pyrite.
	240-245		"	"	"	"	Same.
	245-250		"	"	"	"	Sug. Lmy. Tr dk bn sh matx,bl gy sh,fos frags,pyr,pl bn fossif
	250-255		"	Gy brown	"	"	Same but few fossil frags. \ cht,calc xtls,fos molds.
	255-260		"	"	"	"	Sug. Lmy. Few fos frags(conc in gy chips w/sh). Tr bl gy sh,dk
	260-265		"	Dk gy & bn	"	"	See end of log. \ bn sh matx,pyr,fos molds,calc xtls.
	265-270		"	Dk gray	"	"	Lmy. Mny fos frags/molds. Ltl bl gy to dk gy sh matx. Tr pyrite.
	270-275		"	"	"	"	Lmy. Mny fos frags/molds. Mch bl gy to dk gray shale. Tr pyrite.
	275-280		"	Gray	"	"	Lmy. Tr dk bn sh matrix,pyr,fos frags,calc xtls,shaly fossif dol.
	280-285		"	Gy brown	"	"	Ltl shly fossil dol. Tr fossil frags,dk bn sh partings,pyrite.
	285-290		"	Yl brown	"	"	Ltl yl bn silt coating chips. Tr dk bn sh partings,yl bn cht,bk
	290-295		NO SAMPLE. Driller reports dolomite.				\ lath fos frags.
	295-300		Dolomite	Brown	M	Fn/M	Lmy. Tr pyrite,dk bn sh partings,bk lath fossil frags,dk gy stng.
	300-305		"	"	"	"	Same.
	305-310		"	Gy brown	"	"	"
	310-315		"	Gy bn to gy	"	"	Lmy. Few fos frags. Ltl dk gy sh matx. Tr pyr,dk rd spklg.
200'	315-320		"	Gy brown	"	"	Lmy. Tr fos frags,dk gy sh matrix,pyrite,dk rd speckling.
Glen.	320-325		Sandstone	"	VC	Vfn/VC	Rnd. Tr G dol cem,G pyr cem,mafic incl,fos frags,dk rd spklg.Mch
TONTI	325-330	P	"	Lt bn gy	M/C	"	See end of log. \ dol as abv.frstg. Few sec qtz grwths. Ltl pl
	330-335	P	"	"	"	"	Same as 325'-330' but trace pyrite. \ gn sh.
	335-340	P	"	"	"	"	Same.
	340-345	P	"	"	"	"	"
	345-350	P	"	"	"	"	Rnd. Mch G sil to slgtly dolic cem,frstg. Few sec qtz grwths.
30'	350-355		"	Pink	"	"	Same plus ltl gn to dk gn sil sh. \ Ltl pyr(cem&incl). Tr pl gn
READS	355-360		"	Lt gy to gy	"	"	See end of log. \ sh,mafic incl,caved dol.
	360-365		"	lt gy to dk gy	"	"	Same as 355'-360' but even more pk or & gy chertified ss,& even
	365-370		"	"	"	"	Same. \ more gy sil sh.
	370-375		"	Wh rd to yl	"	"	Srnd to rnd. Mch VG sil cem,sil matx(pl yl to rd yl,now v cht-
25'	375-380		"	Mxd & oy	"	"	See end of log. \ like),frstg. Mny sec qtz grwths. Tr pyr,gy mica
PRAIRIE du CHIEN	380-385		Dolomite	Lt bn gy	M	Fn/M	See end of log. \ sil sh,qtz st,lim,mafic incl,drsy qtz. Dkr
	385-390		"	lt bn gy to dk gy	"	"	See end of log. \ chips have more "cht" present(intergranual),
	390-395		Sandstone	Lt gray	Fn/M	Vfn/VC	Sang to rnd. Ltl F to G dol cem,dol, \ wh chips only sil cem.
	395-400		"	"	"	"	Same. \ frstg,pl gn sh. Mny sec qtz grwths. Mch st(qtz&dol). Tr
	400-405		Dolomite	lt bn gy to gy bn	M	Fn/M	See end of log. \ Vfn/Fn-zircon,white oolitic chert,hem shale.
	405-410		"	"	"	"	Same as 400'-405' plus trace clear dol xtls.
	410-415		Dol & Cht	lt bn gy & wh	"	"	Ltl wh to clear & or drsy qtz occurring w/cht. Few chips of dol
	415-420	G	Dolomite	Lt gray	"	"	See end of log. \ xtls fltg in wh cht. Tr gn sil sh w/dk gn sh
	420-425	G	"	"	"	"	See end of log. \ mottling,dk bn sh partings w/stylolites,pyrite.
	425-430	G	"	"	"	"	Tr fltg qtz snd,Vfn-glauc,pl gn sh,wh cht,gy sh,pyr,dol xtls,bn
	430-435	G	"	"	"	"	Slgtly sug. Tr qtz snd(free & fltg),mssv & Vfn- \ sh partings.
	435-440	G	"	"	"	"	Same. \ glauc,pyr,bn sh prtg,vugs.
	440-445	G	"	"	"	"	Slgtly sug. Tr pyr,mssv & Vfn glauc,wh cht,rd bn hem stng,bn sh
	445-450	G G	"	Lt gy to rd bn	"	"	Mch dk rd bn hem sh matx(conc). Ltl Vfn-glauc. Tr qtz \ matrix.
	450-455	G	"	V pl bn	"	"	Sug. Ltl fltg qtz snd. Tr Vfn-mssv glauc, \ snd(free&fltg),pyr.
	455-460	G	"	"	"	"	See end of log. \ rd bn hem sh matx,dk bn sh mottling.
	460-465	G	"	"	"	"	Sug. Few dol xtls. Tr fltg qtz snd,pyr,wh cht,wh cht matx,drsy
	465-470	G	"	"	"	"	Same. \ qtz,Vfn-glauc,rd bn hem sh matx,or-pk stng,gn sh,bn stng.
	470-475	G	"	Yl pl bn to lt bn gy	"	"	Slgtly sug. Ltl pk or stng. Tr qtz snd(free&fltg),drsy qtz,dol
100'	475-480	G	"	Wh to v pl bn	"	"	See end of log. \ xtls,mssv & Vfn glauc,wh cht matx(w/sandiest
C.V.	480-485		"	Wh to lt gy	"	"	See end of log. \ chips),pyr,dk bn sh prtg.
	485-490		"	Wh to v pl bn	"	"	Sug. Mch fltg qtz snd. Few snd cored ool(conc in chips,most of
							\ ool is snd). Tr pyrite,pl gn sh & sh matrix,dk bush partings.

Page 2 of 3

FL-659 WGNHS geologic log, 1985

Well information historically compiled by WGNHS, page 3 of 3

WISCONSIN GEOLOGICAL and NATURAL HISTORY SURVEY
3817 Mineral Point Road • Madison, WI 53705

Log No. P119-FL-659

Well name: Fond du Lac City Exploratory Well EW-2

	Depths	Graphic Section	Rock Type	Color	Grain Size Mode	Grain Size Range	Miscellaneous Characteristics
C.V.	490–495		Dolomite	Wh to v pl bn	M	Fn/M	Sug. Mch fltg qtz snd. Tr pyr,gn sh matx,wh cht ool,dk bn sh
	495–500		Sandstone	White	M/C	Vfn/VC	Srnd to rnd. Tr G sil cem,pl gn to gn sil sh,qtz st,wh partings.
25'	500–505		Dolomite	Pl brown	M	Fn/M	See end of log. cht,mafic incl. Mny sec qtz grwths. Ltl frstg,
1' P-€	505–506		Quartzite	Wh & pk to wk rd	Fn/M	Vfn/C	Ltl metallic vng/cem(ilmenite & pyr),wh to or drsy dol as abv. quartz. Trace sericite,mica,dol(caved).
			END OF LOG				
			Unlabelled	samples.			
	A		Dolomite	Pl bn & gy	M	Fn/M	Ltl gy stng. Tr fossil molds(conc in gy chips)dk gy bn sh matx, pyrite,clear dol xtls,wh chert matrix.
	B		Dolomite	Bn gray	M	Fn/M	Limy. Tr pyrite,wea pyrite,dk gy staining(from pyrite),black lath fossil frags.
			DUPLICATE SAMPLE.				
	120–125A		Shale & Dol	Gy & gy bn	M	Fn/M	Shale as in 100'-105'. Dol: Tr black lath fossil frags,dk yl bn to dk bn sh matrix (in layers),pyrite.
			"See end of log" samples.				
	260–265		Dolomite	Dk gy & bn	"	"	Limy. Many fossil frags/molds(assoc w/sh & dk chips). Much bl gy to dk gy shale matrix. Trace pyrite,calcite crystals.
	325–330		Sandstone	Lt bn gy	M/C	Vfn/VC	Rnd. Ltl G sil cem,pyrite(as cem&inclusions). Few sec qtz grwths. Much frosting. Trace pale green shale,caved dol,mafic incl.
	355–360		Sandstone	Lt gy to gy	M/C	Vfn/VC	Rnd. Mch VG sil cem(wh to lt gy),lt gy to bk sil sh(multi lyr w/wide color range,most gray),frosting,sandy chert(bn,or & gy sh(?) w/much floating qtz sand,chertified to hard layered chips, toomuch matrix for a ss/qtzite). Few sec qtz growths. Tr fossils(?)-the thinnest wh & bk layers of sh appear to be the result of fossil remains, G dol cem,G cal cem,VG pyrite cem,pyrite,pl gn sil sh,mafic incl,wh(sand cored)chert oolites in drusy quartz,quartz silt.
	375–380		Sandstone	Mxd & gy	M/C	Vfn/VC	Srnd to rnd. Mch VG sil cem/matrix(as above,wh to pl yl to rd yl,very chert-like),frosting,shale(much gy to bl gy sil sh occurring in layers w/ss,some shows bk fossil evidence as abv, also w/tr occurrence of much floating rd bn hem mica,also w/ little mottling by dk rd bn sh. Mch rd bn to dk rd bn hem sh w/tr bl gy sh mottling. Ltl pl gn sil sh. All shales have chips w/verying amounts of qtz sand(none to heavy)), dol(lt bn gy w/normal xtl structure to slgtly rnd dol grains/xtls w/thin bl wh sil sh matx between most grains to wrnd small dol grains w/greater amounts of bl wh sil matrix). Many sec qtz grwths. Ss chips approx 45% of sample,shale chips approx 35%,dol chips approx 20% of sample.
	380–385		Dolomite	Lt bn gy	M	Fn/M	Ltl pl gn sil sh,dk rd bn hem sh. Tr wh chert,floating qtz snd, pl gn sh matrix,ss as above.
	385–390		Dolomite	lt bn gy to dk gy	M	Fn/M	Tr floating qtz-sand,wh chert mottling(fossil molds),bn immature oolites,dk bn sh partings,wh oolitic chert,pl gn sh & matx.
	400–405		Dolomite	lt bn gy to gy bn	M	Fn/M	Much wh chert w/some wh to clear & or drusy quartz. Few chips show many dol xtls floating in wh chert. Tr gn sil sh w/dk gn sh mottling,floating qtz sand,pyrite,dk bn sh partings.
	415–420	G	Dolomite	Lt gray	M	Fn/M	Ltl qtz sand(fltg & free). Tr wh chert,Vfn-glauc,gn sh w/dk gn mottling,pyrite,gray shale.
	420–425	G	Dolomite	Lt gray	M	Fn/M	Trace quartz sand (floating & free),Vfn-glauc,wh chert,gn sh, pyrite,dol xtls,dk bn sh partings,gy sh.
	455–460	G	Dolomite	V pl bn	M	Fn/M	Sugary. Ltl floating qtz sand. Tr pyrite,Vfn-mssv glauc,immature ooliths(conc),caved hematitic dol.
	475–480	G	Dolomite	Wh to v pl bn	M	Fn/M	Slgtly sug. Tr pk or stng,fltg qtz snd,drusy qtz,dol xtls,wh chert oolites,oolites(conc),bn staining,massive glauc,Fn-zr, pyrite.
	480–485		Dolomite	Wh to lt gy	M	Fn/M	Sugary. Mch floating qtz sand. Little drusy qtz. Tr pl gn to gn sh & sh matrix,wh cht matrix,pink staining,pyrite.
	500–505		Dolomite	Pl brown	M	Fn/M	Much qtz sand(free&fltg). Tr wh cht,wh cht matrix,pl gn sh,pyr cvd rd bn hem stained dol,caved soil.

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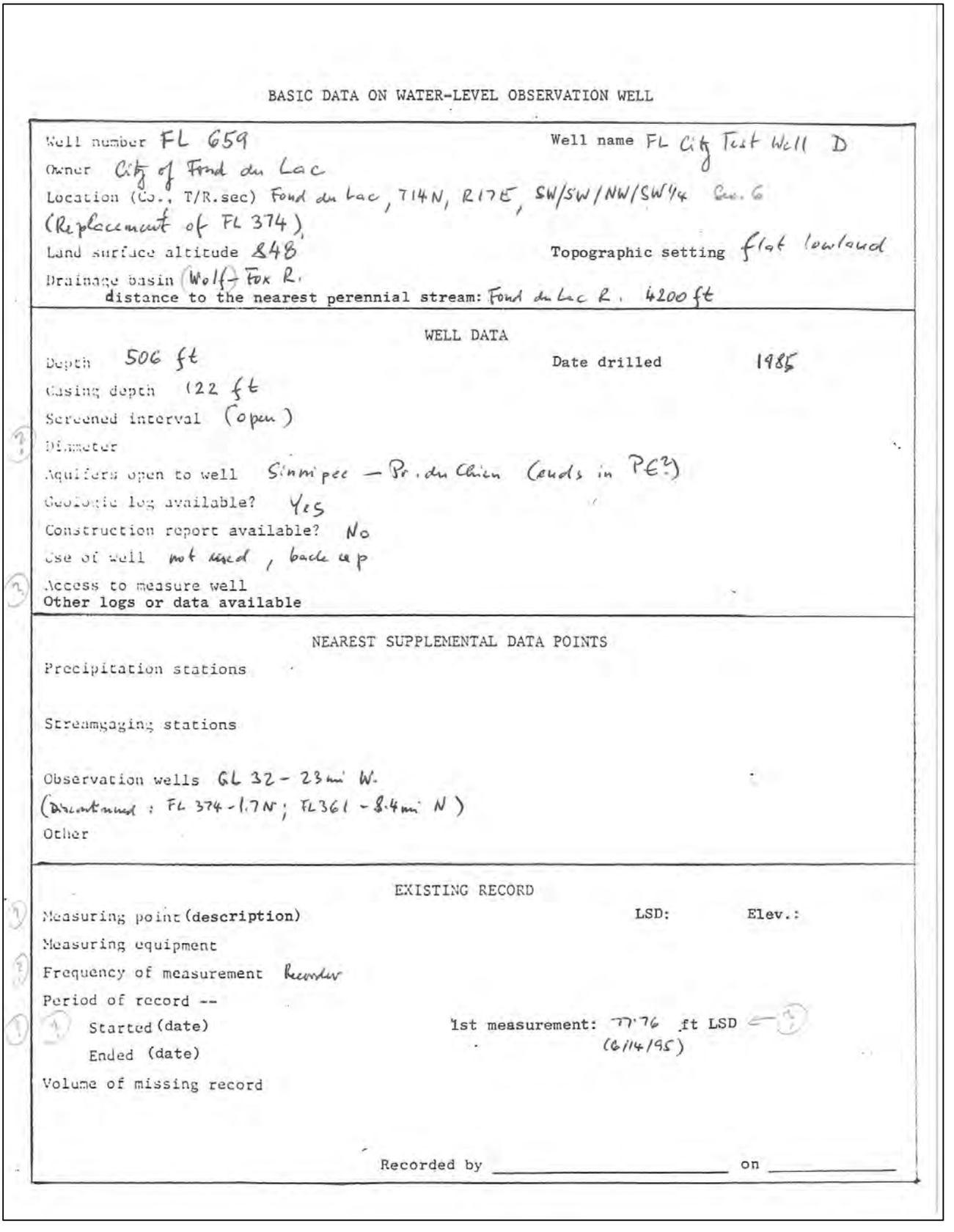
FL-659 Basic well information, 1985

Well information historically compiled by WGNHS, page 1 of 1



BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number FL 659 Well name FL City Test Well D

Owner City of Fond du Lac

Location (Co., T/R.sec) Fond du Lac, 714N, R17E, SW/SW/NW/SW¼ Sec. 6

(Replacement of FL 374),

Land surface altitude 848 Topographic setting flat lowland

Drainage basin Wolf-Fox R.

distance to the nearest perennial stream: Fond du Lac R. 4200 ft

WELL DATA

Depth 506 ft Date drilled 1985

Casing depth 122 ft

Screened interval (open)

Diameter

Aquifers open to well Sinnipee – Pr. du Chien (Cands in PE?)

Geologic log available? Yes

Construction report available? No

Use of well not used, back up

Access to measure well

Other logs or data available

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations

Streamgaging stations

Observation wells GL 32 – 23mi W.

(Discontinued: FL 374 - 1.7N; FL361 - 8.4mi N)

Other

EXISTING RECORD

Measuring point (description) LSD: Elev.:

Measuring equipment

Frequency of measurement Recorder

Period of record --

Started (date) 1st measurement: 77.76 ft LSD (6/14/95)

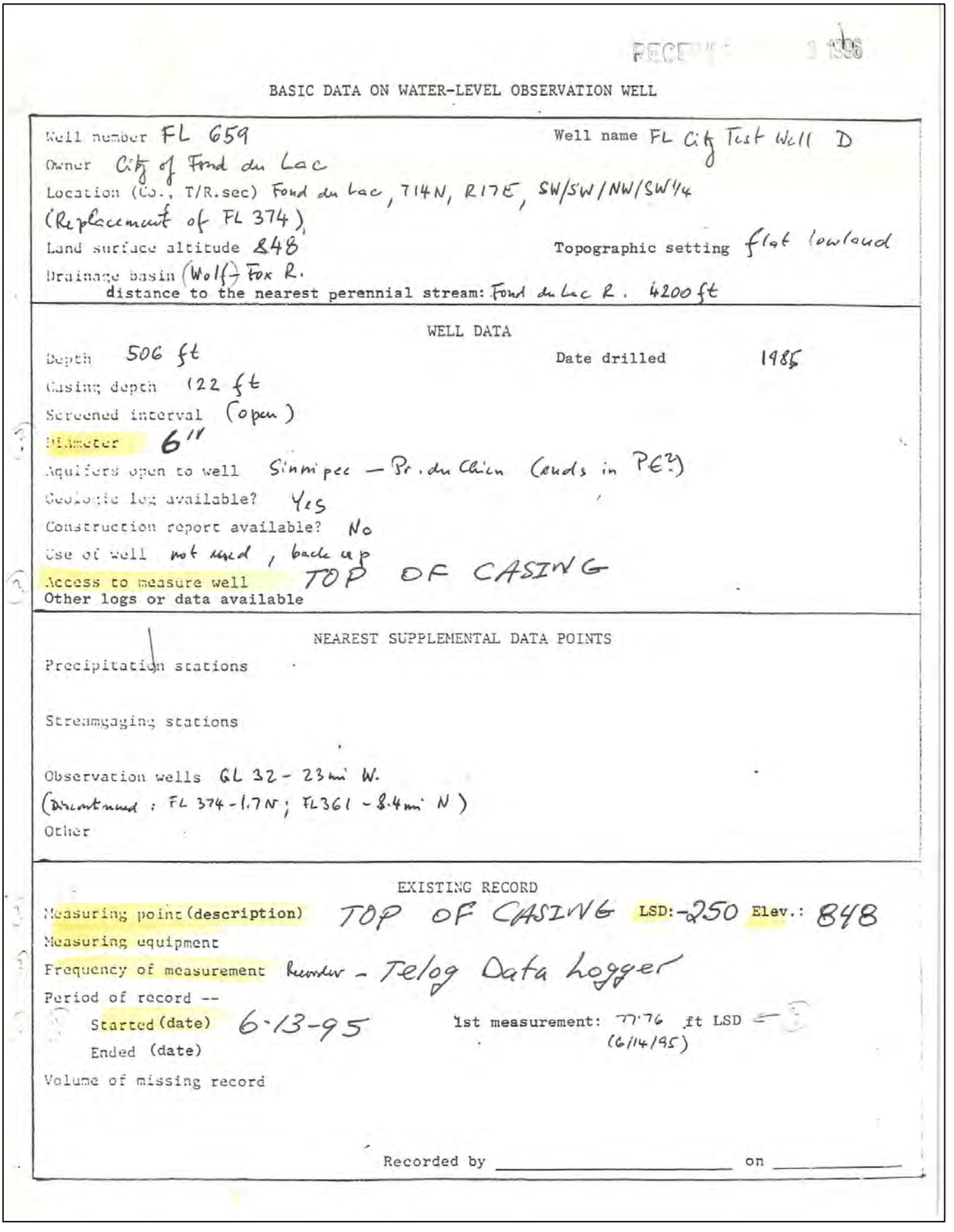
Ended (date)

Volume of missing record

Recorded by _____ on _____

FL-659 Basic well information, 1996

Well information historically compiled, page 1 of 1



RECEIVED 1996

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number FL 659 Well name FL City Test Well D

Owner City of Fond du Lac

Location (Co., T/R.sec) Fond du Lac, 714N, R17E, SW/SW/NW/SW1/4

(Replacement of FL 374),

Land surface altitude 848 Topographic setting flat lowland

Drainage basin (Wolf) Fox R.

distance to the nearest perennial stream: Fond du Lac R. 4200 ft

WELL DATA

Depth 506 ft Date drilled 1985

Casing depth 122 ft

Screened interval (open)

Diameter 6"

Aquifers open to well Sinnipee — Pr. du Chien (sands in PE?)

Geologic log available? Yes

Construction report available? No

Use of well not used, back up

Access to measure well TOP OF CASING

Other logs or data available

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations

Streamgaging stations

Observation wells GL 32 - 23 mi W.

(Discontinued: FL 374 - 1.7 N; FL 361 - 8.4 mi N)

Other

EXISTING RECORD

Measuring point (description) TOP OF CASING LSD: -250 Elev.: 848

Measuring equipment

Frequency of measurement Recorder - Telog Data logger

Period of record --

Started (date) 6-13-95 1st measurement: 77.76 ft LSD (6/14/95)

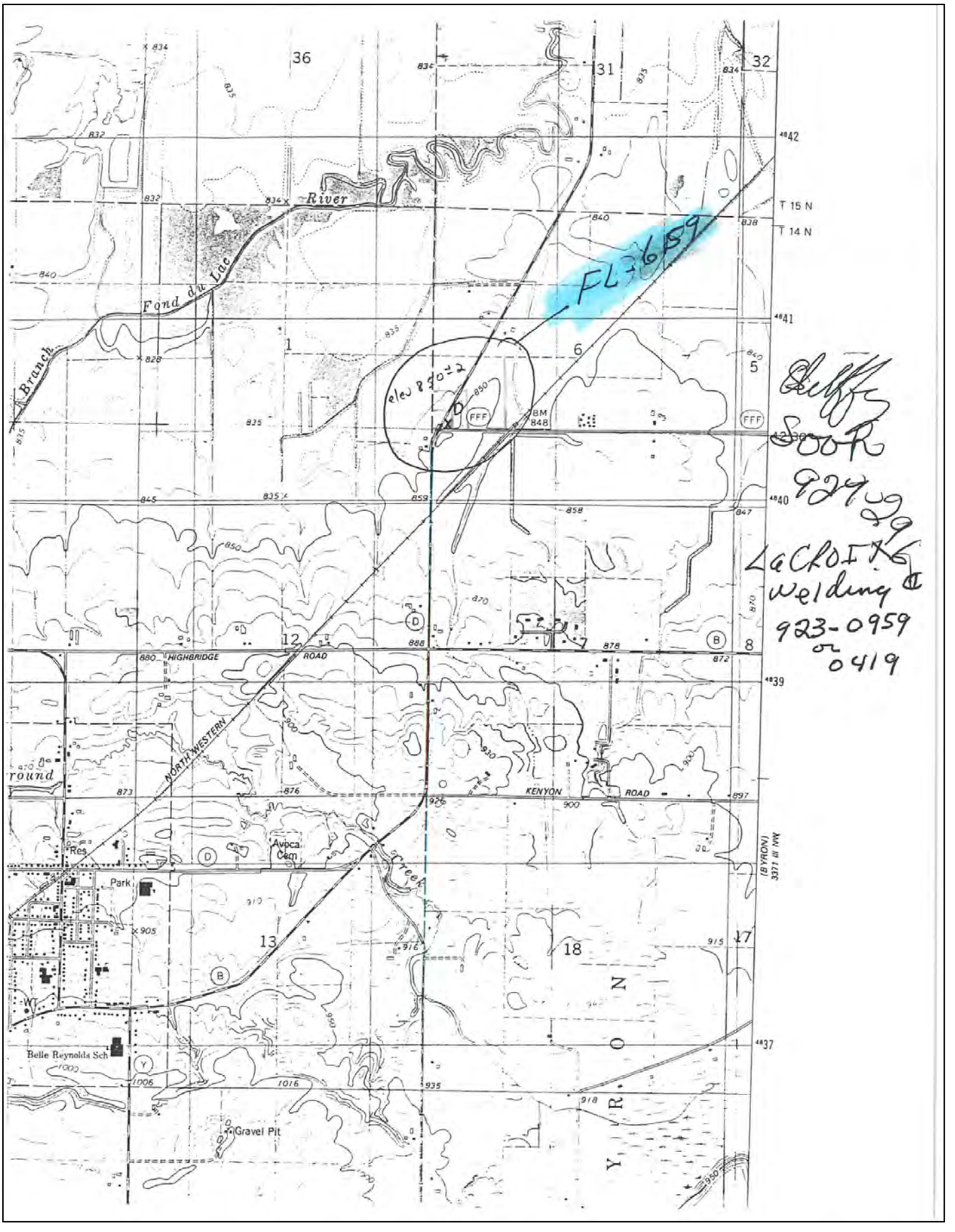
Ended (date)

Volume of missing record

Recorded by _____ on _____

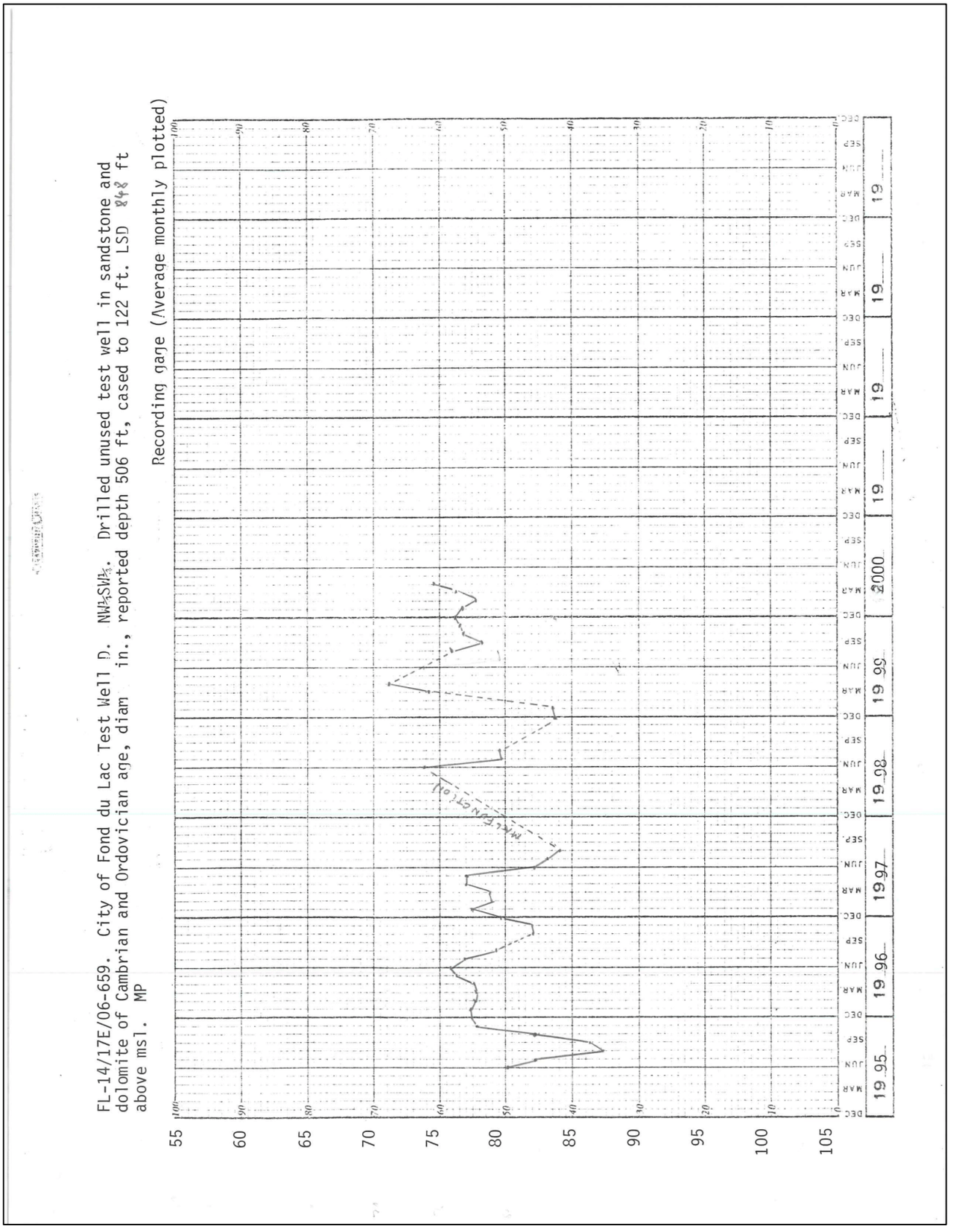
FL-659 Well location map, date unknown

Well information historically compiled by WGNHS, page 1 of 1



FL-659 Water-level data, 1995-2000

Well information historically compiled by WGNHS, page 1 of 1



Appendix 10: Well GN-02 documents

Historical Documents

GN-02 Basic well information, 1980

Well information historically compiled by WGNHS, 1 page

GN-02 Well evaluation, 1980

Well information historically compiled by WGNHS, 1 page

GN-02 Well location map, date unknown

Well information historically compiled by WGNHS, 1 page

GN-02 Water-level data, 1991-2000

Well information historically compiled by WGNHS, 1 page

GN-02 USGS well schedule, 1966

1 page

GN-02 Basic well information, 1980

Well information historically compiled by WGNHS, page 1 of 1

7/11/80

GN-2

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number GN-03/06E/18-0002
Owner EARL WADDINGTON
Location (Co., T/R.sec) GREEN Co.
T. 3 N., R. 6E., SEC. 18 NE¼NW¼
Land surface altitude 1,020 FT.
Drainage basin Pecatonica River Basin
Dist. to nearest perennial stream: 2000 ft to unnamed trib. to Praire Brook

WELL DATA

Depth 150 FT.
Casing depth ?
Screened interval —
Diameter 6 IN.
Aquifers open to well SS
Geologic log available? No
Construction report available? No
Use of well UNUSED
Access to measure well GOOD

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Blanchardville – 5 mi NNW Monroe – 13 mi SE
Darlington – 14 mi WSW
Streamgaging stations 05433000
E. Branch Pecatonica River near Blanchardville, WI – 4 mi NNW
Observation wells GN 1 – 8 mi SE LF 78 – 10 mi WNW
Other LF 63 – 7 mi WNW

EXISTING RECORD

Measuring point HOLE IN PUMP BASE, 0.50 FT. ABOVE L.S.D.
Measuring equipment TAPE
Frequency of measurement MONTHLY
Period of record --
Started 1946
Ended CONTINUING
Volume of missing record

GN-02 Well evaluation, 1980

Well information historically compiled by WGNHS, page 1 of 1

GN-2

July 1980
R. D. Cotter

CRITERIA FOR EVALUATION OF WATER–LEVEL OBSERVATION WELLS IN WISCONSIN

1. Areal spacing -- distance from any observation well 1.5 MI.
   -- distance from observation well in same aquifer 2.5 MI.

2. Ownership (-- private)
   -- public

3. Use of well UNUSED

4. Access -- physical OK
   -- owner's permission OK

5. Condition of well (--casing) GOOD
   -- housing

6. Geologic log -- yes
   (-- no)

7. Construction report -- yes
   (-- no)

8. Diameter (4 inch minimum for recorder) 6 IN.

9. Aquifer (-- single)
   -- multiple

10. Hydraulic connection with aquifer

11. Knowledge of pumping effects

12. Range and character of water level fluctuations 20 FT.

13. Length of record 34 YRS.

14. Missing record

15. Adequacy of current measuring frequency IMPROVE

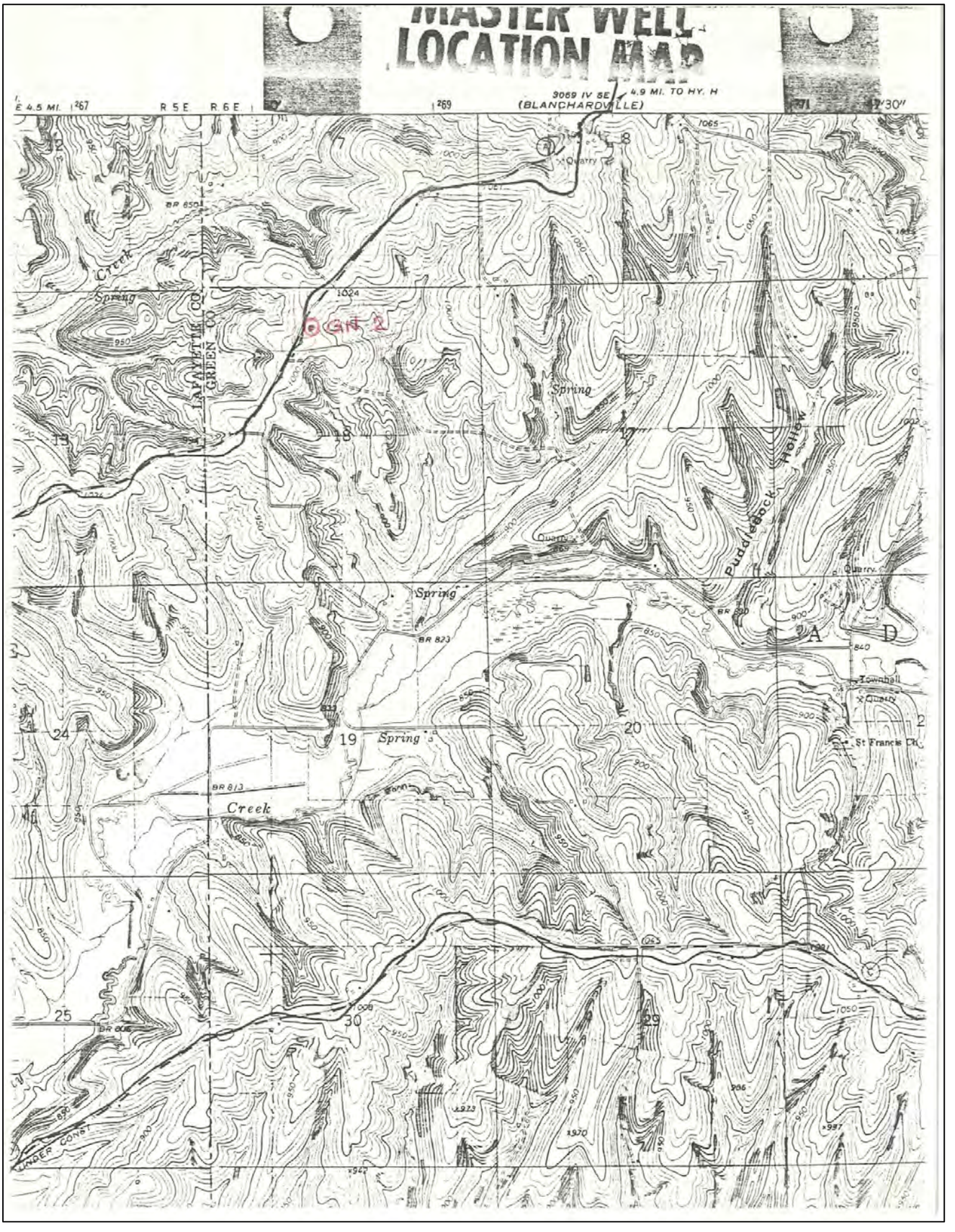
16. Probability of permanance GOOD

NOTES

Recommendations

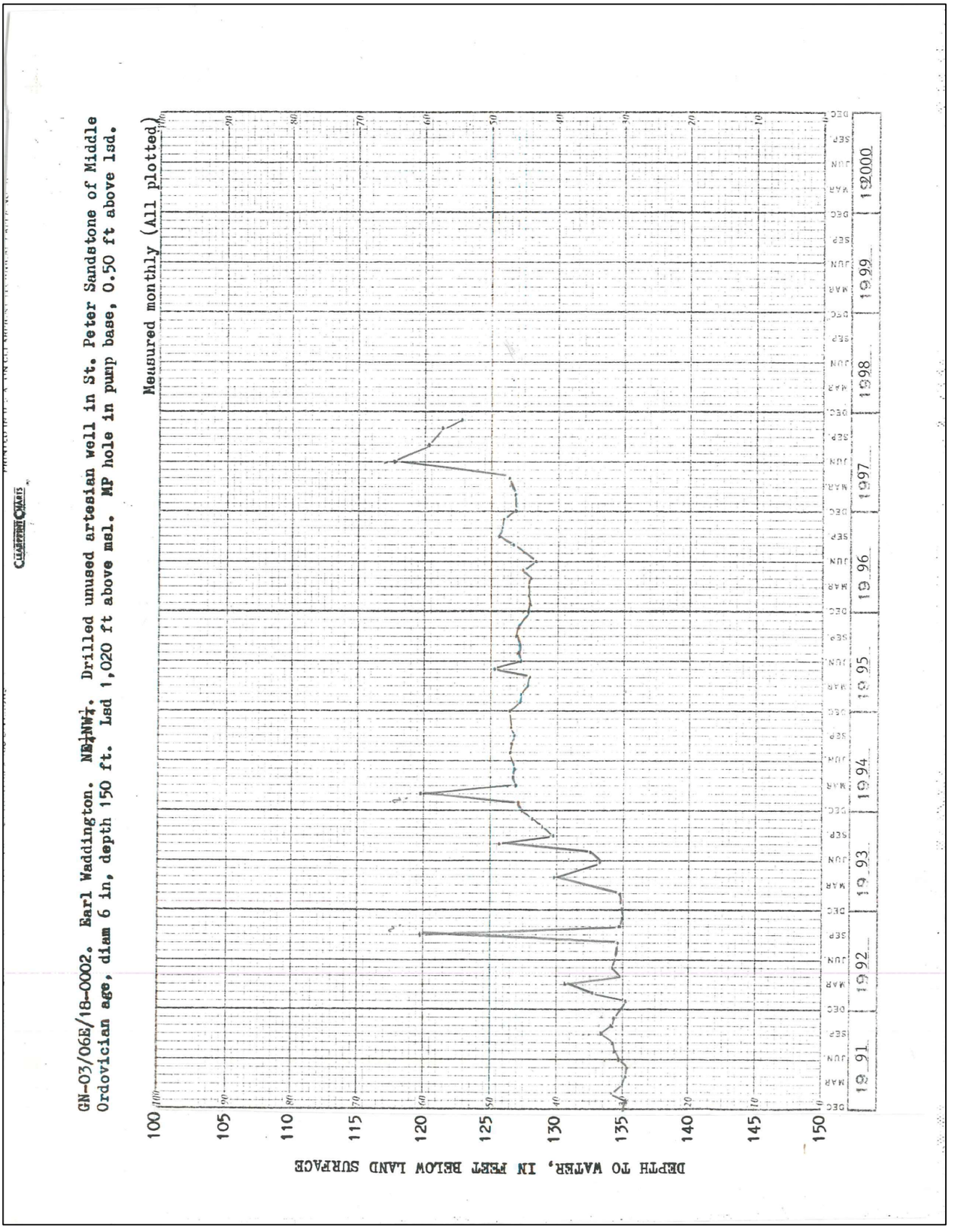
GN-02 Well location map, date unknown

Well information historically compiled by WGNHS, page 1 of 1



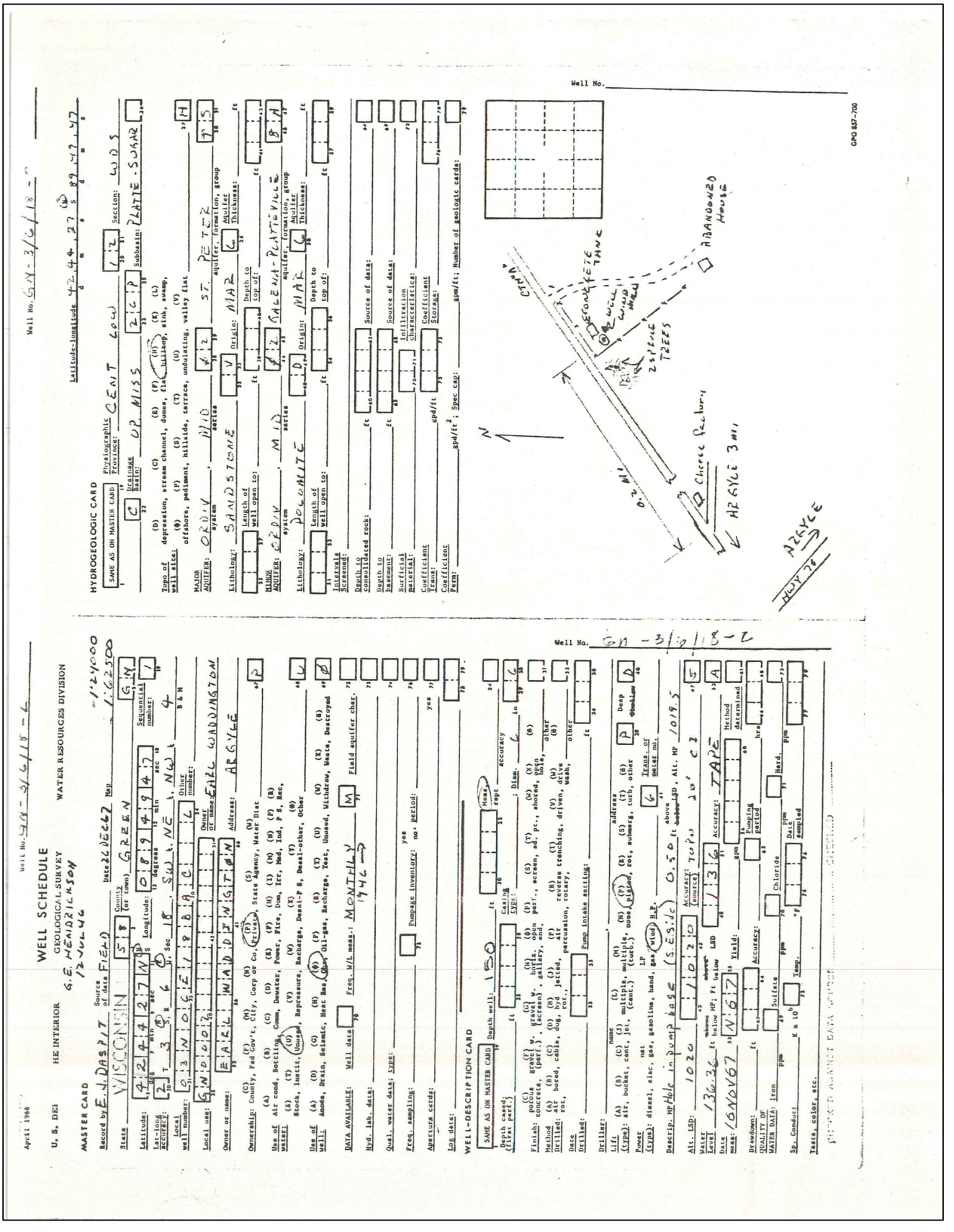
GN-02 Water-level data, 1991-2000

Well information historically compiled by WGNHS, page 1 of 1



GN-02 USGS well schedule, 1966

Page 1 of 1



Appendix 11: Well MQ-26 documents

Historical Documents

MQ-26 WGNHS boring log, 1960
Well information historically compiled by WGNHS, 1 page

MQ-26 Basic well information, 1980
Well information historically compiled by WGNHS, 1 page

MQ-26 Well evaluation, 1980
Well information historically compiled by WGNHS, 1 page

MQ-26 Well location map, date unknown
Well information historically compiled by WGNHS, 1 page

MQ-26 Water-level data, 1965-circa 1988
Well information historically compiled by WGNHS, 3 pages

MQ-26 USGS well schedule, 1930
1 page

MQ-26 Well construction report, 1965
Well information historically compiled by WGNHS, 1 page

MQ-26 WGNHS boring log, 1960

Well information historically compiled by WGNHS, page 1 of 1

WISCONSIN GEOLOGICAL SURVEY, Science Hall, Madison, Wisconsin Log No. Mq-26

Wayside Park, Highway 51, Moundville, Wisconsin
NE1/4 Sec 31 T 14N, R 9E 13
E. Sperling & Son, Driller, June, 1960
Sample Nos. 218333-218366 - Examined by M. E. Ostrom

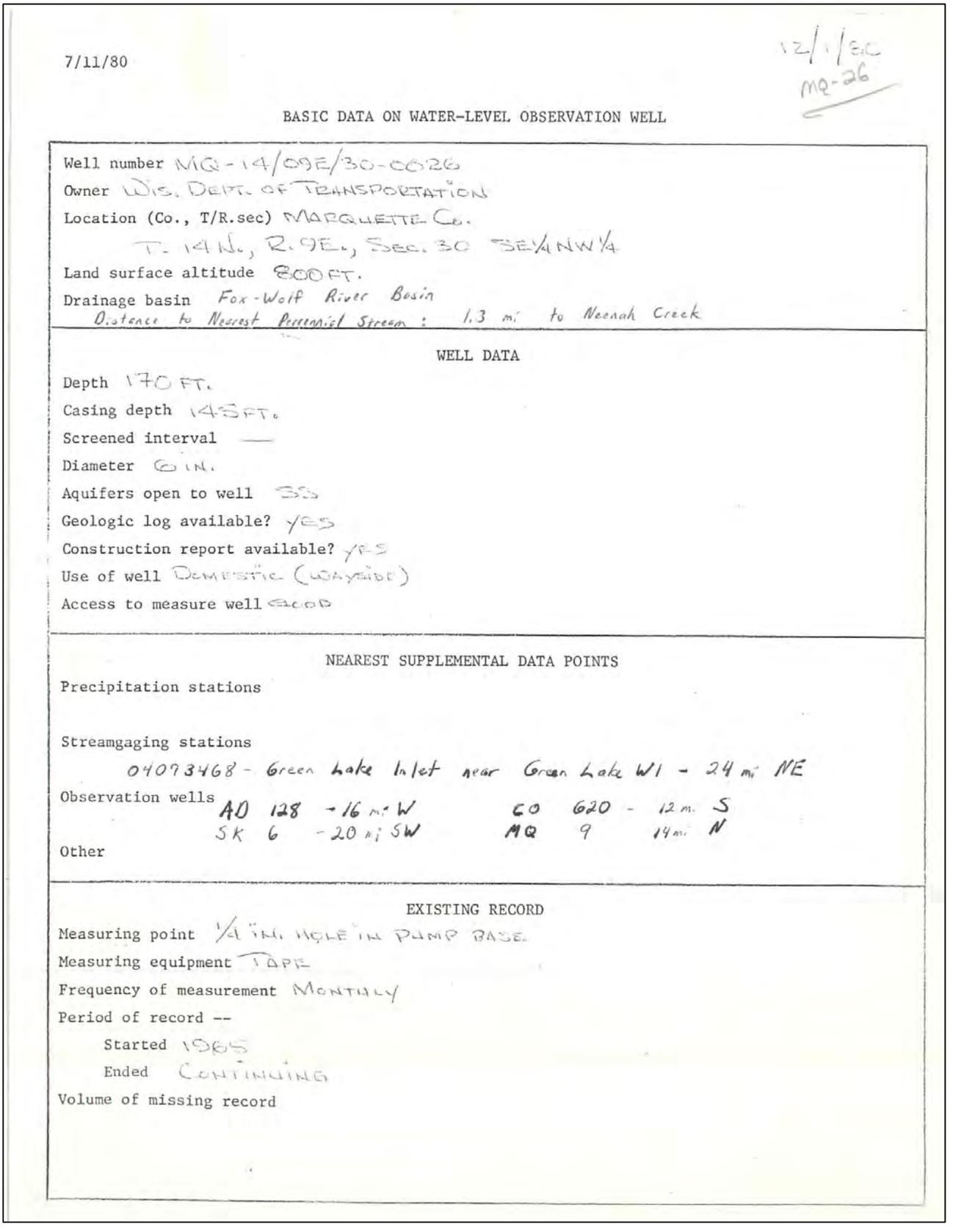
					+8"	
DRIFT		0- 5	5	Snd,dk yl bn,C-Vfn,Srnd,P srtg,mostly qtz,ltl cl&st		6"hole
		5- 15	10	Snd,dk yl bn,C-Vfn,Srnd,P srtg,mostly qtz,ltl cl & st		6"steel pipe
		15- 20	5	Snd,dk yl bn,M-Vfn,Srnd,ltl C,mostly qtz,tr st	—	20'
		20- 25	5	Snd,dk yl bn,Vfn-C,Srnd,P srtg,mostly qtz,ltl st		
		25- 30	5	Snd,dk yl bn,Vfn-M,mostly qtz,mch st,ltl cl		
		30- 35	5	Snd,dk yl bn,C-Vfn,Sang,mostly qtz,mch st,ltl cl		
		35- 40	5	Snd,dk yl bn,C-Vfn,Sang,ltl VC,mostly qtz,ltl st		
		40- 45	5	Snd,dk yl bn,C-Vfn,ltl VC,mostly qtz,tr gvl,ltl st		
		45- 55	10	Snd,dk yl bn,VC-M,Srnd,P srtg,ltl fn,mostly qtz, tr st,ltl Vfn-fn mxd gvl		
		55- 60	5	Snd,dk yl bn,C-M,ltl VC & fn,mostly qtz,tr st&gvl		
		60- 65	5	Snd,dk yl bn,C-fn,ltl VC & fn,mostly qtz,tr st&gvl		
		65- 70	5	Gvl,dk yl bn,Vfn-fn,ang,mxd,mch VC-M snd,ltl st		
		70- 75	5	Snd,dk yl bn,Vfn-C,mxd,tr Vfn mxd gvl,ltl cl&st		
		75- 80	5	Snd,dk yl bn,VC-fn,Srnd,P srtg,mxd,ltl st		
		80- 85	5	Gvl,yl bn,fn-Vfn,mxd,mch dol,mch VC-Vfn mxd snd,		
		85- 90	5	Snd,yl bn,Vfn-C,Sang,mxd,mch Vfn-fn gvl,mch st		
		90-100	10	Snd,lt gry bn,Vfn-C,Sang,P srtg,mxd,ltl st,tr cl & Vfn gvl		
		100-105	5	St&cl,lt gry bn,slgt dolic,mch Vfn snd,tr fn-C		
		105-110	5	St&cl,lt gry bn,slgt dolic,mch Vfn snd,ltl M-Vfn gvl		
	115	110-115	5	Snd,lt yl bn,VC-M,rnd,P srtg,tr fn,tr st		
DRESBACH		115-170	55	Ss,yl gry,C-M,rnd,P srtg,ltl VC & fn,tr dol		145'
	55					170'

Formations: Drift, Dresbach

Well tested for 6 hrs. at 30 gpm with 4 ft. of drawdown, specific capacity 7.5 gpm per foot of drawdown.

MQ-26 Basic well information, 1980

Well information historically compiled by WGNHS, page 1 of 1



7/11/80

12/1/EC
MQ-26

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number MQ-14/09E/30-0026
Owner WIS. DEPT. OF TRANSPORTATION
Location (Co., T/R.sec) MARQUETTE Co.
T. 14N., R. 9E., Sec. 30 SE¼NW¼
Land surface altitude 800 FT.
Drainage basin Fox-Wolf River Basin
Distance to Nearest Perennial Stream : 1.3 mi to Neenah Creek

WELL DATA

Depth 170 FT.
Casing depth 145 FT.
Screened interval —
Diameter 6 IN.
Aquifers open to well SS
Geologic log available? YES
Construction report available? YES
Use of well DOMESTIC (LOAYSIDE)
Access to measure well GOOD

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations

Streamgaging stations
04073468 - Green Lake Inlet near Green Lake WI - 24 mi NE

Observation wells
AD 128 - 16 mi W
SK 6 - 20 mi SW
CO 620 - 12 mi S
MQ 9 - 14 mi N

Other

EXISTING RECORD

Measuring point ¼ IN. HOLE IN PUMP BASE.
Measuring equipment TAPE
Frequency of measurement MONTHLY
Period of record --
Started 1965
Ended CONTINUING
Volume of missing record

MQ-26 Well evaluation, 1980

Well information historically compiled by WGNHS, page 1 of 1

July 1980
R. D. Cotter

MQ-26

CRITERIA FOR EVALUATION OF WATER–LEVEL OBSERVATION WELLS IN WISCONSIN

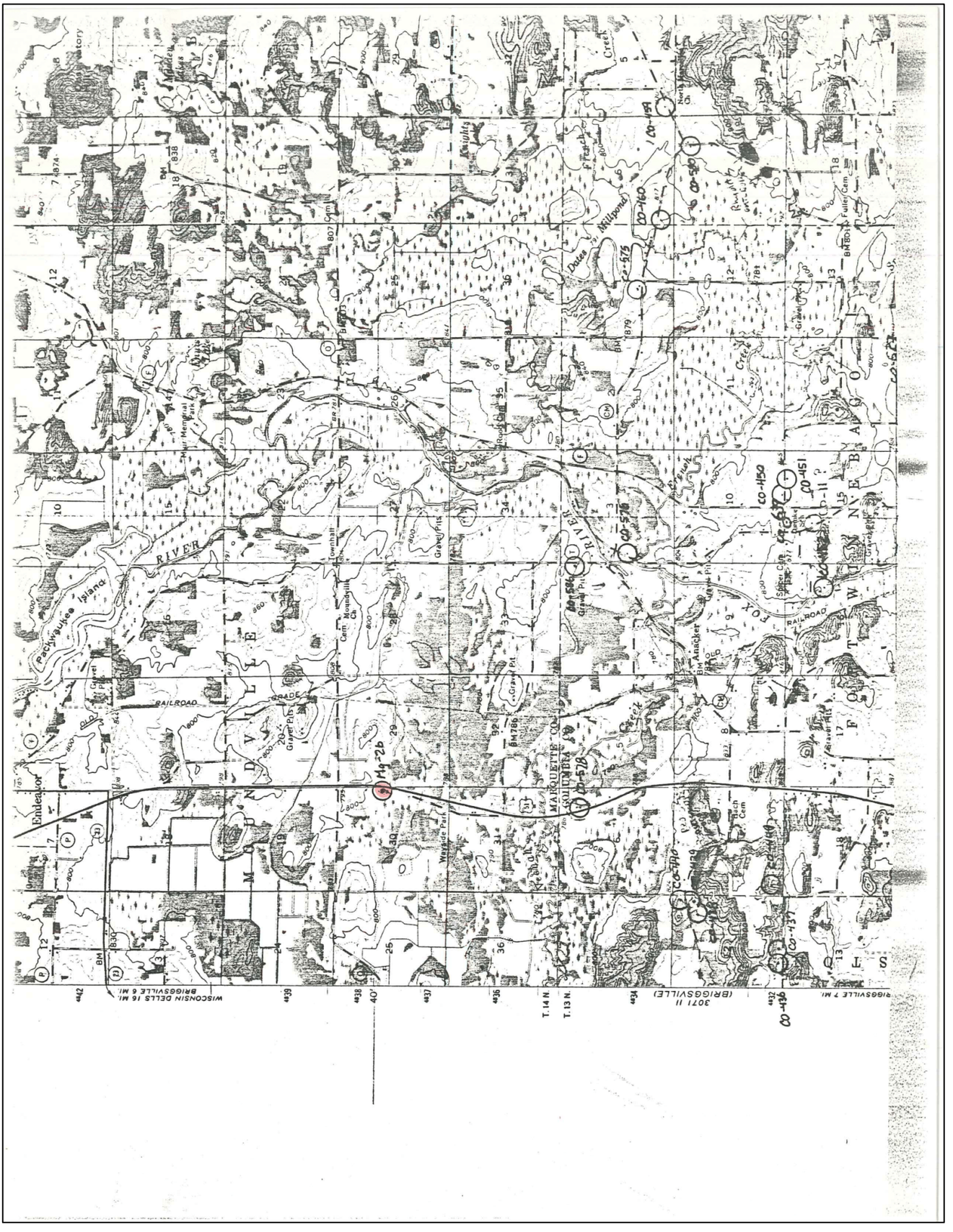
1. Areal spacing -- distance from any observation well 1.5 Mi.
   -- distance from observation well in same aquifer 1.5 Mi.
2. Ownership -- private
   -- public
3. Use of well DOMESTIC (WAYSIDE)
4. Access -- physical GOOD
   -- owner's permission OK
5. Condition of well -- casing GOOD
   -- housing
6. Geologic log -- yes
   -- no
7. Construction report -- yes
   -- no
8. Diameter (4 inch minimum for recorder) 6 IN.
9. Aquifer -- single
   -- multiple
10. Hydraulic connection with aquifer GOOD
11. Knowledge of pumping effects ——
12. Range and character of water level fluctuations 7 FT.
13. Length of record 15 YRS
14. Missing record
15. Adequacy of current measuring frequency OK
16. Probability of permanance GOOD

NOTES

Recommendations

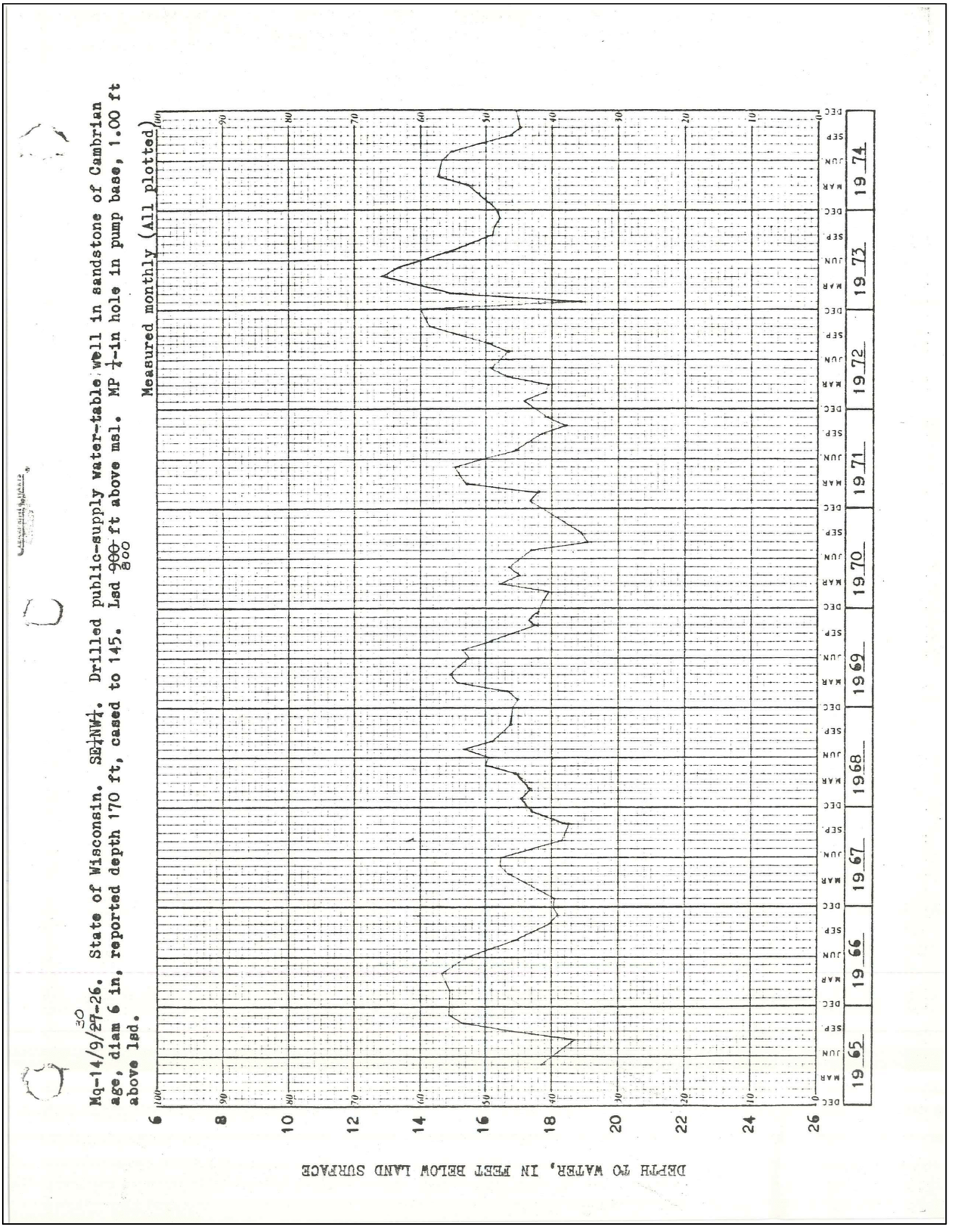
MQ-26 Well location map, date unknown

Well information historically compiled by WGNHS, page 1 of 1



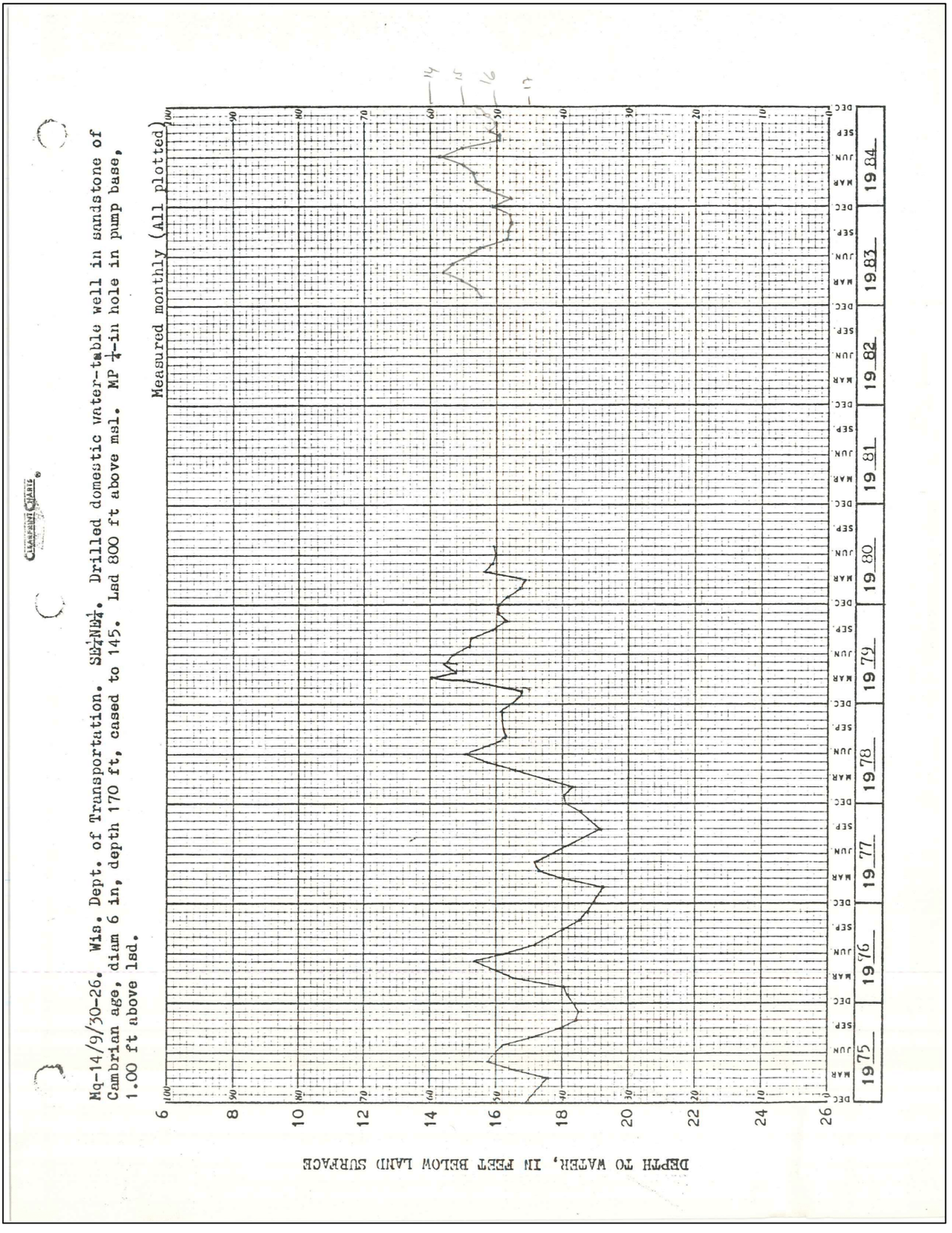
MQ-26 Water-level data, 1965-circa 1988

Well information historically compiled by WGNHS, page 1 of 3



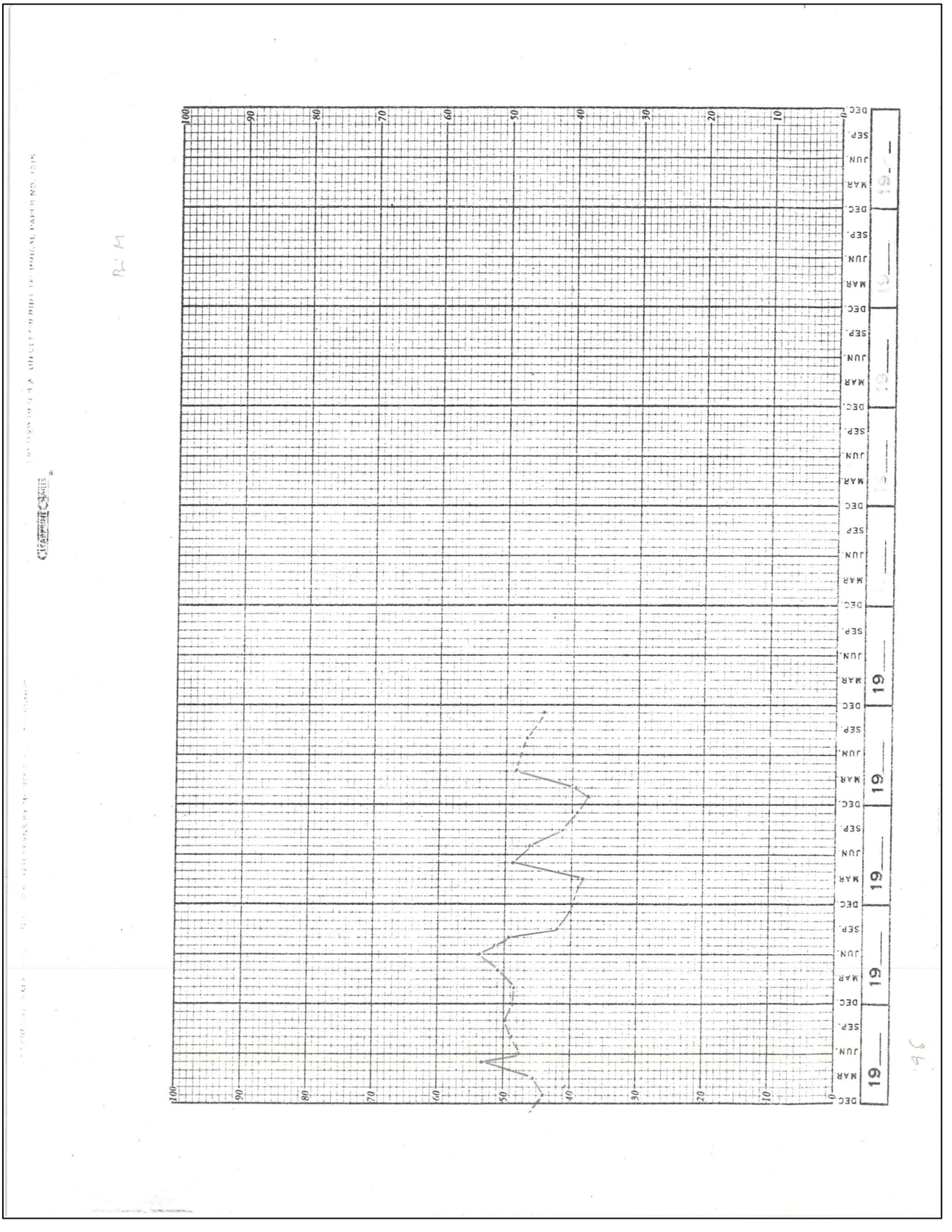
MQ-26 Water-level data, 1965-circa 1988

Well information historically compiled by WGNHS, page 2 of 3



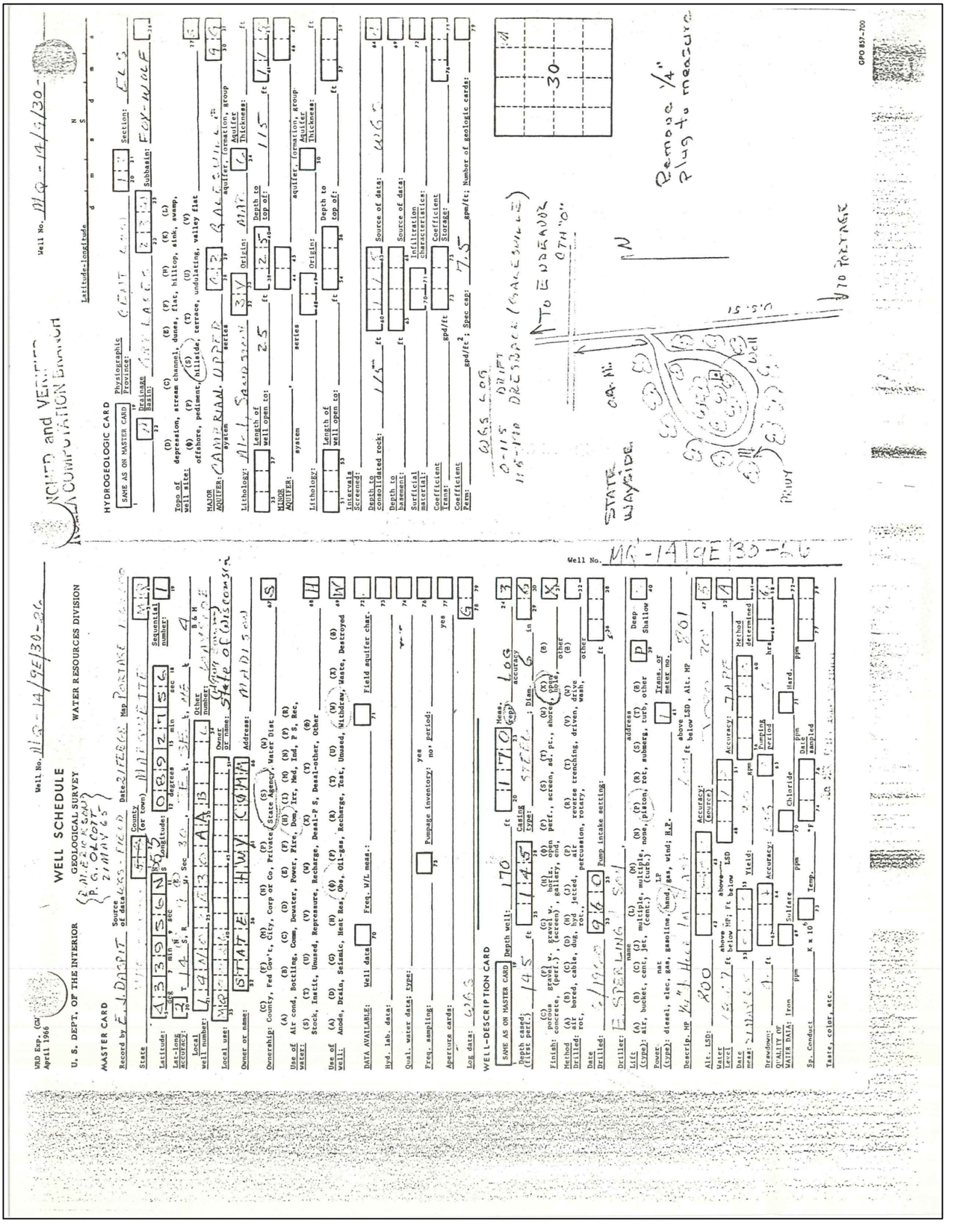
MQ-26 Water-level data, 1965-circa 1988

Well information historically compiled by WGNHS, page 3 of 3



MQ-26 USGS well schedule, 1930

Page 1 of 1



MQ-26 Well construction report, 1965

Well information historically compiled by WGNHS, page 1 of 1

1ST. ORIGNAL to madison 6-23-60 Box 54 MQ-26-G

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH Wel 6

See Instructions on Reverse Side

copy to Madison 3-2-65

1. County Marquette (NE, SE, SE, NE Sec. 30) Town ☒ Village ☐ City ☐ Moundville — Check one and give MAP

RECEIVED MAR - 2 1965 SANITARY ENGINEERING

2. Location T. 14 N R. 9 E South County Line Road Hy. 51
Name of street and number of premise or Section, Town and Range numbers

3. Owner ☒ or Agent ☐ State Highway Commission Of Wisconsin
Name of individual, partnership or firm

4. Mail Address State Office Building Madison Wisconsin
Complete address required

5. From well to nearest: Building ____ft; sewer ____ft; drain ____ft; septic tank ____ft; dry well or filter bed ____ft; abandoned well ____ft. No buildings

6. Well is intended to supply water for: Wayside Park

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6	0	170			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
6	steel 19.18	0	145

9. GROUT:

Kind	From (ft.)	To (ft.)
self grouting		

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
organic sand	0	23
floating sand	35	44
clay layer	44	45
quick sand	45	81
dark lake sand	81	111
white silica like sand	111	145
sandstone	145	170

11. MISCELLANEOUS DATA:

Yield test: 6 Hrs. at 30 GPM.

Depth from surface to water-level: 20 ft.

Water-level when pumping: 24 ft.

Water sample was sent to the state laboratory at: Madison on 6-27 19 60
second sample

Construction of the well was completed on: 6-13 19 60

The well is terminated 8 inches ☒ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion? Yes + No

Was the well sealed watertight upon completion? Yes + No

E. Sperling & Son
Signature Elmer E. Sperling
Registered Well Driller

Box 93 Iron Ridge, Wisconsin
Complete Mail Address

Please do not write in space below

Rec'd ____ No. ____

Ans'd ____

Interpretation ____

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ____

MQ924 plot

Appendix 12: Well OU-416 documents

Historical Documents

OU-416 Well location maps, date unknown
Well information historically compiled by WGNHS, 2 pages

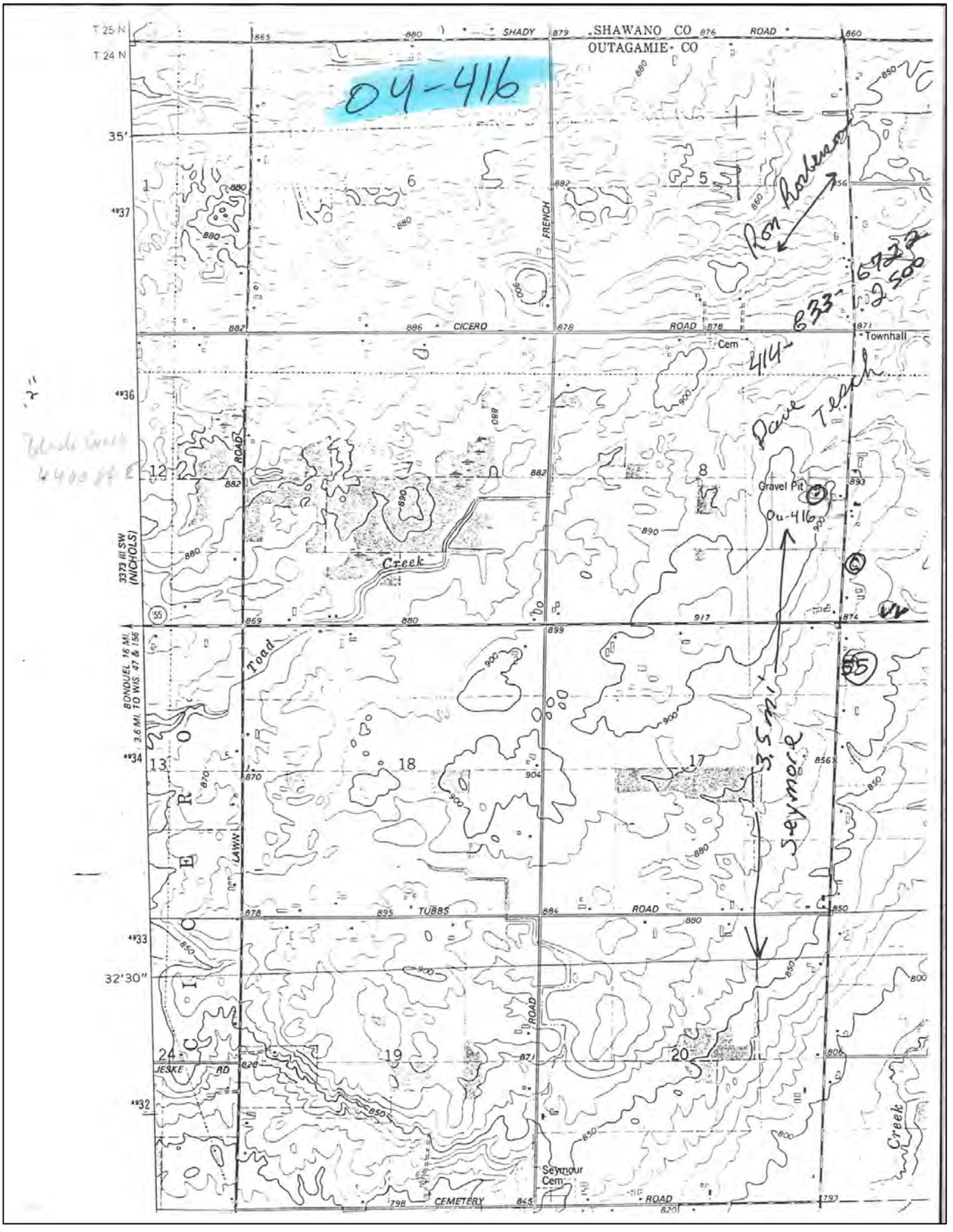
OU-416 USGS groundwater site schedule, 1994
4 pages

OU-416 USGS geologic log schedule, 1994
2 pages

OU-416 Water-level data, 1995-2000
Well information historically compiled by WGNHS, 1 page

OU-416 Well location maps, date unknown

Well information historically compiled by WGNHS, page 1 of 2



OU-416 Well location maps, date unknown

Well information historically compiled by WGNHS, page 2 of 2

FORM NO. 9-1904-A
Revised February 1987

ØU- 24/18E/08-0416

Coded by W Batten
Checked by ______ in GWSI
Entered by JA Dedering

File Code ______
Date 1-26-94

U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

GROUND-WATER SITE SCHEDULE
General Site Data

AGENCY CODE (C4): USGS
SITE ID (C1): 443353088194201
PROJECT NO. (C5): 445518200

STATION NAME (C12): ØU-24/18E/08-0416

LATITUDE (C9): 443353
LONGITUDE (C10): 0881942
LAT-LONG ACCURACY (C11): (S) F T M — sec., 5 sec., 10 sec., min

DISTRICT (C6): 551
STATE (C7): 55
COUNTY or TOWN (C8): Outagamie — County code 087

LAND NET (C13): NE NE SE S08 T024N R018E 4 — ¼ ¼ ¼ section, township, range, merid

LOCATION MAP (C14): SEYMOUR, WI
MAP SCALE (C15): 24000

ALTITUDE (C16): 905.5
METHOD OF MEASUREMENT (C17): (A) L M — alti-meter, level, map
ACCURACY (C18): 1.0
HYDROLOGIC UNIT CODE (C20): 04030202

DRAINAGE BASIN CODE (C801): ______
TOPOGRAPHIC SETTING (C19): A B C D E F G (H) K L M O P S T U V W — alluvial fan, playa, stream channel, depression, dunes, flat, flood plain, hill-top, sink-hole, lake or swamp, mangrove swamp, off-shore, pediment, hill-side, terrace, undulating, valley flat, upland draw

AGENCY USE (C803): A I (O) — active, inactive, inventory only

DATE INVENTORIED (C711): 09-03-1992 — month, day, year

STATION TYPE (C802) (Place a "Y" in the appropriate box): Y — well

DATA TYPE (C804) (Place an 'A' (active), an 'I' (inactive), or an 'O' (inventory) in the appropriate box): O O — WL cont., WL int., QW cont., QW int., State water use

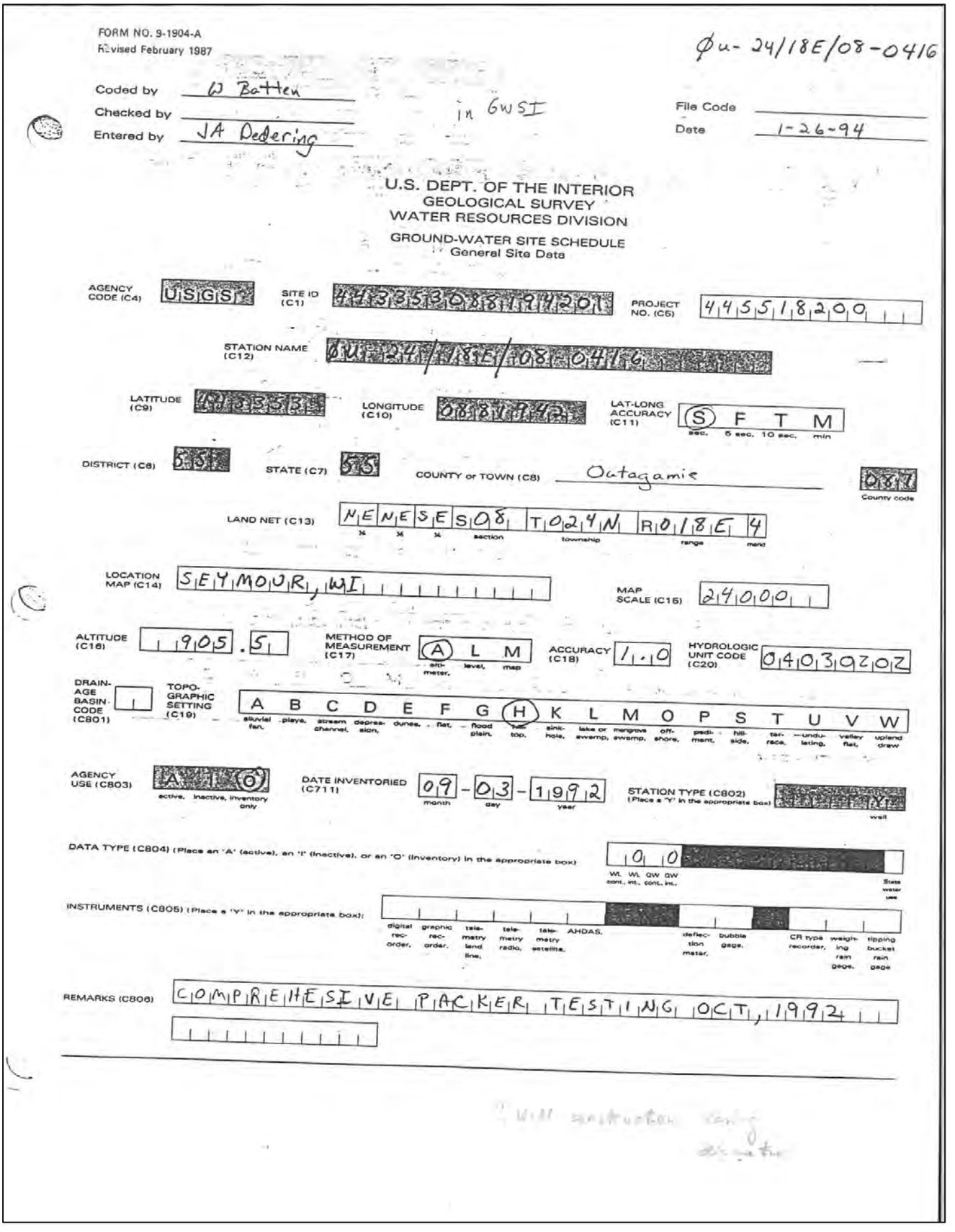
INSTRUMENTS (C805) (Place a "Y" in the appropriate box): digital recorder, graphic recorder, telemetry land line, telemetry radio, telemetry satellite, AHDAS, deflection meter, bubble gage, CR type recorder, weighing rain gage, tipping bucket rain gage

REMARKS (C806): COMPREHESIVE PACKER TESTING OCT, 1992

? Well construction: casing diameter

OU-416 USGS groundwater site schedule, 1994

Page 1 of 4



FORM NO. 9-1904-A
Revised February 1987

Ou- 24/18E/08-0416

Coded by W Batten
Checked by
Entered by JA Dedering

in GWSI

File Code
Date 1-26-94

U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

GROUND-WATER SITE SCHEDULE
General Site Data

AGENCY CODE (C4): USGS
SITE ID (C1): 443530088194201
PROJECT NO. (C6): 44551820 0
STATION NAME (C12): OU-24/18E/08-0416
LATITUDE (C9): 443535
LONGITUDE (C10): 0881942
LAT-LONG ACCURACY (C11): (S) F T M (sec. 5 sec. 10 sec. min)
DISTRICT (C6): 55
STATE (C7): 55
COUNTY or TOWN (C8): Outagamie
County code: 087
LAND NET (C13): NE NE SE SE 08 T024N R018E 4 (section township range mer.)
LOCATION MAP (C14): SEYMOUR, WI
MAP SCALE (C15): 24000
ALTITUDE (C16): 1905.5
METHOD OF MEASUREMENT (C17): (A) L M (alt-meter, level, map)
ACCURACY (C18): 1.0
HYDROLOGIC UNIT CODE (C20): 04030202
DRAINAGE BASIN CODE (C801):
TOPOGRAPHIC SETTING (C19): A B C D E F G (H) K L M O P S T U V W (alluvial fan, playa, stream channel, depression, dunes, flat, flood plain, hilltop, sinkhole, lake or swamp, mangrove swamp, offshore, pediment, hillside, terrace, undulating, valley flat, upland draw)
AGENCY USE (C803): (A) I O (active, inactive, inventory only)
DATE INVENTORIED (C711): 09 - 03 - 1992 (month day year)
STATION TYPE (C802) (Place a "Y" in the appropriate box): W (well)
DATA TYPE (C804) (Place an "A" (active), an "I" (inactive), or an "O" (inventory) in the appropriate box): 1 0 0 (WL cont., WL int., QW cont., QW int., Stage water use)
INSTRUMENTS (C805) (Place a "Y" in the appropriate box): (digital recorder, graphic recorder, telemetry land line, telemetry radio, telemetry satellite, AHDAS, deflection meter, bubble gage, CR type recorder, weighing rain gage, tipping bucket rain gage)
REMARKS (C806): COMPREHENSIVE PACKER TESTING OCT, 1992

Will sanitation [illegible] at the

OU-416 USGS groundwater schedule, 1994

Page 2 of 4

RECORD SEQUENCE NO. (C147)

DATE DISCHARGE MEASURED (C148) 1 – – 19 (month – day – year)

TYPE OF DISCHARGE (C703) P F (pumped, flow)

DISCHARGE (gpm) (C150)

SOURCE OF DATA (C151) A D G L M O R S Z (other government, driller, geologist, logs, memory, owner, other reported, reporting agency, other)

METHOD OF DISCHARGE MEASUREMENT (C152) A B C D E F M O P R T U V W Z (accoustic meter, boiler, current meter, Doppler meter, estimated, flume, totaling meter, orifice, pitot-tube meter, reported, trajectory, venturi meter, volumetric meas., weir, other)

PRODUCTION WATER LEVEL (C153)

STATIC WATER LEVEL (C154)

SOURCE OF DATA (C155) A D G L M O R S Z (other government, driller, geologist, logs, memory, owner, other reported, reporting agency, other)

METHOD OF WATER LEVEL MEASUREMENT (C156) A B C E G H L M N R S T V Z (airline, analog, calib. airline, estimated, pressure gage, calib. pressure gage, geophysical logs, manometer, non-rec. gage, reported, steel tape, electric tape, calib., elec. tape, other)

PUMPING PERIOD (C157)

SPECIFIC CAPACITY (C272)

DRAWDOWN (C309)

GEOHYDROLOGIC DATA

RECORD TYPE (C748) GEOH

RECORD SEQUENCE NO. (C721) 001

DEPTH TO TOP OF UNIT (C91) 70

DEPTH TO BOTTOM OF UNIT (C92) 714

UNIT IDENTIFIER (C93) 360ØVCB

LITHOLOGY (C96) SNDS

CONTRIBUTING UNIT (C304) P S N (U) (principal aquifer, secondary aquifer, no contribution, unknown)

LITHOLOGIC MODIFIER (C97) W/ DOLOMITE LYRS

GEOHYDROLOGIC AQUIFER DATA

RECORD TYPE (C750) AQFR

RECORD SEQUENCE NO. (C742) 091

SEQUENCE NO. OF PARENT RECORD (C256) 009

DATE (C95) 09 – 03 – 1992 (month – day – year)

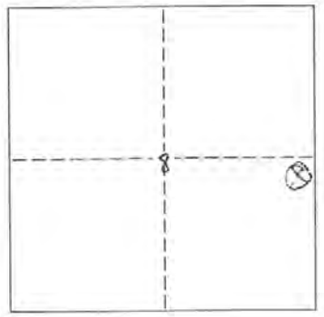
STATIC WATER LEVEL (C126) 105.5

CONTRIBUTION (C132) 75

SITE LOCATION SKETCH AND DIRECTIONS

Township 24N Range 18E

Section# 08



715'

* U.S. GOVERNMENT PRINTING OFFICE: 1987 - 174-608 - 814/60137

OU-416 USGS groundwater schedule, 1994

Page 3 of 4

CONSTRUCTION HOLE DATA (3 sets shown)

RECORD TYPE (C756): HOLE | RECORD SEQUENCE NO. (C724): 001 | SEQUENCE NO. OF PARENT RECORD (C59): 091

DEPTH TO TOP OF INTERVAL (C73): 0.0 | DEPTH TO BOTTOM OF INTERVAL (C74): 18. | DIAMETER OF INTERVAL (C75): 10.

RECORD SEQUENCE NO. (C724): 002

DEPTH TO TOP OF INTERVAL (C73): 18. | DEPTH TO BOTTOM OF INTERVAL (C74): 740. | DIAMETER OF INTERVAL (C75): 6.

RECORD SEQUENCE NO. (C724):

DEPTH TO TOP OF INTERVAL (C73): . | DEPTH TO BOTTOM OF INTERVAL (C74): . | DIAMETER OF INTERVAL (C75): .

CONSTRUCTION CASING DATA (3 sets shown)

RECORD TYPE (C758): CSNG | RECORD SEQUENCE NO. (C725): 001 | SEQUENCE NO. OF PARENT RECORD (C59): 001

DEPTH TO TOP OF CASING (C77): -3. | DEPTH TO BOTTOM OF CASING (C78): 18. | DIAMETER OF CASING (C79): 6.

[1] CASING MATERIAL (C80): S | CASING THICKNESS (C81): .

RECORD SEQUENCE NO. (C725):

DEPTH TO TOP OF CASING (C77): . | DEPTH TO BOTTOM OF CASING (C78): . | DIAMETER OF CASING (C79): .

[1] CASING MATERIAL (C80): | CASING THICKNESS (C81): .

RECORD SEQUENCE NO. (C725):

DEPTH TO TOP OF CASING (C77): . | DEPTH TO BOTTOM OF CASING (C78): . | DIAMETER OF CASING (C79): .

[1] CASING MATERIAL (C80): | CASING THICKNESS (C81): .

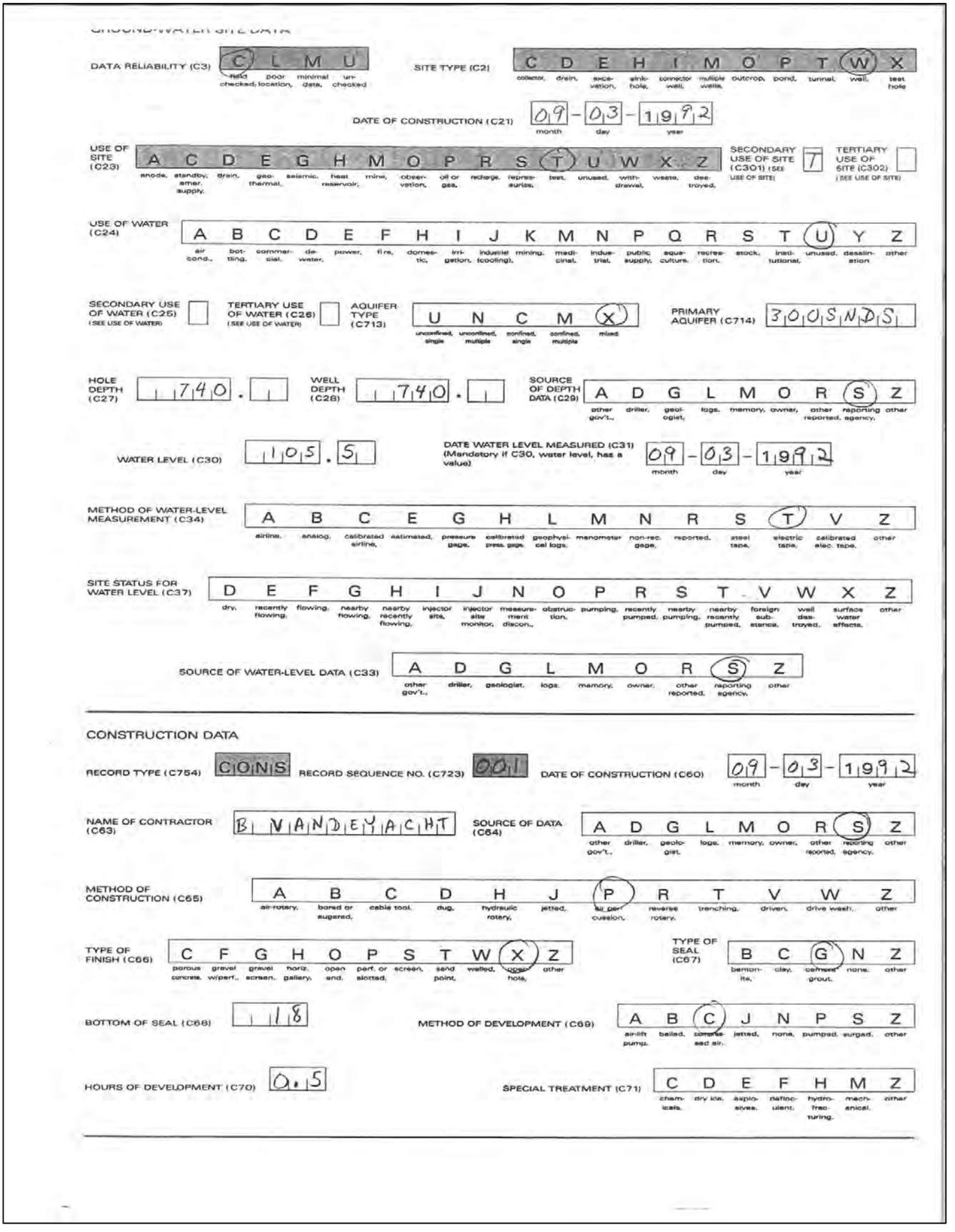
FOOTNOTE:

[1] CASING MATERIAL CODES:

B	C	D	G	I	M	P	R	S	T	U	W	Z
brick,	concrete,	copper,	galv. iron,	wrought iron,	other metal,	PVC or plastic,	rock or stone,	steel,	tile,	coated steel,	wood,	other material

OU-416 USGS groundwater schedule, 1994

Page 4 of 4



GROUND-WATER SITE DATA

DATA RELIABILITY (C3): C L M U — C = field checked; L = poor location; M = minimal data; U = unchecked

SITE TYPE (C2): C D E H I M O P T (W) X — C collector, D drain, E excavation, H sinkhole, I connector well, M multiple wells, O outcrop, P pond, T tunnel, W well, X test hole

DATE OF CONSTRUCTION (C21): 09 (month) - 03 (day) - 1992 (year)

USE OF SITE (C23): A C D E G H M O P R S (T) U W X Z — A anode, C standby; emer. supply, D drain, E geothermal, G seismic, H heat reservoir, M mine, O observation, P oil or gas, R recharge, S repressurize, T test, U unused, W withdrawal, X waste, Z destroyed

SECONDARY USE OF SITE (C301) (SEE USE OF SITE): 7

TERTIARY USE OF SITE (C302) (SEE USE OF SITE):

USE OF WATER (C24): A B C D E F H I J K M N P Q R S T (U) Y Z — A air cond., B bottling, C commercial, D dewater, E power, F firs, H domestic, I irrigation, J industrial (cooling), K mining, M medicinal, N industrial, P public supply, Q aquaculture, R recreation, S stock, T institutional, U unused, Y dessalination, Z other

SECONDARY USE OF WATER (C25) (SEE USE OF WATER):

TERTIARY USE OF WATER (C26) (SEE USE OF WATER):

AQUIFER TYPE (C713): U N C M (X) — U unconfined, single; N unconfined, multiple; C confined, single; M confined, multiple; X mixed

PRIMARY AQUIFER (C714): 3 0 0 S N D S

HOLE DEPTH (C27): 740.

WELL DEPTH (C28): 740.

SOURCE OF DEPTH DATA (C29): A D G L M O R (S) Z — A other gov't., D driller, G geologist, L logs, M memory, O owner, R other reported, S reporting agency, Z other

WATER LEVEL (C30): 105.5

DATE WATER LEVEL MEASURED (C31) (Mandatory if C30, water level, has a value): 09 (month) - 03 (day) - 1992 (year)

METHOD OF WATER-LEVEL MEASUREMENT (C34): A B C E G H L M N R S (T) V Z — A airline, B analog, C calibrated airline, E estimated, G pressure gage, H calibrated press. gage, L geophysical logs, M manometer, N non-rec. gage, R reported, S steel tape, T electric tape, V calibrated elec. tape, Z other

SITE STATUS FOR WATER LEVEL (C37): D E F G H I J N O P R S T V W X Z — D dry, E recently flowing, F flowing, G nearby flowing, H nearby recently flowing, I injector site, J injector site monitor, N measurement discon., O obstruction, P pumping, R recently pumped, S nearby pumping, T nearby recently pumped, V foreign substance, W well destroyed, X surface water effects, Z other

SOURCE OF WATER-LEVEL DATA (C33): A D G L M O R (S) Z — A other gov't., D driller, G geologist, L logs, M memory, O owner, R other reported, S reporting agency, Z other

CONSTRUCTION DATA

RECORD TYPE (C754): C O N S

RECORD SEQUENCE NO. (C723): 001

DATE OF CONSTRUCTION (C60): 09 (month) - 03 (day) - 1992 (year)

NAME OF CONTRACTOR (C63): B I N A N D E Y A C H T

SOURCE OF DATA (C64): A D G L M O R (S) Z — A other gov't., D driller, G geologist, L logs, M memory, O owner, R other reported, S reporting agency, Z other

METHOD OF CONSTRUCTION (C65): A B C D H J (P) R T V W Z — A air-rotary, B bored or augered, C cable tool, D dug, H hydraulic rotary, J jetted, P air percussion, R reverse rotary, T trenching, V driven, W drive wash, Z other

TYPE OF FINISH (C66): C F G H O P S T W (X) Z — C porous concrete, F gravel w/perf., G gravel screen, H horiz. gallery, O open end, P perf. or slotted, S screen, T sand point, W welded, X open hole, Z other

TYPE OF SEAL (C67): B C (G) N Z — B bentonite, C clay, G cement grout, N none, Z other

BOTTOM OF SEAL (C68): 18

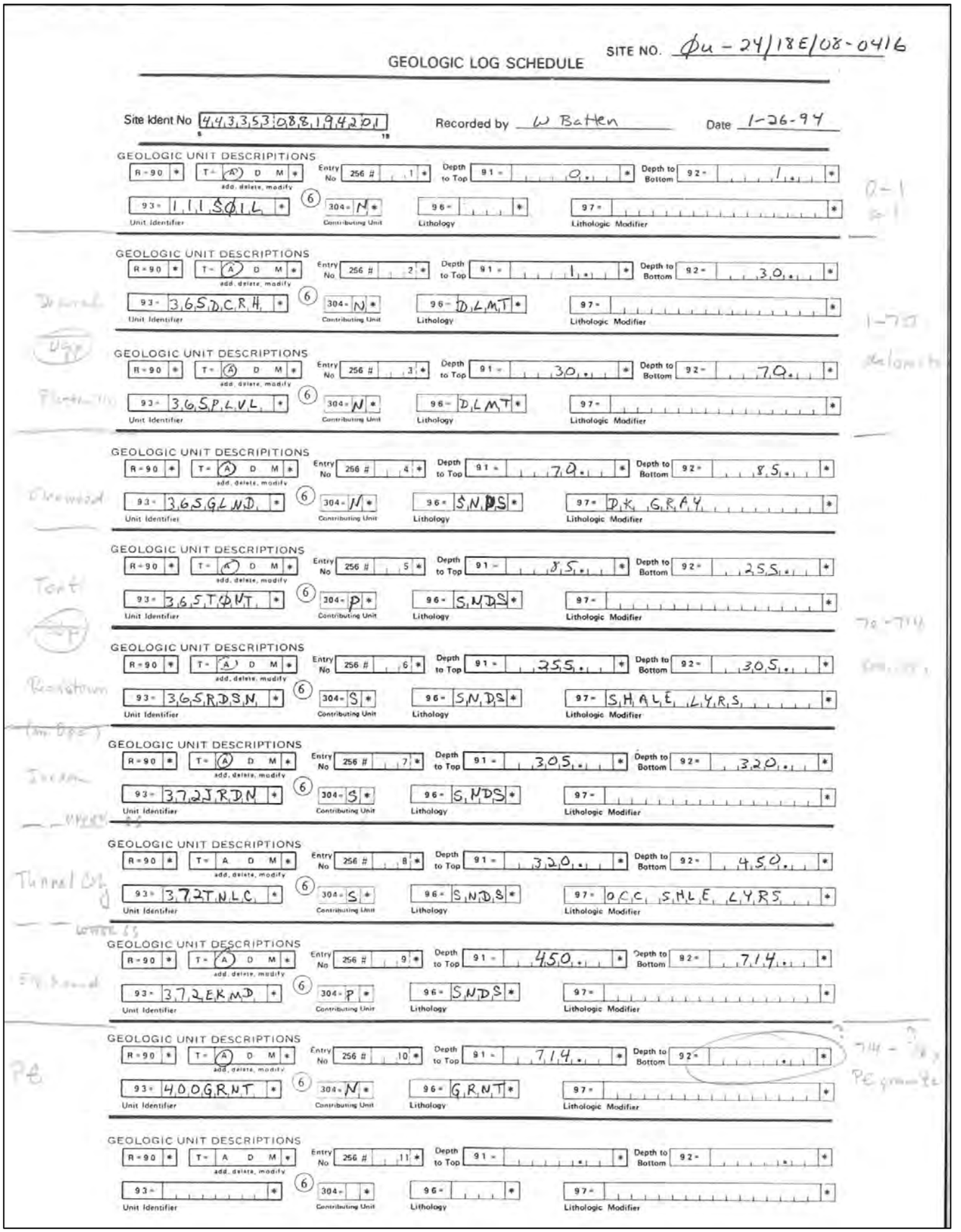
METHOD OF DEVELOPMENT (C69): A B (C) J N P S Z — A air-lift pump, B bailed, C compressed air, J jetted, N none, P pumped, S surged, Z other

HOURS OF DEVELOPMENT (C70): 0.5

SPECIAL TREATMENT (C71): C D E F H M Z — C chemicals, D dry ice, E explosives, F deflocculent, H hydrofracturing, M mechanical, Z other

OU-416 USGS geologic log schedule, 1994

Page 1 of 2



GEOLOGIC LOG SCHEDULE

SITE NO. Ou - 24/18E/08-0416

Site Ident No 4,4,3,3,5,3:0,8,8,1,9,4,2,0,1 (5 … 19)

Recorded by W Batten

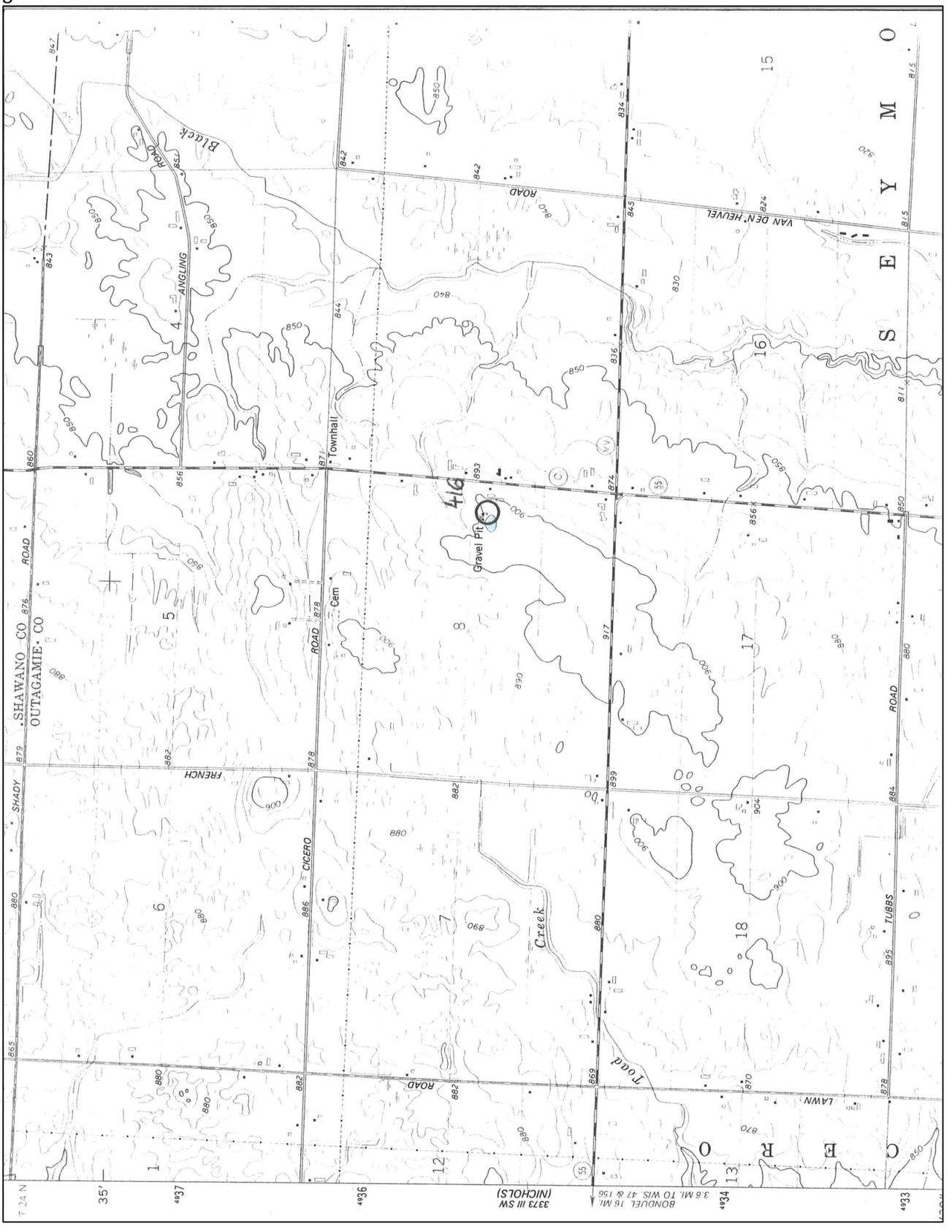
Date 1-26-94

GEOLOGIC UNIT DESCRIPTIONS

Entry No	Depth to Top	Depth to Bottom	Unit Identifier	Contributing Unit	Lithology	Lithologic Modifier
256 # 1	91 - 0.	92 - 1.	93 - 1,1,1,SOIL	304 - N	96 -	97 -
256 # 2	91 - 1.	92 - 30.	93 - 3,6,5,D,C,R,H,	304 - N	96 - D,L,M,T	97 -
256 # 3	91 - 30.	92 - 70.	93 - 3,6,5,P,L,V,L,	304 - N	96 - D,L,M,T	97 -
256 # 4	91 - 70.	92 - 85.	93 - 3,6,5,G,L,W,D,	304 - N	96 - S,N,D,S	97 - D,K, G,R,A,Y,
256 # 5	91 - 85.	92 - 255.	93 - 3,6,5,T,O,N,T,	304 - P	96 - S,N,D,S	97 -
256 # 6	91 - 255.	92 - 305.	93 - 3,6,5,R,D,S,N,	304 - S	96 - S,N,D,S	97 - S,H,A,L,E, L,Y,R,S,
256 # 7	91 - 305.	92 - 320.	93 - 3,7,2,J,R,D,N	304 - S	96 - S,N,D,S	97 -
256 # 8	91 - 320.	92 - 450.	93 - 3,7,2,T,N,L,C,	304 - S	96 - S,N,D,S	97 - O,C,C, S,H,L,E, L,Y,R,S,
256 # 9	91 - 450.	92 - 714.	93 - 3,7,2,E,R,M,D,	304 - P	96 - S,N,D,S	97 -
256 # 10	91 - 714.	92 -	93 - 4,0,0,G,R,N,T,	304 - N	96 - G,R,N,T	97 -
256 # 11	91 -	92 -	93 -	304 -	96 -	97 -

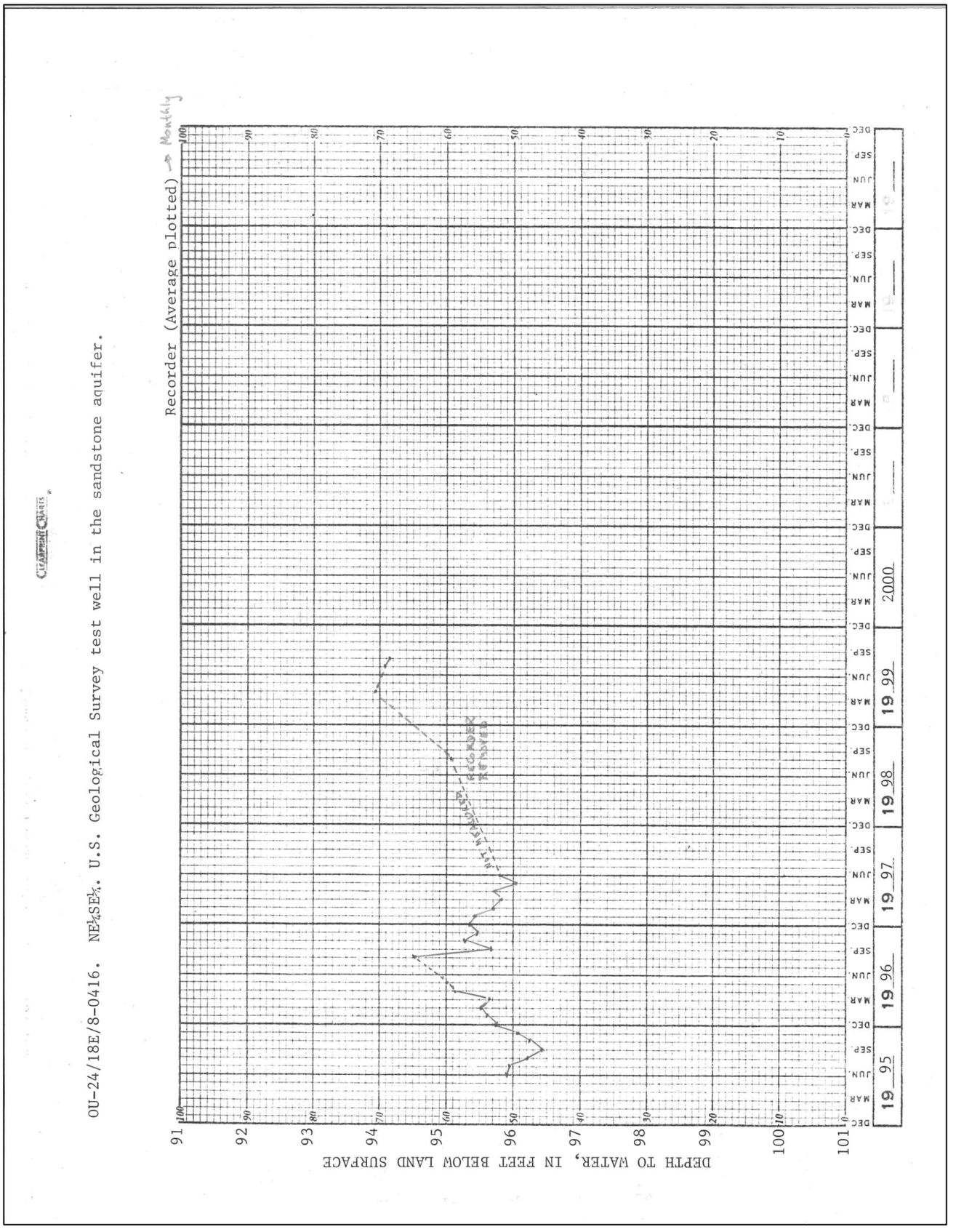
OU-416 USGS geologic log schedule, 1994

Page 2 of 2



OU-416 Water-level data, 1995-2000

Well information historically compiled by WGNHS, Page 1 of 1



Appendix 13: Well OU-1900 documents

Documentation of work done for this report

OU-1900 WDNR well construction report, 2021
Form 3300-077A, 2 pages

OU-1900 WDNR groundwater monitoring station easement, 2021
8 pages

OU-1900 WDNR soil boring log, 2021
Form 4400-122, 1 page

OU-1900 WDNR well construction report, 2021

Form 3300-077A, page 1 of 2

Well Construction Report
WISCONSIN UNIQUE WELL NUMBER **AAJ872**

Drinking Water and Groundwater - DG/5
Department of Natural Resources, Box 7921
Madison WI 53707
Form 3300-077A

Property Owner	WISCONSIN GEOLOGICAL & NATURAL HISTORY SURVEY
Phone #	
Mailing Address	3817 MINERAL POINT ROAD
City	MADISON
State	WI
Zip Code	53705
County	Outagamie
Co. Permit #	
Notification #	8566467201
Completed	10-29-2021
Well Constructor (Business Name)	GROUND SOURCE INC
Lic. #	4462
Facility ID # (Public Wells)	
Address	3671 MONROE RD DE PERE WI 54115-9711
Well Plan Approval #	
Approval Date (mm-dd-yyyy)	
Hicap Permanent Well #	
Common Well #	
Specific Capacity	0

1. Well Location

City of KAUKAUNA	Fire # (if avail.)
Street Address or Road Name and Number	PARK STREET
Subdivision Name	Lot # / Block #
Latitude / Longitude in Decimal Degree (DD)	44.2781 °N -88.2771 °W
Method Code	GPS008
NE SE or Govt Lot #	
Section	23
Township	21 N
Range	18 E

2. Well Type New Well
of previous unique well # constructed in
Reason for replaced or reconstructed well ?
Construction Type Drilled

3. Well serves 1 # of OBSERVATION MONITORING WELL
Test Well
Heat Exchange____# of drillholes

Hicap Well ? No
Hicap Property ? No
Hicap Potable ? No

4. Potential Contamination Sources - ON REVERSE SIDE

5. Drillhole Dimensions and Construction Method

Dia. (in.)	From (ft.)	To (ft.)
9	Surface	277
6	277	320

Upper Enlarged Drillhole		Lower Open Bedrock
Yes	Rotary - Mud Circulation	No
No	Rotary - Air	Yes
No	Rotary - Air & Foam	No
No	Drill-Through Casing Hammer	
No	Reverse Rotary	
No	Cable-tool Bit ____in. dia...	No
No	Dual Rotary	No
No	Temp. Outer Casing ____in. dia	
No	Removed? ____depth ft. (If NO explain on back side)	

8. Geology

Geology Codes				8. Geology Type, Caving/Noncaving, Color, Hardness, etc...	From (ft.)	To (ft.)
R		C	S	R-RED C-CLAY S-SANDY	Surface	55
	S	G	S	S-SOFT/LOOSE G-GRAVEL/STONES S-SANDY	55	72
G		L	J	G-GRAY L-LIMESTONE/DOLOMITE J-W/CRYSTALLINE	72	168
G		L	H	G-GRAY L-LIMESTONE/DOLOMITE H-SHALEY	168	175
G		L	J	G-GRAY L-LIMESTONE/DOLOMITE J-W/CRYSTALLINE	175	250
G		L	H	G-GRAY L-LIMESTONE/DOLOMITE H-SHALEY	250	270
T		L		T-TAN/BROWN L-LIMESTONE/DOLOMITE	270	295
E		L	H	E-GREEN L-LIMESTONE/DOLOMITE H-SHALEY	295	296
G		L		G-GRAY L-LIMESTONE/DOLOMITE	296	300
T		L	N	T-TAN/BROWN L-LIMESTONE/DOLOMITE N-W/SANDSTONE	300	308
T		L	R	T-TAN/BROWN L-LIMESTONE/DOLOMITE R-W/CHERT	308	320

6. Casing, Liner, Screen

WISCONSIN UNIQUE WELL NUMBER **AAJ872**

OU-1900 WDNR well construction report, 2021

Form 3300-077A, page 2 of 2

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6	NEW PLN END BLK STEEL WELDED 18.97 .280 A53 WHEATLAND	Surface	277
Dia. (in.)	Screen type, material & slot size	From (ft.)	To (ft.)

7. Grout or Other Sealing Material

Method BRADENHEAD

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT GROUT	Surface	277	56 S

4a. Potential Contamination Sources Is the well located in floodplain ?

Comment:

Water Quality Text:

Water Quantity Text:

Difficulty Text:

9. Static Water Level

230 ft. below ground surface

10. Pump Test

Pumping level 300 ft. below surface

Pumping at 30 GP M for 1 Hrs.

Pumping Method ? Test Pump

11. Well Is

36 in. above grade

Developed ? Yes

Disinfected ? Yes

Capped ? Yes

12. Notified Owner of need to fill & seal ? No

Filled & Sealed Well(s) as needed? No

13. Constructor / Supervisory Driller	Lic #	Date Signed
TV	4468	11-04-2021
Drill Rig Operator	Lic or Reg #	Date Signed
CV		11-04-2021

Created On: 11-04-2021 Created by: LCIESLEWICZ1 Updated On: 11-11-2021 Updated by: LCIESLEWICZ1

WISCONSIN UNIQUE WELL NUMBER **AAJ872**

OU-1900 WDNR groundwater monitoring station easement, 2021

Page 1 of 8

Document #: 2238581
Date: 06-22-2021 Time: 3:23 PM
Pages: 8 Fee: $30.00
County: OUTAGAMIE COUNTY State: WI

Sarah R VanCamp

SARAH R VAN CAMP, REGISTER OF DEEDS
Return via MAIL (REGULAR)
KAUKAUNA, CITY OF

GROUND WATER MONITORING STATION EASEMENT

Document Name

Recording Area

Name and Return Address:
City Of Kaukauna
Planning Dept.
144 W. Second St.
Kaukauna, WI 541401

8

323037901
Parcel Identification Number

THIS GROUNDWATER MONITORING STATION EASEMENT ("Easement") made by and between the City of Kaukauna, a Municipal Corporation ("Grantor"), and the U.S. Department of the Interior, U.S. Department of Geological Survey and Wisconsin Geological and Natural History Survey – University of Wisconsin - Madison ("Collectively Grantee").

RECITALS

WHEREAS, Grantor and Grantee enter into this agreement to cooperatively collect long-term groundwater level data to fulfill Grantor's requirement to regulate high-capacity wells under s. 281.34, Wis. Stats., and Chapter NR 820, Wis. Adm. Code, and its responsibility to implement the Great Lake Compact under s. 281.343(4)(a), Wis. Stats.;

WHEREAS, Grantee desires to install monitoring station in order to collect said data;

WHEREAS, Grantee requests an Easement allowing access over and upon Grantor's property to collect groundwater data by constructing, installing, operating, maintaining, removing and replacing a monitoring station containing one groundwater well; and

WHEREAS, the portion of Grantor's property subject to this Easement ("Premises") is described below and more particularly shown on Exhibit "A":

BEING PART OF "KLEINS PARK" (NOW KNOWN AS LAFOLLETTE PARK) PER THE ASSESSOR'S MAP OF THE CITY OF KAUKAUNA, LOCATED IN AND BEING PART OF GOVERNMENT LOT 8, SECTION 22, TOWNSHIP 21 NORTH, RANGE 18 EAST, SOUTH OF THE FOX RIVER, CITY OF KAUKAUNA, OUTAGAMIE COUNTY, WISCONSIN, BOUNDED AND DESCRIBED AS FOLLOWS: COMMENCING AT THE NORTH ¼ CORNER OF SECTION 23, TOWNSHIP 21 NORTH, RANGE 18 EAST, NORTH OF THE FOX RIVER; THENCE S26°32'23"E, 3298.11 FEET TO THE POINT OF BEGINNING; THENCE N90°00'00"E, 18.00 FEET; THENCE S00°00'00"E, 18.00 FEET; THENCE S90°00'00"W, 18.00 FEET; THENCE N00°00'00"W, 18.00 FEET TO THE POINT OF BEGINNING; SAID PARCEL CONTAINS 324 SQ. FT. OF LAND MORE OR LESS. SUBJECT TO ALL EASEMENTS AND RESTRICTIONS OF RECORD.

NOW, THEREFORE, Grantor hereby agrees to convey to Grantee and its assigns, a non-exclusive perpetual easement to access, construct, install, operate, maintain, repair, remove and replace monitoring stations drilled and/or placed on the above described Premises, along with activities directly related to water sampling as required collect long-term groundwater level data.

It is understood by Grantor and Grantee that this Easement is subject to the following conditions:

1. Grantor and Grantee hereto confirm and agree that the recitals set forth above are true and correct and incorporate the same herein for all purposes.

OU-1900 WDNR groundwater monitoring station easement, 2021

2. Grantor grants and conveys to Grantee this non-exclusive Easement for the construction, installation, operation, maintenance, repair, replacement and removal of monitoring stations consisting of, but not limited to a drilled well which shall be constructed in compliance with Ch. NR 141 and Ch. NR 812, Wis. Adm. Codes, along with vehicle and walk in access to the Premises, as is reasonably deemed necessary for installation and collecting data including, but not limited to water-level measurements, geophysical measurements and /or water quality sampling purposes. Grantee shall share all information gained fromsaid monitoring upon request of the Grantor.

3. This Easement is limited to Grantee and its assigns and is not transferrable to any other third party, except after prior written notification to Grantor. Grantee will not have the right to allow additional co-locationof other facilities in the Easement.

4. The Easement shall be non-exclusive and Grantor may use the Premises and shall have the right to leaseor convey other easements to one or more other person(s), company(ies) or other entity(ies); provided that any such subsequent use, lease or conveyance shall not interfere with Grantee's rights.

5. Grantee shall submit a written notification of project commencement to Grantor's Project Manager identified in Paragraph 18 herein at least thirty (30) days prior to the initiation of any well construction workon the Premises. Grantee may commence said work unless Grantor informs Grantee not to proceed ten (10) days prior to commencing work. If an emergency situation arises within the Premises requiring immediate action by Grantee, Grantee shall immediately notify Grantor's project manager that an emergency exists, and that Grantee is proceeding to correct the emergency situation.

6. If approved in writing in advance by Grantor's Property Manager, Grantee may enter upon the Premises at a specified location outside of the Easement Area to gain access to the Easement Area in order to construct, install, operate, maintain, repair, remove and replace an underground electric line and to do any and all other such work as is reasonably necessary in accordance with the rights granted under this Easement.

7. Grantee may cut, trim and remove any brush, trees, logs, stumps or branches within the Premises which by reason of their proximity may interfere with the installation, repair, maintenance, operation, removal and replacement of the station. Grantee's representative (employee or contractor) will communicate in writing, the planned vegetative activities with Grantor's project manager prior to vegetation work commencing. Grantee may commence said work unless Grantor informs Grantee not to proceed five (5) working days prior to commencing work. Accepted arborist pruning/removal and equipment practices must be adhered to and all waste debris, stumps and slash must be removed and disposed of by Grantee off site before project completion in accordance with all applicable federal, state and local statutes, rules, regulationsand ordinances. When the removal of a tree is permitted, the stump shall be cut flush with the ground or be removed. All trees having a commercial value, including firewood, shall be cut in 100-inch lengths and piledconveniently by Grantee, for disposal, by sale or otherwise, by Grantor.

8. Use of pesticides and herbicides shall only be allowed with the prior written approval of the Grantor, Any pesticides or herbicides used as part of a management plan must conform to the Forest Stewardship Council list found at https://ic.fsc.org/en/our-impact/program-areas/forest-program/pesticides. Grantee shall report to the Grantor (i.e. property manager), prior to December 1 of each year chemicals are applied, the chemicals that are applied on the Premises including the date, product trade name, active ingredient(s) and corresponding CAS number(s), purpose, rate, location with a map, total area treated, and total amount of

OU-1900 WDNR groundwater monitoring station easement, 2021

chemical used.

9. Any signage placed by Grantee for purposes of project activities shall have prior written approval from Grantor.
10. Grantee shall maintain the Premises in a decent, sanitary, and safe condition during construction, repair, maintenance, removal and replacement, and at no time shall Grantee allow its work to cause a hazard orunsafe conditions.
11. Grantee is responsible for identifying any existing utility lines located within the Premises and for any and all damages, costs or liabilities that result caused by Grantee that result from any damages to any exiting utilities within the Premises.
12. Grantor does not warrant that title to the Premises is free and clear of all encumbrances or that it has sole ownership or that it will defend Grantee in its peaceful use and occupancy of the Premises. Granteeassumes all liability in determining the sufficiency of Grantor's right to convey this Easement.
13. Grantee shall obtain all necessary permits, approvals, and licenses and comply with all applicable federal, state, and local statutes, regulations and ordinances affecting the design, materials or performance ofexercising any and all rights granted by this Easement.
14. Grantee shall properly abandon the monitoring well and restore the Premises to pre-existing conditionswhen monitoring work has been completed and the monitoring station is decommissioned. If a replacement monitoring well is drilled, due to some unforeseen problem, the replaced well will be properly abandoned and this Easement will remain in place for a newly drilled replacement well. Upon final decommissioning of wells at this monitoring station, this Easement shall terminate.
15. The Easement shall automatically terminate upon Grantee's abandonment of the Premises and shall automatically revert to and re-vest in Grantor without reentry upon the abandonment of the use of the same for groundwater data collection purposes, or upon non-use of the same for a period of 2 years. Grantee's duties as reflected in paragraph 14 shall survive the reversion.
16. Grantee agrees to hold harmless Grantor, its officers, agents and employees from any and all liability, including claims, demands, losses, costs, damages, and expenses of every kind and description (including death), or damages to persons or property arising out of or in connection with or occurring during the course of this Easement where such liability is founded upon or grows out of the acts or omissions of any of the officers, employees or agents of Grantee while acting within the scope of their employment where protection is afforded by secs. 893.82 and 895.46(1), Wis. Stats.
17. Grantor retains management, supervision and control over the Premises for the purpose of enforcing pertinent state laws needed to protect the Premises, its natural resources or the general public, including Chapter NR 45, Wis. Admin. Code, which governs the conduct of visitors to state lands.
18. All notices or other writings this Easement requires to be given, or which may be given, to either party by the other shall be deemed to have been fully given when made in writing and deposited in the United Statesmail, prepaid and addressed as follows:

OU-1900 WDNR groundwater monitoring station easement, 2021

a. To Grantor: City of Kaukauna, 144 W. 2nd Street, Kaukauna, WI 54130.
b. To Grantee: U.S. Department of the Interior, U.S. Geological Survey, c/o Robert Waschbusch, 8505 Research Way, Middleton, WI 53562-3581
c. The address to which any notice, demand, or other writing may be given, made or sent to either party to this Easement may be changed by written notice.

19. This Easement shall be binding on Grantor and Grantee, their successors and assigns.

20. This Easement shall be construed and enforced in accordance with the internal laws of the State of Wisconsin.

21. This Easement sets forth the entire understanding of the parties and may not be changed except by a written document executed and acknowledged Grantor and Grantee.

22. If any term or condition of this Easement shall be deemed invalid or unenforceable, the remainder of this Easement shall not be affected thereby, and each term and condition shall be valid and enforceable to the fullest extent permitted by law.

23. Enforcement of this Easement may be by proceedings at law or in equity against any person or persons violating or attempting or threatening to violate any term or condition in this Easement, either to restrain or prevent the violation or to obtain any other relief.

END OF CONDITIONS

OU-1900 WDNR groundwater monitoring station easement, 2021

GRANTOR:

CITY OF KAUKAUNA

By: _____
Name: Anthony J. Penterman
Title: Mayor

By: _____
Name: Sally A. Kenny
Title: Clerk

STATE OF WISCONSIN)
) SS
COUNTY OF OUTAGAMIE)

Personally came before me on May 19, 2021, the above-named Anthony J. Penterman and Sally A. Kenney, to me known by the person(s) who executed the foregoing instrument and acknowledged to me that they executed the same in their authorized capacity, and that by his/her signature on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

Witness my hand and official seal.

Christina J. Nelson
Christina J. Nelson,
Notary Public, State of Wisconsin
My commission expires: 10-7-24

CHRISTINA J. NELSON NOTARY PUBLIC STATE OF WISCONSIN

OU-1900 WDNR groundwater monitoring station easement, 2021

IN WITNESS WHEREOF, U.S. Department of the Interior, U.S. Geological Survey, c/o Hydrologist, 8505Research Way, Middleton, WI 53562 hereby accepts and consents to the terms and conditions of this Easement this 24 day of May, 2021.

U.S. Department of the Interior,
U.S. Geological Survey

By Robert Waschbusch (SEAL)
Robert Waschbusch, Hydrologist
Midwest Region

State of Wisconsin)
) ss.
County of Dane)

Personally came before me this 24th day of May, 2021, the above named, Robert Waschbusch, Hydrologist, U.S. Department of the Interior, U.S. Geological Survey, to me known to be the person who executed the foregoing instrument and acknowledged that he executed and delivered the same as and for the act and deed of Grantee.

DANIEL MIJAL NOTARY PUBLIC STATE OF WISCONSIN

*
Notary Public, State of Wisconsin
My Commission (expires)(is) 8-25-23.

OU-1900 WDNR groundwater monitoring station easement, 2021

IN WITNESS WHEREOF, Wisconsin Geological and Natural History Survey – UW Madison, c/o hydrologist, 3817 Mineral Point Road, Madison, WI 53705 hereby accepts and consents to the terms and conditions of this Easement this 1 day June, 2021.

Wisconsin Geological and Natural History Survey, University of Wisconsin - Madison

By_____(SEAL)
Dan Langer
Assistant, Vice Chancellor/Controller

State of Wisconsin)
) ss.
County of_____)

Personally came before me this 1st day of June, 2021, the above named, Dan Langer Assistant Vice Chancellor/Controller for UW-Madison, to me known to be the person who executed the foregoinginstrument and acknowledged that he executed and delivered the same as and for the act and deed of the Grantee.

*
Notary Public, State of Wisconsin
My Commission ~~(expires)~~(is) permanent.

This instrument prepared by:
City of Kaukauna
Attorney Kevin Davidson, 144 W. Second Street, Kaukauna, WI 54130

OU-1900 WDNR groundwater monitoring station easement, 2021

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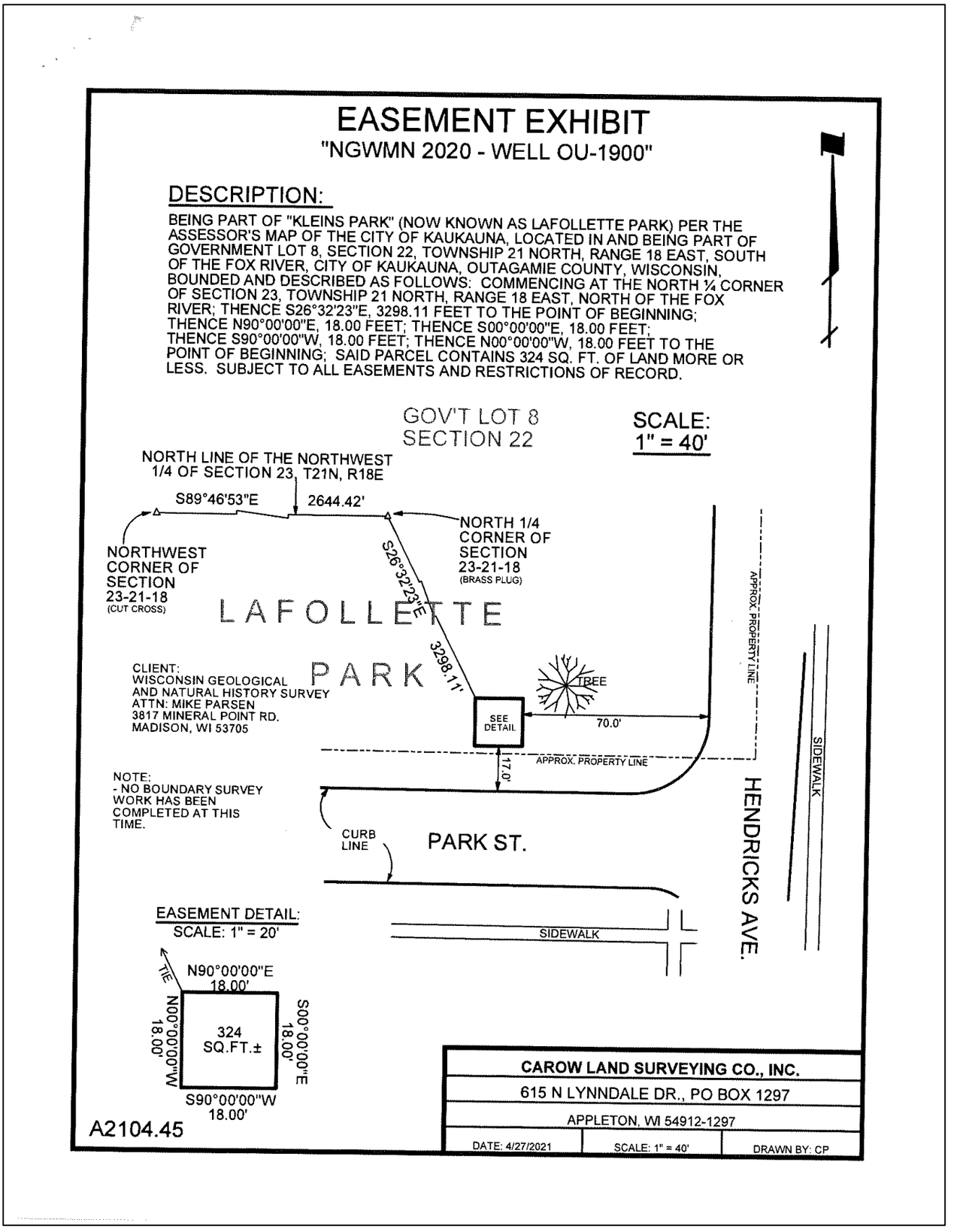

OU-1900 WDNR soil boring log, 2021

Form 4400-122, page 1 of 1

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐ _____

Page 1 of 1

Facility/Project Name: WI Groundwater-Level Monitoring Network, New Well	License/Permit/Monitoring Number	Well name: 45001900 (AKA OU-1900)
Boring Drilled By: Name of crew chief (first, last) and Firm — First Name: Chad Last Name: Van de Yacht — Firm: Groundsource	Date Drilling Started: 10/28/2021	Date Drilling Completed: 11/01/2021 — Drilling Method: Mud rotary with tricone bit
WI Unique Well No.: AAJ872 — DNR Well ID No.: — Well Name: OU-1900	Final Static Water Level: 523 Feet MSL	Surface Elevation: 708 Feet MSL — Borehole Diameter: 9"/6" inches
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒ — State Plane _____ N, _____ E	Lat 44.278417 Long -88.277186	Local Grid Location: _____ Feet ☐ N ☐ S _____ Feet ☐ E ☐ W
Facility ID	County: Outagamie — County Code: 45	Civil Town/City/ or Village: Kaukauna

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
Grab samples every 5 ft			0-55	Lean Clay w/up to 15% sand, Red brown, moist, plastic										
			55-72	Gravel w/ sand and clay. Red brown, soft, mostly dolomite with few mafics. Lost mud circulation, pulled rods, added 150# chipped bentonite.										
			72-168	Dolomite, dark grey to tan, microcrystalline, hard										
			168-175	Dolomite gray to dark gray, shaley										
			175-250	Dolomite, dark grey to tan, microcrystalline, hard										
			250-270	Dolomite tan to dark gray, shaley										
			270-300	Dolomite, dark grey to tan, microcrystalline, thin green shale 295-296										
			300-308	Dolomite tan to gray with thin clean quartz sandstone layers										
			308-320	Dolomite white to tan to gray with trace shale, trace red and brown chert										
				END OF BORING 320 ft										
				9" mud rotary with tricone to 277 ft., set 6" casing to 277 ft. w/ Bradenhead method and 56 sacks cement grout. 6" mud rotary w/ tricone to total depth. Flush mud from the hole w/water then airlift for 60 minutes										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: PMChase — Firm: Wis. Geological and Natural History Survey

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

Appendix 14: Well RO-1180 documents

Documentation of work done for this report

RO-1180 WDNR well construction report, 2021
Form 3300-077A, 2 pages

RO-1180 WDNR soil boring log, 2021
Form 4400-122, 1 page

RO-1180 WDNR groundwater monitoring easement, 2022
8 pages

RO-1180 WDNR well construction report, 2021

Form 3300-077A, page 1 of 2

Well Construction Report — ***WISCONSIN UNIQUE WELL NUMBER*** **AAO328**

Drinking Water and Groundwater - DG/5 — Form 3300-077A
Department of Natural Resources, Box 7921
Madison WI 53707

Property Owner: WISCONSIN GELOLGICAL & NATURAL HISTORY — Phone #: (608)262-2307
Mailing Address: 3817 MINERAL POINT ROAD
City: MADISON — State: WI — Zip Code: 53705
County: Rock — Co. Permit #: — Notification #: 8464201405 — Completed: 12-10-2021

1. Well Location — Fire # (if avail.):
Town of PLYMOUTH
Street Address or Road Name and Number: W ORFORDVILLE HANOVER ROAD
Subdivision Name: — Lot #: — Block #:

Well Constructor (Business Name): SAM'S WELL DRILLING INC — Lic. #: 370 — Facility ID # (Public Wells):
Address: PO BOX 150 N9935 PLEASANT RD RANDOLPH WI 53956
Well Plan Approval #:
Approval Date (mm-dd-yyyy):
Hicap Permanent Well #: — Common Well #: — Specific Capacity: 0.3

Latitude / Longitude in Decimal Degree (DD): 42.6213 °N -89.2026 °W — Method Code: GPS008
NE SW — Section: 21 — Township: 2 N — Range: 11 E
or Govt Lot #:

2. Well Type: New Well
of previous unique well # — constructed in
Reason for replaced or reconstructed well ?

3. Well serves: 1 # of TEST WELL
Private,potable
Heat Exchange____# of drillholes
Hicap Well ? No
Hicap Property ? No
Hicap Potable ? No
Construction Type: Drilled

4. Potential Contamination Sources - ON REVERSE SIDE

5. Drillhole Dimensions and Construction Method

Dia. (in.)	From (ft.)	To (ft.)
6	Surface	99

Upper Enlarged Drillhole		Lower Open Bedrock
No	Rotary - Mud Circulation	No
No	Rotary - Air	Yes
No	Rotary - Air & Foam	No
No	Drill-Through Casing Hammer	
No	Reverse Rotary	
No	Cable-tool Bit ____in. dia...	No
Yes	Dual Rotary	No
No	Temp. Outer Casing ____in. dia	
No	Removed? ____depth ft. (If NO explain on back side)	

8. Geology

Geology Codes			8. Geology Type, Caving/Noncaving, Color, Hardness, etc...	From (ft.)	To (ft.)
	S	C	S-SAND C-CLAYEY	Surface	12
	G		G-GRAVEL/STONES	12	62
S	N		S-SOFT/LOOSE N-SANDSTONE	62	75
	N		N-SANDSTONE	75	99

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6	STD, BLK, PIPE, .280 WALL, P.E., A53B, SEAH STEEL	Surface	76
Dia. (in.)	Screen type, material & slot size	From (ft.)	To (ft.)

9. Static Water Level: 2 ft. below ground surface
10. Pump Test: Pumping level 70 ft. below surface
Pumping at 20 GP M for 1 Hrs.
Pumping Method ? Airlift

11. Well Is: 24 in. above grade
Developed ? Yes
Disinfected ? Yes
Capped ? Yes

7. Grout or Other Sealing Material
Method: MOUNDED

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
GRANULAR BENTONITE	Surface		

12. Notified Owner of need to fill & seal ? No
Filled & Sealed Well(s) as needed? No

13. Constructor / Supervisory Driller	Lic #	Date Signed
JVG	6026	12-10-2021
Drill Rig Operator	Lic or Reg #	Date Signed
TS	8981	12-10-2021

WISCONSIN UNIQUE WELL NUMBER AAO328

RO-1180 WDNR well construction report, 2021

Form 3300-077A, page 2 of 2

4a. Potential Contamination Sources Is the well located in floodplain ? No

Comment:

Water Quality Text:

Water Quantity Text:

Difficulty Text:

Created On: 12-13-2021 Created by: swdlabs Updated On: 12-13-2021 Updated by: swdlabs

WISCONSIN UNIQUE WELL NUMBER **AAO328**

RO-1180 WDNR soil boring log, 2021

Form 4400-122, page 1 of 1

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐ _____

Page 1 of 1

Facility/Project Name: Statewide Groundwater Monitoring Network	License/Permit/Monitoring Number: Notification# 8464201405	Boring Number: RO-1180 54001180 New well	
Boring Drilled By: Name of crew chief (first, last) and Firm — First Name: Troy Last Name: S. Firm: Sam's Well Drilling	Date Drilling Started: 12/10/2021	Date Drilling Completed: 12/10/2021	Drilling Method: Dual/air rotary
WI Unique Well No.: AAO328	DNR Well ID No.:	Well Name:	Final Static Water Level: 2 ft/TOC Feet MSL
Surface Elevation: 841 Feet MSL	Borehole Diameter: 6 inches		
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒	Lat 42.6213° ' " Long -89.2026° ' "	Local Grid Location: ☐ N ☐ E _____ Feet ☐ S _____ Feet ☐ W	
Facility ID	County: Rock	County Code:	Civil Town/City/ or Village: Township of Plymouth

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
Grab Each 5ft			0-12	SANDY SILT 85% fines 15% f-m sand, slightly plastic, moist, brown LOESS/ALLUVIUM										
			12-62	SANDY GRAVEL 60% gravel, 30% sand, 10% fines, yellow brown to brown, wet. Gravel mostly dolomite. OUTWASH										
			62-99	SANDSTONE,soft, non caving, f-c sand, yellow to red brown. ANCELL GROUP										
				END OF BORING 101.4 ft./TOC 6" casing to 76' then open hole to total depth.Well developed using air lift for 60 min @ 20 GPM										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
Peter M. Chase P.G.	Wisconsin Geological and Natrual History Survey

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

OU-1900 WDNR well construction report, 2021

Form 2200-118, page 1 of 8

RO-1180

2211979
SANDY DISRUD
REGISTER OF DEEDS
ROCK COUNTY, WI
RECORDED ON
02/15/2022 01:34 PM
REC FEE: 30.00
PAGES: 8

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Document Number | Document Title

State of Wisconsin
Department of Natural Resources
Box 7921
Madison, WI 53707

GROUNDWATER MONITORING STATION EASEMENT
Section 23.09(2), Wis. Stats.
Form 2200-118

THIS GROUNDWATER MONITORING STATION EASEMENT ("Easement") made by and between the State of Wisconsin Department of Natural Resources ("Grantor"), and the U.S. Department of the Interior, U.S. Department of Geological Survey and Wisconsin Geological and Natural History Survey – University of Wisconsin - Madison ("Collectively Grantee").

Recording Area
Return: Department of Natural Resources
Bureau of Facilities & Land - LF/6
P.O. Box 7921
Madison, WI 53707-7921
Attn: Bill Peterson (CE 10009)

Parcel Identification Number (PIN):
030001203

RECITALS

WHEREAS, the Grantor and Grantee are entering into an agreement to cooperatively collect long-term groundwater levels in order to fulfill the Grantor's requirement to regulate high-capacity wells under s. 281.34, Wis. Stats., and Chapter NR 820, Wis. Adm. Code, and its responsibility to implement the Great Lake Compact under s. 281.343(4)(a), Wis. Stats.;

WHEREAS, the Grantee desires to install a monitoring station in order to collect said data;

WHEREAS, the Grantee requests an Easement allowing it to access Grantor's property in order to collect groundwater data by constructing, installing, and operating and maintaining, a monitoring station containing one groundwater well; and

WHEREAS, the portion of Grantor's property subject to this Easement ("Premises") is described below and more particularly shown on Exhibit "A":

> Part of the NE ¼ of the SW of Section 21, Township 02 North, Range 11 East, Town of Plymouth, Rock County, Wisconsin. Monitoring Well location in a part of the Footville Wildlife Area being a 30-foot-wide radius around Lat: 42.621259; Long: -89.202506

NOW, THEREFORE, the Grantor hereby agrees to convey to the Grantee, its assigns, a non-exclusive perpetual easement to access, construct, install, operate, maintain, repair, remove and replace a monitoring station drilled and/or placed on the above described Premises, along with duties related to water sampling as deemed necessary.

It is understood by the Grantor and the Grantee that this Easement is subject to the following conditions:

1. The Grantor and Grantee hereto confirm and agree that the recitals set forth above are true and correct and incorporate the same herein for all purposes.

2. The Grantor grants and conveys to the Grantee this non-exclusive Easement for the construction, installation, operation, maintenance, repair, replacement and removal of a monitoring station consisting of, but not limited to a drilled well which shall be constructed in compliance with Ch. NR 141 or Ch. NR 812, Wis. Adm. Code,

RO-1180 WDNR groundwater monitoring easement, 2022

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as applicable, along with vehicle and walk in access to the Premises, as is reasonably deemed necessary for installation and collecting data including, but not limited to water-level measurements, geophysical measurements and /or water quality sampling purposes. The Grantee shall share all information gained from said monitoring upon request of the Grantor.

3. This Easement is limited to the Grantee, its assigns and is not transferrable to any other third party, except after prior written notification to Grantor. The Grantee will not have the right to allow additional co-location of other facilities in the Easement.

4. The Easement shall be non-exclusive and the Grantor may use the Premises and shall have the right to lease or convey other easements to one or more other person(s), company(ies) or other entity(ies); provided that any such subsequent use, lease or conveyance shall not interfere with the Grantee's rights.

5. Grantee shall submit a written notification of project commencement to the Grantor's Project Manager identified in Paragraph 18 herein at least thirty (30) days prior to the initiation of any well construction work on the Premises. The Grantee may commence said work unless the Grantor informs the Grantee not to proceed ten (10) days prior to commencing work. If an emergency situation arises within the Premises requiring immediate action by the Grantee, the Grantee shall immediately notify the Grantor's project manager that an emergency exists and that the Grantee is proceeding to correct the emergency situation.

6. If approved in writing in advance by Grantor's Property Manager, Grantee may enter upon the Premises at a specified location outside of the Easement Area to gain access to the Easement Area in order to construct, install, operate, maintain, repair, remove and replace a monitoring station and to do any and all other such work as is reasonably necessary in accordance with the rights granted under this Easement.

7. Grantee may cut, trim and remove any brush, trees, logs, stumps or branches within the Premises which by reason of their proximity may interfere with the installation, repair, maintenance, operation, removal and replacement of the station. Grantee's representative (employee or contractor) will communicate in writing, the planned vegetative activities with Grantor's project manager prior to vegetation work commencing. The Grantee may commence said work unless the Grantor informs the Grantee not to proceed five (5) working days prior to commencing work. Accepted arborist pruning/removal and equipment practices must be adhered to and all waste debris, stumps and slash must be removed and disposed of by the Grantee off site before project completion in accordance with all applicable federal, state and local statutes, rules, regulations and ordinances. When the removal of a tree is permitted, the stump shall be cut flush with the ground or be removed. All trees having a commercial value, including firewood, shall be cut in 100-inch lengths and piled conveniently by the Grantee, for disposal, by sale or otherwise, by the Grantor.

8. Use of pesticides and herbicides shall only be allowed with the prior written approval of the Grantor, Any pesticides or herbicides used as part of a management plan must conform to the Forest Stewardship Council list found at https://ic.fsc.org/en/our-impact/program-areas/forest-program/pesticides. Grantee shall report to the Grantor (i.e. property manager), prior to December 1 of each year chemicals are applied, the chemicals that are applied on the Premises including the date, product trade name, active ingredient(s) and corresponding CAS number(s), purpose, rate, location with a map, total area treated, and total amount of chemical used.

9. Any signage placed by the Grantee for purposes of project activities shall have prior written approval from the Grantor.

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10. The Grantee shall maintain the Premises in a decent, sanitary, and safe condition during construction, repair, maintenance, removal and replacement, and at no time shall the Grantee allow its work to cause a hazard or unsafe conditions.

11. The Grantee is responsible for identifying any existing utility lines located within the Premises and for any and all damages, costs or liabilities that result caused by the Grantee that result from any damages to any exiting utilities within the Premises.

12. Grantor does not warrant that title to the Premises is free and clear of all encumbrances or that it has sole ownership or that it will defend the Grantee in its peaceful use and occupancy of the Premises. The Grantee assumes all liability in determining the sufficiency of the Grantor's right to convey this Easement.

13. The Grantee shall obtain all necessary permits, approvals, and licenses and comply with all applicable federal, state, and local statutes, regulations and ordinances affecting the design, materials or performance of exercising any and all rights granted by this Easement.

14. The Grantee shall properly abandon the monitoring well and restore the Premises to pre-existing conditions prior to installation of the monitoring station when its monitoring work has been completed unless Grantor agrees in writing to take over operation and maintenance of the well. Upon removal and proper abandonment, this Easement shall terminate.

15. The Easement shall automatically terminate upon Grantee's abandonment of the Premises and shall automatically revert to and re-vest in the Grantor without reentry upon the abandonment of the use of the same for groundwater data collection purposes, or upon non-use of the same for a period of 2 years. The Grantee's duties as reflected in paragraph 14 shall survive the reversion.

16. The Grantee agrees to hold harmless Grantor, its officers, agents and employees from any and all liability, including claims, demands, losses, costs, damages, and expenses of every kind and description (including death), or damages to persons or property arising out of or in connection with or occurring during the course of this Easement where such liability is founded upon or grows out of the acts or omissions of any of the officers, employees or agents of the Grantee while acting within the scope of their employment where protection is afforded by secs. 893.82 and 895.46(1), Wis. Stats.

17. The Grantor retains management, supervision and control over the Premises for the purpose of enforcing pertinent state laws needed to protect the Premises, its natural resources or the general public, including Chapter NR 45, Wis. Admin. Code, which governs the conduct of visitors to state lands.

18. All notices or other writings this Easement requires to be given, or which may be given, to either party by the other shall be deemed to have been fully given when made in writing and deposited in the United States mail, prepaid and addressed as follows:
    a. To the Grantor: Department of Natural Resources, Bureau of Facilities and Lands PO Box 7921, Madison, WI 53707-7921
    b. To the Grantee: U.S. Department of the Interior, U.S. Geological Survey, c/o Robert Waschbusch, 8505 Research Way, Middleton, WI 53562-3581
    c. The address to which any notice, demand, or other writing may be given, made or sent to either party to this Easement may be changed by written notice.

19. This Easement shall be binding on the Grantor and Grantee, their successors and assigns.

20. This Easement shall be construed and enforced in accordance with the internal laws of the State of Wisconsin.

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21. This Easement sets forth the entire understanding of the parties and may not be changed except by a written document executed and acknowledged the Grantor and the Grantee.

22. If any term or condition of this Easement shall be deemed invalid or unenforceable, the remainder of this Easement shall not be affected thereby, and each term and condition shall be valid and enforceable to the fullest extent permitted by law.

23. Enforcement of this Easement may be by proceedings at law or in equity against any person or persons violating or attempting or threatening to violate any term or condition in this Easement, either to restrain or prevent the violation or to obtain any other relief.

END OF CONDITIONS

RO-1180 WDNR groundwater monitoring easement, 2022

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IN WITNESS WHEREOF, the Grantor grants this Easement and has caused this instrument to be executed on its behalf this 29th day of November, 2021.

State of Wisconsin
Department of Natural Resources
For the Secretary

By Terry H. Bay (SEAL)
Terry H. Bay
Bureau Director, Facilities and Lands

State of Wisconsin)
) ss.
County of Dane)

Personally came before me this 29th day of November, 2021, the above named Terry H. Bay, Facilities and Lands Bureau Director, State of Wisconsin Department of Natural Resources, to me known to be the person who executed the foregoing instrument and acknowledged that he executed and delivered the same as for the act and deed of said Department of Natural Resources.

NOTARY PUBLIC CONNIE M. SCOTT STATE OF WISCONSIN

Connie M. Scott
Connie M Scott
Notary Public, State of Wisconsin
Commission (expires)(is) 5-3-23

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RO-1180 WDNR groundwater monitoring easement, 2022

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IN WITNESS WHEREOF, U.S. Department of the Interior, U.S. Geological Survey, c/o Hydrologist, 8505 Research Way, Middleton, WI 53562 hereby accepts and consents to the terms and conditions of this Easement this 4 day February, 2022.

U.S. Department of the Interior,
U.S. Geological Survey

By _____ (SEAL)
Robert Waschbusch, Hydrologist
Midwest Region

State of Wisconsin)
) ss.
County of Dane)

Personally came before me this 4 day of February, 2022, the above named, Robert Waschbusch, Hydrologist, U.S. Department of the Interior, U.S. Geological Survey, to me known to be the person who executed the foregoing instrument and acknowledged that he executed and delivered the same as and for the act and deed of the Grantee.

_____
Notary Public, State of Wisconsin
My Commission (expires)(is) My Commission Expires September 10, 2024

JEANNA PIPITONE
Notary Public
State of Wisconsin

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IN WITNESS WHEREOF, Wisconsin Geological and Natural History Survey – UW Madison, c/o hydrologist, 3817 Mineral Point Road, Madison, WI 53705 hereby accepts and consents to the terms and conditions of this Easement this 15 day November, 2021.

Wisconsin Geological and Natural History Survey,
University of Wisconsin - Madison

By _____ (SEAL)
Dan Langer
Assistant Vice Chancellor/Controller

State of Wisconsin)
) ss.
County of Dane)

Personally came before me this 15 day of November, 2021, the above named, Dan Langer Assistant Vice Chancellor/Controller for UW-Madison, to me known to be the person who executed the foregoing instrument and acknowledged that he executed and delivered the same as and for the act and deed of the Grantee.

Jennifer Leyden

Notary Public, State of Wisconsin
My Commission (~~expires~~)(is) permanent.

This instrument drafted by:
State of Wisconsin
Department of Natural Resources

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RO-1180 WDNR groundwater monitoring easement, 2022

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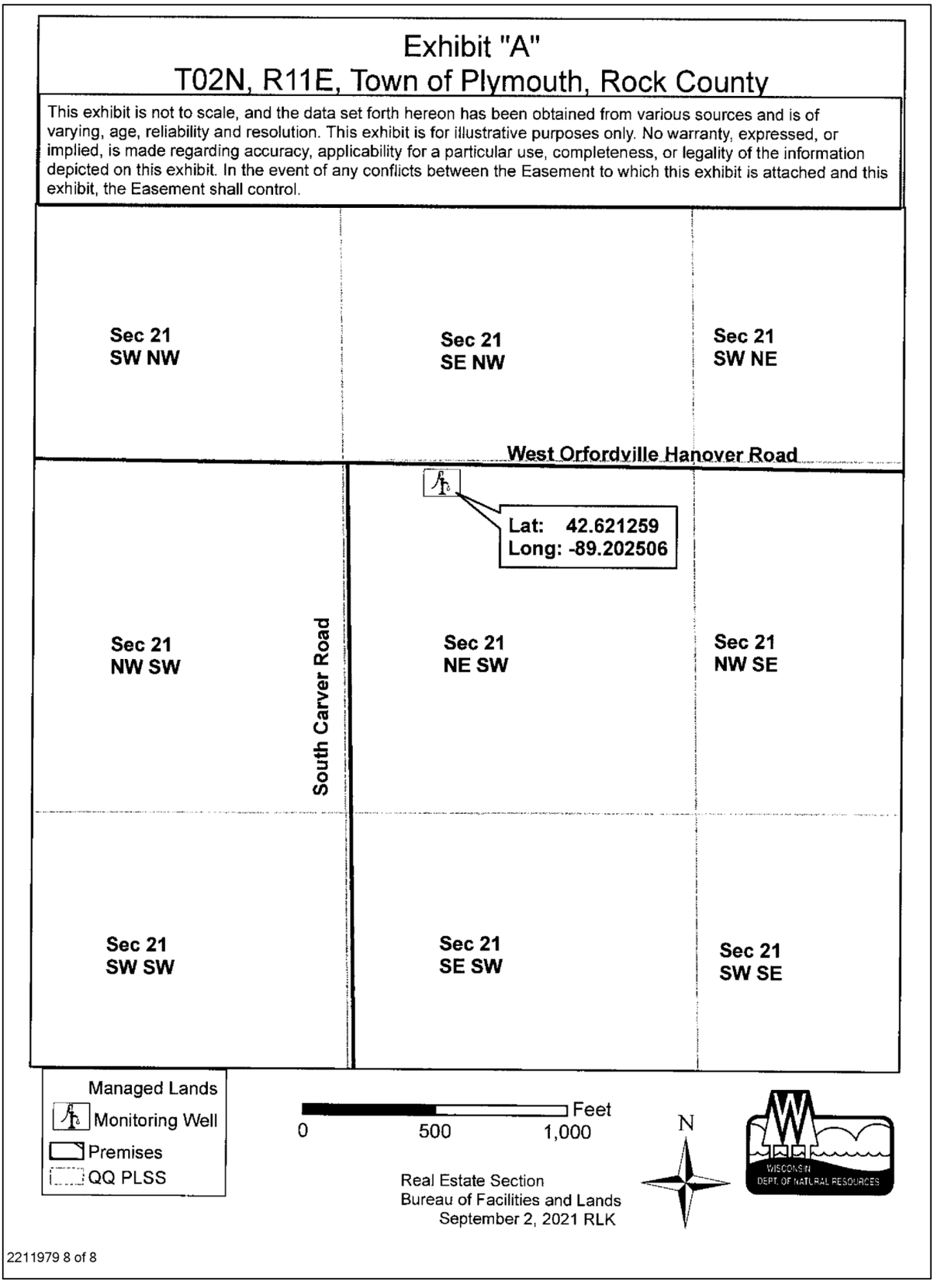

Appendix 15: Well SC-4072 documents

Documentation of work done for report

SC-4072 DNR well construction report, 2023
Form 3300-077A, 2 pages

SC-4072 Memorandum of agreement, 2021
3 pages

SC-4072 WDNR soil boring log, 2023
Form 4400-122, 1 page

SC-4072 DNR well construction report, 2023

Form 3300-077A, page 1 of 2

Well Construction Report
WISCONSIN UNIQUE WELL NUMBER **ABA896**

Drinking Water and Groundwater - DG/5 Form 3300-077A
Department of Natural Resources, Box 7921
Madison WI 53707

Property Owner: WISCONSIN GEOLOGICAL & NATURAL HISTORY — Phone #
Mailing Address: 3817 MINERAL POINT ROAD
City: MADISON — State: WI — Zip Code: 53705

County	Co. Permit #	Notification #	Completed
Saint Croix		9050863401	06-13-2023

Well Constructor (Business Name): D M B DRILLING CO INC — Lic. #: 6749 — Facility ID # (Public Wells):
Address: W8760 CTY HWY J, SHELL LAKE WI 54871
Well Plan Approval #:
Approval Date (mm-dd-yyyy):
Hicap Permanent Well #: — Common Well #: — Specific Capacity: 10

3. Well serves 1 # of OBSERVATION WELL
Private, non-potable
Heat Exchange____# of drillholes
Hicap Well ? No
Hicap Property ? No
Hicap Potable ? No

1. Well Location
Town of RICHMOND — Fire # (if avail.): 1244
Street Address or Road Name and Number: 140TH AVE
Subdivision Name: — Lot #: — Block #:
Latitude / Longitude in Decimal Degree (DD): 45.0649 °N -92.5495 °W — Method Code: GPS008
SE SW Section: 22 Township: 30 N Range: 18 W
or Govt Lot #:

2. Well Type New Well
of previous unique well #: constructed in
Reason for replaced or reconstructed well ?
Construction Type: Drilled

4. Potential Contamination Sources - ON REVERSE SIDE

5. Drillhole Dimensions and Construction Method

Dia. (in.)	From (ft.)	To (ft.)
10	Surface	40
6	40	100

Upper Enlarged Drillhole		Lower Open Bedrock
Yes	Rotary - Mud Circulation	No
No	Rotary - Air	Yes
No	Rotary - Air & Foam	No
No	Drill-Through Casing Hammer	
No	Reverse Rotary	
No	Cable-tool Bit ____in. dia...	No
No	Dual Rotary	No
No	Temp. Outer Casing ____in. dia	
No	Removed? ____depth ft. (If NO explain on back side)	

8. Geology

Geology Codes	8. Geology Type, Caving/Noncaving, Color, Hardness, etc...	From (ft.)	To (ft.)
R V C C	R-RED V-NON-CAVING C-CLAY C-CLAYEY	Surface	4
Y A Y S	Y-YELLOW A-COARSE Y-SAND & GRAVEL S-SANDY	4	24
Y H L L	Y-YELLOW H-HARD/FIRM L-LIMESTONE/DOLOMITE L-LIMEY OR DOLOMITIC	24	100

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6	WHEATLAND STEEL ASTM A53 18.99 280 WALL WELDED JOINTS	Surface	40

Dia. (in.) Screen type, material & slot size — From (ft.) — To (ft.)

9. Static Water Level
33 ft. below ground surface

10. Pump Test
Pumping level 35 ft. below surface
Pumping at 20 GP M for 1 Hrs.
Pumping Method ? Airlift

11. Well Is
24 in. above grade
Developed ? Yes
Disinfected ? Yes
Capped ? Yes

7. Grout or Other Sealing Material
Method: TREMIE PIPE - PUMPED

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT GROUT	Surface	40	15 S

12. Notified Owner of need to fill & seal ? No
Filled & Sealed Well(s) as needed? No

13. Constructor / Supervisory Driller — Lic # — Date Signed
DMB — 6242 — 06-13-2023
Drill Rig Operator — Lic or Reg # — Date Signed

WISCONSIN UNIQUE WELL NUMBER ABA896

SC-4072 DNR well construction report, 2023

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4a. Potential Contamination Sources Is the well located in floodplain ? No

Comment:

Water Quality Text:

Water Quantity Text:

Difficulty Text:

Created On: 06-13-2023 Created by: DMBDRILLINGINC Updated On: 06-13-2023 Updated by: DMBDRILLINGINC

WISCONSIN UNIQUE WELL NUMBER **ABA896**

SC-4072 Memorandum of agreement, 2021

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Memorandum of Agreement
between the
U.S. Geological Survey,
Wisconsin Geological and Natural History Survey (UW-Madison) and the
U.S. Fish and Wildlife Service
St. Croix Wetland Management District

I. BACKGROUND/AUTHORITY - This Memorandum of Agreement is entered into between the U.S. Department of Interior – U.S. Geological Survey Upper Midwest Water Science Center, hereinafter referred to as the "USGS", Wisconsin Geological and Natural History Survey – University of Wisconsin-Madison, hereinafter referred to as the "WGNHS", and the U.S. Department of the Interior, Fish and Wildlife Service, hereinafter referred to as the "Service." The Service is the principle Federal Government agency charged with the responsibility for carrying out programs related to fish and wildlife conservation throughout the US in accordance with the Migratory Bird Treaty Act (16 U.S.C. 715); the Fish and Wildlife Coordination Act (16 U.S.C. 661-667E) as amended; the Fish and Wildlife Act of 1956, 16 U.S.C. 7429(a); and the National Wildlife Refuge System Administration Act of 1966, 16 U.S.C. Sec. 668dd as amended. The USGS collects, analyzes, and interprets water data and conducts unbiased scientifically sound research on water resources in cooperation with other Federal, State, and local agencies, universities, and research centers. The WGNHS conducts earth-science surveys, field studies and research; provides objective scientific information about the geology, mineral resources, and water resources of Wisconsin; and collects, interprets, disseminates, and archives natural resource information to support informed decision making by government, industry, business, and individual citizens of Wisconsin.

II. OBJECTIVE - To establish a groundwater-level monitoring station and obtain long-term groundwater level data in St. Croix County. This information is necessary to establish a baseline of groundwater level fluctuations throughout the annual cycle. Data collection and analysis is also expected to further our understanding of any connection between groundwater levels to surface waters, how local climate events influence groundwater and interactions with the "built" environment or human infrastructure such as groundwater withdrawals for commercial, municipal and household uses on groundwater levels. All parties recognize that there is a need for establishing long-term monitoring sites in locations with sensitive natural areas. The objective of this cooperative effort is to make available a physical site to place the well which will facilitate the long-term, groundwater monitoring program. Further, the Agreement will also allow the USGS and WGNHS access to the site to install a monitoring well and perform routine well evaluations, data collection and maintenance.

III. SCOPE OF WORK

1. The Service will:

SC-4072 Memorandum of agreement

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a. Allow the USGS and WGNHS to install a groundwater monitoring well adjacent to the Lundy Waterfowl Production Area parking lot (located at physical address 1244 140th Ave, New Richmond, WI 54017 in St. Croix County, Wisconsin).
b. Complete documentation to install the well on federal property needed to meet requirements under the National Environmental and Policy Act.

2. The USGS and WGNHS will:
   a. Contract with a well driller to install the groundwater monitoring well.
   b. Ensure no wheel ruts or piles of soil are left on the site resulting from drilling activities.
   c. Install the monitoring wells within 10' of the road right-of-way and/or within 25' of a parking area. Work with Service personnel to site specific well location.
   d. Clearly mark the wellhead with at least 1 metal post to prevent accidental collision with Service vehicles and equipment.
   e. Make available, upon request, ground water level information which is obtained from the well.
   f. Upon termination of the MOA, properly seal the well and remove all above grade materials associated with the well.

IV. SPECIAL PROVISIONS

1. The scope of work and terms of this Memorandum of Agreement may be modified or amended at any time by mutual consent of the signatory parties.

2. Liability: Each party agrees that it will be responsible for its own acts and the results thereof and shall not be responsible for the acts of the other party and the results thereof. Each party, therefore, agrees that it will assume all risk and liability to itself, its agents, or employees, for any injury to persons or property resulting in any operations of its agents or employees, under this agreement, and for any loss, cost, damage, or expense resulting at any time from any and all causes due to any act or acts, negligence, or the failure to exercise proper precautions of or by itself or its own employees while occupying or visiting the premises and utilizing loaned equipment pursuant to this agreement. Such agreement by the Service and USGS will be to the extent allowed by law, to process claims submitted for alleged loss, injury, or damage to persons or property which might arise from the acts or omissions of Service and/or USGS employees, acting within the scope of their employment, in the operation and maintenance of the premises for wildlife management purposes in accordance with the terms and conditions of this Cooperative Agreement in pursuant to the Federal Tort Claims Act (28 U.S.C., Section 2671, et. seq.).

3. It is agreed that the USGS is acting as a Service authorized agent conducting activities that support fulfilling the refuge purpose and the mission of the National Wildlife Refuge System.

V. PROJECT OFFICERS - Project Officers, for the purpose of administering this Memorandum of Agreement are:

For the Service:	For the USGS:	For the WGNHS (UW-Madison):
Bridget Olson	Robert Waschbusch	Dan Langer

SC-4072 Memorandum of agreement, 2021

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Project Leader
St. Croix WMD,
U.S FWS 1764 95th Street
New Richmond, WI 54017

Hydrologist
UMWSC
8505 Research Way
Middleton, WI 53562

Asst. Vice Chancellor/Controller
Division of Business Services
UW-Madison
21 N. Park St
Madison, WI 53715

VI. PERIOD OF AGREEMENT-This Memorandum of Agreement will be effective until 2050 when signed by both parties except that it may be modified, extended or terminated at any time by either party giving 60 days written notice to the other party.

U.S. Fish and Wildlife Service

BRIDGET OLSON Digitally signed by BRIDGET OLSON Date: 2021.04.05 14:47:36 -05'00'

Project Leader

Date: 04/05/2021

U.S. Geological Survey

ROBERT WASCHBUSCH Digitally signed by ROBERT WASCHBUSCH Date: 2021.04.08 14:28:42 -05'00'

Hydrologist

Date: _____

WGNHS (UW-Madison)

DocuSigned by: Dan Langer Dan Langer 92796E26F6F7479...

Asst. Vice Chancellor/Controller

Date: 4/14/2021

SC-4072 WDNR soil boring log, 2023

Form 4400-122, page 1 of 1

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐ _____

Page 1 of 1

Facility/Project Name: Wisconsin Groundwater Monitoring Network — New well	License/Permit/Monitoring Number: Notification# 9050863401	Boring Number: SC-4072 56004072	
Boring Drilled By: Name of crew chief (first, last) and Firm — First Name: David Last Name: Beecroft; Firm: DMB Drilling Co. Inc.	Date Drilling Started: 06/13/2023 (m m d d y y y y)	Date Drilling Completed: 06/13/2023	Drilling Method: 10" Mud rotary to 40' 6" Air rotary to TD
WI Unique Well No.: ABA896 _ — DNR Well ID No.: _ _ _ — Well Name:	Final Static Water Level: 33ft/TOC Feet MSL	Surface Elevation(land): 983.61 Feet MSL	Borehole Diameter: 10/6 inches
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒ — State Plane: 45.0649 N, -92.5495	Lat ° ' " — Long ° ' "	Local Grid Location: ☐ N ☐ E _____ Feet ☐ S _____ Feet ☐ W	
Facility ID	County: St. Croix	County Code: 56	Civil Town/City/ or Village: Tn of Richmond

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
Grab Each 5ft 20 total samples			0-4	SANDY SILT 85% fines 15% f-m sand slightly plastic, moist, red-brown ALLUVIUM										
			4-25	SAND W/ GRAVEL 60%sand 30% gravel 10% fines, nonplastic,yellow to dark brown OUTWASH										
			25-100	DOLOMITE yellow to brown, cherty, sandy from 50-55' little green shale near 90' PRAIRE du CHIEN GRP										
				END OF BORING 100 ft' 101.5'/Top Of Casing										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
Peter M. Chase P.G.	Wisconsin Geological and Natrual History Survey

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

Appendix 16: Wells VE-08 and VE-410 documents

Well VE-410 replaces Well VE-08

Historic Documents for Well VE-08

VE-08 USGS well schedule for well VE-08, 1967
1 page
VE-08 Basic well information, 1980
Well information historically compiled by WGNHS, 1 page
VE-08 Well evaluation, 1980
Well information historically compiled by WGNHS, 1 page
VE-08 Well location map, date unknown
Well information historically compiled by WGNHS, 1 page
VE-08 Water-level data, 1926-2005
Well information historically compiled by the WGNHS, 7 pages

Documentation of work done for this report: VE-08

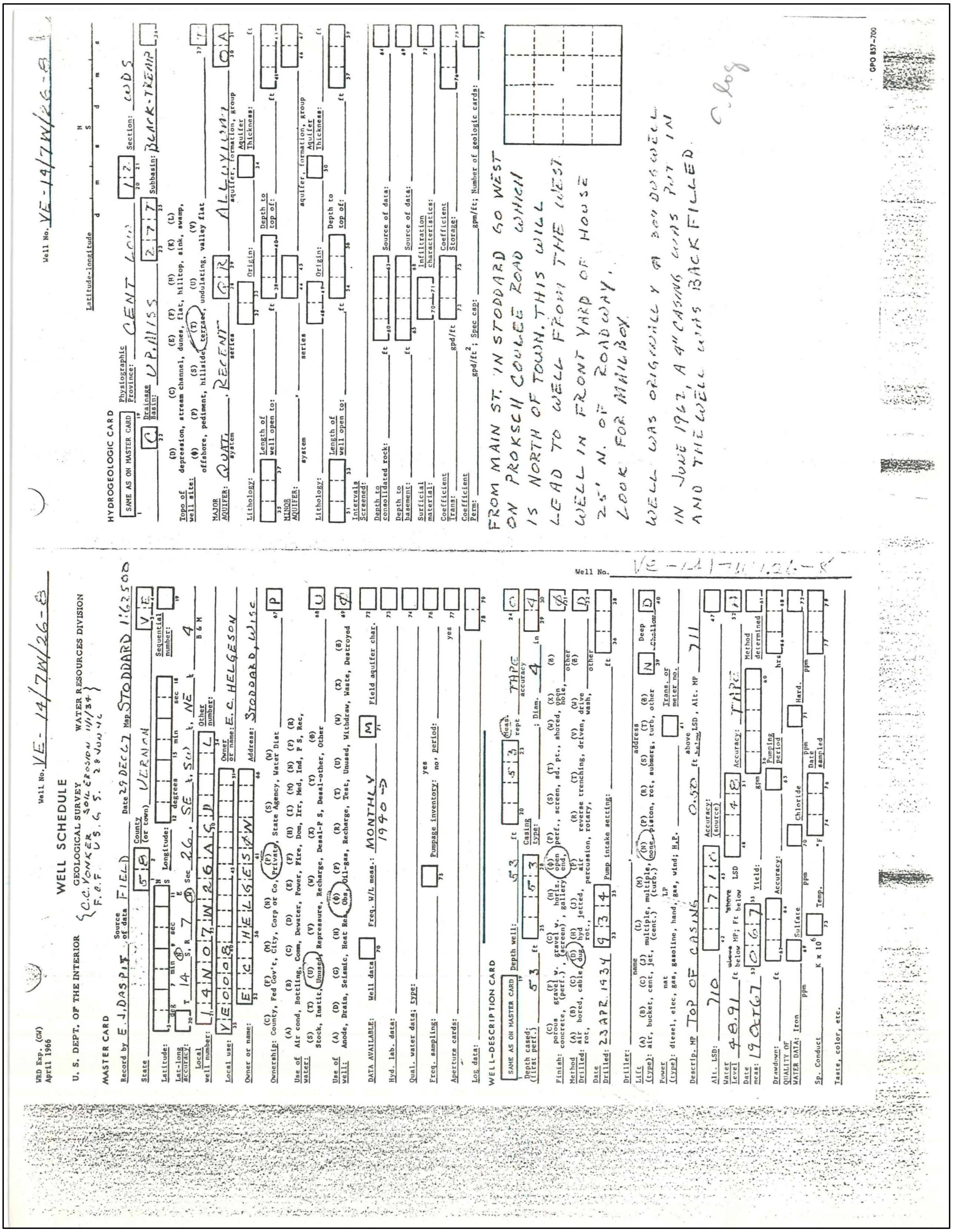
VE-08 WDNR fill & seal report, 2023
Form 3300-005, 1 page

Documentation of work done for this report: VE-410

VE-410 WDNR soil boring log, 2021
Form 4400-122, 1 page
VE-410 WDNR monitoring well construction form, 2021
Form 4400-113A. 1 page
VE-410 WDNR monitoring well development form, 2021
Form 4400-113B, 1 page
VE-410 Well owner document, 2021
Property access agreement, 2 pages

VE-08 USGS well schedule for well VE-08, 1967

Page 1 of 1



WRD Exp. (GW) April 1966

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

WELL SCHEDULE

Well No. VE-14/7W/26-8

MASTER CARD

Record by E. J. DASPIT; Source of data FIELD; Date 29 DEC 67; Map STODDARD 1:62500

State 5 5; County VERNON

Latitude; Longitude; T 14 N, R 7 W, Sec 26, SE ¼ SW ¼ NE ¼ 4

Local well number: 14N07W26ACD

Local use: VE 0008

Owner or name: E C HELGESEN; Owner: E. C. HELGESON; Address: STODDARD, WISC

Ownership: Private

Use of water: U (Unused)

Use of well: O (Obs)

Freq. W/L meas.: MONTHLY 1940 →

WELL-DESCRIPTION CARD

Depth well: 53; Depth cased: 53; Casing type: TAPE; Diam. 4 in

Date Drilled: 23 APR 1934

Descrip. MP: TOP OF CASING, 0.50 ft above LSD, Alt. MP 711

Alt. LSD: 710

Water level: 48.91 ft below MP; Date meas.: 19 OCT 67; Accuracy: TAPE

HYDROGEOLOGIC CARD

Physiographic Province: CENT LOW; Section: WDS

Drainage Basin: UP MISS; Subbasin: BLACK-TREMP

Topo of well site: (T) terrace

MAJOR AQUIFER: QUAT, RECENT, ALLUVIUM

FROM MAIN ST. IN STODDARD GO WEST ON PROKSCH COULEE ROAD WHICH IS NORTH OF TOWN. THIS WILL LEAD TO WELL FROM THE WEST. WELL IN FRONT YARD OF HOUSE 25' N. OF ROADWAY. LOOK FOR MAILBOX.

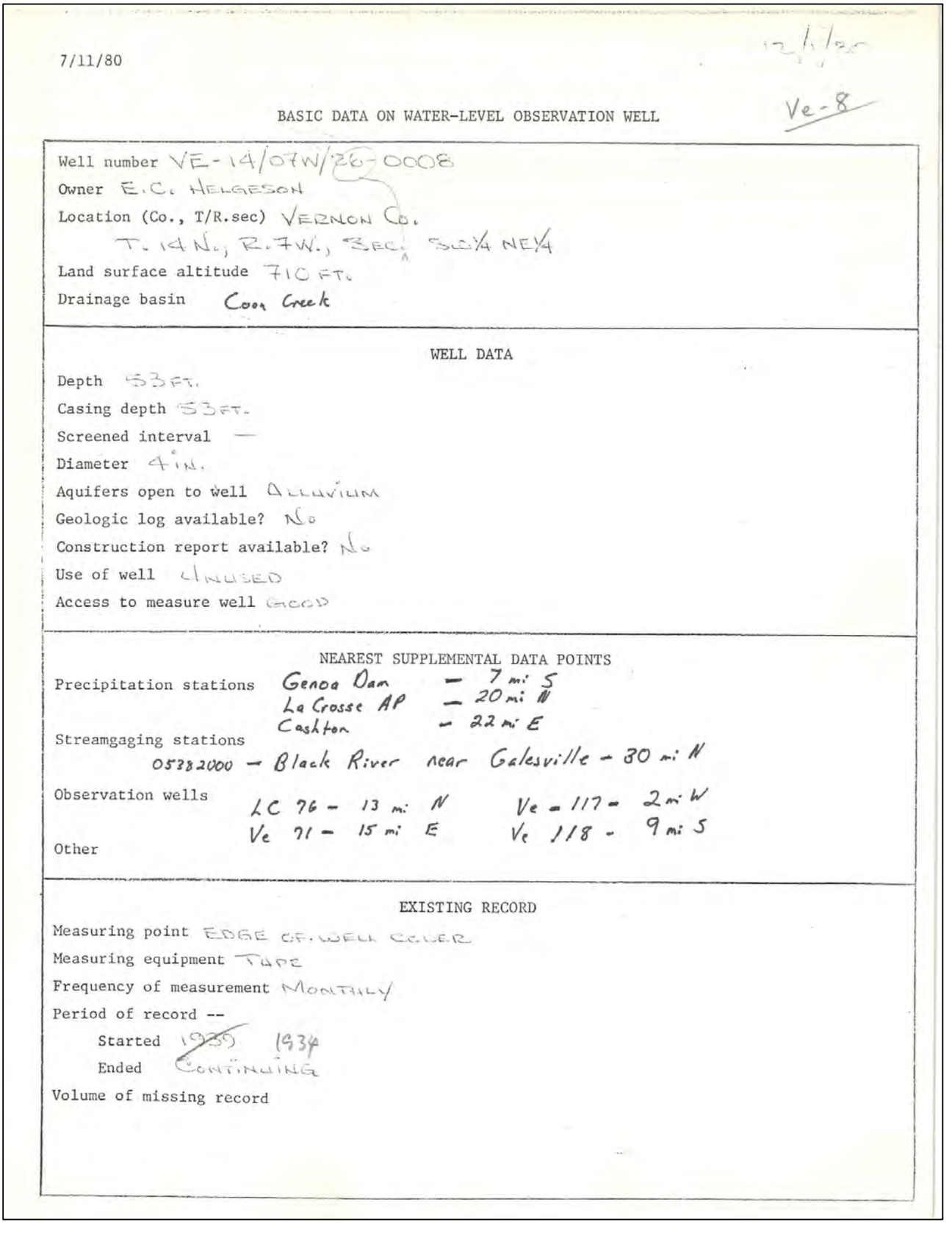
WELL WAS ORIGINALLY A DUG WELL. IN JUNE 1962, A 4" CASING WAS PUT IN AND THE WELL WAS BACKFILLED.

C. log

GPO 857-700

VE-08 Basic well information, 1980

Well information historically compiled by WGNHS, page 1 of 1



7/11/80

12/1/80

Ve-8

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number VE-14/07W/26-0008
Owner E.C. HELGESON
Location (Co., T/R.sec) VERNON Co.
T. 14 N., R. 7 W., Sec. SE¼ NE¼
Land surface altitude 710 FT.
Drainage basin Coon Creek

WELL DATA

Depth 53 FT.
Casing depth 53 FT.
Screened interval —
Diameter 4 IN.
Aquifers open to well ALLUVIUM
Geologic log available? No
Construction report available? No
Use of well UNUSED
Access to measure well GOOD

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Genoa Dam — 7 mi S
La Crosse AP — 20 mi N
Cashton — 22 mi E

Streamgaging stations
05382000 — Black River near Galesville — 30 mi N

Observation wells
LC 76 — 13 mi N
Ve 71 — 15 mi E
Ve 117 — 2 mi W
Ve 118 — 9 mi S

Other

EXISTING RECORD

Measuring point EDGE OF WELL COVER
Measuring equipment TAPE
Frequency of measurement MONTHLY
Period of record --
Started 1939 1934
Ended CONTINUING
Volume of missing record

VE-08 Well evaluation, 1980

Well information historically compiled by WGNHS, page 1 of 1

July 1980
R. D. Cotter

VE-8

CRITERIA FOR EVALUATION OF WATER–LEVEL OBSERVATION WELLS IN WISCONSIN

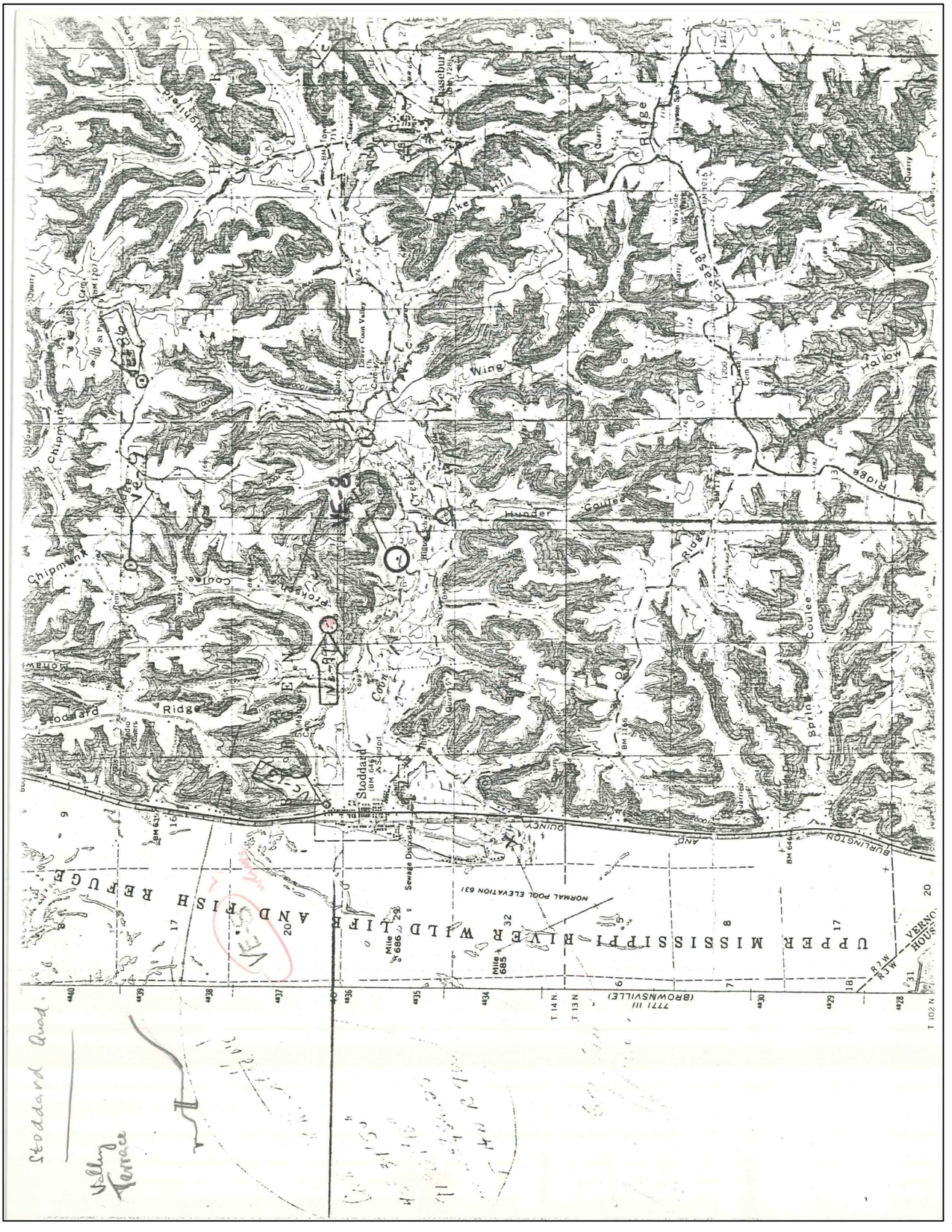
1. Areal spacing -- distance from any observation well 15 MI.
   -- distance from observation well in same aquifer 30 MI.
2. Ownership -- private
   -- public
3. Use of well UNUSED
4. Access -- physical OK
   -- owner's permission OK
5. Condition of well -- casing GOOD
   -- housing
6. Geologic log -- yes
   -- no
7. Construction report -- yes
   -- no
8. Diameter (4 inch minimum for recorder) 4 IN.
9. Aquifer -- single
   -- multiple
10. Hydraulic connection with aquifer GOOD
11. Knowledge of pumping effects —
12. Range and character of water level fluctuations 7 FT..
13. Length of record 41 YRS.
14. Missing record
15. Adequacy of current measuring frequency GOOD
16. Probability of permanance GOOD

NOTES

Recommendations

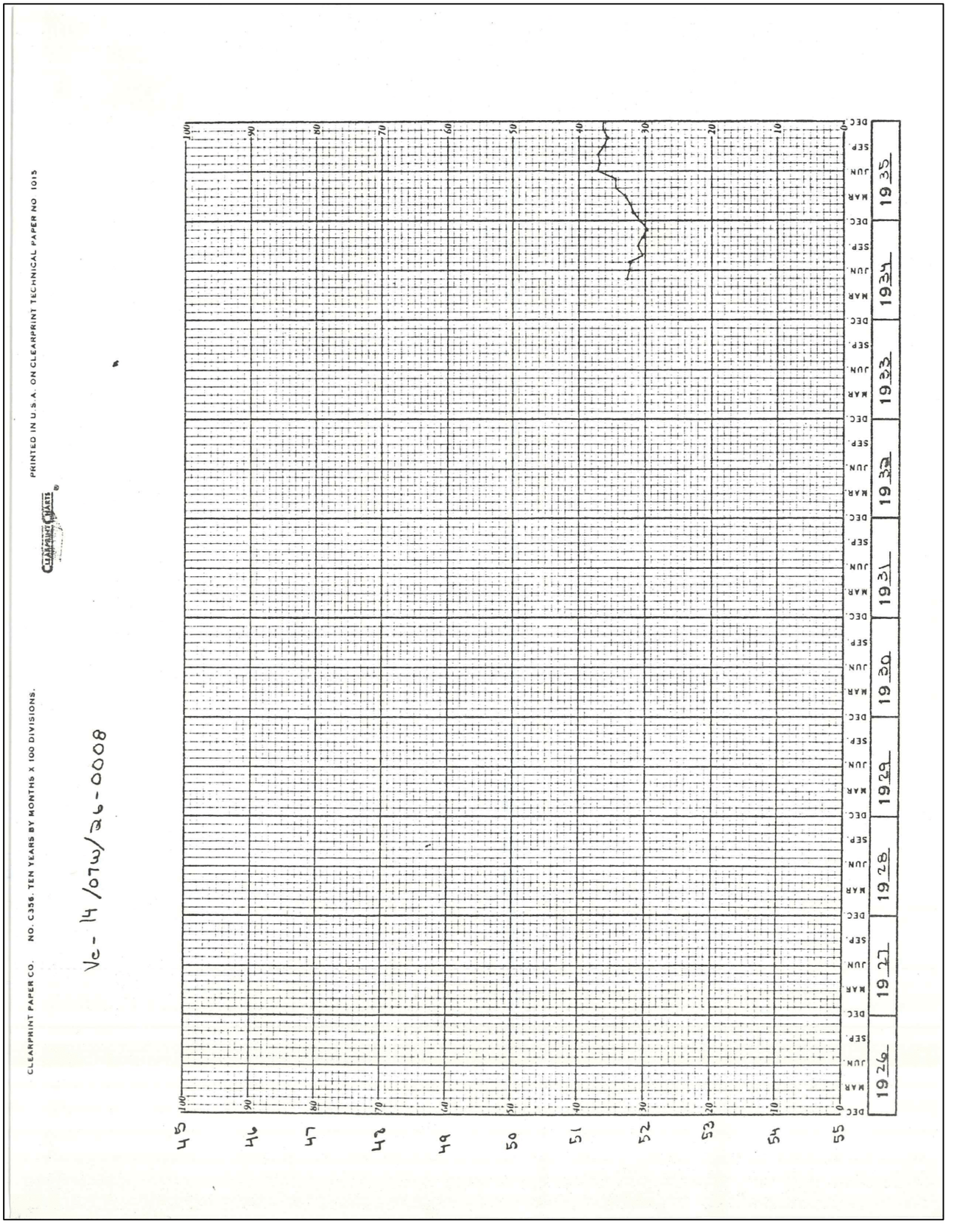
VE-08 Well location map, date unknown

Well information historically compiled by WGNHS, page 1 of 1



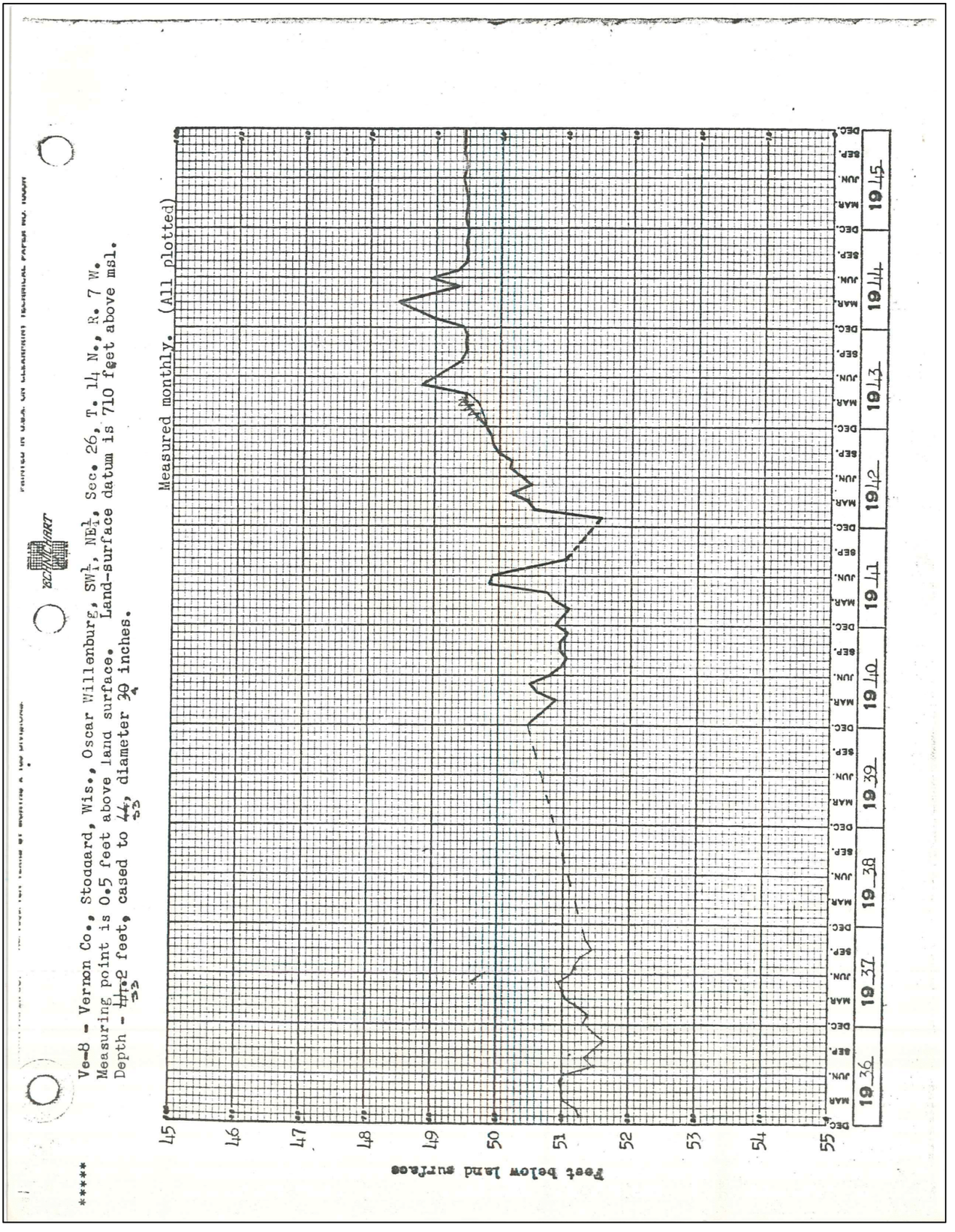
VE-08 Water-level data, 1926-2005

Well information historically compiled by WGNHS, page 1 of 7



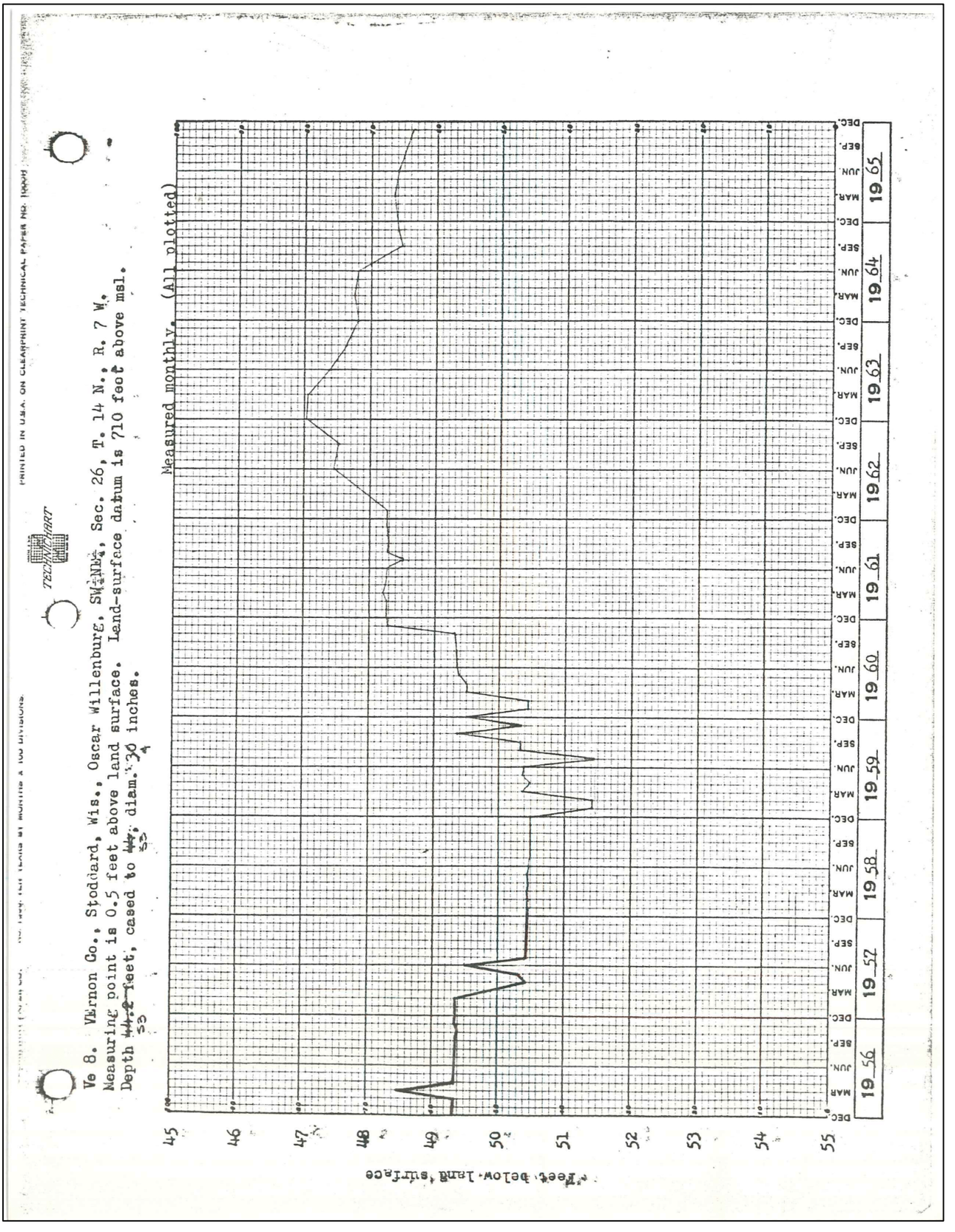
VE-08 Water-level data, 1926-2005

Well information historically compiled by WGNHS, page 2 of 7



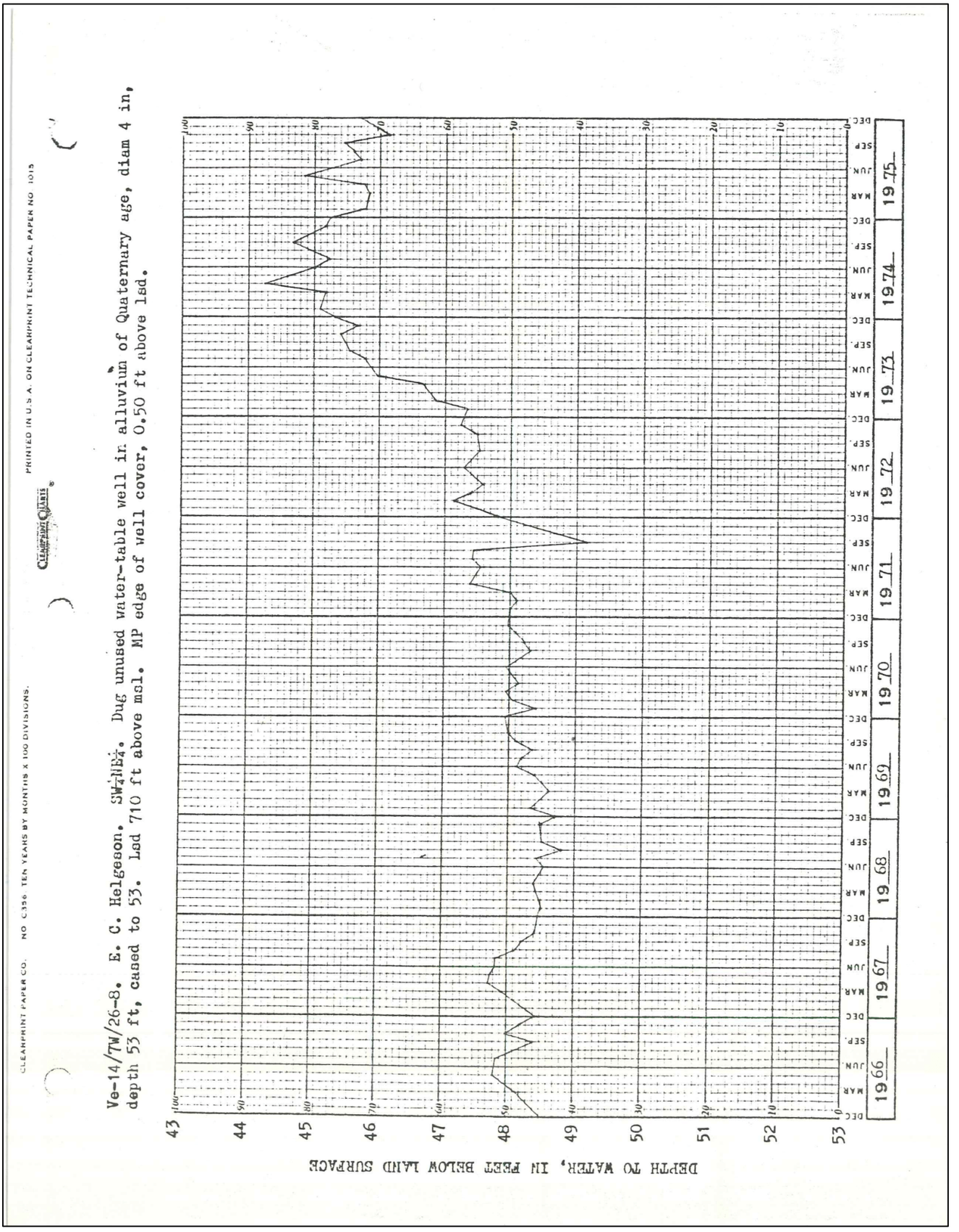
VE-08 Water-level data, 1926-2005

Well information historically compiled by WGNHS, page 3 of 7



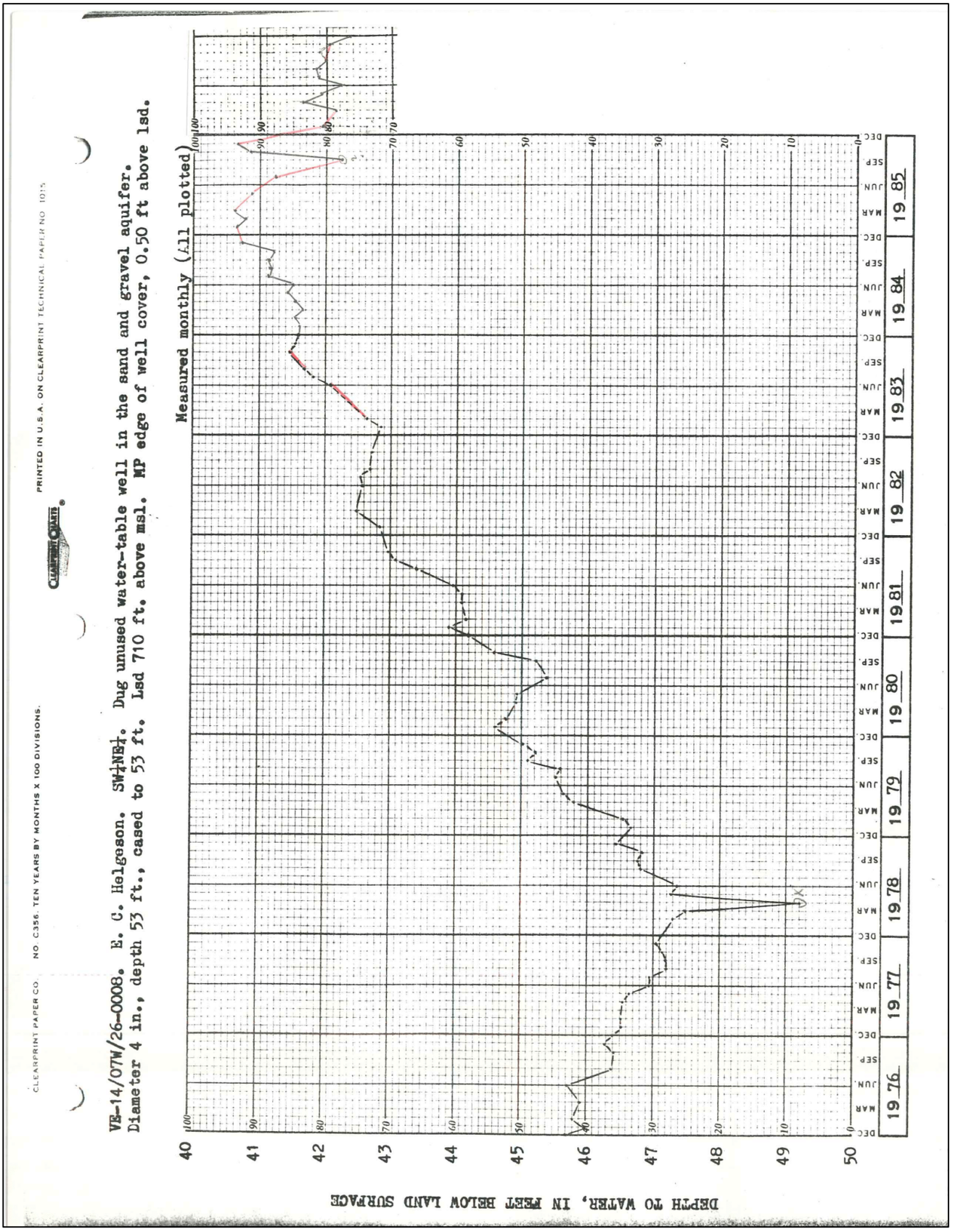
VE-08 Water-level data, 1926-2005

Well information historically compiled by WGNHS, page 4 of 7



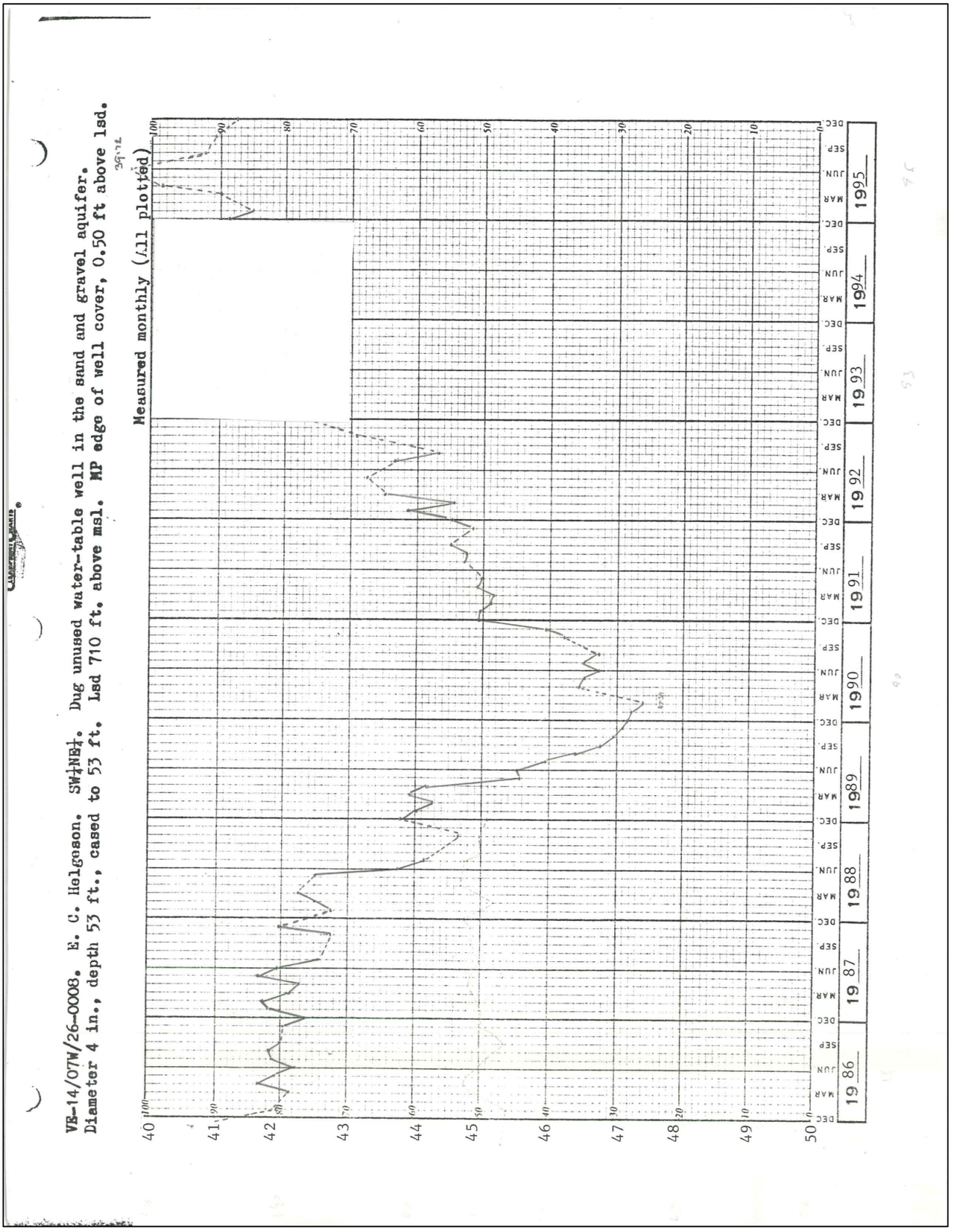
VE-08 Water-level data, 1926-2005

Well information historically compiled by WGNHS, page 5 of 7



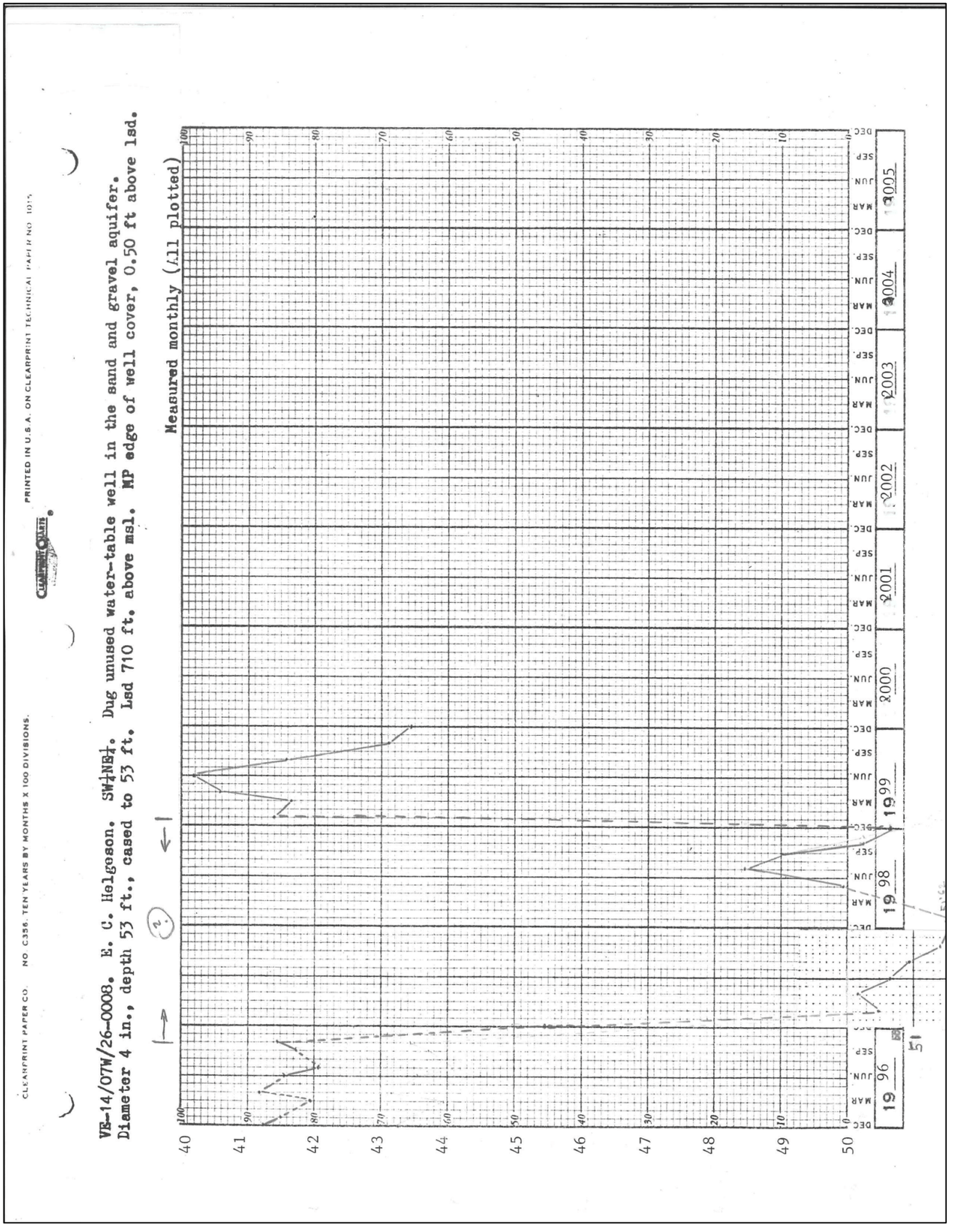
VE-08 Water-level data, 1926-2005

Well information historically compiled by WGNHS, page 6 of 7



VE-08 Water-level data, 1926-2005

Well information historically compiled by WGNHS, page 7 of 7



VE-08 WDNR fill & seal report, 2023

Form 3300-005, page 1 of 1

63000008 (aka VE-08)

State of Wis., Dept. of Natural Resources
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing Report
Form 3300-005 (R 4/2015) Page 1 of 2

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and chs. NR 141 and 812, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

☐ **Verification Only of Fill and Seal**

Route to DNR Bureau: ☐ Drinking Water ☐ Watershed/Wastewater ☐ Remediation/Redevelopment ☐ Waste Management ☐ Other:

1. Well Location Information

County	WI Unique Well # of Removed Well	Hicap #
Vernon	unknown/ NA	NA

Latitude / Longitude (see instructions): 43.6584 N, -91.1770 W — Format Code: ☒ DD ☐ DDM — Method Code: ☐ GPS008 ☐ SCR002 ☐ OTH001

¼ / ¼ SW / ¼ NE — Section 26 — Township 14 N — Range 7 ☐ E ☒ W — or Gov't Lot #

Well Street Address: W610 CEDAR VALLEY RD

Well City, Village or Town: STODDARD — Well ZIP Code: 54658

Subdivision Name — Lot #

Reason for Removal from Service: Hazardous — WI Unique Well # of Replacement Well: WA234

2. Facility / Owner Information

Facility Name: Wisconsin Groundwater Monitoring Network 63000008

License/Permit/Monitoring #

Original Well Owner: EC HELGESON

Present Well Owner

Mailing Address of Present Owner: W610 CEDAR VALLEY RD

City of Present Owner: STODDARD — State: WI — ZIP Code: 54658

3. Filled & Sealed Well / Drillhole / Borehole Information

☒ Monitoring Well ☐ Water Well ☐ Borehole / Drillhole

Original Construction Date (mm/dd/yyyy): < 1934

If a Well Construction Report is available, please attach.

Construction Type: ☐ Drilled ☐ Driven (Sandpoint) ☒ Dug ☐ Other (specify):

Formation Type: ☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth From Ground Surface (ft.): 52 — Casing Diameter (in.): 36

Lower Drillhole Diameter (in.): 36 — Casing Depth (ft.): NA

Was well annular space grouted? ☐ Yes ☒ No ☐ Unknown

If yes, to what depth (feet)? — Depth to Water (feet): 43

4. Pump, Liner, Screen, Casing & Sealing Material

Pump and piping removed?	☐ Yes	☐ No	☒ N/A
Liner(s) removed?	☐ Yes	☐ No	☒ N/A
Liner(s) perforated?	☐ Yes	☐ No	☒ N/A
Screen removed?	☐ Yes	☐ No	☒ N/A
Casing left in place?	☐ Yes	☐ No	☒ N/A
Was casing cut off below surface?	☐ Yes	☐ No	☒ N/A
Did sealing material rise to surface?	☒ Yes	☐ No	☐ N/A
Did material settle after 24 hours?	☒ Yes	☐ No	☐ N/A
If yes, was hole retopped?	☒ Yes	☐ No	☐ N/A
If bentonite chips were used, were they hydrated with water from a known safe source?	☐ Yes	☐ No	☒ N/A

Required Method of Placing Sealing Material: ☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped ☒ Screened & Poured (Bentonite Chips) ☐ Other (Explain):

Sealing Materials: ☐ Neat Cement Grout ☐ Concrete ☐ Sand-Cement (Concrete) Grout ☐ Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only: ☒ Bentonite Chips ☐ Bentonite - Cement Grout ☐ Granular Bentonite ☒ Bentonite - Sand Slurry

5. Material Used to Fill Well / Drillhole

	From (ft.)	To (ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
NATIVE SILTY SAND (SCREENED)	Surface	45	14 yards	
BENTONITE CHIPS	45	52	10 sacks	

6. Comments

Stone walls pushed into well, chips added, then native fill

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing	License #	Date of Filling & Sealing or Verification (mm/dd/yyyy)
Peter M Chase P.G		08/30/2023

Street or Route: 3817 MINERAL PT RD — Telephone Number: ( ) — City: MADISON — State: WI — ZIP Code: 53705

Signature of Person Doing Work: PM Chase — Date Signed: 10/14/23

DNR Use Only

Date Received	Noted By

Comments

VE-410 WDNR soil boring form, 2021

Form 4400-122, page 1 of 1

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐ _____

This well replaces VE-08

Page 1 of 1

Facility/Project Name: National Groundwater Monitoring Network	License/Permit/Monitoring Number:	Boring Number: VE 410 (63000410)	
Boring Drilled By: Name of crew chief (first, last) and Firm — First Name: Tony Last Name: Kapugi — Firm: OnSite Environmental Services LLC	Date Drilling Started: 09/10/2021	Date Drilling Completed: 09/10/2021	Drilling Method: Geoprobe & 4 1/4 HSA
WI Unique Well No.: WA234	DNR Well ID No.:	Well Name: VE410	Final Static Water Level: _____ Feet MSL
Surface Elevation: 701.2 Feet MSL	Borehole Diameter: 8.2 inches		
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒ — State Plane _____ N, _____ E — _____ 1/4 of _____ 1/4 of Sectior. _____ , T _____ N, R _____	Lat 43 39' 31.47" — Long -91 10' 34.86"	Local Grid Location: ☐ N ☐ E _____ Feet ☐ S _____ Feet ☐ W	
Facility ID	County: Vernon	County Code: 63	Civil Town/City/ or Village: Town of Bergen

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
Grab each 5'			0-5	SILT -(ML) 90% fines,10% sand, trace gravel Red-brown to brown, moist, soft										
			5-10	SILT as above, without gravel, mostly brown										
			10-15	SILT as above										
			15-20	SILT as above										
			20-25	SILT as above but w/ faint, thin laminations										
			25-30	SILT as above										
			30-35	SILT as above but grey near bottom										
			35-40	As above, grey, few thin fine sand laminations										
Core	60/55"		40-45	SILT as above but wet										
Grab			45-50	As above										
				END of boring 51 ft., set 2" PVC well w/ 15' screen 50'-35' bgs										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Sarah Brown — Firm: Wis Geological and Natural History Survey

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

VE-410 WDNR monitoring well construction form, 2021

Form 4400-113A, page 1 of 1

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: WI Groundwater-Level Monitoring Network
(Replacement well for VE-08)

Local Grid Location of Well ☐ N. ☐ S. _____ ft. ☐ E. ☐ W. _____ ft.

Well Name: 4 - 63000410 aka VE-410

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 43.658741 Long. -91.176351

Wis. Unique Well No.: WA234 DNR Well ID No.: ___

St. Plane _____ ft. N, _____ ft. E. S/C/N

Date Well Installed: 09/10/2021 (m m d d y y y y)

Section Location of Waste/Source: SW 1/4 of NE 1/4 of Sec. 26 T. 14 N. R. 7 ☐ E. ☒ W.

Well Installed By: Name (first, last) and Firm: Tony Kapug. On Site

Type of Well — Well Code 11 / MW

Distance from Waste/Source _____ ft. Enf. Stds. Apply ☐

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Gov. Lot Number: _____

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation _____ ft. MSL
C. Land surface elevation 701.2 ft. MSL
D. Surface seal, bottom _____ ft. MSL or _____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50 Hollow Stem Auger ☒ 41 Other ☐ _____

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe _____

17. Source of water (attach analysis, if required): _____

E. Bentonite seal, top _____ ft. MSL or 0.0 ft.
F. Fine sand, top 669.7 ft. MSL or 31.5 ft.
G. Filter pack, top 668.2 ft. MSL or 33.0 ft.
H. Screen joint, top 665.2 ft. MSL or 36 ft.
I. Well bottom _____ ft. MSL or _____ ft.
J. Filter pack, bottom 650.2 ft. MSL or 51.0 ft.
K. Borehole, bottom 650.2 ft. MSL or 51.0 ft.
L. Borehole, diameter 8.3 in.
M. O.D. well casing 2.375 in.
N. I.D. well casing 2.0 in.

All depths are in feet below land surface datum

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.0 ft.
c. Material: _____ Steel ☒ 04 Other ☐ _____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: _____ Bentonite ☒ 30 Concrete ☐ 01 Other ☐ _____
4. Material between well casing and protective pipe: #40 Sand Bentonite ☐ 30 Other ☒ _____
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. _____ Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. #15 RedFlint
b. Volume added 1 bag ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. #40 RedFlint
b. Volume added 9 bags ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11 Continuous slot ☐ 01 Other ☐ _____
b. Manufacturer Mountain Flex
c. Slot size: 0.010 in.
d. Slotted length: 15 ft.
11. Backfill material (below filter pack): _____ None ☒ 14 Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: P. M Cu Firm: Wi Geological Survey

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

VE-410 WDNR monitoring well development form, 2021

Form 4400-113B, page 1 of 1

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
WI Groundwater-Level Monitoring Network	Vernon	63000410 (VE-410)
Replacement well for VE-08	County Code: 63	Wis. Unique Well Number: WA234 / DNR Well ID Number: ___

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☒ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐ __

3. Time spent developing well: 45 min.

4. Depth of well (from top of well casisng): 53.14 ft.

5. Inside diameter of well: 2.0 in.

6. Volume of water in filter pack and well casing: ____.__ gal.

7. Volume of water removed from well: 18.0 gal.

8. Volume of water added (if any): 0.0 gal.

9. Source of water added: N/A

10. Analysis performed on water added? ☐ Yes ☐ No (If yes, attach results) N/A

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 40.84 ft.	____.__ ft. well dry
Date	b. 12/13/2021 (mm/dd/yyyy)	__/__/____
Time	c. 12:51 ☐ a.m. ☒ p.m.	__:__ ☐ a.m. ☐ p.m.
12. Sediment in well bottom	0.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Well developed by: Name (first, last) and Firm
First Name: Jason Last Name: Smith
Firm: US Geological Survey

17. Additional comments on development:
Well bailed dry 3 times. Did not have time to let water level recover for final after development water level reading.

Name and Address of Facility Contact /Owner/Responsible Party
First Name: Jason Last Name: Smith
Facility/Firm: US Geological Survey
Street: 1 Gifford Pinchot Dr.
City/State/Zip: Madison, WI 53726

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: [signature]
Print Name: Jason Smith
Firm: U.S. Geological Survey

NOTE: See instructions for more information including a list of county codes and well type codes.

VE-410 Well owner document, 2021

Property access agreement, page 1 of 2

Wisconsin Geological and Natural History Survey
DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN–MADISON

July 26, 2021

Wisconsin Groundwater-Level Monitoring Network – Well Owner Document

Re: Landowner Property Access

Dear ,

As part of the Wisconsin Groundwater-Level Monitoring Network (WGLMN), the Wisconsin Geological and Natural History Survey (WGNHS) looks forward to working with you to collect geological and groundwater data on your property. Collaboration by property owners such as yourself is essential to maintaining and strengthening the WGLMN for generations to come and we greatly appreciate your willingness to participate as a partner.

The WGLMN is collaboratively operated, maintained, and managed by the WGNHS, Wisconsin Department of Natural Resources (WDNR), and U.S. Geological Survey Upper Midwest Water Science Center (USGS). The WGLMN dates back to 1946 when the Wisconsin State Legislature formally established a groundwater-monitoring network. Water levels collected from the network help scientists and managers evaluate effects of well pumping, the response of groundwater levels to drought or increased precipitation, and effects of land-use change on groundwater resources. These data are also routinely used in the development of regional groundwater flow models, because long-term water-level measurements serve as reliable model calibration targets. More information about the WGLMN, including a link to an interactive map of network wells can be found here: *https://wgnhs.wisc.edu/water-environment/groundwater-monitoring-network/*

This document seeks to establish clear lines of communication between you and the WGNHS (as well as our partners at the WDNR and USGS) and clarify the mutual responsibilities and expectations for well installation and data collection on your property. While not every situation can be anticipated, the following section provides an outline of joint responsibility and mutual expectation.

Wisconsin Geological and Natural History Survey
3817 Mineral Point Road Madison, WI 53705 608-262-1705 WGNHS.org
Kenneth R. Bradbury, Director and State Geologist

Appendix 16: Well owner document, 2021

Property access agreement, page 2 of 2

The WGNHS acknowledges that we (in coordination with the USGS) will:

- Inform you of site visits and serve as a point of contact regarding on-site activities and ongoing monitoring.
- Strive to clearly communicate the status of on-site activities and ongoing monitoring.
  - On-site activities may include basic reconnaissance, well drilling and installation, well maintenance, and data collection.
  - Routine visits will be performed on an as-needed basis but typically not more than monthly.
  - The most intensive activity occurs during the initial phase when the well is sited, Diggers Hotline confirms the location of utility lines, and the monitoring well and water level monitoring equipment is installed.
- Ensure ongoing operation and maintenance of the new monitoring well in coordination with the USGS.
- Removal from service (including filling and sealing) of existing well VE-08 (USGS Site No: 433928091102501, USGS Site Name: VE-14/07W/26-0008, WGNHS Well ID: 63000008) in compliance with WDNR codes and provide a copy of the filling and sealing report to you for record keeping purposes. Removal from service of IW-32 will occur following 6-12 months of concurrent monitoring to establish an overlapping water-level record between the two wells.

As hosting property owner, you acknowledge that you:

- Have received information about the WGLMN and wish to volunteer your well for the collection of geologic and hydrogeologic data.
- Are the owner / operator of the property and, as such, have the authority to allow for the described activities on your land.
- Will not tamper with the well and any of the equipment installed as part of ongoing monitoring efforts.
- Will not be responsible for any costs associated with well installation or ongoing operation and maintenance of the new well, nor removal from service (including filling and sealing) of existing well VE-08.
- Will facilitate on-site activities to the best of your ability and communicate any specific requests or concerns directly to WGNHS and USGS staff.

If you have any questions or concerns, feel free to contact us directly by email or phone.

Sincerely,

Mike Parsen
Hydrogeologist
3817 Mineral Point Rd.
Madison, WI 53705
mike.parsen@wisc.edu
(608) 262-9419 (direct)

Pete Chase
Geotechnician
3817 Mineral Point Rd
Madison, WI 53705
pete.chase@wisc.edu
(608) 265-6003

Sarah Bremmer
Project Geologist
3817 Mineral Point Rd
Madison, WI 53705
sarah.bremmer@wisc.edu
(608) 265-5323

P.s. Contact information for our partners at WDNR and USGS is as follows:

Rob Waschbusch
USGS
Hydrologist
8505 Research Way
Middleton, WI 53562
rjwaschb@usgs.gov
608-821-3868

Nicole Clayton
WDNR
Water Supply Specialist
PO Box 7921
Madison, WI 53707
nicole.clayton@wisconsin.gov
(608) 266-9254

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Wisconsin Geological and Natural History Survey
DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN-MADISON

Appendix 17: Wells WS-105 and WS-2372 documents

Well WS-2372 replaces Well WS-105

Historical Documents for Well WS-105

WS-105 Basic well information, 1980
Well information historically compiled by the WGNHS, 1 page

WS-105 Well evaluation, 1980
Well information historically compiled by the WGNHS, 1 page

WS-105 USGS site schedule, 1978
3 pages

WS-105 USGS water-level data, 1956-1986
5 pages

Documentation of work done for this report: WS-105

WS-105 WDNR fill & seal report, 2022
Form 3300-005, 1 page

Documentation of work done for this report: WS-2372

WS-2372 WDNR well construction report, 2021
Form 4400-113A, 1 page

WS-2372 Well owner document, 2021
Property access agreement, 2 pages

WS-2372 WDNR soil boring log, 2021
Form 4400-122, 1 page

WS-2372 WDNR monitoring well development form, 2021
Form 4400-113B, 1 page

WS-105 Basic well information, 1980

Well information historically compiled by WGNHS, page 1 of 1

7/11/80

11/5/80
WS-105

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number WS-18/10E/01-0105
Owner RONALD CAMPBELL
Location (Co., T/R.sec) WAUSHARA Co. SW NE ~~NE~~ ¼ ~~NW~~ ¼
T. 18 N., R. 10E., SEC. 1
Land surface altitude ~~ESTIMATED~~ 873 FT.
Drainage basin

WELL DATA

Depth 14 FT.
Casing depth 14 FT.
Screened interval ——
Diameter 4 IN.
Aquifers open to well S & G
Geologic log available? No
Construction report available? No
Use of well OBSERVATION
Access to measure well GOOD

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Hancock Exp. Farm - 14.5 NW, Montello - 19 mi S, Ripon 5NE - 27 mi SE
Streamgaging stations 04073500 Fox R. at Berlin - 17 mi ESE
Observation wells WS 8 - 14.5 mi NW, WS 53 - 13 mi NNE, Mq 9 - 17 mi SW
Other

EXISTING RECORD

Measuring point TOP OF CASING
Measuring equipment CONTINUOUS RECORDER
Frequency of measurement CONTINUOUS
Period of record --
Started 1956
Ended CONTINUING
Volume of missing record

WS-105 Well evaluation, 1980

Well information historically compiled by WGNHS, page 1 of 1

July 1980
WS-105 R. D. Cotter

CRITERIA FOR EVALUATION OF WATER–LEVEL OBSERVATION WELLS IN WISCONSIN

1. Areal spacing -- distance from any observation well 15 Mi.
   -- distance from observation well in same aquifer 15 Mi.
2. Ownership ~~private~~
   -- public
3. Use of well OBSERVATION
4. Access -- physical OK
   -- owner's permission OK
5. Condition of well -- casing } GOOD
   -- housing }
6. Geologic log -- yes
   -- no
7. Construction report -- yes
   -- no
8. Diameter (4 inch minimum for recorder) 4 in.
9. Aquifer -- single
   -- multiple
10. Hydraulic connection with aquifer GOOD
11. Knowledge of pumping effects —
12. Range and character of water level fluctuations 7 FT.
13. Length of record 24 yrs.
14. Missing record
15. Adequacy of current measuring frequency GOOD
16. Probability of permanance GOOD

NOTES

Recommendations

WS-105 USGS site schedule, 1978

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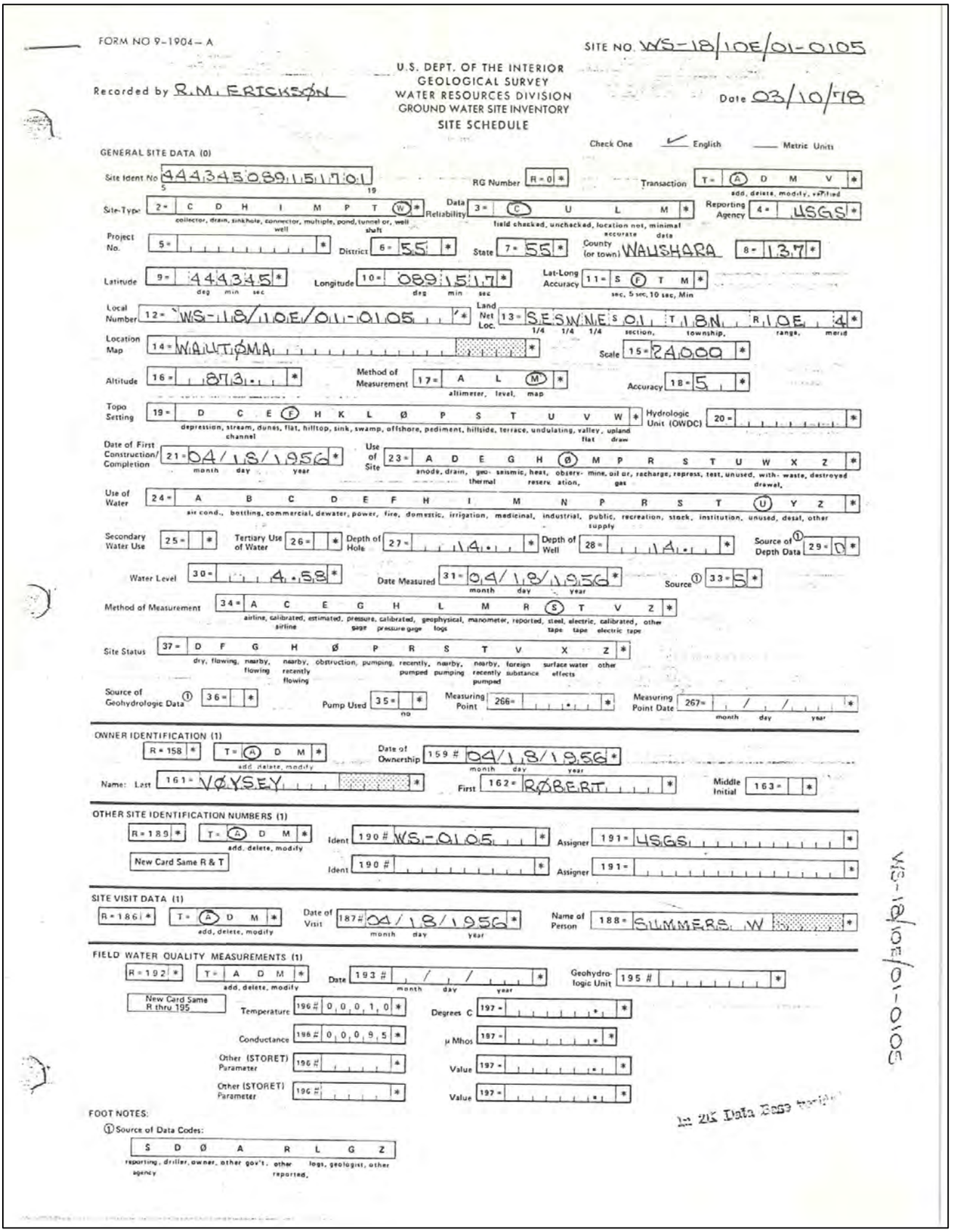


FORM NO 9-1904-A

SITE NO. WS-18/10E/01-0105

U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
GROUND WATER SITE INVENTORY
SITE SCHEDULE

Recorded by R.M. ERICKSON Date 03/10/78

Check One ✓ English — Metric Units

GENERAL SITE DATA (0)

Site Ident No 444345089151701 (5–19) RG Number R=0 * Transaction T=A (add, delete, modify, verified)

Site-Type 2=W (collector, drain, sinkhole, connector, multiple, pond, tunnel or, well shaft) Data Reliability 3=C (field checked, unchecked, location not, minimal accurate data) Reporting Agency 4=USGS

Project No. 5= District 6=55 State 7=55 County (or town) WAUSHARA 8=137

Latitude 9=444345 (deg min sec) Longitude 10=089151.7 (deg min sec) Lat-Long Accuracy 11=S (sec, 5 sec, 10 sec, Min)

Local Number 12=WS-18/10E/01-0105 Land Net Loc. 13=SE SW NE S 01 T 18N R 10E 4 (1/4 1/4 1/4 section, township, range, merid)

Location Map 14=WAUTOMA Scale 15=24000

Altitude 16=873. Method of Measurement 17=A L M (altimeter, level, map) Accuracy 18=5

Topo Setting 19=D C E F H K L Ø P S T U V W (depression, stream, dunes, flat, hilltop, sink, swamp, offshore, pediment, hillside, terrace, undulating, valley, upland channel, flat draw) Hydrologic Unit (OWDC) 20=

Date of First Construction/ Completion 21=04/18/1956 (month day year) Use of Site 23=A D E G H Ø M P R S T U W X Z (anode, drain, geothermal, seismic, heat reserv, observation, mine, oil or gas, recharge, repress, test, unused, withdrawal, waste, destroyed)

Use of Water 24=A B C D E F H I M N P R S T U Y Z (air cond., bottling, commercial, dewater, power, fire, domestic, irrigation, medicinal, industrial, public supply, recreation, stock, institution, unused, desal, other)

Secondary Water Use 25= Tertiary Use of Water 26= Depth of Hole 27=14. Depth of Well 28=14. Source of Depth Data ① 29=0

Water Level 30=4.58 Date Measured 31=04/18/1956 (month day year) Source ① 33=S

Method of Measurement 34=A C E G H L M R S T V Z (airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel tape, electric, calibrated, other electric tape, other)

Site Status 37=D F G H Ø P R S T V X Z (dry, flowing, nearby, flowing, nearby, recently flowing, obstruction, pumping, recently pumped, nearby, pumping, nearby, recently pumped, foreign substance, surface water effects, other)

Source of Geohydrologic Data ① 36= Pump Used 35= (no) Measuring Point 266= Measuring Point Date 267= (month day year)

OWNER IDENTIFICATION (1)

R=158 * T=A (add, delete, modify) Date of Ownership 159#04/18/1956 (month day year)

Name: Last 161=VOYSEY First 162=ROBERT Middle Initial 163=

OTHER SITE IDENTIFICATION NUMBERS (1)

R=189 * T=A (add, delete, modify) Ident 190#WS-0105 Assigner 191=USGS

New Card Same R & T Ident 190# Assigner 191=

SITE VISIT DATA (1)

R=186 * T=A (add, delete, modify) Date of Visit 187#04/18/1956 (month day year) Name of Person 188=SUMMERS, W

FIELD WATER QUALITY MEASUREMENTS (1)

R=192 * T=A D M (add, delete, modify) Date 193# (month day year) Geohydrologic Unit 195#

New Card Same R thru 195

Temperature 196#0,0,0,1,0 Degrees C 197=

Conductance 196#0,0,0,9,5 µ Mhos 197=

Other (STORET) Parameter 196# Value 197=

Other (STORET) Parameter 196# Value 197=

FOOT NOTES:

① Source of Data Codes:

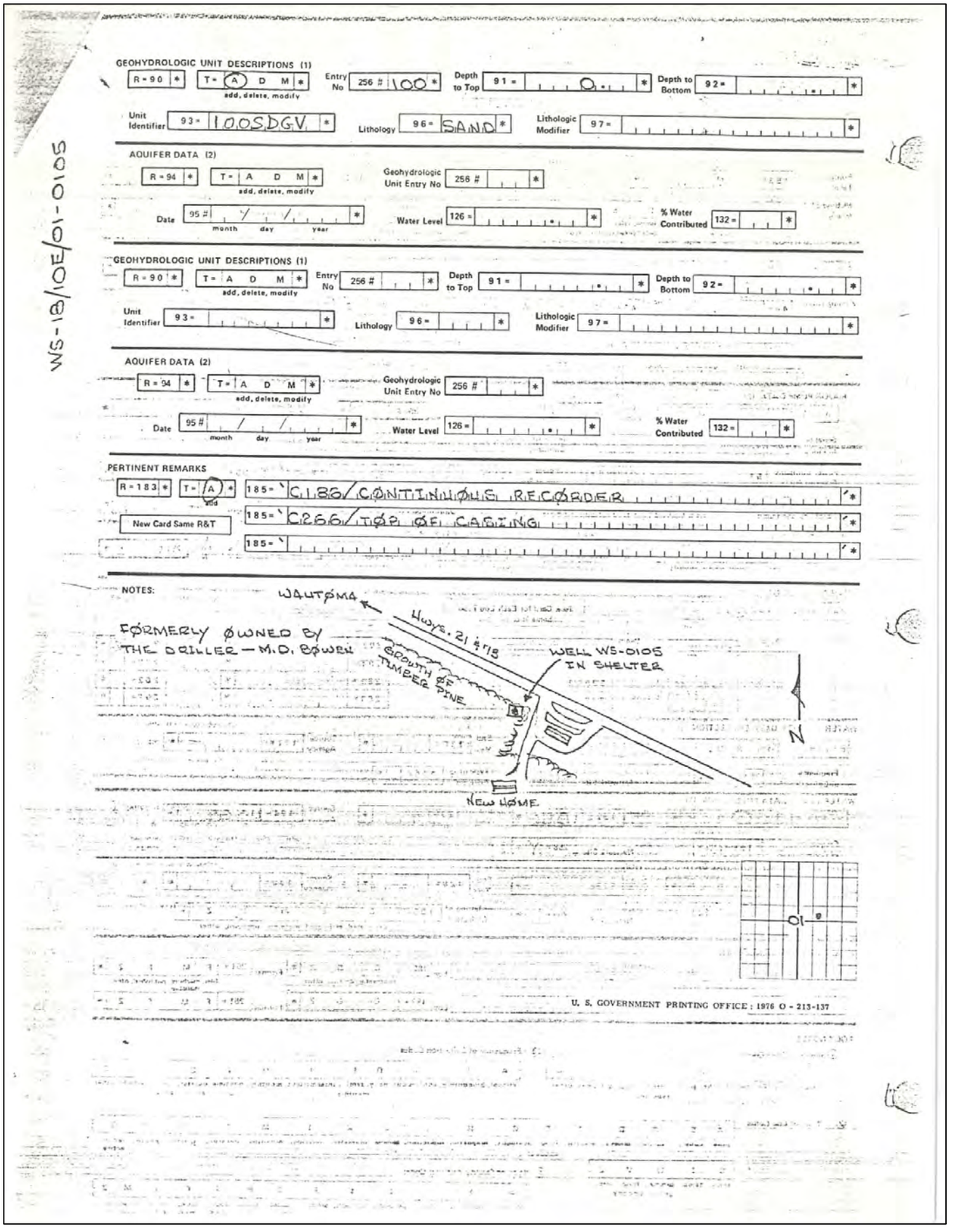
S D Ø A R L G Z (reporting agency, driller, owner, other gov't. other reported, logs, geologist, other)

In 215 Data Base twice

WS-18/10E/01-0105

Appendix 17: USGS site schedule, 1978

Page 2 of 3



WS-18/10E/01-0105

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * | T = A D M * (add, delete, modify) | Entry No 256 # 100 * | Depth to Top 91 = 0. * | Depth to Bottom 92 = *

Unit Identifier 93 = 100SDGV * | Lithology 96 = SAND * | Lithologic Modifier 97 = *

AQUIFER DATA (2)

R = 94 * | T = A D M * (add, delete, modify) | Geohydrologic Unit Entry No 256 # *

Date 95 # / / * (month day year) | Water Level 126 = * | % Water Contributed 132 = *

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * | T = A D M * (add, delete, modify) | Entry No 256 # * | Depth to Top 91 = * | Depth to Bottom 92 = *

Unit Identifier 93 = * | Lithology 96 = * | Lithologic Modifier 97 = *

AQUIFER DATA (2)

R = 94 * | T = A D M * (add, delete, modify) | Geohydrologic Unit Entry No 256 # *

Date 95 # / / * (month day year) | Water Level 126 = * | % Water Contributed 132 = *

PERTINENT REMARKS

R = 183 * | T = A (add) * | 185 = C186/CONTINUOUS RECORDER

New Card Same R&T | 185 = C266/TOP OF CASING

185 =

NOTES:

FORMERLY OWNED BY THE DRILLER — M.D. BOWER

U. S. GOVERNMENT PRINTING OFFICE : 1976 O - 213-137

Appendix 17: USGS site schedule, 1978

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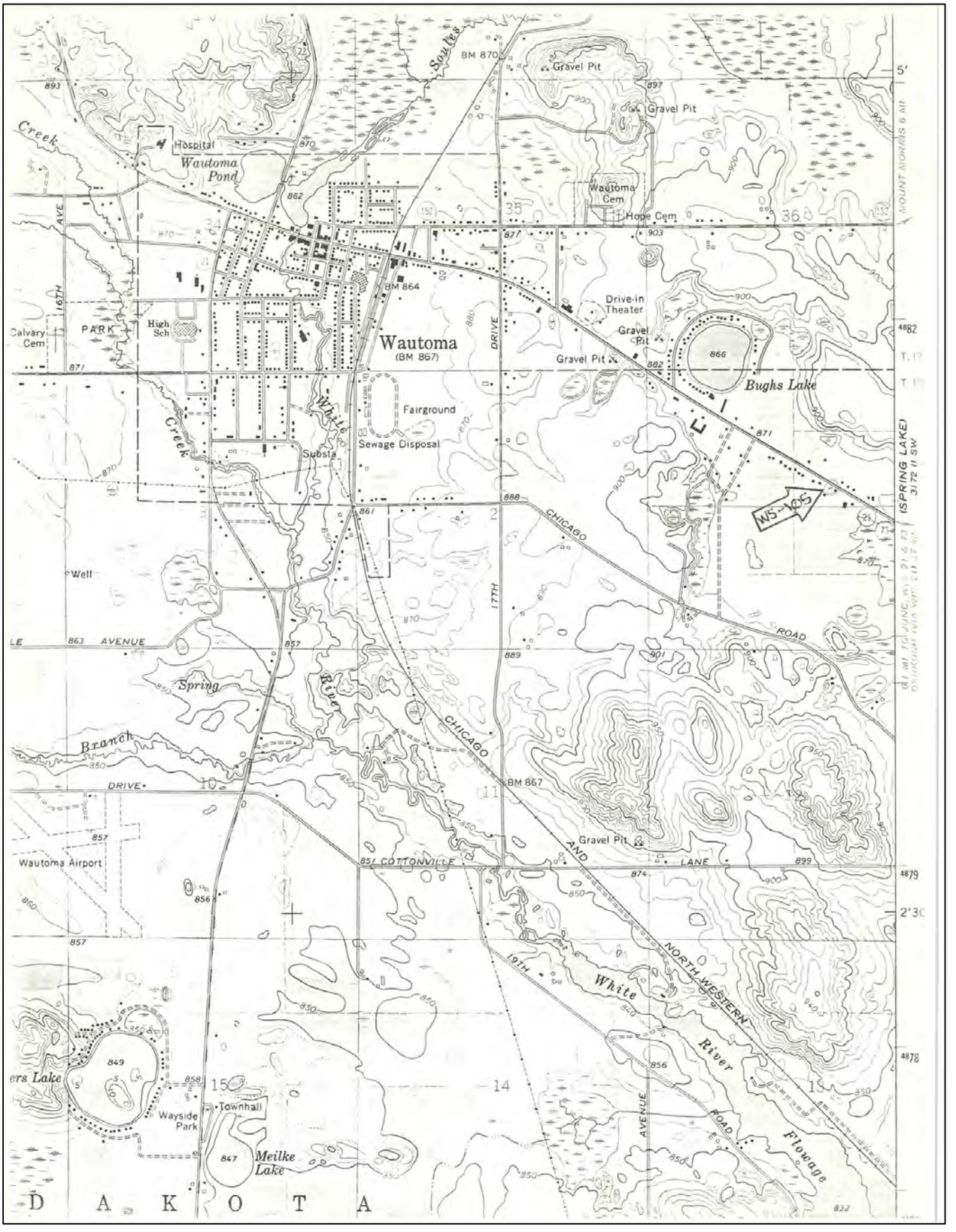

WS-105 USGS water-level data, 1956-1986

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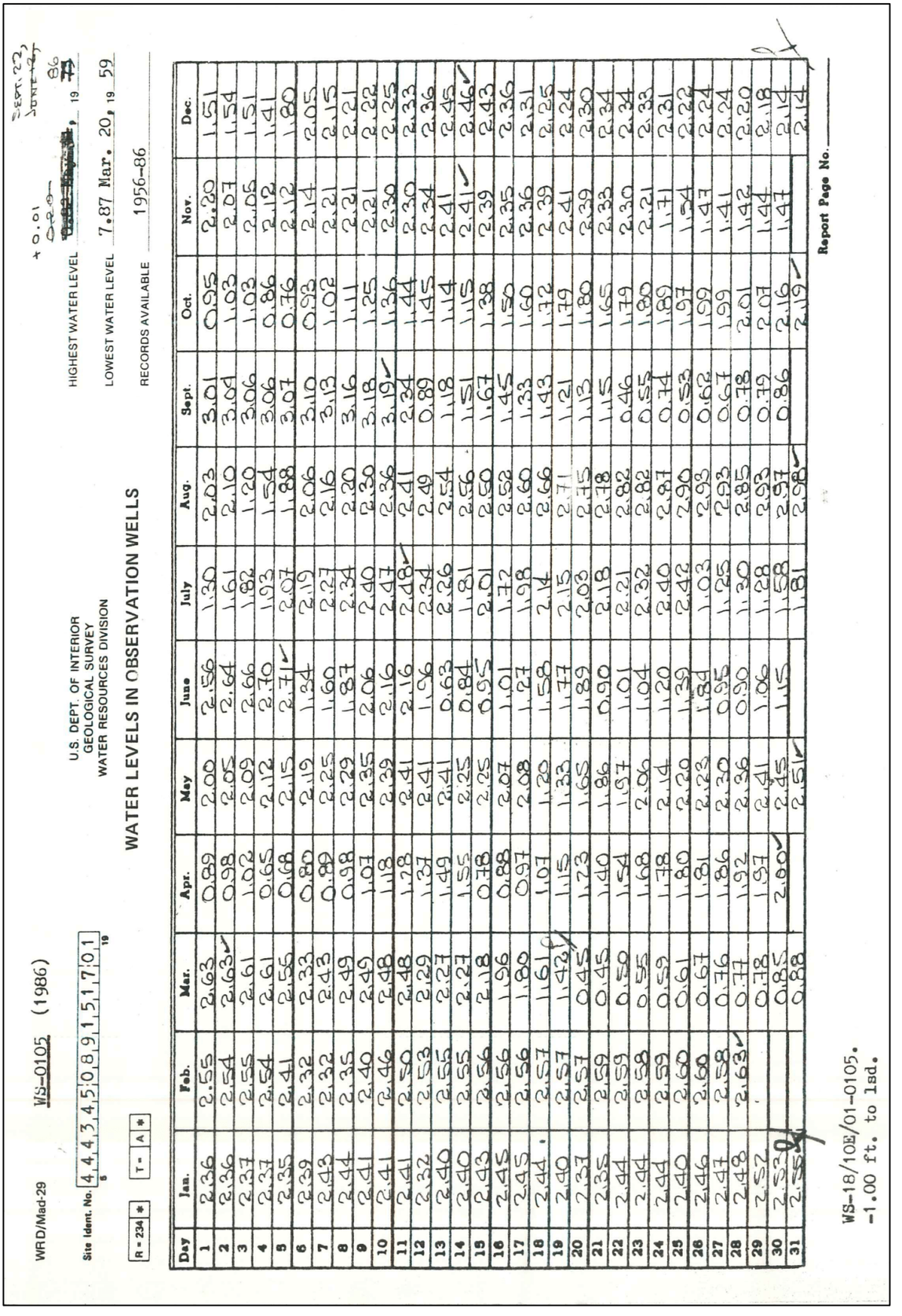

WRD/Mad-29 WS-0105 (1986)

Site Ident. No. 4 4 3 4 5 0 8 9 1 5 1 7 0 1

R - 234 * T - A *

U.S. DEPT. OF INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

WATER LEVELS IN OBSERVATION WELLS

HIGHEST WATER LEVEL [illegible], 19 [illegible]

LOWEST WATER LEVEL 7.87 Mar. 20, 19 59

RECORDS AVAILABLE 1956-86

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.36	2.55	2.63	0.89	2.00	2.56	1.30	2.03	3.01	0.95	2.20	1.51
2	2.36	2.54	2.63	0.98	2.05	2.64	1.61	2.10	3.04	1.03	2.07	1.54
3	2.37	2.55	2.61	1.02	2.09	2.66	1.82	1.20	3.06	1.03	2.05	1.51
4	2.37	2.54	2.61	0.65	2.12	2.70	1.93	1.54	3.06	0.86	2.12	1.41
5	2.35	2.41	2.55	0.68	2.15	2.71	2.07	1.88	3.07	0.76	2.12	1.80
6	2.39	2.32	2.33	0.80	2.19	1.34	2.19	2.06	3.10	0.93	2.14	2.05
7	2.43	2.32	2.43	0.89	2.25	1.60	2.27	2.16	3.13	1.02	2.21	2.15
8	2.44	2.35	2.49	0.98	2.29	1.87	2.34	2.20	3.16	1.11	2.21	2.21
9	2.41	2.40	2.49	1.07	2.35	2.06	2.40	2.30	3.18	1.25	2.21	2.22
10	2.41	2.46	2.48	1.18	2.39	2.16	2.47	2.36	3.19	1.36	2.30	2.25
11	2.41	2.50	2.48	1.28	2.41	2.16	2.48	2.41	2.34	1.44	2.30	2.33
12	2.32	2.53	2.29	1.37	2.41	1.96	2.34	2.49	0.89	1.45	2.34	2.36
13	2.40	2.55	2.27	1.49	2.41	0.63	2.26	2.54	1.18	1.14	2.41	2.45
14	2.40	2.55	2.27	1.55	2.25	0.84	1.81	2.56	1.51	1.15	2.41	2.46
15	2.43	2.56	2.18	0.78	2.25	0.95	2.01	2.50	1.67	1.38	2.39	2.43
16	2.45	2.56	1.96	0.88	2.07	1.01	1.72	2.52	1.45	1.50	2.35	2.36
17	2.45	2.56	1.80	0.97	2.08	1.27	1.98	2.60	1.33	1.60	2.36	2.31
18	2.44	2.57	1.61	1.07	1.20	1.58	2.14	2.66	1.43	1.72	2.39	2.25
19	2.40	2.57	1.42	1.15	1.33	1.77	2.15	2.71	1.21	1.79	2.41	2.24
20	2.37	2.57	0.45	1.23	1.65	1.89	2.03	2.75	1.13	1.80	2.39	2.30
21	2.35	2.59	0.45	1.40	1.86	0.90	2.18	2.78	1.15	1.65	2.33	2.34
22	2.44	2.59	0.50	1.54	1.97	1.01	2.21	2.82	0.46	1.79	2.30	2.34
23	2.44	2.58	0.55	1.68	2.06	1.04	2.32	2.82	0.55	1.80	2.21	2.33
24	2.44	2.59	0.59	1.38	2.14	1.20	2.40	2.87	0.74	1.89	1.71	2.31
25	2.40	2.60	0.61	1.80	2.20	1.39	2.42	2.90	0.53	1.97	1.54	2.22
26	2.46	2.60	0.67	1.81	2.23	1.84	1.03	2.93	0.62	1.99	1.43	2.24
27	2.47	2.58	0.76	1.86	2.30	0.95	1.25	2.93	0.67	1.99	1.41	2.24
28	2.48	2.63	0.77	1.92	2.36	0.90	1.30	2.85	0.78	2.01	1.42	2.20
29	2.52		0.78	1.97	2.41	1.06	1.28	2.93	0.79	2.07	1.44	2.18
30	2.53		0.85	2.00	2.45	1.15	1.58	2.97	0.86	2.16	1.47	2.14
31	2.55		0.88		2.51		1.81	2.98		2.19		2.14

Report Page No. ____

WS-18/10E/01-0105.
-1.00 ft. to lsd.

WS-105 USGS water-level data, 1956-1986

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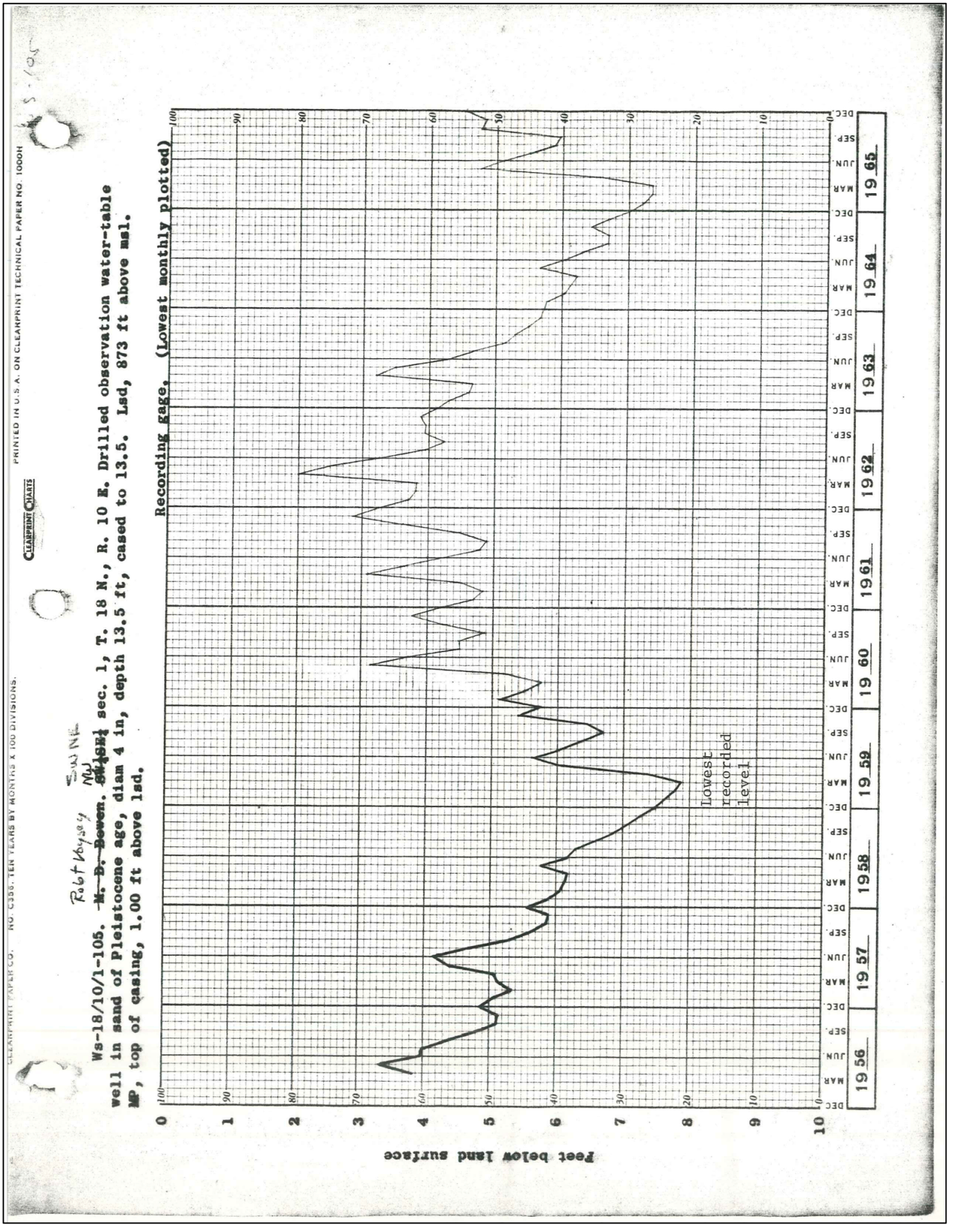

WS-105 USGS water-level data, 1956-1986

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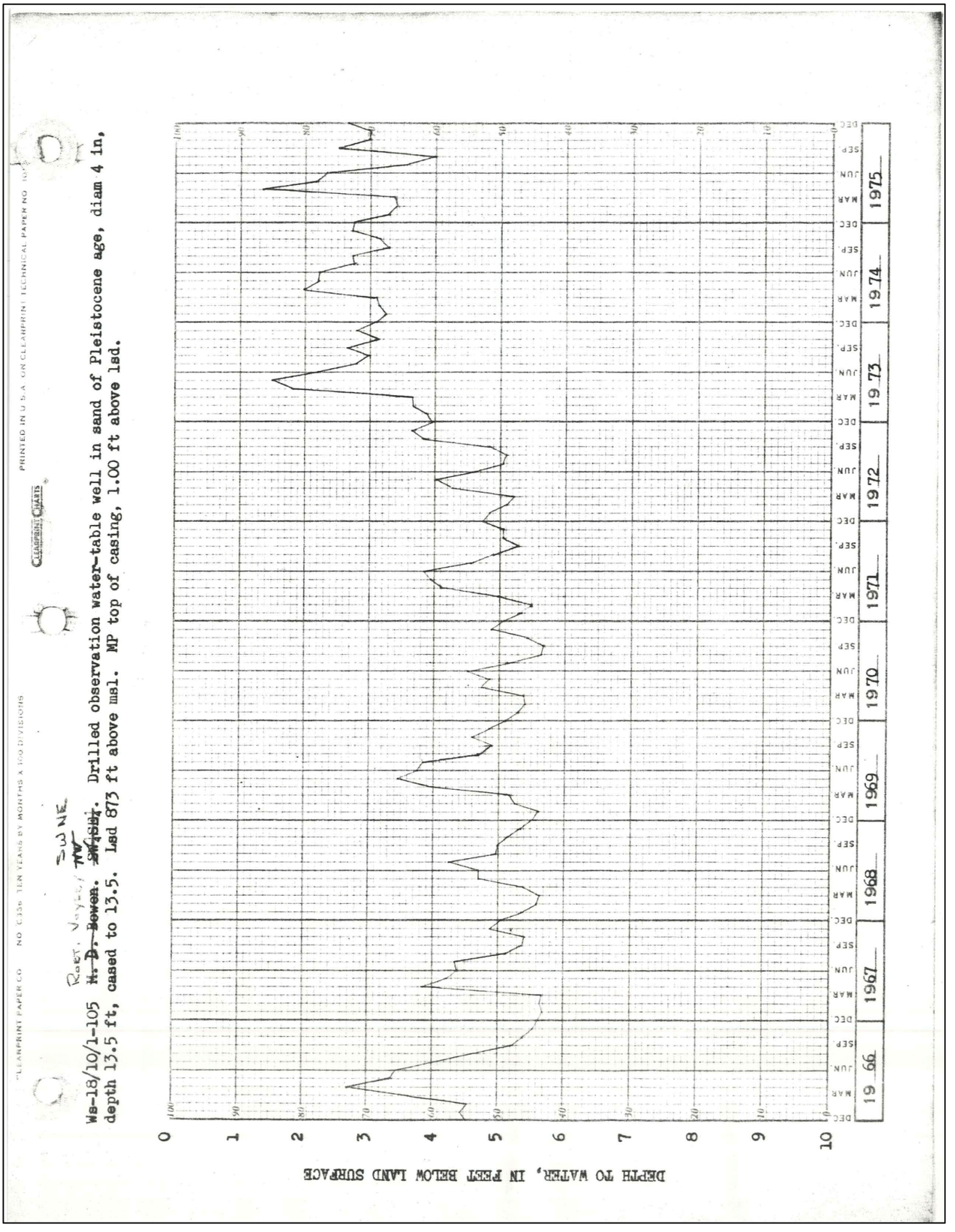

WS-105 USGS water-level data, 1956-1986

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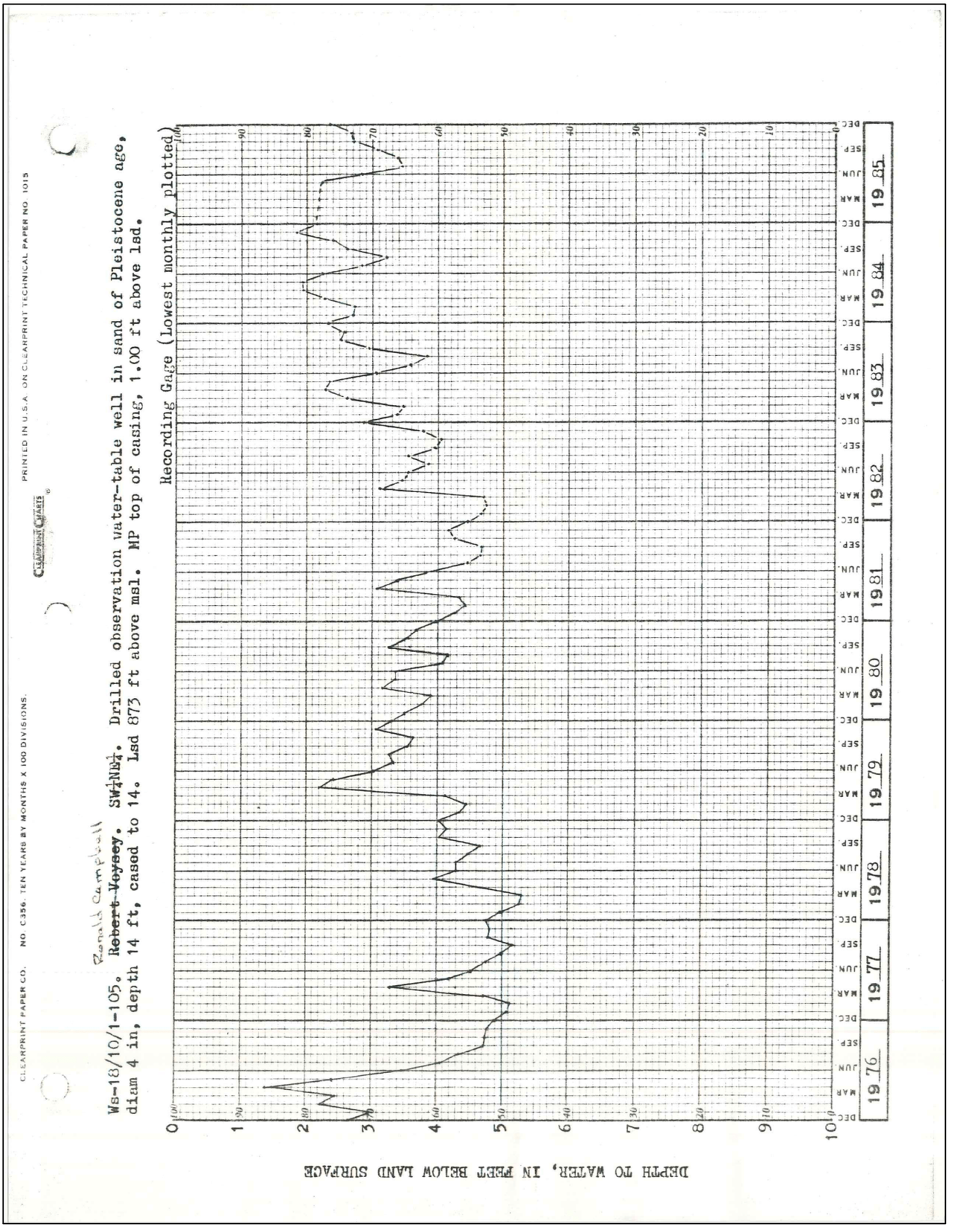

WS-105 USGS water-level data, 1956-1986

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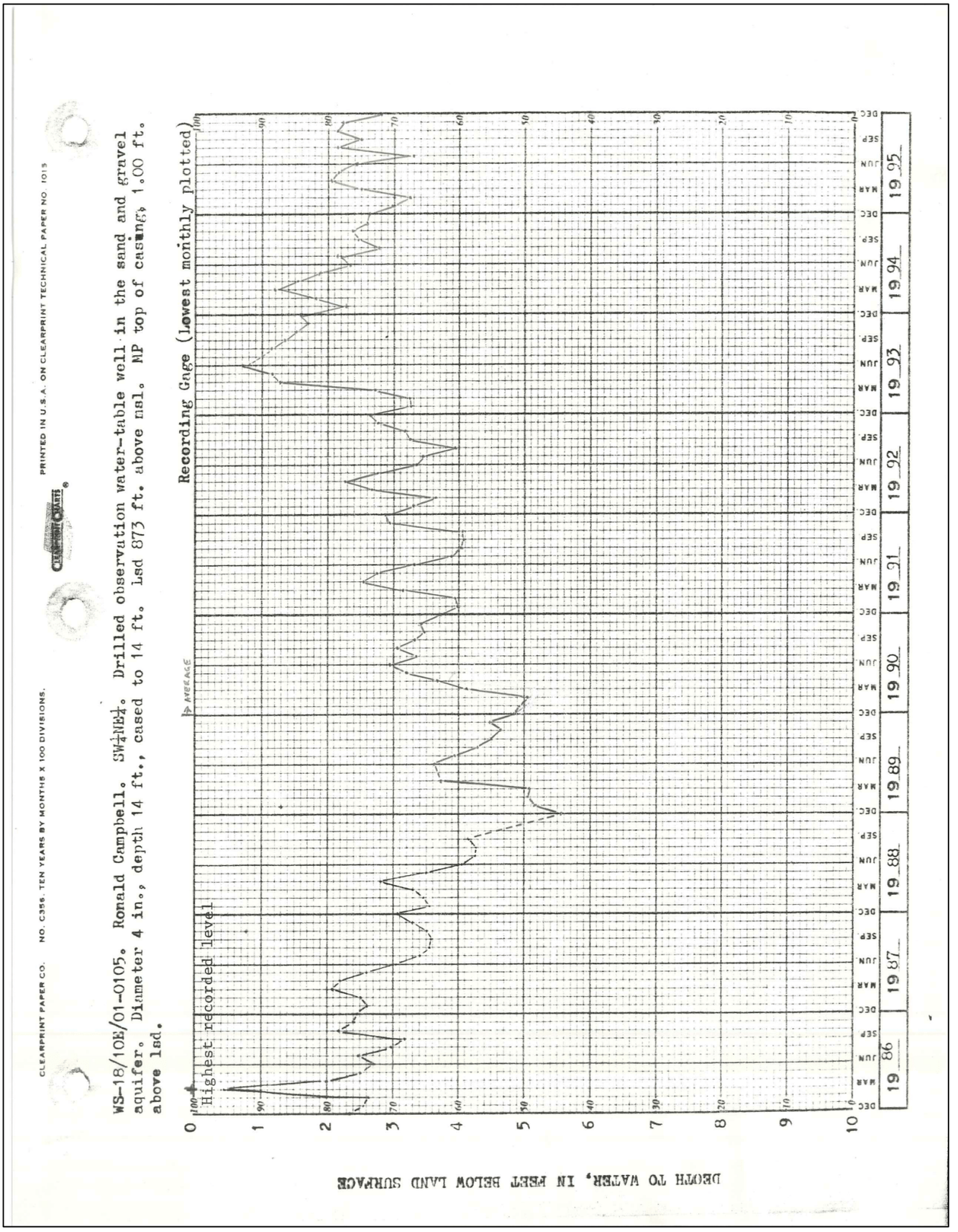

WS-105 WDNR fill & seal report, 2022

Form 3300-005, page 1 of 1

700000105 (aka WS-105)

State of Wis., Dept. of Natural Resources
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing Report
Form 3300-005 (R 4/2015) Page 1 of 2

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and chs. NR 141 and 812, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

☐ **Verification Only of Fill and Seal**

Route to DNR Bureau: ☐ Drinking Water ☐ Watershed/Wastewater ☐ Remediation/Redevelopment ☐ Waste Management ☐ Other:

1. Well Location Information

County	WI Unique Well # of Removed Well	Hicap #
Waushara	unknown	

Latitude / Longitude (see instructions): 44.06276 N, -89.25464 W — Format Code: ☐ DD ☐ DDM — Method Code: ☐ GPS008 ☐ SCR002 ☐ OTH001

¼ / ¼	¼	Section	Township	Range	or Gov't Lot #
SW	NE	1	18 N	10 ☒ E ☐ W	

Well Street Address: 7427 STH 21

Well City, Village or Town: Wautoma — Well ZIP Code:

Subdivision Name: — Lot #:

Reason for Removal from Service: Flooded — WI Unique Well # of Replacement Well: WA237

2. Facility / Owner Information

Facility Name: Wisconsin Groundwater Monitoring Network 70000105

License/Permit/Monitoring #:

Original Well Owner: USGS

Present Well Owner: USGS

Mailing Address of Present Owner: 1 Gilford Pinchot Dr

City of Present Owner: Madison — State: WI — ZIP Code: 53726

3. Filled & Sealed Well / Drillhole / Borehole Information

☒ Monitoring Well ☐ Water Well ☐ Borehole / Drillhole

Original Construction Date (mm/dd/yyyy):

If a Well Construction Report is available, please attach.

Construction Type: ☒ Drilled ☐ Driven (Sandpoint) ☐ Dug ☐ Other (specify):

Formation Type: ☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth From Ground Surface (ft.)	Casing Diameter (in.)
12	4
Lower Drillhole Diameter (in.)	**Casing Depth (ft.)**
4	12

Was well annular space grouted? ☐ Yes ☐ No ☒ Unknown

If yes, to what depth (feet)? — Depth to Water (feet):

4. Pump, Liner, Screen, Casing & Sealing Material

Pump and piping removed?	☐ Yes	☐ No	☒ N/A
Liner(s) removed?	☐ Yes	☐ No	☒ N/A
Liner(s) perforated?	☐ Yes	☐ No	☒ N/A
Screen removed?	☐ Yes	☒ No	☐ N/A
Casing left in place?	☒ Yes	☐ No	☐ N/A
Was casing cut off below surface?	☒ Yes	☐ No	☐ N/A
Did sealing material rise to surface?	☒ Yes	☐ No	☐ N/A
Did material settle after 24 hours?	☐ Yes	☒ No	☐ N/A
If yes, was hole retopped?	☐ Yes	☐ No	☒ N/A
If bentonite chips were used, were they hydrated with water from a known safe source?	☒ Yes	☐ No	☐ N/A

Required Method of Placing Sealing Material: ☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped ☒ Screened & Poured (Bentonite Chips) ☐ Other (Explain):

Sealing Materials: ☐ Neat Cement Grout ☐ Concrete ☐ Sand-Cement (Concrete) Grout ☐ Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only: ☒ Bentonite Chips ☐ Bentonite - Cement Grout ☐ Granular Bentonite ☐ Bentonite - Sand Slurry

5. Material Used to Fill Well / Drillhole

	From (ft.)	To (ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
3/8" Bentonite Chips	Surface	12	2 bags	

6. Comments

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing	License #	Date of Filling & Sealing or Verification (mm/dd/yyyy)
Wis. Geological Survey		10/3/2022

Street or Route: 3817 Mineral Pt Rd — Telephone Number: ( )

City: Madison — State: WI — ZIP Code: 53705

Signature of Person Doing Work: PAM — Date Signed: 11/23/22

DNR Use Only

Date Received	Noted By

Comments:

WS-2372 WDNR well construction report, 2021

Form 4400-113A, page 1 of 1

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name WI Groundwater-Level Monitoring Network *(Replacement well for WS-105)*	**Local Grid Location of Well** ☐ N. ☐ S. _____ ft. ☐ E. ☐ W. _____ ft. **Local Grid Origin** ☐ (estimated: ☐) or **Well Location** ■ Lat. 44.065522 Long. -89.256122 St. Plane _____ ft. N, _____ ft. E. S/C/N **Section Location of Waste/Source** ☐ E ☐ W _____ 1/4 of _____ 1/4 of Sec. _____, T. _____ N, R. _____ **Location of Well Relative to Waste/Source** u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known **Gov. Lot Number** _____
Well Name 70002372 (AKA: WS-2372) **Wis. Unique Well No.** WA237 **DNR Well ID No.** _____ **Date Well Installed** 09/13/2021 (m m d d y y y y) **Well Installed By: Name (first, last) and Firm** Gage Kapug On Site ES	
Type of Well Well Code 11 / MW **Distance from Waste/Source** _____ ft. **Enf. Stds. Apply** ☐	

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation of PVC 881.7 ft. MSL
C. Land surface elevation 879.9 ft. MSL
D. Surface seal, bottom _____ ft. MSL or _____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50 Hollow Stem Auger ☒ 41 Other ☐ _____

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe _____

17. Source of water (attach analysis, if required):
Sun Prairie

E. Bentonite seal, top 879.4 ft. MSL or 0.5 ft.
F. Fine sand, top 872.9 ft. MSL or 7.0 ft.
G. Filter pack, top 871.9 ft. MSL or 8.0 ft.
H. Screen joint, top 869.4 ft. MSL or 10.5 ft.
I. Well bottom 854.4 ft. MSL or 25.5 ft.
J. Filter pack, bottom 854.4 ft. MSL or 25.5 ft.
K. Borehole, bottom 854.4 ft. MSL or 25.5 ft.
L. Borehole, diameter 8.2 in.
M. O.D. well casing 2.2 in.
N. I.D. well casing 2.0 in.

All depths are in feet below land surface datum

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.5 ft.
c. Material: Steel ☒ 04 Other ☐ _____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐ _____
4. Material between well casing and protective pipe: #40 Red Flint Bentonite ☐ 30 Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. 1.5 bags Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. _____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. #15 Red Flint
b. Volume added 0.5 bags ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. #40 Red Flint
b. Volume added 8.5 bags ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11 Continuous slot ☐ 01 Other ☐ _____
b. Manufacturer MonoFlex
c. Slot size: 0.010 in.
d. Slotted length: 15 ft.
11. Backfill material (below filter pack): None ☒ 14 Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
Peter Chase	*WGNHS*

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

WS-2372 Well owner document, 2021

Property access agreement, page 1 of 2

Wisconsin Geological and Natural History Survey
DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN–MADISON

July 21, 2021

Wisconsin Groundwater-Level Monitoring Network – Well Owner Document

Re: Landowner Property Access

Dear Waushara County Country Club attention: , Course manager,

As part of the Wisconsin Groundwater-Level Monitoring Network (WGLMN), the Wisconsin Geological and Natural History Survey (WGNHS) looks forward to working with you to collect geological and groundwater data on the Waushara County Country Club property. Collaboration by organizations such as yourself is essential to maintaining and strengthening the WGLMN for generations to come and we greatly appreciate your willingness to participate as a partner.

The WGLMN is collaboratively operated, maintained, and managed by the WGNHS, Wisconsin Department of Natural Resources (WDNR), and U.S. Geological Survey Upper Midwest Water Science Center (USGS). The WGLMN dates back to 1946 when the Wisconsin State Legislature formally established a groundwater-monitoring network. Water levels collected from the network help scientists and managers evaluate effects of well pumping, the response of groundwater levels to drought or increased precipitation, and effects of land-use change on groundwater resources. These data are also routinely used in the development of regional groundwater flow models, because long-term water-level measurements serve as reliable model calibration targets. More information about the WGLMN, including a link to an interactive map of network wells can be found here: *https://wgnhs.wisc.edu/water-environment/groundwater-monitoring-network/*

This document seeks to establish clear lines of communication between you and the WGNHS (as well as our partners at the WDNR and USGS) and clarify the mutual responsibilities and expectations for well installation and data collection on your property. While not every situation can be anticipated, the following section provides an outline of joint responsibility and mutual expectation.

Wisconsin Geological and Natural History Survey
3817 Mineral Point Road Madison, WI 53705 608-262-1705 WGNHS.org
Kenneth R. Bradbury, Director and State Geologist

WS-2372 Well owner document, 2021

Property access agreement, page 2 of 2

The WGNHS acknowledges that we (in coordination with the USGS) will:

- Inform you of site visits and serve as a point of contact regarding on-site activities and ongoing monitoring.
- Strive to clearly communicate the status of on-site activities and ongoing monitoring.
  - On-site activities may include basic reconnaissance, well drilling and installation, well maintenance, and data collection.
  - Routine visits will be performed on an as-needed basis but typically not more than monthly.
  - The most intensive activity occurs during the initial phase when the well is sited, Diggers Hotline confirms the location of utility lines, and the monitoring well and water level monitoring equipment is installed.
- Ensure ongoing operation and maintenance of the new monitoring well in coordination with the USGS.
- Removal from service (including filling and sealing) of existing well WS-105 (USGS Site No: 440345089151701, USGS Site Name: WS-18/10E/01-0105, WGNHS Well ID: 70000105) in compliance with WDNR codes and provide a copy of the filling and sealing report to you for record keeping purposes. Removal from service of WS-105 will occur following 6-12 months of concurrent monitoring to establish an overlapping water-level record between the two wells.

As hosting property owner, you acknowledge that you:

- Have received information about the WGLMN and wish to volunteer your well for the collection of geologic and hydrogeologic data.
- Are the owner / operator of the property and, as such, have the authority to allow for the described activities on your land.
- Will not tamper with the well and any of the equipment installed as part of ongoing monitoring efforts.
- Will not be responsible for any costs associated with well installation or ongoing operation and maintenance of the new well, nor removal from service (including filling and sealing) of existing well WS-105.
- Will facilitate on-site activities to the best of your ability and communicate any specific requests or concerns directly to WGNHS and USGS staff.

If you have any questions or concerns, feel free to contact us directly by email or phone.

Sincerely,

Mike Parsen
Hydrogeologist
3817 Mineral Point Rd.
Madison, WI 53705
mike.parsen@wisc.edu
(608) 262-9419 (direct)

Pete Chase
Geotechnician
3817 Mineral Point Rd
Madison, WI 53705
pete.chase@wisc.edu
(608) 265-6003

Sarah Bremmer
Project Geologist
3817 Mineral Point Rd
Madison, WI 53705
sarah.bremmer@wisc.edu
(608) 265-5323

P.s. Contact information for our partners at WDNR and USGS is as follows:

Rob Waschbusch
USGS
Hydrologist
8505 Research Way
Middleton, WI 53562
rjwaschb@usgs.gov
608-821-3868

Nicole Clayton
WDNR
Water Supply Specialist
PO Box 7921
Madison, WI 53707
nicole.clayton@wisconsin.gov
(608) 266-9254

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Wisconsin Geological and Natural History Survey
DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN-MADISON

WS-2372 WDNR soil boring log, 2021

Form 4400-122, page 1 of 1

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐ _____

Page 1 of 1

Facility/Project Name: WI Groundwater-Level Monitoring Network	License/Permit/Monitoring Number:	Well name: 70002372 (AKA: WS-2372)	
Boring Drilled By: Name of crew chief (first, last) and Firm — First Name: Gage Last Name: Kapugi — Firm: OnSite Environmental Services LLC	Date Drilling Started: 09/13/2021	Date Drilling Completed: 09/13/2021	Drilling Method: Geoprobe & 4.25" HSA
WI Unique Well No.: WA237 — DNR Well ID No.: — Well Name: WS-2372	Final Static Water Level: _____ Feet MSL	Surface Elevation: _____ Feet MSL	Borehole Diameter: 8.25 inches
Local Grid Origin ☐ (estimated: ☐) or Boring Location ■ — State Plane _____ N, _____ E — _____ 1/4 of _____ 1/4 of Section _____, T _____ N, R _____	Lat 44.065522 — Long -89.256122	Local Grid Location: ☐ N ☐ E _____ Feet ☐ S _____ Feet ☐ W	
Facility ID	County: Waushara	County Code: 69	Civil Town/City/ or Village: Town of Dakota

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
Core	60/30"		0-5	FILL- Silty Sand w/ gravel (85% sand) brown to reddish brown, moist, loose										
Core	60/36"		5-10	Poorly sorted SAND (>95%) fine-medium, trace fines, brown to yellow brown, loose, moist										
Core	60/48"		10-15	SAND as a above but w/ some coarse sand and color change to red brown, wet at 12 ft.										
Grab			15-20	SILTY SAND (75% fine sand, 25% fines) red brown, very loose										
Grab			20-25	SILTY SAND as above but brown										
				END of boring 25.5 ft.										
				Top 15 ft. sampled w/ 2" x 5' Geoprobe, then 4 1/4" hollow stemmed augers drilled to 25.5 ft., build 2" PVC well at 25 ft.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Sarah Brown — Firm: Wis. Geological and Natural Histroy Survey

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

WS-2372 WDNR monitoring well development form, 2021

Form 4400-113B, page 1 of 1

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name	
WI Groundwater-Level Monitoring Network *(Replacement well for WS-105)*	Waushara	70002372 (AKA: WS-2372)	
	County Code: 70	Wis. Unique Well Number: WA237	DNR Well ID Number: ___

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

surged with bailer and bailed	☒	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
Other _____	☐	

3. Time spent developing well: 65 min.

4. Depth of well (from top of well casisng): 27.4 ft.

5. Inside diameter of well: 2.05 in.

6. Volume of water in filter pack and well casing: ____.__ gal.

7. Volume of water removed from well: 30.0 gal.

8. Volume of water added (if any): Ø.__ gal.

9. Source of water added: NA

10. Analysis performed on water added? (If yes, attach results) ☐ Yes ☒ No

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 12.92 ft.	13.01 ft.
Date	b. 09/13/2021 (mm/dd/yyyy)	09/15/2021 (mm/dd/yyyy)
Time	c. 11:40 ☒ a.m. ☐ p.m.	3:15 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	___.__ inches	___.__ inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe): Brown Opaque Silty	Clear ☐ 20 Turbid ☐ 25 (Describe): Brown Opaque

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids: ____.__ mg/l ____.__ mg/l

15. COD: ____.__ mg/l ____.__ mg/l

16. Well developed by: Name (first, last) and Firm
First Name: Peter Last Name: Chase
Firm: WGNHS

17. Additional comments on development:

Name and Address of Facility Contact/Owner/Responsible Party
First Name: _____ Last Name: _____
Facility/Firm: _____
Street: _____
City/State/Zip: _____

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: PM Chase
Print Name: Peter M Chase
Firm: Wis Geological Survey

NOTE: See instructions for more information including a list of county codes and well type codes.

Appendix 18: Well WW-09 documents

Historical Documents

WW-09 Basic well information, 1980
Well information historically compiled by WGNHS, 1 page

WW-09 Well evaluation, date unknown
Well information historically compiled by WGNHS, 1 page

WW-09 Well location maps, date unknown
Well information historically compiled by WGNHS, 2 pages

WW-09 Water-level data, 1941-1950
Well information historically compiled by WGNHS, 1 page

WW-09 Water-level data, 1991-2000
Well information historically compiled by WGNHS, 1 page

WW-09 Basic well information, 1980

Page 1 of 1

7/11/80 WW-0009

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number WW-03/15E-33-0009
Owner RUSSELL STEWART
Location (Co., T/R.sec) WALWORTH Co.
T. 3N., R. 15E., SEC. 33 SW¼SW¼
Land surface altitude 965 FT.
Drainage basin Turtle Creek Rock-Fox Basin

WELL DATA

Depth 287 FT.
Casing depth 287 FT.
Screened interval
Diameter 6 IN.
Aquifers open to well DOLOMITE
Geologic log available? No.
Construction report available?
Use of well STOCK
Access to measure well OK

NEAREST SUPPLEMENTAL DATA POINTS

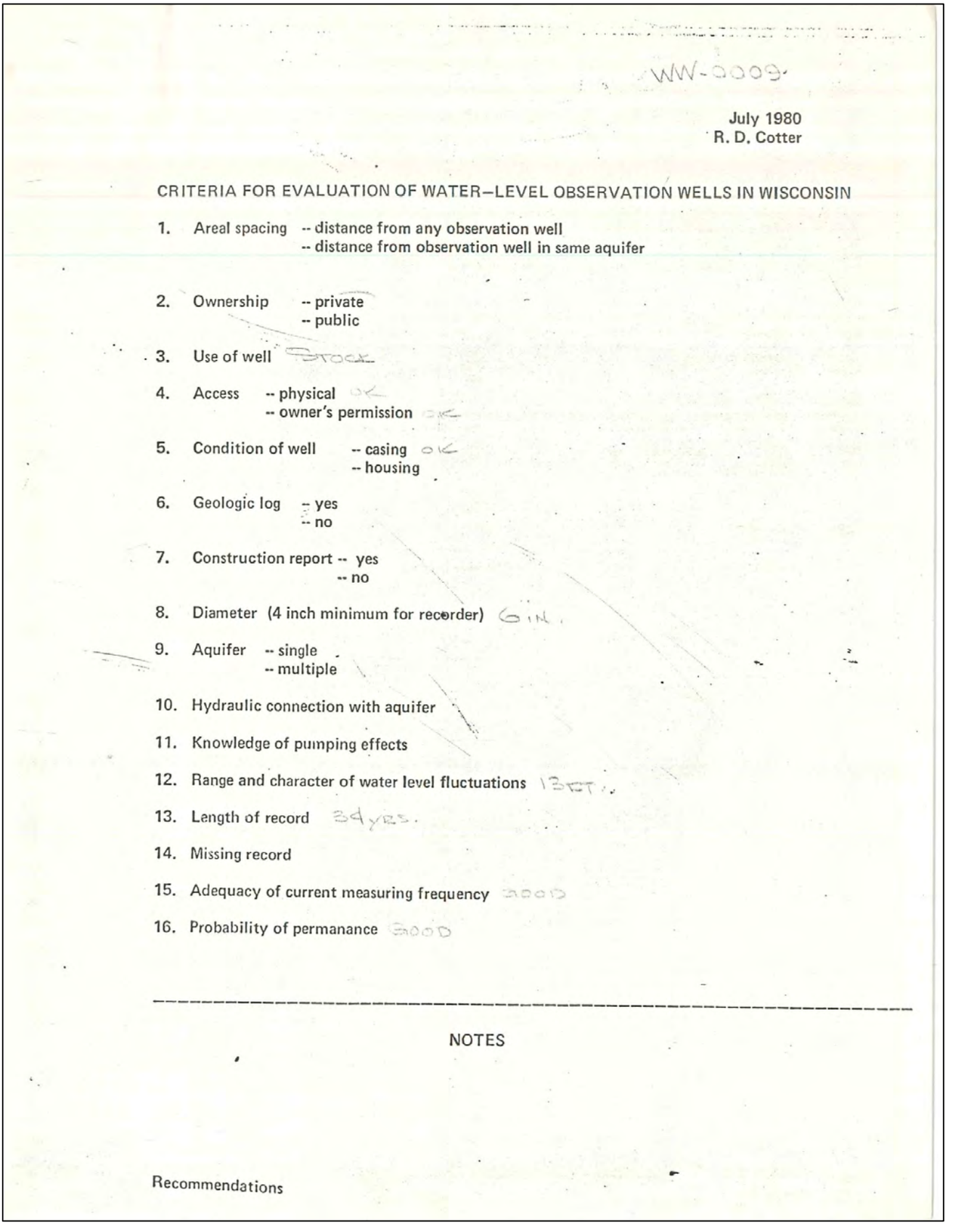
Precipitation stations Lake Geneva - 16 mi SE
Janesville - 15 mi W
Whitewater - 11 mi N
Streamgaging stations 05431486 Turtle Creek near Clinton - 7 mi SW
Observation wells WW 37 - 16 mi ESE Ro 8 - 12 mi NW
WW 83 - 11 mi SE Ro 491 - 16 mi SW
Other

EXISTING RECORD

Measuring point HOLE IN PUMP BASE, 1.00 FT. ABOVE LSD
Measuring equipment TAPE
Frequency of measurement MONTHLY
Period of record --
Started 1947
Ended CONTINUING
Volume of missing record

WW-09 Well evaluation, date unknown

Page 1 of 1



WW-0009

July 1980
R. D. Cotter

CRITERIA FOR EVALUATION OF WATER–LEVEL OBSERVATION WELLS IN WISCONSIN

1. Areal spacing -- distance from any observation well
   -- distance from observation well in same aquifer

2. Ownership -- private
   -- public

3. Use of well STOCK

4. Access -- physical OK
   -- owner's permission OK

5. Condition of well -- casing OK
   -- housing

6. Geologic log -- yes
   -- no

7. Construction report -- yes
   -- no

8. Diameter (4 inch minimum for recorder) 6 IN.

9. Aquifer -- single
   -- multiple

10. Hydraulic connection with aquifer

11. Knowledge of pumping effects

12. Range and character of water level fluctuations 1 FOOT.

13. Length of record 34 YRS.

14. Missing record

15. Adequacy of current measuring frequency GOOD

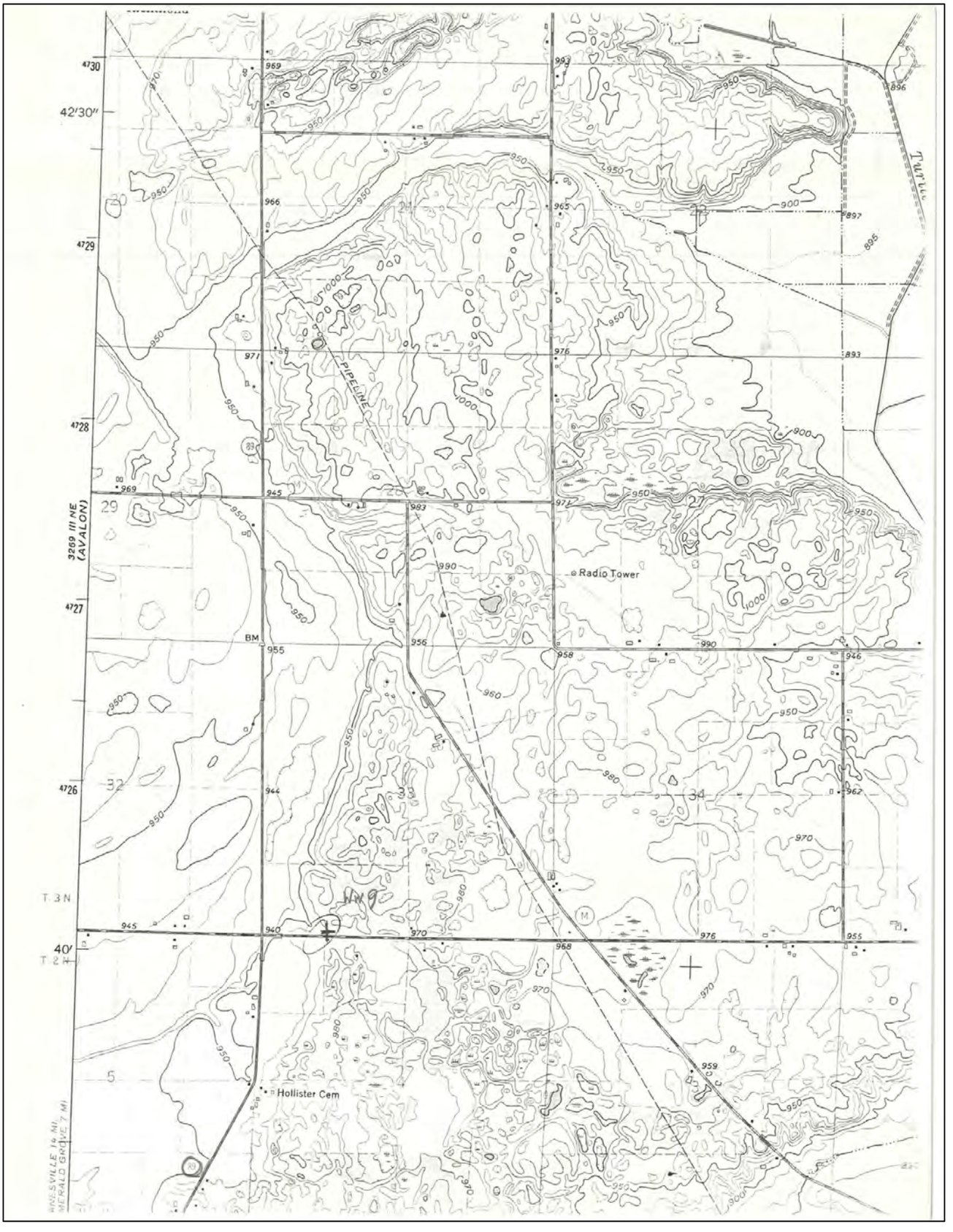
16. Probability of permanance GOOD

NOTES

Recommendations

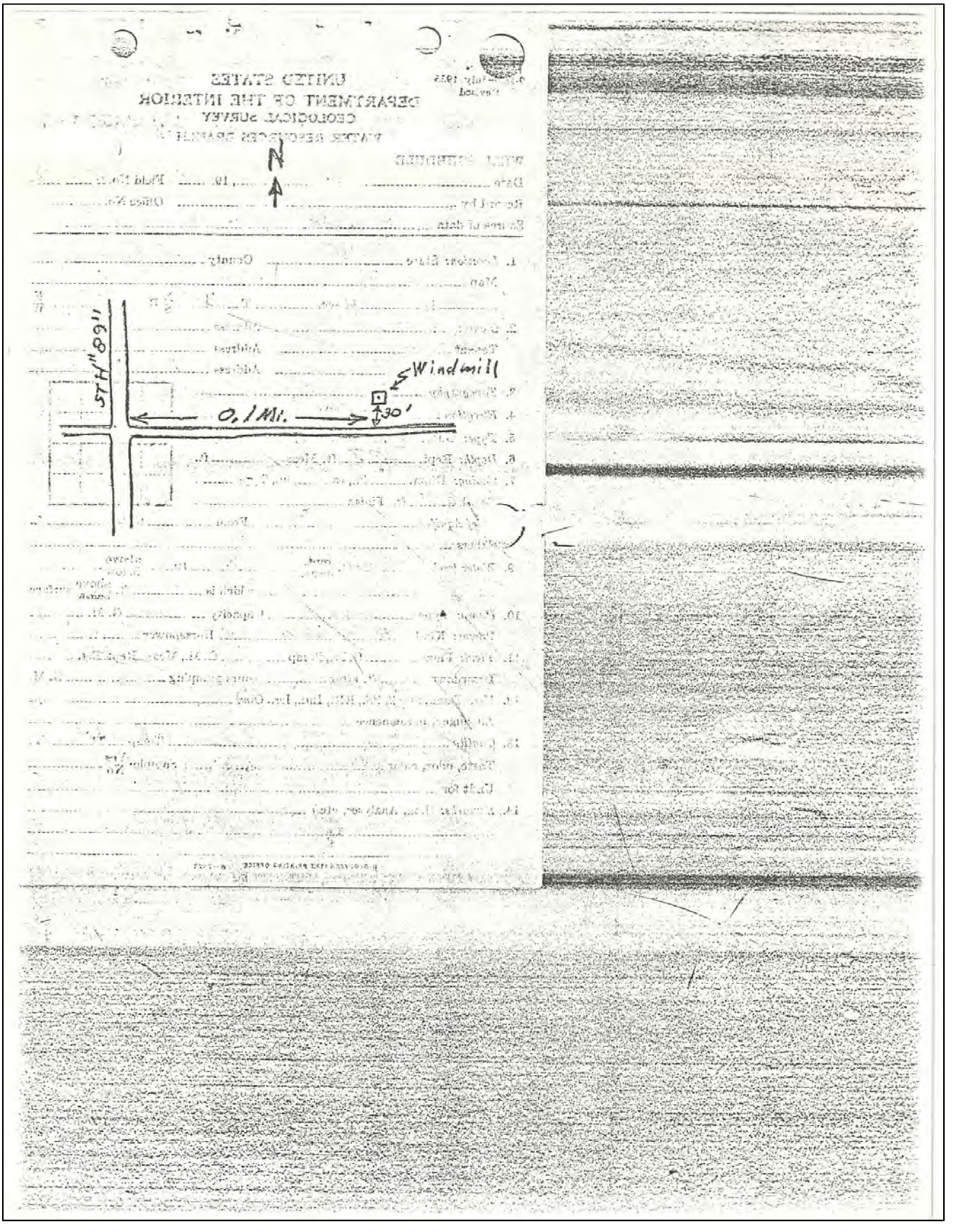
WW-09 Well location maps, date unknown

Page 1 of 2



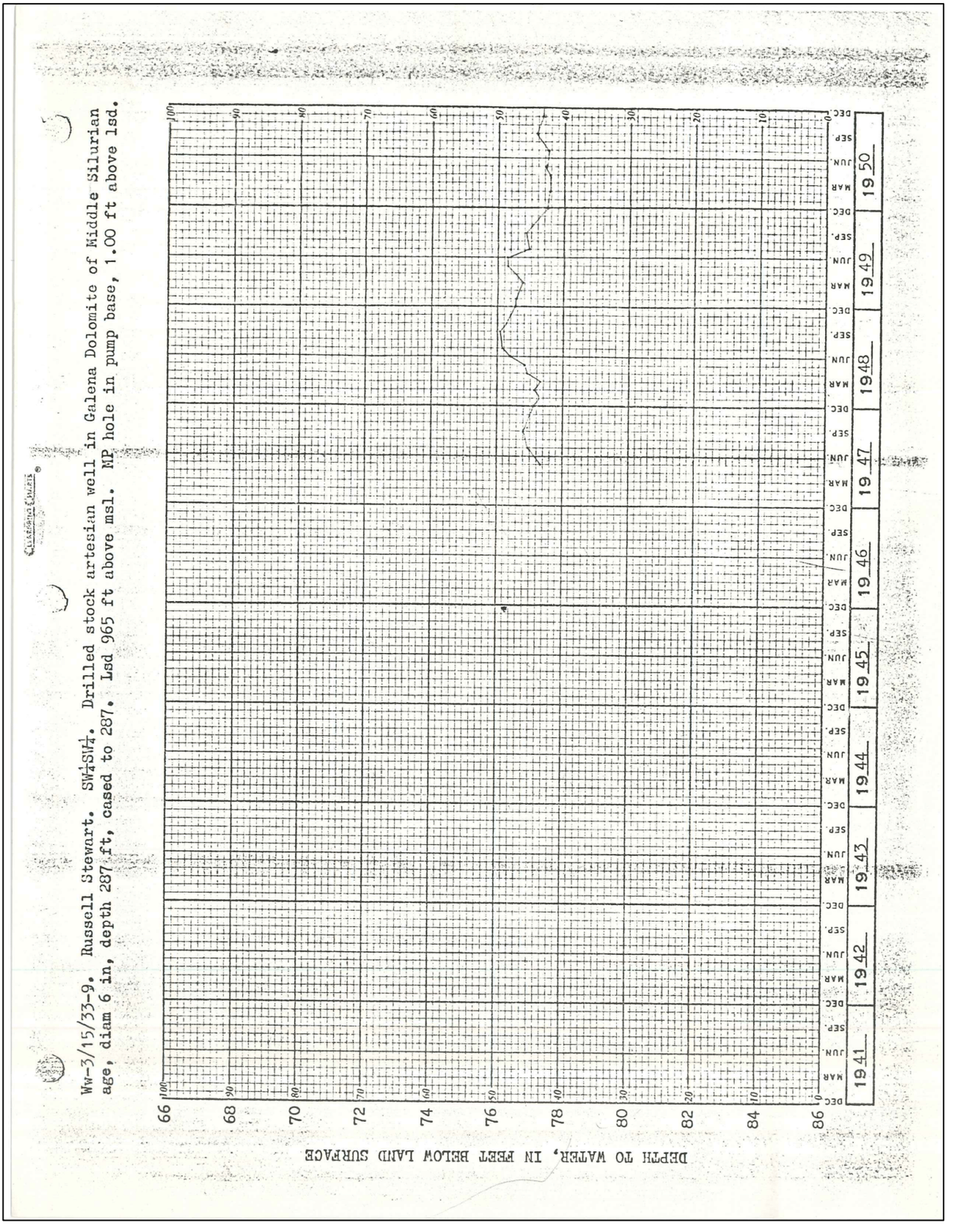
WW-09 Well location maps, date unknown

Page 2 of 2



WW-09 Water-level data, 1941-1950

Page 1 of 1



WW-09 Water-level data, 1991-2000

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