



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

Wisconsin Groundwater-Level Monitoring Network Improvements, 2018-2021

Final report to the U.S. Geological Survey

Project activities: well maintenance (objective 4) and well drilling (objective 5)

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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, the total number of Core Network long-term monitoring wells remains below 100, while 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 WGLMN Core Network currently consists of 92 long-term monitoring wells that represent the NGWMN in Wisconsin (fig. 1). The WGLMN Core Network provides a consistent, long-term record of fluctuations in water levels in several shallow and deep national aquifers: (1) Sand and gravel aquifers (N100GLCIAL), (2) the Silurian-Devonian aquifer system (N400SLRDVN), (3) the Cambrian-Ordovician aquifer system (S300CAMORD), and (4) Other aquifer systems (N9999OTHER), which is represented by one well located in a Precambrian aquifer system in northern Wisconsin.

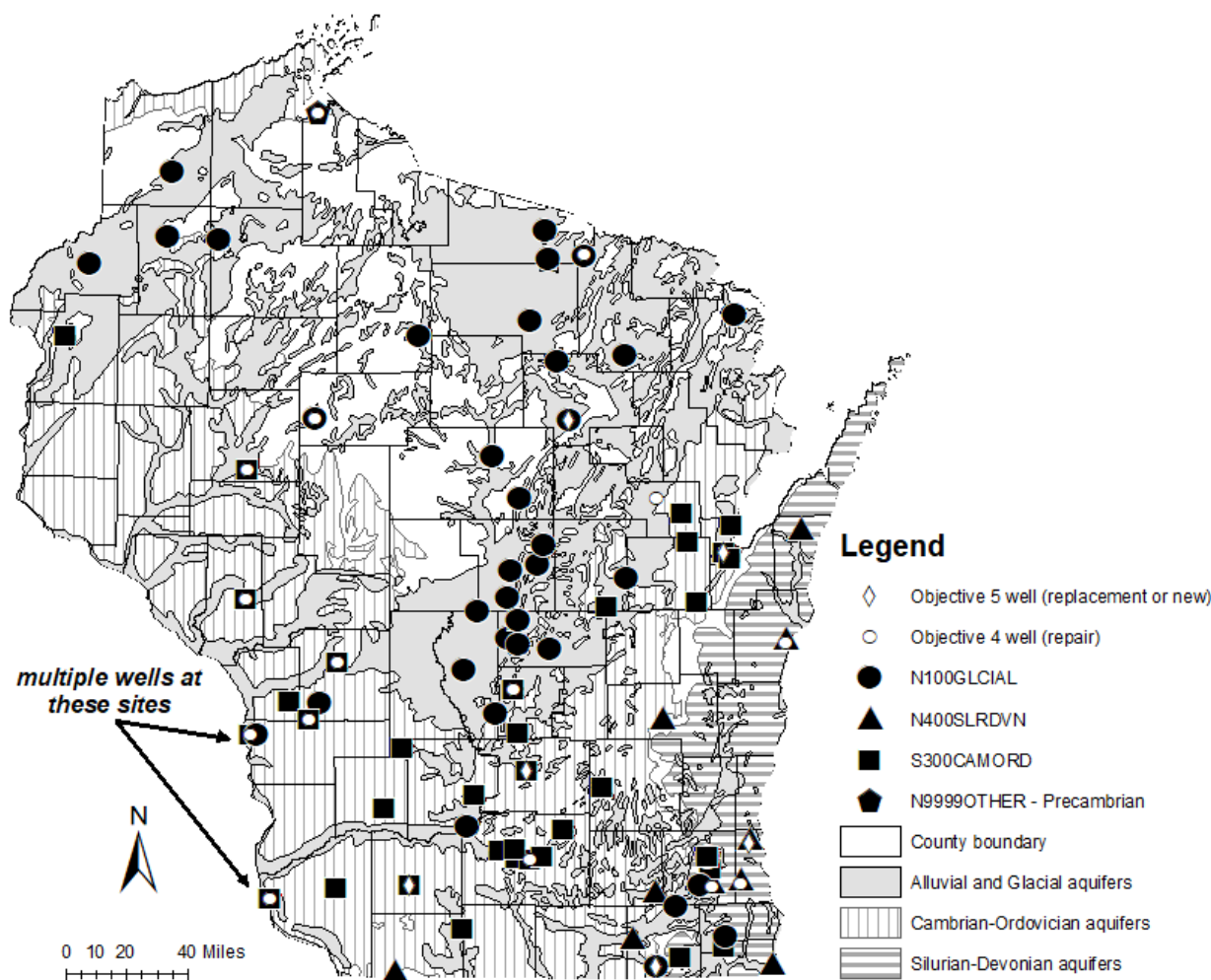


Figure 1. Locations of all monitoring sites in the WGLMN (and NGWMN) as of January 2022. The base map depicts the spatial extent of the USGS national aquifers in Wisconsin. Wells are symbolized by national aquifer and represent the locations of the long-term Core Network wells, which comprise the NGWMN 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 21 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 is collected, it is 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.



Figure 2. WGNHS borehole geophysics setup at a monitoring well. Top left photo shows the logging van with the fiber-optic cable running from the winch inside the logging van, to the tripod, and down to the borehole logging tool suspended within the well. Top right photo shows a more detailed view inside the logging van, where a live feed of borehole geophysical data can be viewed on the computer. Bottom photo shows the well head and centralizers, which stabilize certain geophysical logging tools at the center of the well during logging.

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. The depth shown on still images from video logs may not be accurate.

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 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. (3m). 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 is 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 is 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 late November 2017, included 20 work items in fulfillment of objective 4 (well maintenance) and objective 5 (well drilling) as outlined in the program announcement (USGS funding opportunity G17AS00070). While figure 1 depicts these wells in relation to all NGWMN wells in Wisconsin, figure 3 only shows the location of the 20 wells that were worked on as part of this funding opportunity.

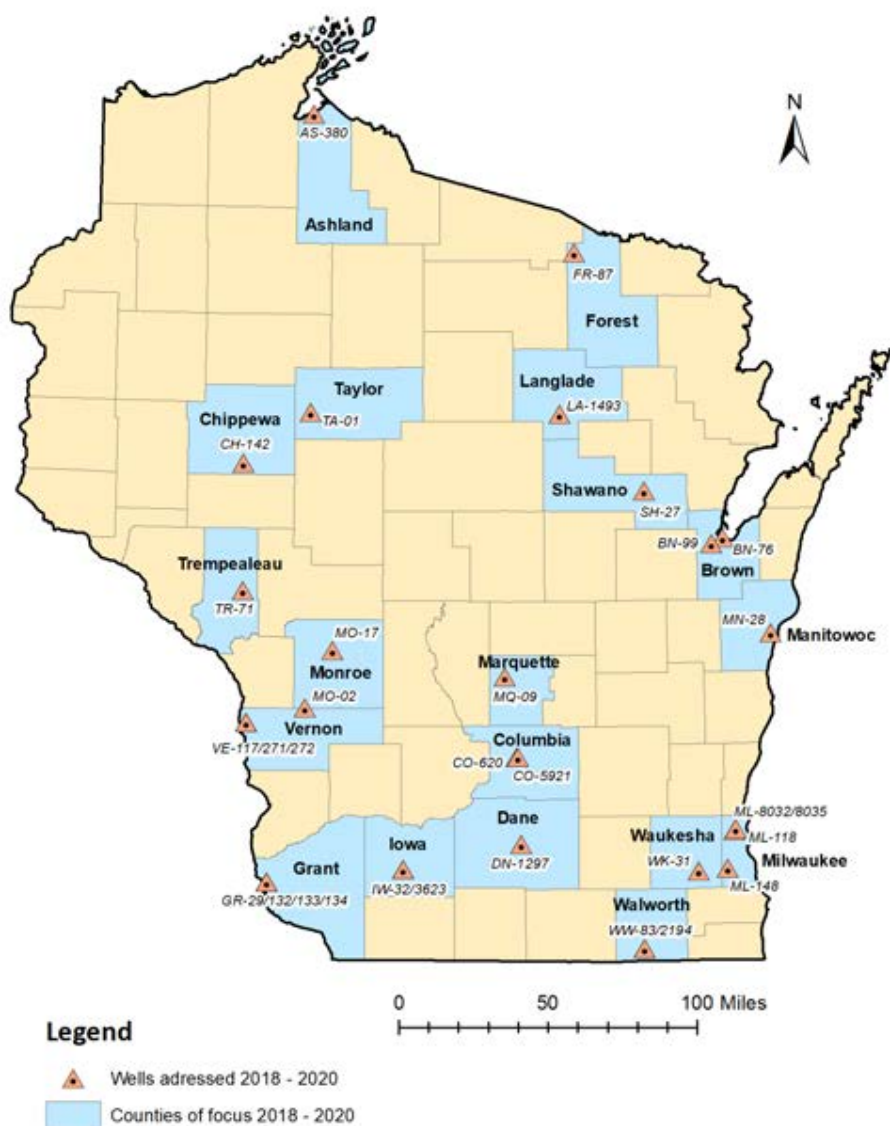


Figure 3. Locations and site names of all monitoring wells in the WGLMN (and NGWMN) that were worked on as part of this funding opportunity. Site names referenced here are short-hand names for the full WGNHS well identifying numbers (WIDs). Full WIDs are provided in each respective well section in the 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 July 2018 and July 2021, and the status of the well sites as of August 2021 is presented in table 1. The grant was originally approved as a two-

year project, from July 2018 to July 2020, but was later extended under two successive six-month, no-cost extensions until July 2021. These extensions were needed due to work delays and challenges presented by the onset of COVID-19 during spring 2020.

Table 1. Work activities proposed, work completed, and status of well sites as of August 2021

Well	Objective ¹	Goal	Outcome	Status of Well ³
AS-380 Ashland Co.	4	Characterize well and test well-aquifer connection	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
BN-76 Brown Co.	5	Replace well	Successful - Replaced by existing well BN-99	BN-76: removed from network (NGWMN and WGLMN) and filled and sealed BN-99: Added to network; depth = 777 ft; national aquifer = S300CAMORD; USGS-UWMSC to continue routine monitoring and maintenance. Well would benefit from complete borehole characterization should pump ever be removed for service.
CH-142 Chippewa Co.	4	Characterize well and test well-aquifer connection	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
CO-620 Columbia Co.	5	Replace well	Successful - Replaced by drilling new well CO-5921	CO-620: removed from network (NGWMN and WGLMN) and filled and sealed CO-5921: Added to network; depth = 65.7 ft; national aquifer = N100GLCIAL; USGS-UMWSC to continue routine monitoring and maintenance
DN-1297 Dane Co.	4	Remove blockage and redevelop well	Unsuccessful - blockage could not be removed	Recommend replacement, concurrent monitoring, and filling and sealing

Well	Objective ¹	Goal	Outcome	Status of Well ³
FR-87 Forest Co.	4	Characterize well and test well-aquifer connection	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
GR-29/132/ 133/134 ² Grant Co.	4	Install an insulated and heated well shelter	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
IW-32 Iowa Co.	4 Unused obj. 5 funds were approved for drilling replacement well	Remove blockage and redevelop well	Blockage could not be removed; well successfully replaced by drilling new well CO-5921	IW-32: removed from network (NGWMN and WGLMN) and filled and sealed IW-3623: Added to network; depth = 90.5 ft; national aquifer = S300CAMORD; USGS-UMWSC to continue routine monitoring and maintenance
LA-1493 Langlade Co.	5	Drill new well	Work successfully completed	LA-1493: Added to network, depth = 51.3 ft; national aquifer = N100GLCIAL; USGS-UMWSC to continue routine monitoring and maintenance
ML-118 Milwaukee Co.	5	Replace well	Work successfully completed	ML-118: removed from network (NGWMN and WGLMN); private landowner is responsible for filling and sealing ML-8035: Added to network, depth = 122.4; national aquifer = N400SLRDVN; USGS-UMWSC to continue routine monitoring and maintenance
ML-148 Milwaukee Co.	4	Remove blockage and redevelop well	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance

Wisconsin Groundwater-Level Monitoring Network improvements, 2018-2021

Well	Objective¹	Goal	Outcome	Status of Well³
MN-28 Manitowoc Co.	4	Characterize well	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance
MO-02 Monroe Co.	4	Replace well shelter	Protective pipe installed and padlocked	Recommend replacement, concurrent monitoring, and filling and sealing
MO-17 Monroe Co.	4	Replace well shelter, characterize well and test well-aquifer connection	Work successfully completed	Recommend replacement, concurrent monitoring, and filling and sealing
MQ-09 Marquette Co.	4	Characterize well and test well-aquifer connection	Work successfully completed; extended protective pipe and padlocked	USGS-UMWSC to continue routine monitoring and maintenance
SH-27 Shawano Co.	4	Remove old well head and redevelop well	Unsuccessful - unable to access well	Well removed from network (NGWMN and WGLMN); private landowner is responsible for filling and sealing
TA-01 Taylor Co.	4	Replace well shelter, characterize well and test well-aquifer connection	Mostly successfully - unable to perform slug test	USGS-UMWSC to continue routine monitoring and maintenance
TR-71 Trempealeau Co.	4	Remove old well head and redevelop well	Work successfully completed	USGS-UMWSC to continue routine monitoring. Well characterization recommended
VE-117/271/ 272 Vernon Co.	4	Replace well shelter, trench electrical, and install heater and thermostat	Work successfully completed	USGS-UMWSC to continue routine monitoring and maintenance

Well	Objective ¹	Goal	Outcome	Status of Well ³
WK-31 Waukesha Co.	4	Remove blockage and redevelop well	Work successfully completed. Also removed shelter and replaced well head	USGS-UMWSC to continue routine monitoring and maintenance
WW-83 Walworth Co.	4 Unused obj. 5 funds were approved for drilling replacement well	Remove blockage and redevelop well	Blockage could not be removed; well successfully replaced by drilling new well WW-2194	WW-83: removed from network (NGWMN and WGLMN) and filled and sealed WW-2194: Added to network, depth = 146 ft; national aquifer = N100GLCIAL; USGS-UMWSC to continue routine monitoring and maintenance

¹ Objective 4: Well Maintenance, Objective 5: Well Drilling

² Not included in original proposal

³ All depths are reported as feet below land surface datum; 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 section. Supplemental historical records or records collected for each site as part of this current project, such as well construction reports, soil boring logs, site-access permits and easements, are included in the respective appendix.

Project details

AS-380 (Ashland County, WI)

USGS Site Number: 463635090481101

USGS Site Name: AS-48/04W/25-0380

WGNHS Well ID: 2000380

WDNR Well Number: None

Well information

AS-380 was drilled by Luisier Drilling, Inc. as part of a USGS groundwater study in 1998 and completed to a reported total depth of 217 feet below land surface (ft bls) ^[1]. A 6-in.-diameter

casing was grouted into bedrock to a reported depth of 98 ft bls, and a 3-in.-diameter casing was subsequently installed down to 111.5 ft bls. Below the 3-in. casing, the 3-in. hole was left open to bedrock from 111.5 to 217 ft bls. The well is located on the Bad River Indian Reservation (landowner), north of U.S. Highway 2 and east of Ashland, WI (fig. 4). Monitoring began in 2011 ^[2] and the well is currently in good condition.

Latitude, longitude: 46°36'34.55", -90°48'42.12" (NAD83) ^[2]

Land surface datum: 644.4 feet above mean sea level (NAVD88) ^[2]

Hydrologic Unit (USGS Watershed Code): 04010301 ^[2]

Well completed in: USGS national aquifer N9999OTHER (Other aquifers) and local aquifer 420BFLD (Bayfield Group - a Precambrian sandstone) ^[2]

Current well depth: 219 ft-BTOC (217.4 ft blsd) ^[3]

Current casing depth: 113 ft-BTOC (111.4 ft blsd) ^[3]

^[1] Well details obtained from the USGS open-file report 2004-1425 (Dunning, 2005). The Well Construction Report, historic geophysical logs and historical flow logs in this report are the only original well records known to exist for this well

^[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 3/18/20 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Historical and recent documentation for this well is included in appendix 1.

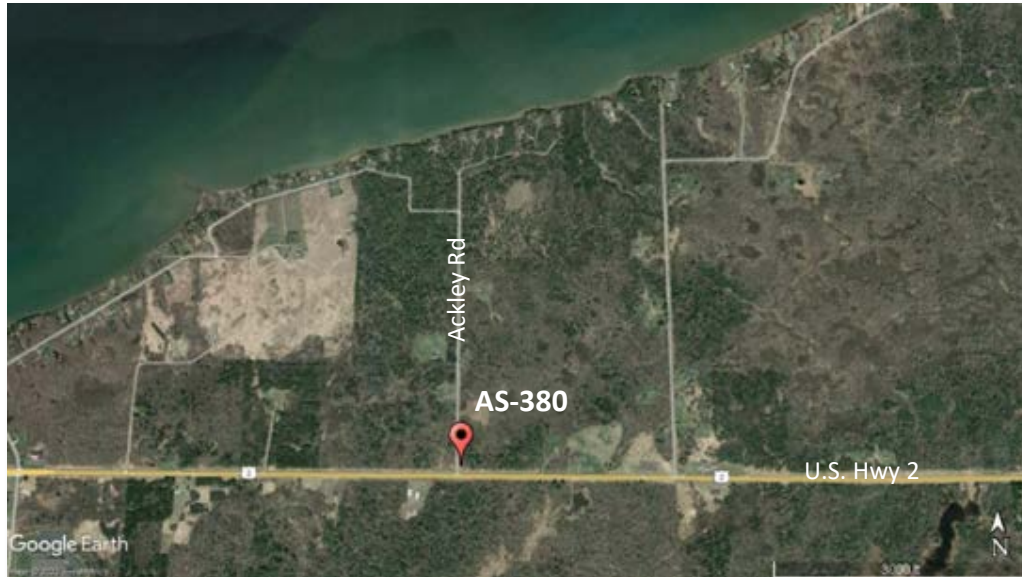


Image ©2022 TerraMetrics, Landsat/Copernicus

Figure 4. Location of well AS-380 (red marker) in Ashland County, Wisconsin. The site is located on Bad River Indian Reservation property, approximately 70 ft north of U.S. Highway 2 at Ackley Rd., 3-mi east of Ashland, WI.

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include characterization of the well, with a borehole video and full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection.

Description of work completed

The only original records known to exist for this well are found in the USGS open-file report 2004-1425 (Dunning, 2005), which was discovered while completing our search for historical records. Upon review of these records, the WGNHS discovered that this well was incorrectly reported to be completed in the Cambrian-Ordovician national Aquifer system (local Lake Superior Sandstone Aquifer). The historical records indicate the well is instead completed in the local Bayfield Group aquifer, which is a Precambrian sandstone. This information was used to update the USGS Groundwater Watch page for AS-380, which now accurately reports the well as being completed in the national “Other Aquifers” group that includes all Precambrian aquifers.

In lieu of a verbal agreement made between the Bad River Indian Reservation and USGS-UMWSC for a study done prior to this round of repairs and continued routine monitoring, the WGNHS obtained a one-time Tribal Access Permit on February 21, 2019, to complete well characterization and evaluation. Geophysical logging and a video of the borehole was completed on October 25, 2019, by the WGNHS (fig. 5). Geophysical logging verified a well depth of 217.4 ft blsd and a casing depth of 111.4 ft blsd, suggesting little to no material accumulation at the bottom of the well. The video log (fig. 6) shows that the well casing is in good condition and the bottom of casing appears well seated into bedrock.



Figure 5. Geophysical logging tripod set up over well AS-380.

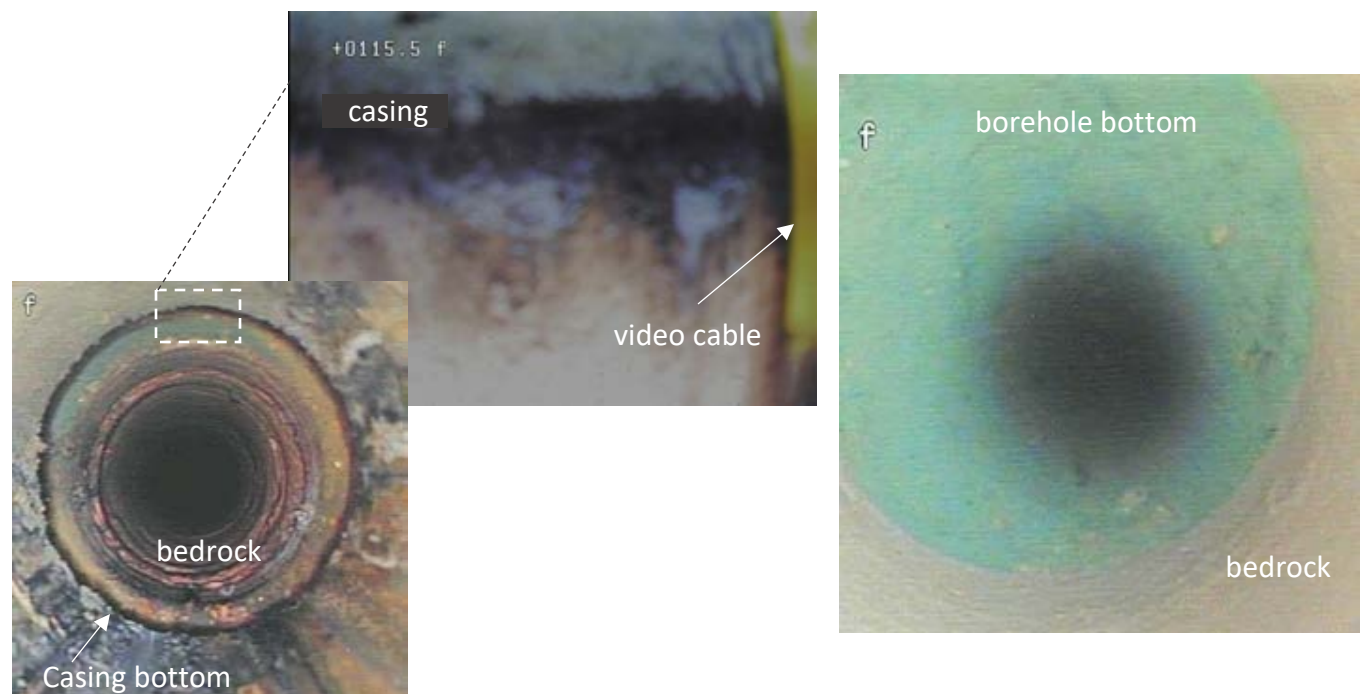


Figure 6. Still shots from borehole video log of AS-380, collected October 25, 2019, showing bottom of casing, as seen from looking down the borehole (left), bottom of casing as seen looking at the borehole wall (middle), and bottom of well (right).

The USGS-UMWSC performed a slug test on AS-380 April 17, 2019, using a 1.5-in.-diameter, 5-ft-long solid PVC slug. The water column was displaced by approximately 2 feet and showed a good hydraulic response, suggesting AS-380 is well connected to the surrounding aquifer (fig. 7).

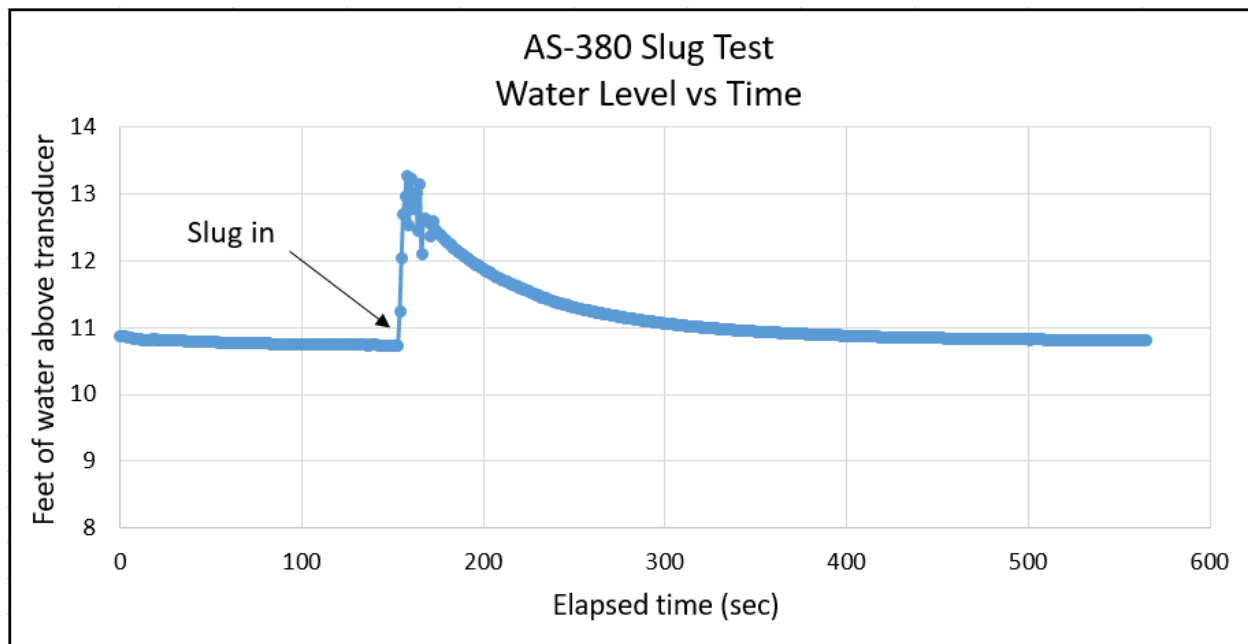


Figure 7. Slug test results for AS-380. Slug testing was performed on April 17, 2019. Data courtesy of U.S. Geological Survey.

Suggestions for future work

After completing work on the well, it was determined to be in good condition. No future work is anticipated for this well except for routine maintenance and monitoring by the USGS-UMWSC.

BN-76 (Brown County, WI) – replaced by BN-99

USGS Site Number: 443228088003101

USGS Site Name: BN-24/20E/24-0076

WGNHS Well ID: 05000076

WDNR Well Number: None

Well information

BN-76 was drilled in 1926 to a reported total depth of 500 below land surface (ft bls) ^[1]. A 5-in.-diameter casing was installed to a reported total depth of 150 ft bls. Below the casing, the hole was left open to bedrock from 150 to 500 ft bls. Water-level monitoring began in 1950 ^[2]. This well was north of U.S. Interstate 43 in Green Bay, WI (fig. 8), in a difficult-to-access location in the basement of the J.P. Pulliam power plant (fig. 9). Historically, this plant was owned and operated by Wisconsin Public Service (WPS). Around 2016, the parent company of WPS was acquired by WEC Energies and WPS became a subsidiary of WEC Energy. As of early 2022, WPS and We Energies are two of several utility companies operating under the WEC Energy Group umbrella. Due to difficult access conditions on a sub-grade level of the power plant, incomplete or missing well history (e.g., no well construction record, discrepancies in well-depth measurements), and an uncertain future for the well, a replacement well was secured. BN-76 was filled and sealed 7/10/2020 and effectively replaced by BN-99 in both the WGLMN and NGWMN.

Latitude, longitude: 44°32'28", -88°00'31" (NAD27) ^[2]

Land surface datum: 590 feet above mean sea level (NAVD29) ^[2]

Hydrologic Unit (USGS Watershed Code): 04030103 ^[2]

Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDSA (Sandstone Aquifer) ^[2]

Current well depth: n/a well filled and sealed ^[3]

Current casing depth: n/a well filled and sealed ^[3]

^[1] Well details obtained from 1949 USGS well schedule

^[2] Well details obtained from the USGS

^[3] Well details obtained from 2020 fill and seal report

Historical and recent documentation for this well is included in appendix 2.



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Figure 8. Location of well BN-76 (red marker) in the basement of a privately owned power plant in Brown County, Wisconsin. This site is north of U.S. Interstate 43 in the basement of the J.P. Pulliam power plant, in Green Bay, WI.



Figure 9. Well BN-76 located in the basement of a privately owned power plant; well shelter (left) and well head (right). Photos courtesy of U.S. Geological Survey.

Initial work plan

The water-level record for this site, in Green Bay, Wisconsin is recognized as one of the most important historical records documenting the drawdown and recovery trends in this part of the state as local municipalities transitioned between groundwater and surface water sources for potable water supply.

This well was initially proposed under objective 5 for well evaluation and replacement. Work planned to include a complete borehole evaluation followed by drilling of a new well nearby in the same aquifer that was easier to access. Due to the importance of the well record of BN-76, we planned to continue water-level monitoring as long as possible. The new replacement well would be drilled and fully characterized, then operated concurrently with BN-76 to establish an overlapping water-level record between the two wells.

Description of work completed

In summer 2018, WGNHS began identifying locations near BN-76 where a replacement well could be sited and drilled. As part of this evaluation, historical water-level trends for BN-76, and nearby monitoring network well BN-435, were reviewed. Water-level records suggested that any wells drilled to comparable depths in this area of Green Bay could potentially result in flowing (i.e., artesian) conditions in the coming years to decades (fig. 10). In consultation with the USGS-UMWSC and WDNR, WGNHS decided that drilling a new replacement well in this area was problematic due to the challenges and responsibilities associated with operating and maintaining a flowing well. For these reasons, WGNHS determined it would be best to partner with a landowner in Green Bay, WI with a suitable well that could be added to the WGLMN and NGWMN as a replacement for BN-76.

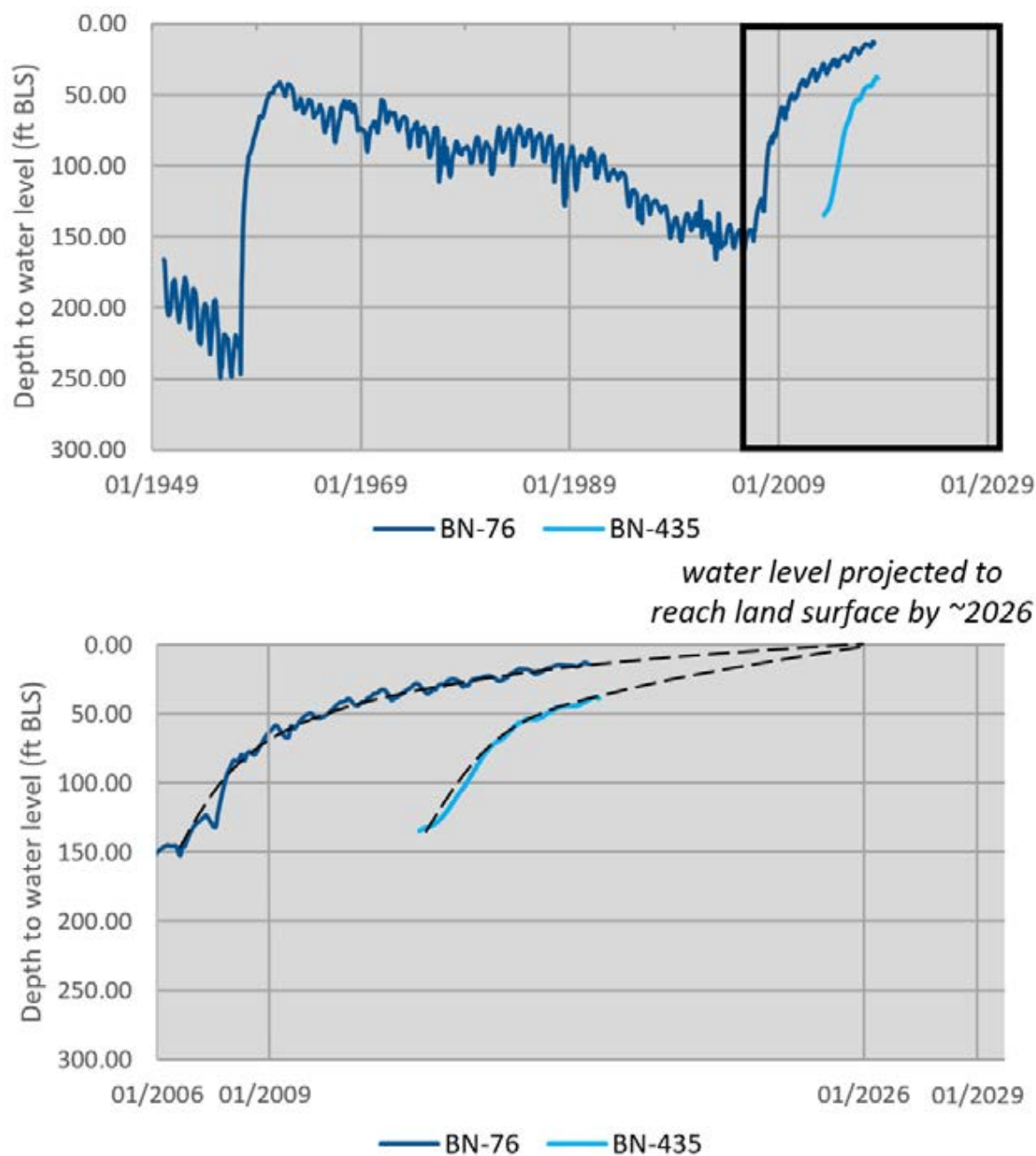


Figure 10. Water-level trends plotted for existing monitoring well BN-76 and nearby BN-435, showing the potential for both wells to go artesian by 2026. Water-level data presented was obtained from the USGS' National Water Information System (NWIS) database (<https://waterdata.usgs.gov/nwis> for wells BN-76 (USGS Site Number: 443228088003101) and BN-435 (USGS Site Number: 442859088025801). Data courtesy of U.S. Geological Survey.

In parallel to the search for a replacement well, WEC Energy Group informed WGNHS in autumn 2018 that the building containing BN-76, at the north end of the J.P. Pulliam Power

Plant, was planned for demolition the following year. In 2018, the coal-fired generating units at Pulliam were retired and in 2019, WPS began efforts to decommission the site. As part of this decommissioning process, the powerhouse and associated coal-handling facilities were demolished and removed. Well BN-76 was removed and sealed in July 2020 as part of the decommissioning effort. WPS contracted with Cooper Well Systems to fill and seal BN-76 and the report to the WDNR is included in appendix 2. Review of the filling and sealing report indicates that bentonite chips only filled the upper 284 feet of the well. Prior WGNHS knowledge of the well and discussions with USGS-UMWSC field staff and WDNR water-supply specialists suggest that an obstruction in the well, possibly due to a constriction in the borehole or unretrievable equipment (e.g., dropped water-level tape) blocking the lower portion of the well, may have prevented the bottom section of the well from being sealed with bentonite.

While the closure of BN-76 did not influence the decision on replacement wells, it did not allow for concurrent monitoring to ensure continuity in water-level records between BN-76 and the replacement well. As discussed in greater detail below, WGNHS and USGS-UMWSC partnered with the Green Bay Water Utility (GBWU) to select and retrofit in-active municipal supply well BN-99 (aka: BF195) as a replacement for BN-76. The last official water-level measurement for BN-76 was recorded on December 10, 2019, and the first official water-level measurement for BN-99 was recorded on December 6, 2019.

Suggestions for future work

BN-76 was filled and sealed on July 10, 2020. No future work remains to be done.

BN-99 (Brown County, WI) – replaces BN-76

USGS Site Number: 443035088045501

USGS Site Name: BN-24/20E/33-0099

WGNHS Well ID: 05000099

WDNR Well Number: BF195

Well information

This well was drilled as municipal high capacity well for the City of Green Bay in 1952 and completed to a reported total depth of 777 feet below land surface (ft bls) ^[1]. A 20-in.-diameter casing was installed to a reported depth of 107 ft bls, and a 16-in.-diameter casing was subsequently cemented down to 235 ft bls. Below the casing, a 19-in. hole was left open to bedrock from 235 to 777 ft bls. BN-99 is also referred to as Green Bay City Well #8 and has been known historically as the Highland Ave #8 well and the Lombardi Avenue Well. The well is currently located on public land west of U.S. Interstate 41, in a residential neighborhood of Green Bay, WI (fig. 11). A historical water-level measurement is documented from 1952 but no water-level monitoring measurements were recorded by USGS until late 2019, when the well became evaluated for addition to the WGLMN and NGWMN ^[2]. BN-99 is currently considered an in-active well that is used for emergency use only by the Green Bay Water Utility (GBWU). As a back-up water-supply well, it is pumped monthly to ensure proper functioning of the pump and sampled quarterly for conformance with public water-quality standards for bacteria and total coliform (T. Landwehr, personal commun(s), Green Bay Water Utility, 2022). BN-99 officially became part of the WGLMN and NGWMN following the start of monitoring under USGS-UMWSC direction beginning in December 2019.

Latitude, longitude: 44°30'40.7", -88°05'08.2" (NAD83) ^[2]

Land surface datum: 651.1 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 300SNDAS (Sandstone Aquifer) ^[2]

Current well depth: 777 ft bls (pump obstructed attempt to confirm in 2019) ^[1]

Current casing depth: 235 ft bls (pump obstructed attempt to confirm in 2019) ^[1]

^[1] Well details obtained from WDNR well construction report

^[2] Well details obtained from the USGS

Historical and recent documentation for this well is included in appendix 2.

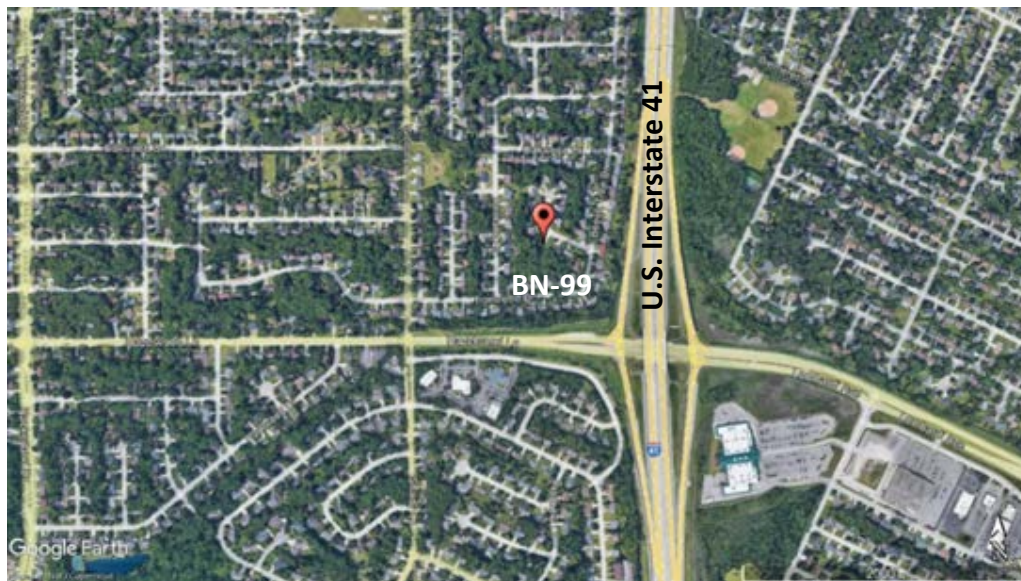


Image ©2022 TerraMetrics, Landsat/Copernicus

Figure 11. Location of well BN-99 (red marker) in Brown County, Wisconsin. This site is on public property in a residential neighborhood west of U.S. Interstate 41 in Green Bay, WI.

Description of work completed

Beginning in fall 2019, WGNHS and the USGS-UMWSC partnered with the GBWU to identify a suitable municipal well that could also serve as a long-term monitoring well for the WGLMN and NGWMN. Several municipal wells were considered; however, BN-99 was determined best suited due to easy well-head access and its status as an in-active well for emergency use only. Under the emergency-use-only designation, the well is pumped infrequently (i.e., monthly) and allows for representative background groundwater-level measurements compared to a well that is actively pumped and would experience rapid water-level fluctuations with each pump on/off cycle. Partnering with the GBWU, who actively operates and maintains the well, was also an enormous benefit considering the potential challenges associated with managing a deep well that could someday become artesian. Review of the well construction record and geologic log for BN-99 suggest that even though the well is completed deeper than BN-76, by approximately 200 ft, BN-99 is constructed like most other high-capacity wells in the area. For this reason, BN-99 should serve as a good replacement well for BN-76 and provide a solid long-term monitoring record when paired with existing well BN-435, which is located closer to the center of the cone of depression documented for Green Bay, WI. The publication by Luczaj and others (2017) provides a detailed illustration of water-level trends for BN-76, BN-435, and BN-99 (aka BF195) and serves as a great resource for understanding the history of water-level fluctuations across this region. Dr. J. Luczaj shared additional water-level data (J. Luczaj, personal commun(s), UW-Green Bay, 2022) that he obtained from the Green Bay Water Utility. This record further substantiates the similarity in historical water-level trends for BN-76 and BN-99 (fig. 12). A hydrogeological investigation by Krohelski (1987) also greatly contributed to

understanding the hydrogeology in this region and helped guide decision-making regarding BN-76 and BN-99.

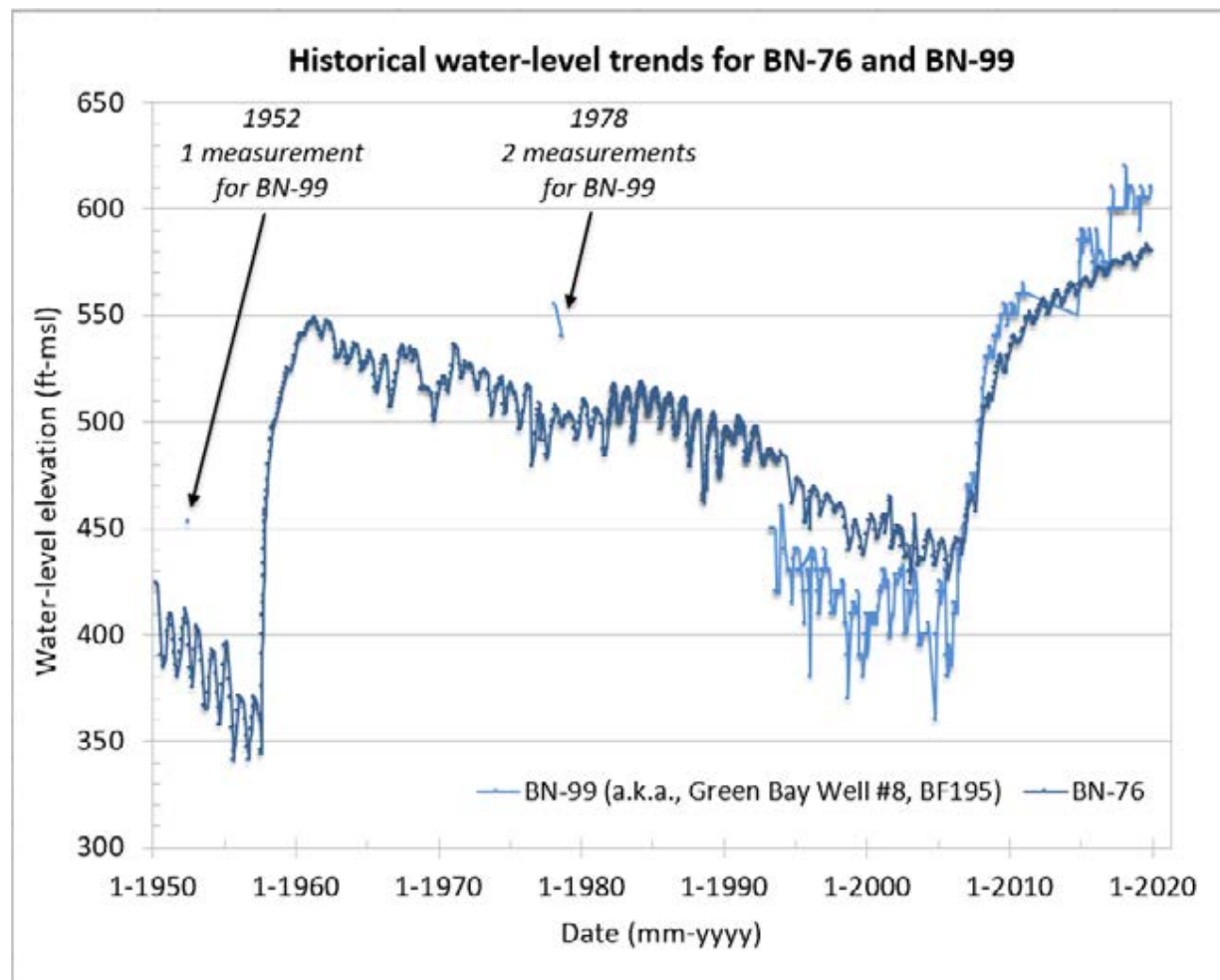


Figure 12. Water-level trends plotted for monitoring well BN-76 and BN-99, showing similar responses over the past decades. Prior to 1993, only 3 data points exist for BN-99 but appear to track the overall trend going back to the 1950s. Water-level data presented for BN-99 was obtained from the USGS' National Water Information System (NWIS) database (<https://waterdata.usgs.gov/nwis> for wells BN-76 (USGS Site Number: 443228088003101). Data for BN-99 was obtained from the Green Bay Water Utility by Dr. J. Luczaj and shared with WGNHS (J. Luczaj, personal commun(s), UW-Green Bay, 2022). Data courtesy of U.S. Geological Survey.

The USGS-UMWSC deployed a pressure transducer to BN-99 on December 11, 2019, to begin recording water-level measurements in the well. On July 14, 2020, the USGS-UMWSC worked with the GBWU to retrofit the well head and install a vented submersible pressure transducer with datalogger and digital readout display (fig. 13). This monitoring configuration was preferred by the USGS-UMWSC based on installations at comparable sites. The installation also

provides the GBWU with an easier way to obtain real-time measurements at the well head, aiding in routine well evaluations and water-level observations. To ensure that water levels published to the WGLMN and NGWMN are representative of static conditions, the USGS-UMWSC routinely excludes measurements collected during the drawdown and recovery period associated with each monthly pump test.



Figure 13. BN-99 retrofitted with a vented submersible pressure transducer with datalogger and digital readout, newly installed on July 14, 2020. The well is test pumped monthly and water-quality samples are collected quarterly in satisfaction of state well codes. Photo courtesy of U.S. Geological Survey.

To ensure water-level monitoring practices for BN-99 were in full compliance with state codes for a municipal public supply well, WGNHS, USGS-UMWSC, and GBWU worked closely with the WDNR. A key component for obtaining WDNR approval was to develop a decontamination procedure to ensure water-level monitoring equipment is properly disinfected and the well's sanitary seal is maintained. In the event of a positive bacteria/total-coliform test, it was agreed that a repeat test would be made and if that second test were positive the well would be disinfected following the standard procedure (i.e., chlorine tablets for 24hr + remove 3x well volume + repeat bacteria test).

A complete borehole characterization and evaluation was not performed on BN-99 due to the presence of pump and riser pipe in the well. On April 2, 2020, the USGS-UMWSC recorded water-levels associated with drawdown and recovery from the GBWU's monthly pump test for BN-99. This pump test demonstrated a good hydraulic response, suggesting BN-99 is well connected to the surrounding aquifer (fig. 14).

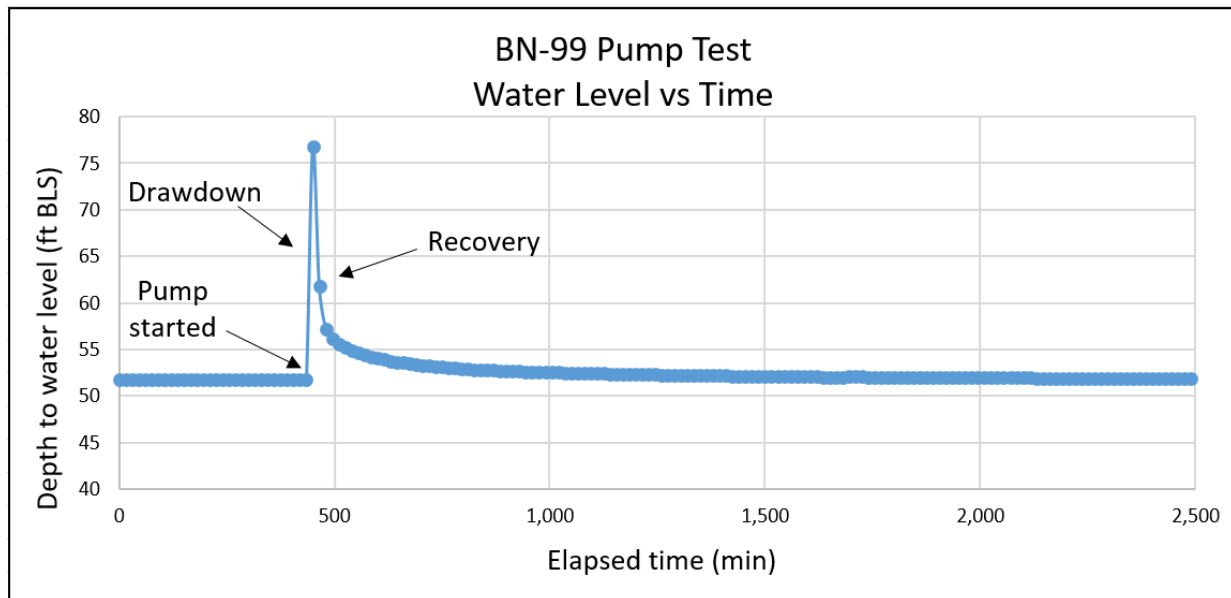


Figure 14. Pump test results for BN-99 on April 2, 2020, showing near instantaneous drawdown (increase in depth to water) and a smooth recovery curve; characteristic of a well with good aquifer connectivity. Data courtesy of U.S. Geological Survey.

Suggestions for future work

BN-99 successfully replaced BN-76. In the event the pump and riser pipe are ever removed for service, it would be beneficial to perform a complete borehole characterization and evaluation of this well. Otherwise, no future work is planned for this well besides routine monitoring and maintenance by the USGS-UMWSC in collaboration with the GBWU.

CH-142 (Chippewa County, WI)

Site Number: 445544091155701

Site Name: CH-28/07W/17-0142

WGNHS Well ID: 9000142

WDNR Well Number: None

Well Information

CH-142 was completed in 1967 to supply water to a wayside rest area ^[1]. The well was drilled to a reported total depth of 60 feet below land surface (ft bls). A 6-in.-diameter steel casing was installed to a reported total depth of 39 ft bls. Below the 6-in. casing, the 6-inch hole was left open to bedrock from 39 to 60 ft bls. In 2015, the USGS-UMWSC reported a blockage in the well around 42 ft bls ^[2]. The WGNHS collected a video log in 2016 to characterize the blockage but could not identify the issue. After the video log, USGS-UMWSC well measurements returned to normal, indicating the borehole camera may have dislodged the well blockage. The well is located on a former WisDOT wayside property, south of State Highway 29 and east of Chippewa Falls, WI (figs. 15 and 16). After the wayside was closed, the land was purchased and is privately owned. It has been monitored since 1968 ^[2] and is currently an NWGMN well in good condition.

Latitude, longitude: 44°54'38.68", -91°15'57.24" (NAD83) ^[2]

Land surface datum: 965.8 feet above mean sea level (NAVD88) ^[2]

Hydrologic Unit (USGS Watershed Code): 07050005 ^[2]

Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 372MNSN (Mount Simon Sandstone) ^[2]

Current well depth: 62 ft-BTOC (60.3 ft blsd) ^[3]

Current depth of casing: 38 ft-BTOC (36 ft blsd) ^[3]

^[1] Well details obtained from 1967 well construction report

^[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 4/16/19 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Additional documentation for this well is included in appendix 3.



Image Landsat/Capernicus

Figure 15. Location of well CH-142 (red marker) in Chippewa County, Wisconsin. This site on private property was formerly a WisDOT wayside station along State Highway 29, east of Chippewa Falls, WI.



Figure 16. CH-142 well head with steel casing stick up and locking steel well head cap. Photos courtesy of U.S. Geological Survey.

Initial work plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include characterization of the well with a full suite of geophysical logs.

Description of work completed

The WGNHS worked with the landowners and Chippewa County Department of Land Conservation and Forest Management to gain access to the site. A 4-wheel drive vehicle was needed to reach the site due to difficult access up a steep embankment and the poor condition of the unmaintained access road. On November 14, 2019, a borehole video and full suite of geophysical logs were collected by the WGNHS. The geophysical logs confirmed a well depth of 60.3 ft blsd and a casing depth of 36 ft blsd, largely consistent with the original well construction. The borehole video shows that the casing is in good condition, but the well contains a lot of floating debris, which is not uncommon for older wells (fig. 17).

On April 16, 2019, a slug test was performed by USGS-UMWSC using a 3 -in.-diameter, 5-ft-long solid PVC slug. The water column was displaced by approximately 2 feet and showed a good hydraulic response suggesting it is well connected to the surrounding aquifer (fig. 18).

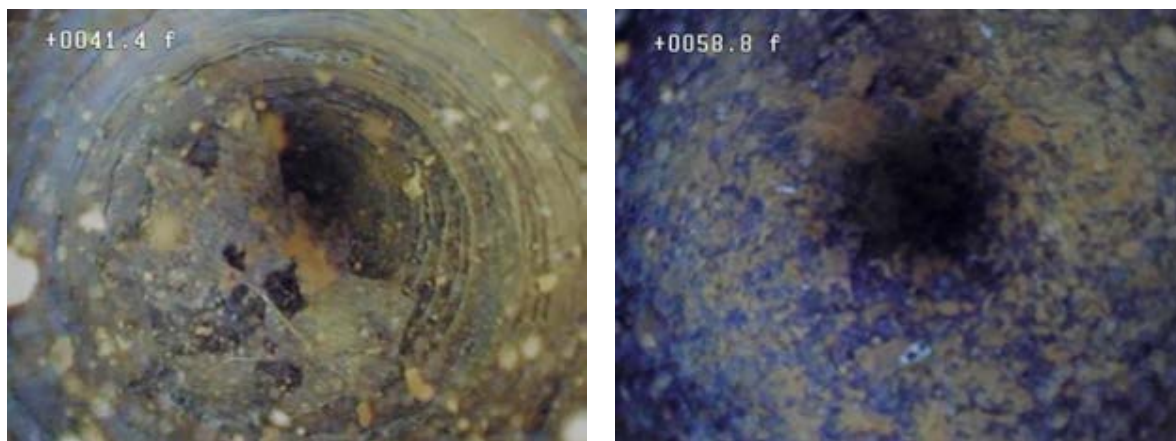


Figure 17. Still shots from borehole video log of CH-142, collected November 14, 2019, showing bedrock borehole with floating particulates and leaf debris (left) and bottom of well (right) with biofilm accumulation on sediment. The bottom of casing was not visible in the video log.

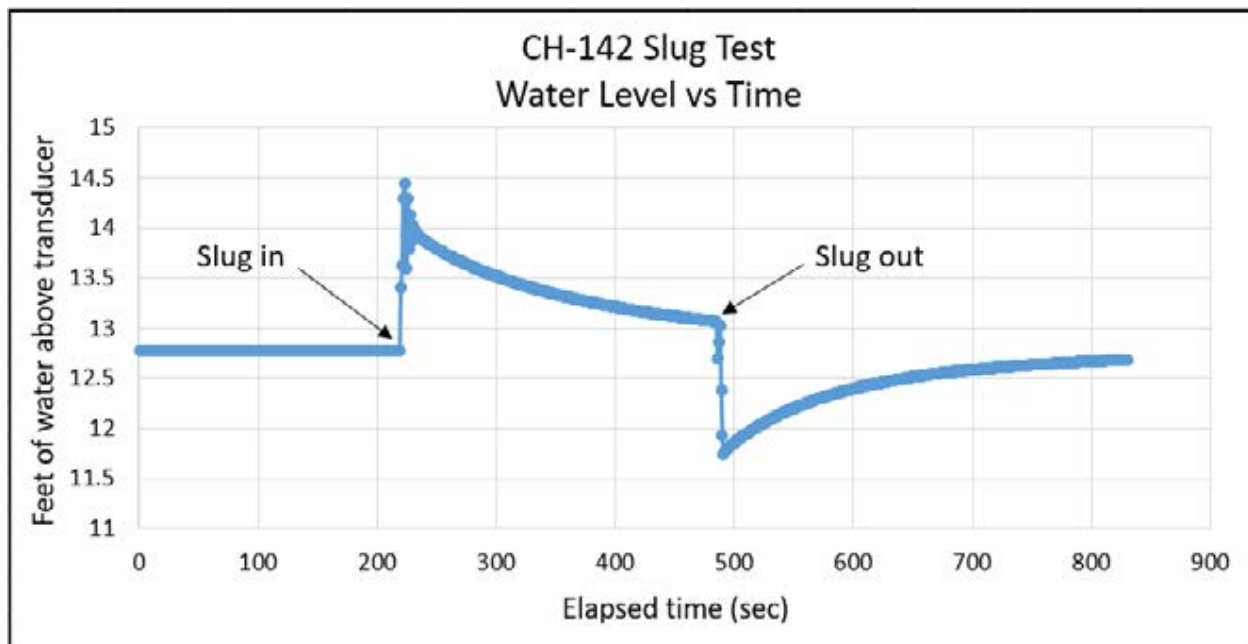


Figure 18. Slug test results for CH-142. Slug testing was performed on April 16, 2019. Data courtesy of U.S. Geological Survey.

Suggestions for Future Work

After completing work on the well, it was determined to be in good condition. No future work is anticipated for this well with the exception of routine monitoring and maintenance by the USGS-UMWSC.

CO-620 (Columbia County, WI) – replaced by CO-5921

USGS Site Number: 432921089245901

USGS Site Name: CO-12/09E/27-0620

WGNHS Well ID: 11000620

WDNR Well Number: None

Well information

CO-620 was drilled in 1974 to a reported total depth of 80 feet below land surface (ft bls) ^[1]. A 1.25-in.-diameter galvanized steel casing was installed to a reported depth of 78 ft bls with a two-foot screened interval from 78 to 80 ft bls ^[1]. The well was located on Alliant Energy property, west of U.S. Highway 51 and south of Portage, WI (figs. 19 and 20). Monitoring began at this site in 1974. While the well was operable and water-level measurements could be made, it was not serviceable and could not be evaluated due to its small diameter. For this reason, well CO-5921 was drilled as a replacement well and CO-620 was filled and sealed June 25, 2021 ^[2]. New well CO-5921 effectively replaced CO-620 in both the WGLMN and NGWMN.

Latitude, longitude: 43°29'21.49", -89°24'56.10" (NAD83) ^[2]

Land surface datum: 815.3 feet above mean sea level (NAVD88) ^[2]

Hydraulic Unit (USGS Watershed Code): 07070003 ^[2]

Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDAS (Sandstone Aquifer) ^[2]

Current well depth: n/a well filled and sealed ^[3]

Current casing depth: n/a well filled and sealed ^[3]

^[1] Well details obtained from 1977 USGS site schedule

^[2] Well details obtained from 2020 fill and seal report

^[3] Well details obtained from the USGS

Historical and recent documentation for this well is included in appendix 4



Image Landsat/Copernicus

Figure 19. Location of well CO-620 (red marker) in Columbia County, Wisconsin. The site is near a parking lot on Alliant Energy property, north of Murray Rd. and approximately 1,700 feet west of U.S. Highway 51.



Figure 20. Well CO-620 (tallest thin pipe sticking up above the snow) before it was filled and sealed. Photos courtesy of U.S. Geological Survey.

Initial work plan

This well was initially proposed under objective 5 for well drilling. As part of routine monitoring and maintenance, the USGS-UMWSC performed a slug test on April 4, 2014, and found the well to be in poor hydraulic connection with the aquifer. A review of water-level records suggested the poor connection started around June 1988. The well was redeveloped on May 28, 2014, using a Waterra oscillating inertial pump, with foot-valve (i.e., check-valve), to purge water from the well and suspend and evacuate accumulated sediment. After redevelopment, slug test results indicated improvement in the well's hydraulic connection with the aquifer (fig. 21). A status code of "M" (well plugged and not in hydraulic connection with aquifer) was added to all water level measurements from July 17, 1998, to April 4, 2014. Despite the successful redevelopment in 2014, the small diameter of CO-620 prevented the well from being fully evaluated with borehole geophysics and video logging methods. The small well diameter combined with the lack of a well construction record for CO-620 led to the decision by the WGNHS, USGS-UMWSC, and WDNR to drill a replacement well nearby in the same aquifer. Prior to the filling and sealing of CO-620, concurrent operation of CO-620 and its replacement was also planned to establish an overlapping water-level record.

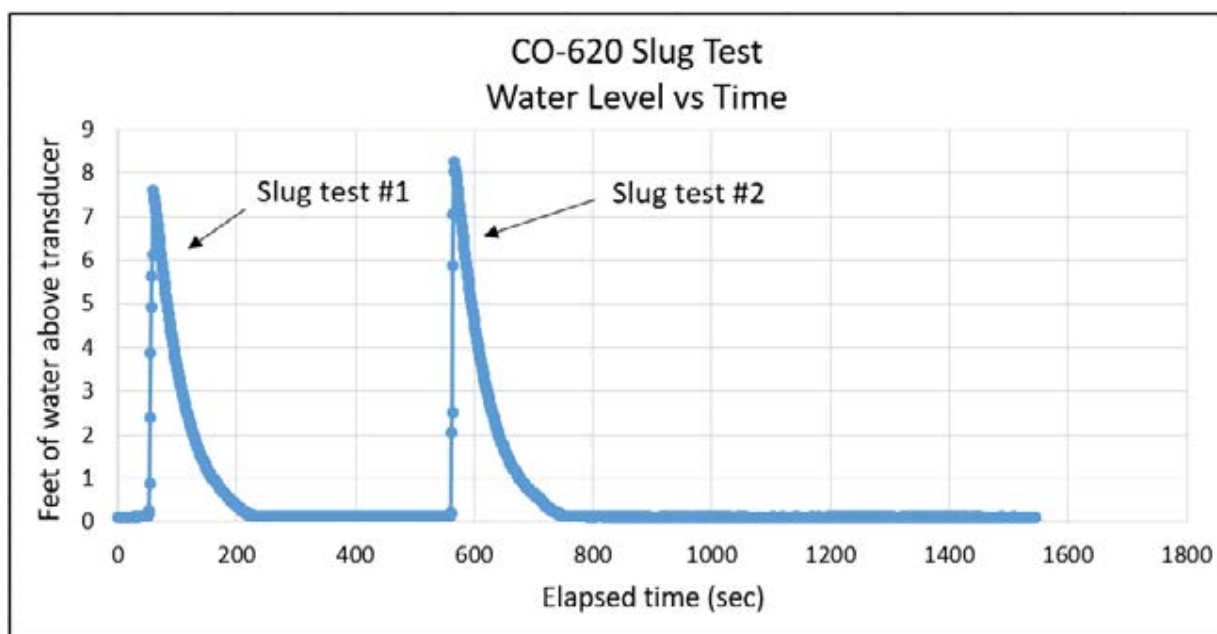


Figure 21. Slug test results for CO-620. Two consecutive slug tests were performed on May 28, 2014, following redevelopment. The pressure transducer was deployed just below static water-level, which explains why there was only about 1-in. of water column above the transducer. Data courtesy of U.S. Geological Survey.

Description of work completed

The WGNHS obtained permission from Alliant Energy in July 2019 to fill and seal CO-620 and drill a replacement well nearby on their property. Replacement well CO-5921 was drilled in October 2019. CO-5921 and CO-620 were monitored concurrently to ensure continuity in the water-level record and CO-620 was subsequently filled and sealed on June 25, 2021. The WGNHS completed a fill and seal report for CO-620, saved a copy in their statewide subsurface database, and submitted a copy to the WDNR in satisfaction of state well drilling codes. CO-5921 effectively replaced CO-620 in both the WGLMN and NGWMN. Details about replacement well CO-5921 are presented below.

Suggestions for future work

CO-620 was filled and sealed on June 25, 2021. No future work remains to be done.

CO-5921 (Columbia County, WI) - replaces CO-620

USGS Site Number: 432924089242901

USGS Site Name: CO-12/09E/27-5921

WGNHS Well ID: 11005921

WDNR Well Number: VQ849

Well information

CO-5921 was drilled October 23, 2019, by Soils & Engineering Services Inc. to replace CO-620. The 8.3-in. diameter borehole was drilled to a reported total depth of 65.7 feet below land surface (ft bls) ^[1]. A 2-in.-diameter PVC casing was subsequently installed to a reported depth of 55.3 ft bls, below which is a PVC screened interval from 55.3 to 65.7 ft blsd. Monitoring began in November 2019 ^[2]. The well was located on Alliant Energy property, east of U.S. Highway 51, south of State Highway 16, and south of Portage, WI (fig. 22). The well is considered to be in good condition.

Latitude, longitude: 43°29'24.16", -89°24'29.22" (NAD83) ^[2]

Land surface datum: 828.6 feet above mean sea level (NAVD88) ^[2]

Hydraulic Unit (USGS Watershed Code): 07070005 ^[2]

Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SND SA (Sandstone Aquifer) ^[2]

Current well depth: 68 ft-BTOC (65.7 ft blsd) ^[1,3]

Current depth of screened interval: 58 to 68 ft-BTOC (55.3 to 65.7 ft blsd) ^[1,3]

^[1] Well details obtained from WDNR Well Construction Form (form 4400-113A)

^[2] Well details obtained from the USGS

^[3] Well details incorporate 11/1/19 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Recent documentation for this well is included in appendix 4



Image Landsat/Copernicus

Figure 22. Location of well CO-5921 (larger red marker), replacement well for CO-620 (also shown) in Columbia County, Wisconsin. The well is located on Alliant Energy property west of U.S. Highway 51 and roughly 2,000 ft east of CO-620.

Initial Work Plan

Work planned to include drilling a replacement well that was constructed as similarly as possible to existing well CO-620. 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 WGNHS Research Collections and Education Center (Core Repository) in Mt. Horeb, Wisconsin. Concurrent operation of CO-620 and its replacement was also planned to establish an overlapping water-level record.

Description of work completed

On October 23, 2019, Soils & Engineering Services, Inc. drilled CO-5921 using a hollow-stem auger to a total depth of 65.7 ft blsd. Drill cuttings were collected every 5 feet and used to generate a lithologic description of the well. Cuttings were archived at the WGNHS Research Collections and Education Center (Core Repository) in Mt. Horeb, Wisconsin. 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. A 7-ft-long, 4-in.-diameter protective cover pipe was installed to 5 ft bls, and a 2-in.-diameter PVC casing was installed to 55.3 ft blsd with a 10 ft screened interval from 55.3 to 65.7 ft blsd. The well was filter-packed with #40 red flint and gravel around the screened interval, from 52 to 65.7 ft bls and the casing was sealed in with bentonite. CO-5921 (fig. 23) is located approximately 2,000 ft from the well it replaced (CO-620) and constructed within the



On November 1, 2019, the USGS-UMWSC surveyed the well using RTN GPS and installed a pressure transducer to begin recording continuous water-level data. On November 14, 2019, the USGS-UMWSC performed a slug test using a 1 and 3/8 -in.-diameter, 5-ft-long solid PVC slug. The water column was displaced by approximately 1.5 feet and showed a good hydraulic response suggesting it is well connected to the surrounding aquifer (fig. 24). Geophysical and video logs were not collected for CO-5921 due to the well's PVC construction and bentonite seal.

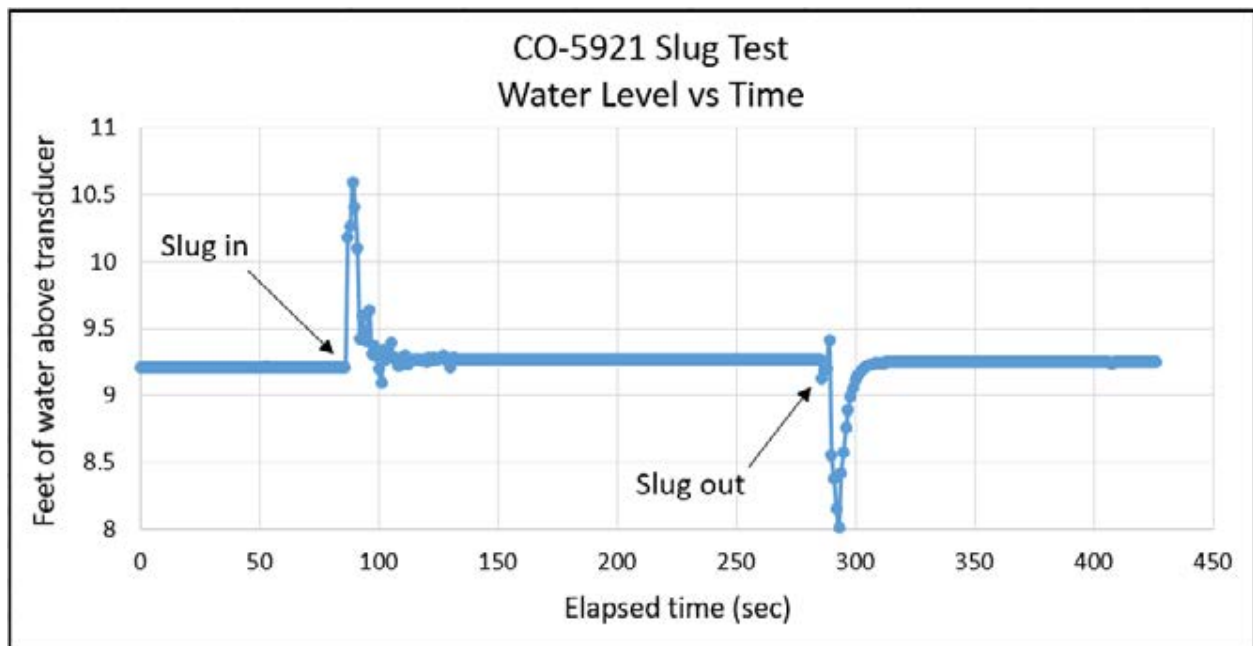


Figure 24. Slug test results for CO-5921. Slug testing was performed on November 14, 2019. Data courtesy of U.S. Geological Survey.

Monitoring for CO-5921 began on November 1, 2019, and concurrent water-level measurements were collected for CO-620 and CO-5921 until June 10, 2020, to ensure continuity of the record at this site (fig. 25).

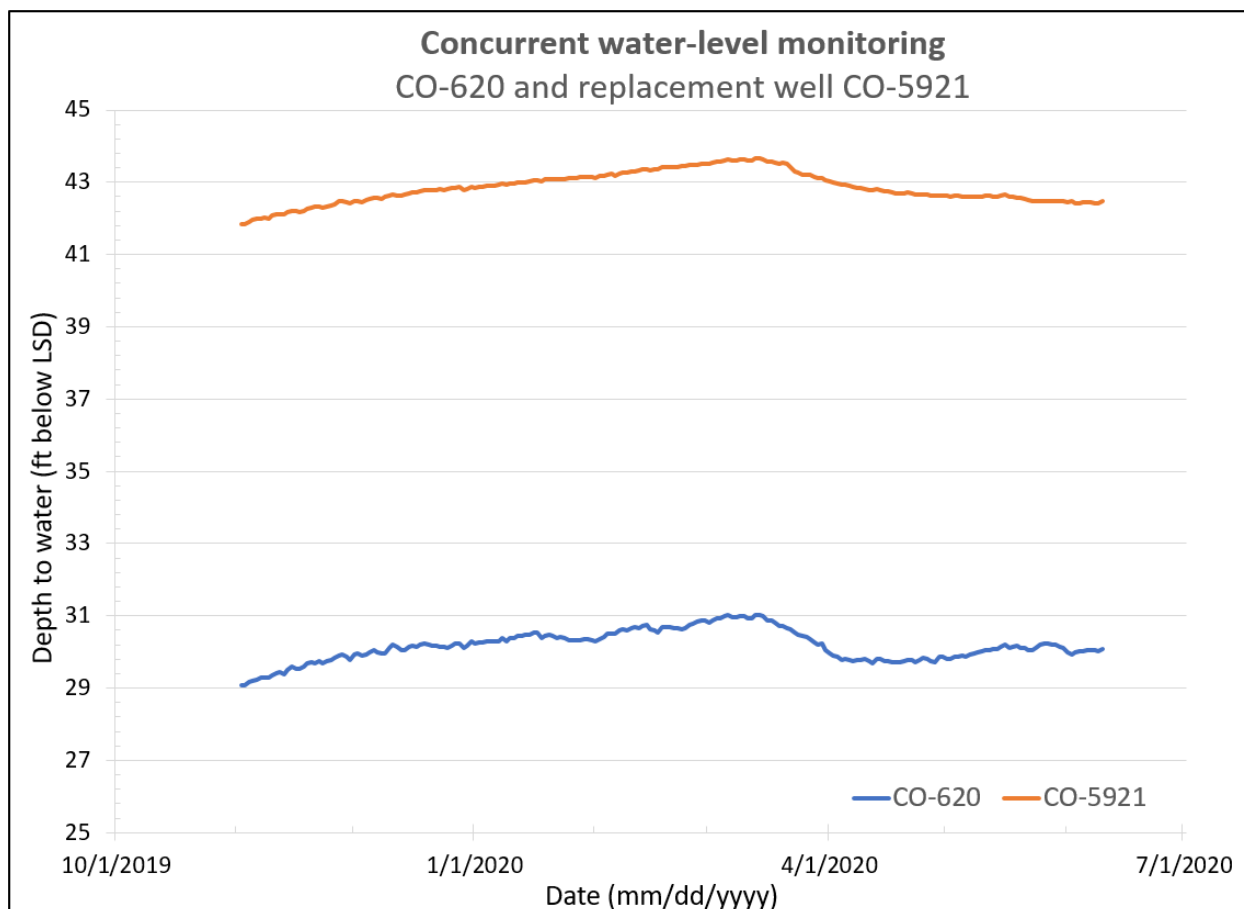


Figure 25. Concurrent water level data for well CO-620 and its replacement well, CO-5921. Accounting for land surface datum of CO-620 (815.3 ft-msl) and CO-5921 (828.6 ft-msl), the difference in water-level elevation between the two wells averaged 0.58 feet over this period. Data courtesy of U.S. Geological Survey.

Concurrent water-level monitoring demonstrates that the response trend for new well CO-5921 closely resembles that of CO-620. The trend for CO-5921, which is located further east from the Wisconsin River than CO-620, appears markedly smoother and less susceptible to water-level fluctuations of the Wisconsin River. In this sense, CO-5921 may provide a more stable water-level response compared to CO-620. Accounting for land surface datum of each well, the average difference in water-level elevations was 0.58 feet over the duration of the concurrent monitoring period. Based on this evaluation, water-level data from CO-5921 appears to provide excellent data continuity at this site and could be combined with historical records for CO-620 to extend the long-term monitoring record.

Suggestions for future work

CO-5921 successfully replaced CO-620. No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

DN-1297 (Dane County, WI)

USGS Site Number: 430406089232901

USGS Site Name: DN-07/09E/23-1297

WGNHS Well ID: 13001297

WDNR Well Number: None

Well Information

This well 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^[3]. The results were inconclusive, and the aquifer type and geologic setting could not be confirmed due to the accumulation of sediment above the bottom of the well's casing. The well is located within the City of Madison-owned right-of-way in downtown Madison, WI (fig. 26) and has been monitored since 1978^[2]. As part of this well investigation, DN-1297 was determined to be unrepairable and in need of replacement.

Latitude, longitude: 43°04'06.14", -89°23'34.08" (NAD83)^[3]

Land surface elevation: 859.0 feet above mean sea level (NAVD88)^[3]

Hydrologic Unit (USGS Watershed Code): 07090001^[3]

Well completed in USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDSDA (Sandstone Aquifer)^[3]

Current well depth: 71.5 ft-BTOC (69.8 ft blsd)^[4]

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 the USGS

^[4] Well details obtained from 7/19/21 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 B of WGNHS Open-File Report 2017-04 (Guenther and others, 2017). A list of these documents is provided in appendix 5 of this report.

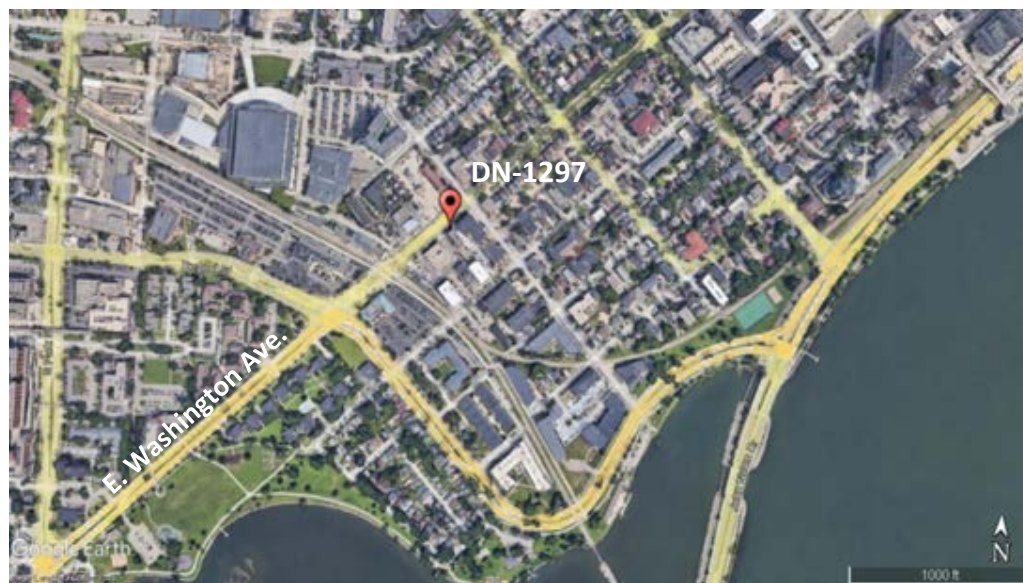


Image Landsat/Copernicus

Figure 26. Location of well DN-1297 (red marker) in Dane County, Wisconsin. The site is 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 4 for well maintenance. Work planned to include redevelopment to remove accumulated sediment at the bottom of the well and confirm the depth of casing, depth of well, and aquifer type. Following redevelopment, 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

The WGNHS obtained permission to access DN-1297 and worked with the City of Madison and a drilling contractor to redevelop the well. In spring 2019, Water Wells, Inc. deployed a bailer to remove debris from the bottom of the well but could not adequately clean out and redevelop the well. Chunks of cement and other fill materials were recovered from the bottom of the well (fig. 27). Although the aquifer response was reasonable (Guenther and others, 2017), the well could not be fully redeveloped and was deemed poorly suited as a long-term monitoring well. Furthermore, due to the lack of historical information about the well (e.g., well construction records, lithologic logs, driller cuttings), it was not possible to confirm the open interval of the well nor the aquifer for which water levels were being recorded. For these reasons, beginning in summer 2019, the WGNHS, USGS-UMWSC, and WDNR decided that it would be best to site and drill a nearby replacement well for DN-1297.



Figure 27. Using a bailer to remove debris and redevelop DN-1297 (left) in the spring of 2019. Cement and other material removed from the bottom of the well (right).

Over the next several months, the WGNHS worked closely with the University of Wisconsin-Madison to identify potential well drilling sites on university property. In autumn 2019, USGS-NGWMN confirmed that surplus objective 5 funds (largely from not drilling a replacement well for BN-76) could not be used to drill a replacement well for DN-1297 under this grant opportunity. WGNHS subsequently included the drilling of a replacement well for DN-1297 in their proposal for USGS-NGWMN Funding Opportunity G20AS00009, which was submitted in January 2020 and approved later that year under USGS-NGWMN Award # G20AC00189. Details about the replacement of DN-1297 will be documented in a future WGNHS Open-File Report pertaining to Award # G20AC00189.

Suggestions for Future Work

Due to the inability to redevelop this well, uncertainty of the well construction and geology, and difficult access conditions along a four-lane road in downtown Madison, WI, we suggest drilling a replacement well for DN-1297.

FR-87 (Forest County, WI)

USGS Site Number: 455620088593901

USGS Site Name: FR-40/12E/21-0087

WGNHS Well ID: 21000087

WDNR Well Number: None

Well Information

This well was drilled in 1967, as an observation well for the U.S. Forest Service, to a reported total depth of 102 feet below land surface (ft bls) ^[1,2]. A 6-in. steel casing was installed to an unknown depth, ^[1] as the original well construction report couldn't be located; however, geophysical logging by WGNHS in 1996 reported a casing depth of approximately 96 feet below top of casing (Dunning and others, 1996) ^[3]. The current landowner remains the U.S. Forest Service and the well is located south of State Highway 70, between Eagle River and Alvin, WI inside a stone structure (figs. 28 and 29). Monitoring began in 1967 ^[2]. Based on the most recent well investigation, FR-87 is considered to be in good condition.

Latitude, longitude: 45°55'58.6", -88°59'27.9" (NAD83) ^[2]

Land surface elevation: 1,750 feet above mean sea level (NAV88) ^[2]

Hydrologic Unit (USGS Watershed Code): 04030108 ^[2]

Well completed in USGS national aquifer N100GLCIAL (Sand and gravel aquifers (glaciated regions)) and local aquifer 110QRNR (Quaternary System) ^[2]

Current well depth: 101.5 ft-BTOC (101.5 ft blsd) ^[4]

Current casing depth: 96.5 ft-BTOC (95.5 ft blsd) ^[4]

^[1] Well details obtained from 1979 USGS well schedule

^[2] Well details obtained from the USGS

^[3] Well details obtained from 1996 DNR Project No. 118 (Dunning and others, 1996)

^[4] Well details from work activities completed for this funding opportunity. Casing and well depths are interpreted from geophysical logs; well depth incorporates 4/7/20 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Historical and recent documentation for this well is included in appendix 6.



Image Landsat/Copernicus

Figure 28. Location of well FR-87 (red marker) in Forest County, Wisconsin. The site is located within the Franklin Lake Campground on U.S. Forest Service property roughly 9-mi southwest of Alvin, WI, and 12-mi east of Eagle River, WI.



Figure 29. FR-87 well head (left) located inside a stone structure (right). Photos courtesy of U.S. Geological Survey.

Initial Work Plan

This well was initially proposed under objective 4 for well maintenance. Work planned to include characterization of the well with a borehole video and full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection and determine a casing depth as no original WCR could be found for this well.

Description of Work Completed

In October 2018, WGNHS obtained permission from the U.S. Forest Service to access and evaluate FR-87. Geophysical and video logging of the borehole was completed by the WGNHS on October 11, 2019. Logging verified a well depth of 101.5 ft blsd, suggesting little to no material accumulation at the bottom of the 6-in.-diameter well. This can be seen in the video-log image taken at the bottom of the well (fig. 30). The well casing depth was established to be 96.5 ft blsd with an additional 5 feet of steel screen. The video log shows that the well casing and screen are in good condition, with only minor biofouling present along the screen and casing wall (fig. 30).

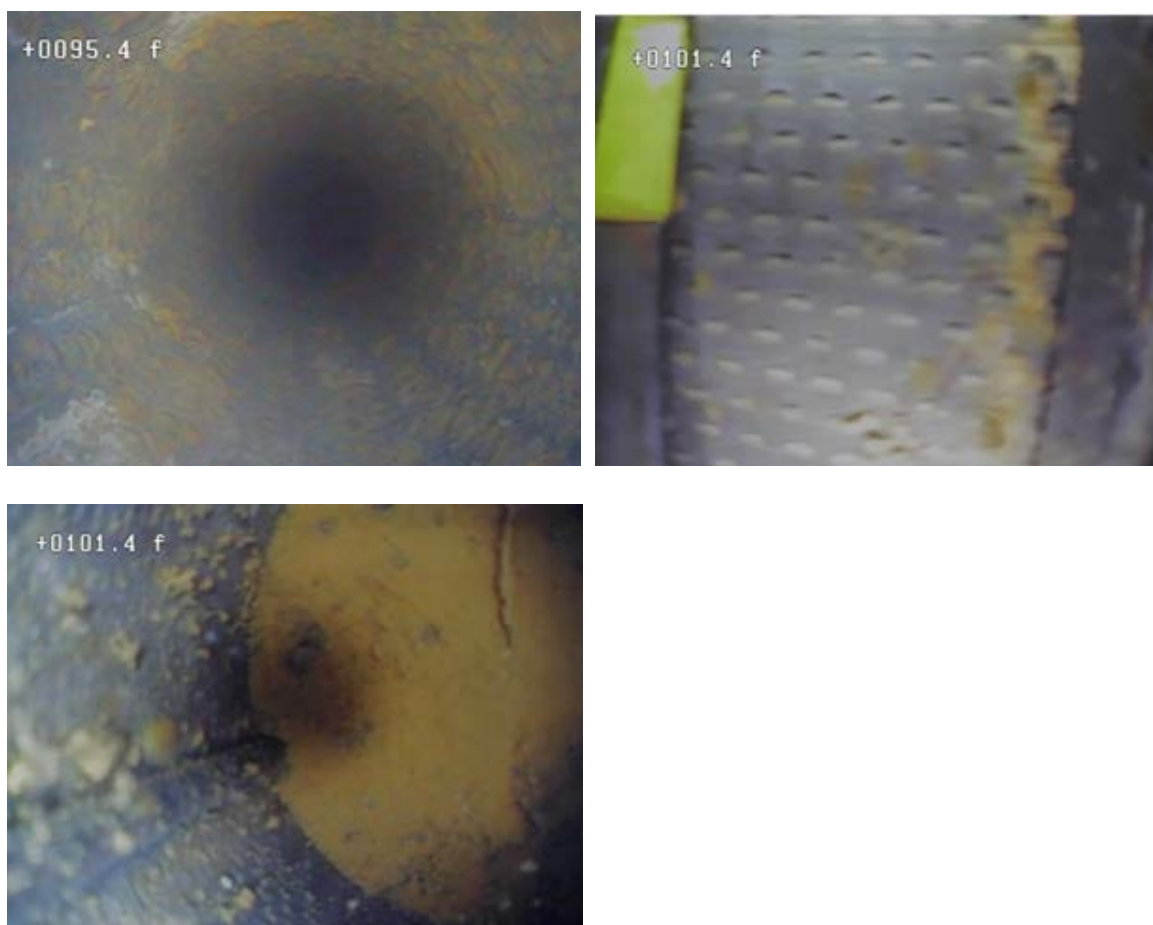


Figure 30. Still shots of borehole video log for FR-87, collected on October 11, 2019, showing small amounts biofouling along the borehole casing (top left), a relatively clean screened interval (top right), and bottom of the well with little sediment accumulation (bottom left).

On May 7, 2020, the USGS-UMWSC performed a slug test using a 3 -in.-diameter, 5-ft-long solid PVC slug. The water column was displaced by approximately 1.25 feet and showed a good hydraulic response, suggesting FR-87 is well connected to the surrounding aquifer (fig. 31).

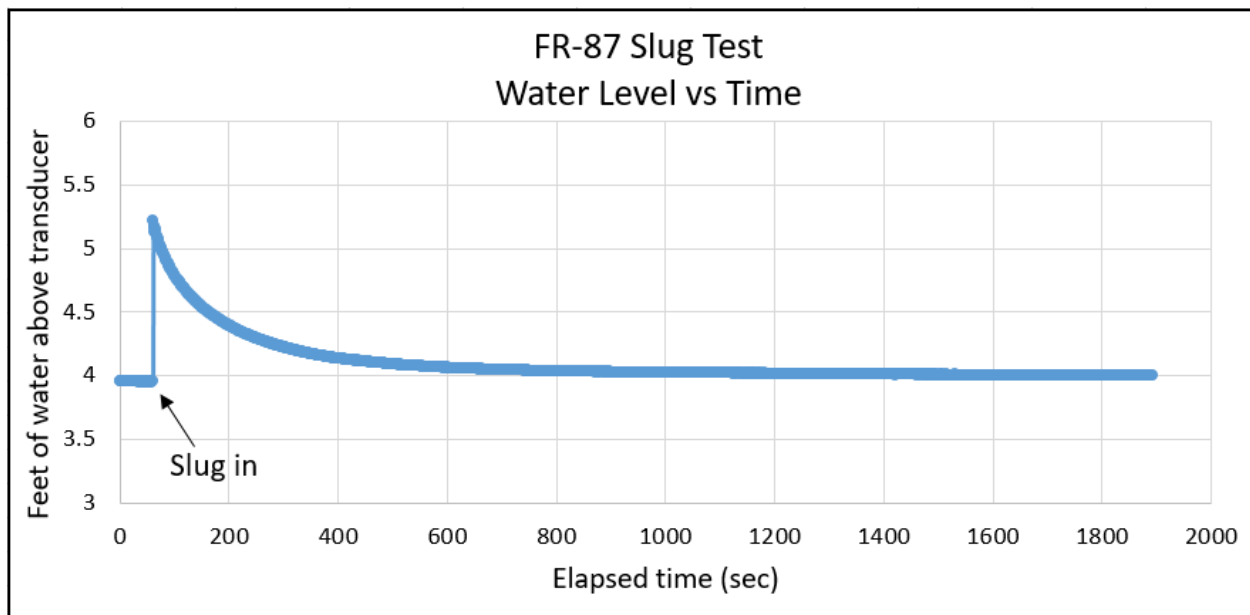


Figure 31. Slug test results for FR-87. Slug testing was performed on May 7, 2020. Data courtesy of U.S. Geological Survey.

Suggestions for Future Work

After completing work on this well, it was determined to be in good condition. No future work is anticipated for this well apart from routine monitoring and maintenance by the USGS-UMWSC.

GR-29/132/133/134 (Grant County, WI)

USGS Site Number: 425246091042 [101], [102], [103], [104]

USGS Site Name: GR-05/06W/27- [0029], [0132], [0133], [0134]

WGNHS Well ID: 22000029, 22000132, 22000133, 22000134

WDNR Well Number: None

Well Information

This site contains a nest of piezometers: GR-29, GR-132, GR-133, and GR-134, also known as the Bagley well nest. Piezometers GR-132, 133, and 134 are artesian. The original well, also named GR-29, was drilled by Layne-Western Co., Inc in 1981 to a reported total depth of 1,428 feet below the land surface datum (ft blsd) ^[1]. The monitoring station is located on private property north of County Rd. A, 2 miles southeast of Bagley, WI (fig. 32). A 16-in.-diameter steel casing was installed from 0 to 26 ft blsd and a 10-in. steel casing was subsequently installed from -3 to 90 ft blsd. Below the 10-in. steel casing, the borehole was left open to bedrock from 90 to 229 ft blsd. Below the open borehole interval are a series of cement plugs and pea gravel intervals were constructed to contain piezometer screens open to discrete intervals of the surrounding aquifer ^[2]. GR-29 is a 2-in.-diameter PVC piezometer that was constructed beneath the upper well seal (depth of 37.38 ft blsd); however, the piezometer does not have a screen and measures water levels associated with the open bedrock interval extending from the bottom of casing (90 ft blsd) to the cement plug at 229 ft blsd. This piezometer corresponds to the Prairie du Chien Aquifer. GR-132 is a 1.5-in.-diameter PVC piezometer (screened from 1,398.73 to 1,413.73 ft blsd) that measures water levels associated with the pea gravel interval from 1,351-1,425 ft blsd (lower Mount Simon Sandstone aquifer). GR-133 is a 1.5-2-in.-diameter PVC piezometer (screened from 819.05 to 834.05 ft blsd) that measures water levels associated with the pea gravel interval from 770 to 1,237 ft blsd (upper Mount Simon Sandstone aquifer). GR-134 is a 1.5-2-in.-diameter PVC piezometer (screened from 519.05 to 534.05 ft blsd) that measures water levels associated with the pea gravel interval from 469 to 665 ft blsd (Wonewoc sandstone aquifer). The geologic log for nearby well GR-87 (Lancaster City Well #2) compares well to the geology encountered in GR-29 (I. Lippelt, WGNHS, personal commun., 2022) and has been included in appendix 7. This monitoring station is located on private property and has been monitored since 1982 ^[3]. Based on this most recent well investigation, GR-29/132/133/134 has been repaired and is considered in good condition.

Latitude, longitude: 42°52'43.11", -91°04'21.11" (NAD27) ^[3]

Current Land surface elevation: 626 feet above mean sea level (NAVD88) ^[3]

Hydrologic Unit (USGS Watershed Code): 07060003 ^[3]

Wells completed in:

GR-29: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 368PRDC (Prairie Du Chien Group) ^[3]

GR-132 and GR-133: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 372MNSN (Mount Simon Sandstone) ^[3]

GR-134: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 372WNWC (Wonewoc Formation) ^[3]

Current well depth: see above paragraph for details

Current casing depth: see above paragraph for details

^[1] Well details obtained from USGS 1981 Site Schedule

^[2] Well details obtained from USGS piezometer construction sketch, 1982

^[3] Well details from USGS

Historical documentation for this well site is included in appendix 7. No new documentation was generated as part of this project.

Initial Work Plan

This work item was not in the original work plan proposal but added later due to a request by the USGS-UMWSC to update the electrical supply and insulated shelter at this monitoring site to prevent freezing and cracking of the artesian wells during winter month. The WGNHS obtained permission from the USGS-NGMWN program to use surplus objective 4 funds for this purpose. Electricity had historically been provided for the monitoring shelter by an extension cord that ran from a nearby Grant County Highway Department facility. Damage to the extension cord, and the need for a safer electrical supply and better insulated shelter, resulted in the trenching of an electrical line to a newly constructed well shelter. The shelter was also equipped with a thermostat-regulated heating unit to prevent freezing conditions during winter months.



Image Landsat/Copernicus

Figure 32. Location of well and piezometer nest GR-29/132/133/134 (red marker), also referred to as the Bagley well nest, in Grant County, Wisconsin. The site is located approximately 66 ft north of County Highway A.

Description of Work Completed

In May of 2020, the USGS-UMWSC installed a new insulated well shelter that was purchased by the WGNHS (fig. 33). WGNHS subsequently contracted with Renner Electric LLC to trench a new electrical line from the power supply at the Grant County Highway Department facility to the well shelter. Renner Electric LLC also completed the electrical wiring and connections needed to power and operate the heating unit, located inside the insulated shelter. As part of this work, Renner Electric LLC also installed additional outlets to improve site conditions for the USGS-UMWSC during routine site visits.



Figure 33. New insulated and heated well shelter (left) and piezometers GR132, GR-133, and GR-134 heads in the shelter (right). Work was completed in May of 2020. Photos courtesy of U.S. Geological Survey.

After Renner Electric LLC completed their work, USGS-UMWSCU confirmed that the shelter was in good working condition. The new insulated shelter with hard-wired electrical service and a thermostat-regulated heating unit provides frost protection for these artesian wells and ensures reliable year-round operation of the monitoring station.

Suggestions for Future Work

As part of this project, WGNHS improved electrical service to the monitoring site and replaced the shelter but did not perform a more extensive evaluation and is therefore not aware of any additional repair needs. No future work is anticipated for this well apart from routine monitoring and maintenance by the USGS-UMWSC.

IW-32 (Iowa County, WI) – replaced by IW-3623

USGS Site Number: 425644090101901

USGS Site Name: IW-06/03E/32-0032

WGNHS Well ID: 25000032

WDNR Well Number: None

Well Information

IW-32 was drilled in 1906 in the city of Dodgeville to supply water to the North Survey School house, which closed in 1960 ^[1]. The well was completed to a reported total depth of 92 ft bls ^[2]. A 6-in.-diameter casing was installed to an unknown depth ^[2]; however, geophysical logs from a WGNHS investigation in 2017 (Guenther and others, 2017) suggest the casing was installed to 13.2 ft bls ^[3]. Below the casing, the hole was open to bedrock. USGS-UMWSC began monitoring the well in 1957 ^[2] but the well was temporarily removed from the WGLMN due to vandalism from 1979-1981 ^[4]. From 1966 onwards, the land was privately owned ^[4]. The well is located at the northeast side of the intersection of Survey Rd. and County Highway B, 2 miles southwest of Dodgeville, WI (figs. 34 and 35). As part of the 2017 investigation (Guenther and others, 2017), IW-32 was determined to be obstructed and WGNHS recommended developing and repairing the well. As part of this investigation, IW-32 was found to be unrepairable, IW-3623 was drilled as a replacement well, and IW-32 was filled and sealed August 5, 2021 ^[6]. New well IW-3623 effectively replaced IW-32 in both the WGLMN and NGWMN.

Latitude, longitude: 42°56'44.53", -90°10'19.64" (NAD83) ^[3]

Land surface datum: 1,201.8 feet above mean sea level (NAVD88) ^[3]

Hydrologic Unit (USGS Watershed Code): 07090003 ^[3]

Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 365GAPV (Galena-Platteville aquifer) ^[3]

Current well depth: n/a well filled and sealed ^[6]

Current casing depth: n/a well filled and sealed ^[6]

^[1] Well details obtained from a 1976 article (Iowa County Bicentennial Education Committee, 1976)

^[2] Well details obtained from 1967 USGS well schedule

^[3] Well details obtained from NGWMN Round II project (Guenther and others, 2017); blsd = below land surface datum

^[4] Well details obtained from historically compiled documents by the WGNHS

^[5] Well details obtained from the USGS

^[6] Well details obtained from 2021 fill and seal report

Historical documentation for this well can be found in WGNHS Open-File Report 2017-04 (Guenther and others, 2017), appendix B; a list of these documents is provided in appendix 8 of this report. Recent documentation for this well is also included in appendix 8 of this report.



Image Landsat/Copernicus

Figure 34. Location of well IW-32 (red marker) in Iowa County, Wisconsin. The site is located on private land at the intersection of Survey Rd. and County Highway B, approximately 3-mi southwest of Dodgeville, WI.



Figure 35. Well cap (wooden board) for well IW-32 hidden by vegetation on a private farm. Photo courtesy of U.S. Geological Survey.

Initial Work Plan

This well was originally proposed under objective 4 for well maintenance. In 2017, as part of the NGWMN Round II project (Guenther and others, 2017), the WGNHS evaluated the well. Based on this evaluation, WGNHS determined the well casing was in adequate condition; however, several problems were identified. The well head was poorly protected by a wooden board and not adequately secure. Inside the well, broken off sections of pipe were visible within and on top of sediment and debris accumulated at the base of the well. The proposed work plan

included removing the pipes, redeveloping the well by removing debris and sediment, and constructing an above-grade wellhead protector to secure the well. Once repaired, a borehole video and full suite of geophysical logs were planned to fully characterize the well, followed by a slug test to ensure proper hydraulic well-aquifer response.

Description of Work Completed

WGNHS obtained permission from the landowner to service the well; however, the proximity to overhead electrical power lines prevented a drill rig from accessing the well. Subsequently, WGNHS obtained approval from USGS-NGWMN in autumn 2019 to apply unused objective 5 funds to drill a replacement well for IW-32 and ensure continued monitoring at this site. Well IW-3623 was drilled in August 2019 to replace IW-32.

IW-3623 was monitored concurrently with IW-32 to ensure continuity in the water-level record and then IW-32 was subsequently filled and sealed on August 5, 2021. The WGNHS completed a fill and seal report for IW-32, saved a copy in the WGNHS statewide subsurface database, and submitted a copy to the WDNR in satisfaction of state well drilling codes. IW-3623 effectively replaced IW-32 in both the WGLMN and NGWMN. Details about replacement well IW-3623 are presented below.

Suggestions for future work

IW-32 was filled and sealed on August 5, 2021. No future work remains to be done.

IW-3623 (Iowa County, WI) - replaces IW-32

USGS Site Number: 425646090102001

USGS Site Name: IW-06/03E/32-3623

WGNHS Well ID: 25003623

WDNR Well Number: VQ879

Well information

IW-3623 was drilled August 16, 2019, by Soils & Engineering Services, Inc. to replace IW-32. The borehole was drilled to reported total depth of 90.5 feet below land surface (ft bls) ^[1]. The borehole is 14.8-in.-diameter from the surface to 9.2 ft bls, reduced to 10-in.-diameter from 9.2 ft bls to 40 ft bls, and 6-in.-diameter from 40 ft bls to 90.5 ft bls. A 6-in. steel casing was installed to a reported depth of 40 ft bls and grouted into bedrock. Below casing the hole is open to bedrock. Monitoring began September 2019 ^[2]. The well is located on the same privately-owned property (fig. 36) as IW-32 and is considered to be in good condition.

Latitude, longitude: 42°56'45.87", -90°10'19.59" (NAD83) ^[2]

Land surface datum: 1197.4 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 365GAPV (Galena-Platteville aquifer) ^[2]

Current well depth: 93 ft-BTOC (90.5 ft blsd) ^[3]

Current casing depth: 42.5 ft-BTOC (40.2 ft blsd) ^[3]

^[1] Well details obtained from WDNR Monitoring Well Construction Form (from 4400-113A)

^[2] Well details obtained from the USGS

^[3] Well details incorporate 9/10/19 USGS-UWMSD tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Recent documentation for this well is included in appendix 8.



Image Landsat/Copernicus

Figure 36. Location of well IW-3623 (larger red marker), replacement well for IW-32 (also shown), in Iowa County, WI. The site is located on private property, approximately 120 ft northwest from IW-32 at the intersection of Survey Rd. and County Highway B, 2-mi southwest of Dodgeville, WI.

Description of work completed

WGNHS established a written land-access agreement with the property owner on August 12, 2019. From August 14-16, 2019, Soils & Engineering Services, Inc. drilled IW-3623 (fig. 37) using a hollow-stem auger and down-hole hammer to a total depth of 90.5 ft blsd. Dolomite bedrock was encountered, below a layer of silty sand and gravel, at 9.2 ft bls. Drill cuttings were collected every 5 ft, used to generate a lithologic description, and archived at the WGNHS Research Collections and Education Center (Core Repository) in Mt. Horeb, Wisconsin. To fulfill reporting requirements with the WDNR, monitoring well construction form 4400-113A, monitoring well development form 4400-113B, and soil boring log 4400-112 were completed and submitted to the WDNR.



Figure 37. Drill rig on site preparing to drill IW-3623, the replacement for IW-32. Well drilling was completed August 14-16, 2019.

The 6-in.-diameter steel casing extends above land surface and was outfitted with a lockable well-head cover. Three yellow steel bumper posts, topped with flags, were installed around the well to protect it from farming equipment in the field and improve visibility (fig. 38). The new well is located approximately 120 feet from IW-32 and is established in the same Cambrian-Ordovician aquifer system to ensure continuity with the monitoring record at IW-32. SES subsequently developed the well on August 16, 2019, using compressed air.



Figure 38. Location of IW-3623 well head surrounded by high-visibility protective bollards and flagging.

On September 9, 2019, the USGS-UMWSC surveyed the well using RTN GPS and installed a pressure transducer to begin recording continuous water-level data. Geophysical and video logging of the borehole was completed September 25, 2019, by the WGNHS. Logging verified a casing depth of 40.2 ft blsd. The video log shows that the steel casing is well seated into bedrock (fig. 39).

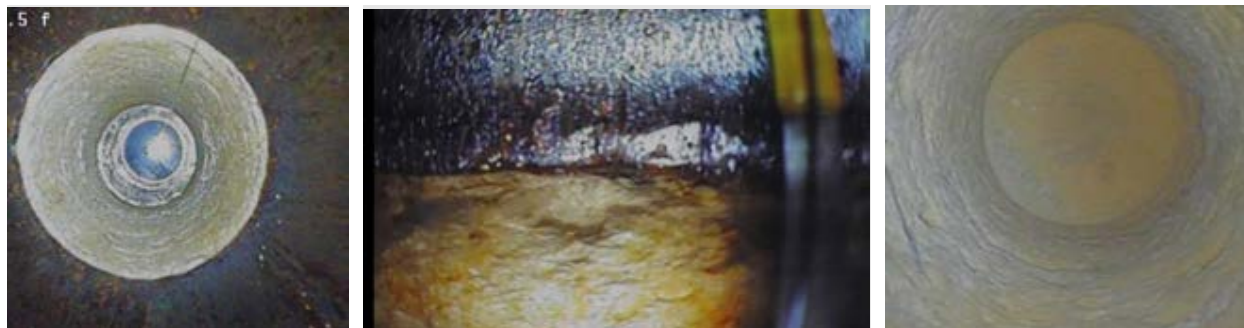


Figure 39. Still shots from borehole video log for IW-3623, collected in September 25, 2019, showing bottom of casing (left and center) and bottom of hole (right).

On March 4, 2020, the USGS-UMWSC performed a slug test using two 3 -in.-diameter, 5-ft-long solid PVC slugs. The water column was displaced by approximately 2.5 feet and showed a good hydraulic response suggesting it is well connected to the surrounding aquifer (fig. 40).

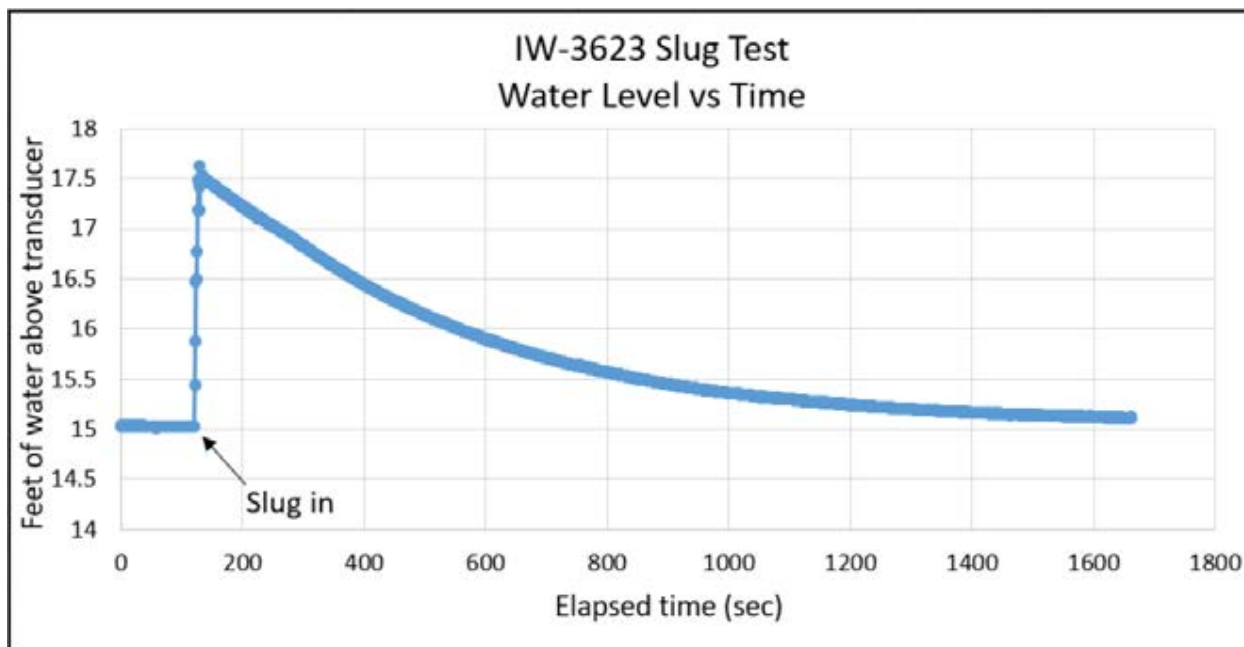


Figure 40. Slug test results for IW-3623. Slug testing was performed on March 4, 2020. Data courtesy of U.S. Geological Survey.

Monitoring for IW-3623 began in September 2019 and concurrent water-level measurements were collected for IW-32 and IW-3623 to ensure continuity of the record at this site (fig. 41). Concurrent water-level monitoring demonstrates that the response trend for new well IW-3623 closely resembles that of IW-32. Accounting for land surface datum of each well, the average difference in water-level elevations was 0.09 feet over the duration of the concurrent monitoring period. Based on this evaluation, water-level data from IW-3623 appears to provide excellent data continuity at this site and could be combined with historical records for IW-32 to extend the long-term monitoring record.

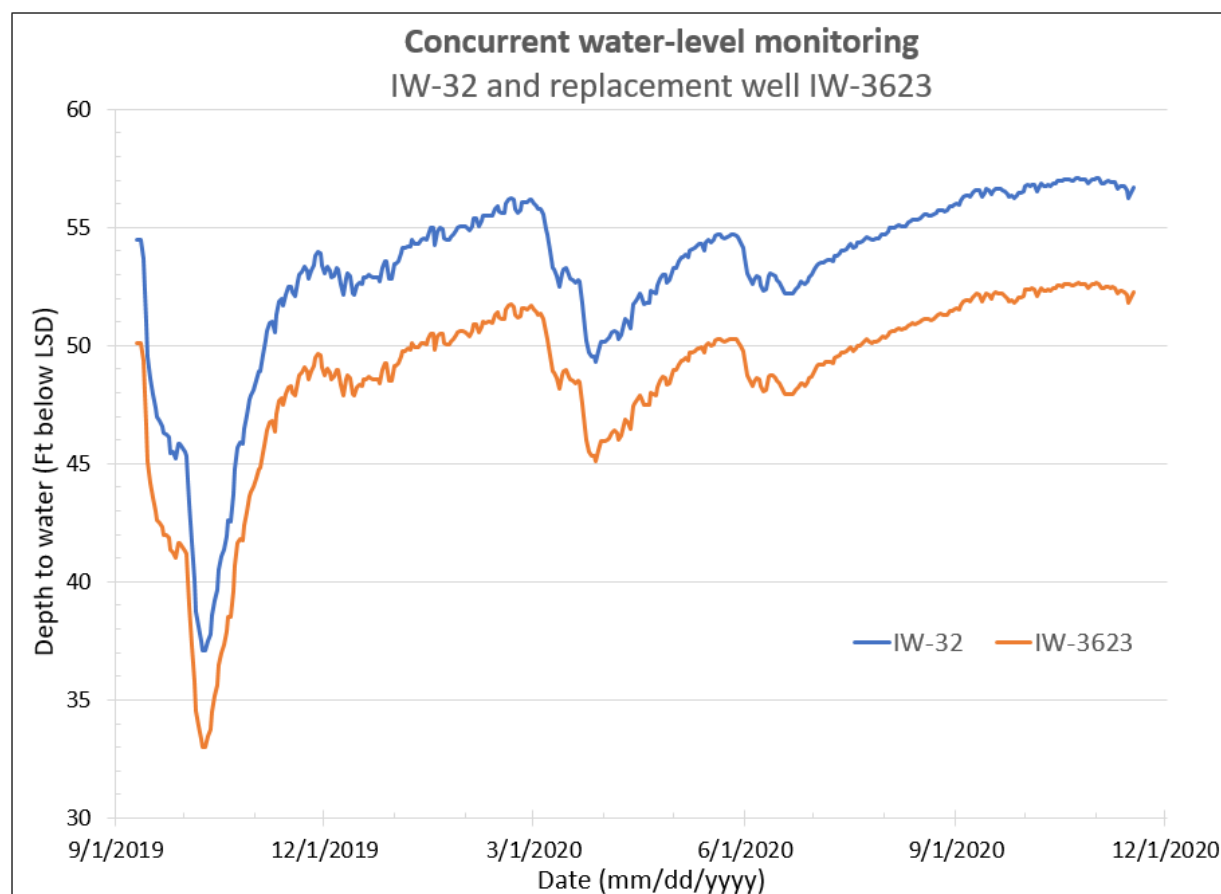


Figure 41. Concurrent water-level data for well IW-32 and its replacement well, IW-3623. Accounting for land surface datum of IW-32 (1201.8 ft-msl) and IW-3623 (1197.4 ft-msl), the difference in water-level elevation between the two wells averaged 0.09 feet over this period. Data courtesy of U.S. Geological Survey.

Suggestions for future work

IW-3623 successfully replaced IW-32. No future work is anticipated for this well with the exception of routine monitoring and maintenance by the USGS-UMWSC.

LA-1493 (Langlade County, WI)

USGS Site Number: 450914089061701

USGS Site Name: LA-31/11E/22-1493

WGNHS Well ID: 34001493

WDNR Well Number: VQ876

Well information

LA-1493 was drilled as a new WGLMN and NGWMN well on October 10, 2019, by Soils & Engineering Services, Inc. The well is located on Langlade County Airport property near Antigo, Wisconsin (fig. 42). The 8.3-in. borehole was drilled with hollow-stemmed augers to a reported total depth of 51.3 feet below land surface datum (ft blsd) ^[1]. A 2-in.-diameter PVC casing was installed to a reported depth of 35.9 ft blsd, below which is a PVC-screened interval from 35.9 to 51.3 ft blsd. Monitoring began in November 2019 ^[2]. The well is considered to be in good condition.

Latitude, longitude: 45°09'13.65", -89°06'17.11" (NAD83) ^[2]

Land surface datum: 1520.7 feet above mean sea level (NAVD88) ^[2]

Hydrologic Unit (USGS Watershed Code): 07070002 ^[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: 53.7 ft-BTOC (51.3 ft blsd) ^[1,3]

Current screened interval: 38.7 to 53.7 ft-BTOC (35.9 to 51.3 ft blsd) ^[1,3]

^[1] Well details obtained from WDNR Monitoring Well Construction Form (form 4400-113A)

^[2] Well details obtained from the USGS

^[3] Well details incorporate 11/14/19 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Recent documentation for this well is included in appendix 9.



Image Landsat/Copernicus

Figure 42. Location of well LA-1493 (red maker) in Langlade County, Wisconsin. The site is located on Langlade County Airport property, approximately 2-mi east of Antigo WI.

Initial work plan

LA-1493 was originally proposed under objective 5 for well drilling. For several years, the WGNHS, USGS-UMWSC, and WDNR have supported the expansion of groundwater-level monitoring within the Antigo Flats, which is one of the most intensively pumped regions in the state. This new well represents a step towards achieving better baseline groundwater-level monitoring in this region, which is recognized as a priority for the WGLMN and NGWMN. 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 WGNHS Research Collections and Education Center (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

In September 2019, the WGNHS established a written land-access agreement with Langlade County Airport to place a well on their property. The well was sited upgradient, east of the airport along Airport Rd. On October 10, 2019, Soils & Engineering Services, Inc. drilled well LA-1493 using a hollow-stem auger to a total depth of 53.31 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 WGNHS Research Collections and Education Center (Core Repository) in Mt. Horeb, Wisconsin. 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. A 7-ft-long, 4-in.-diameter protective cover pipe was installed to 5 ft blsd and a 2-in.-diameter PVC casing was installed to 35.9 ft blsd with a screened interval from 35.9 to 51.31 ft blsd. The well was filter-packed with red flint sand and gravel around the screened interval, from 33 to 51.31 ft blsd and the casing was sealed in with bentonite. Two 7-ft-long, 2-in.-diameter steel high-visibility protective bumper posts were installed around the well head (fig. 43). The well was subsequently developed the same day it was drilled using a submersible pump (fig. 43).



Figure 43. Newly completed well LA-1493 with white 2-in.-diameter PVC well casing visible above the 4-in.-diameter protective cover pipe (left-most yellow post). Two high-visibility protective bollards are located to the right of the well. A submersible pump, equipped with tubing for developing the well, is visible on the ground and an electronic tape for taking discrete tape-down measurements is hanging from the well head.

In November 2019, the USGS-UMWSC surveyed the well using RTN GPS and installed a pressure transducer to begin recording continuous water-level data. On November 14, 2019, the USGS-UMWSC performed a slug test using a 1 and 3/8 -in.-diameter, 5-ft-long solid PVC slug. The water column was displaced by approximately 0.7 feet and showed a rapid hydraulic response suggesting it is well connected to the surrounding aquifer (fig. 44). Geophysical and video logs were not collected for LA-1493 due to the well's PVC construction and bentonite seal. Monitoring for LA-1493 began November 14, 2019. Monitoring for LA-1493 began November 14, 2019.

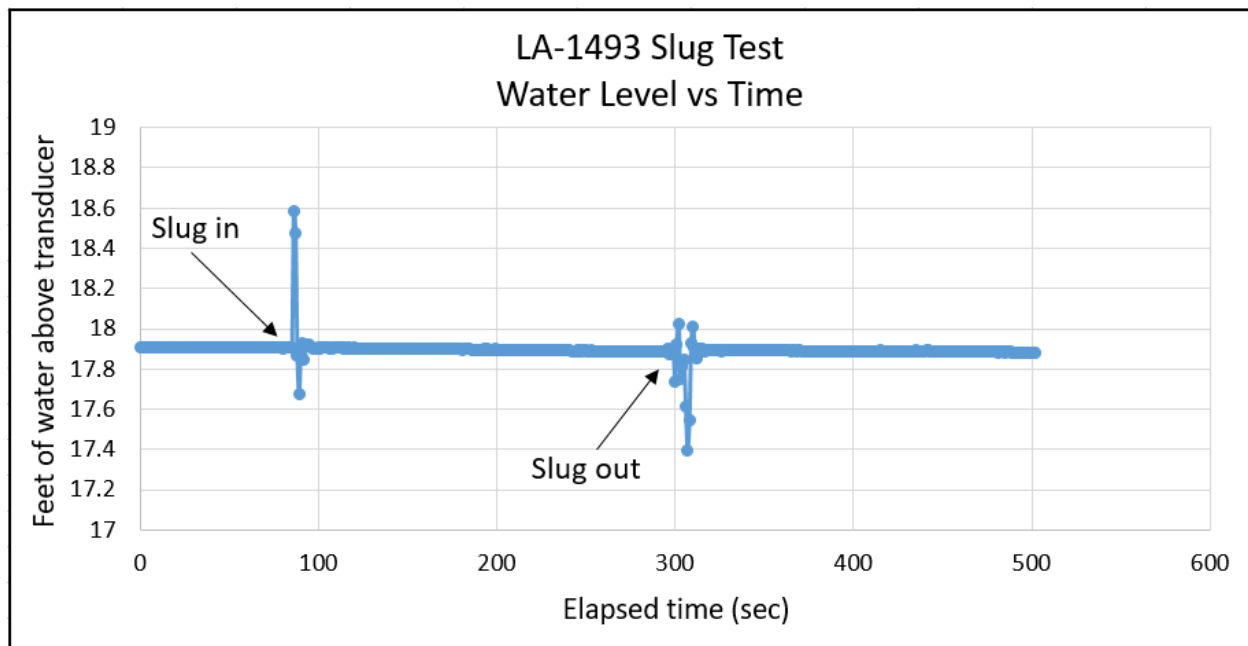


Figure 44. Slug test results for LA-1493. Slug testing was performed on November 14, 2019. Data courtesy of U.S. Geological Survey.

Suggestions for future work

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

ML-118 (Milwaukee County, WI) – replaced by ML-8035

USGS Site Number: 430706087583601

USGS Site Name: ML-08/21E/35-0118

WGNHS Well ID: 41000118

WDNR Well Number: None

Well information

ML-118 was drilled as a domestic water-supply well on privately-owned property in 1941 to a reported total depth of 134.5 ft bls ^[1]. A 6-in.-diameter steel casing was installed to a reported total depth of 124 ft bls ^[2]. Below the casing, the hole was left open to bedrock from 124 to 134.5 ft bls. Monitoring began in 1946 ^[3] and the well was maintained as a monitoring station after homes in this neighborhood transitioned to municipal water supply. This well is in a difficult-to-access location at the backyard of a home in a residential neighborhood close to McGovern Park, approximately 130 feet east of N. 51st St (figs. 45 and 46). Previous investigation of this well by Rauman and others (1999) reported sediment accumulation in the well to a depth of 104.5 ft bls. Due to difficult site access and sediment infill, ML-8035 was drilled as a replacement well in August 2021. New well ML-8035 effectively replaced ML-118 in both the WGLMN and NGWMN. As of publication of this report, ML-118 was not filled and sealed because the landowner remained largely unresponsive to WGNHS requests to access the site.

Latitude, longitude: 43°07'00.54", -87°58'36.24" (NAD83) ^[3]

Land surface altitude: 679.3 feet above mean sea level (NAVD88) ^[3]

Hydrologic Unit (USGS Watershed Code): 04040003 ^[3]

Well completed in: USGS national aquifer N499SLRDNV (Silurian-Devonian aquifer system) and local aquifer 355NGRN (Niagaran Series) ^[3]

Current well depth: 104.5 ft-BTOC ^[4]

Current casing depth: 124 ft-BTOC ^[2]

^[1] Well details obtained from 1946 USGS well schedule

^[2] Well details obtained from 1941 well construction report

^[3] Well details obtained from the USGS

^[4] Well information obtained from 1999 DNR Project No. 135 (Rauman and others, 1999); ft-BTOC = feet below top of casing; distance between land surface and top of casing was approximately 0.6 ft in 1999

Historical and recent documentation for this well is included in appendix 10.



Image NOAA, Landsat/Copernicus

Figure 45. Location of well ML-118 (red marker) in Milwaukee County, Wisconsin. The site is located on private property in a residential neighborhood approximately 130 feet west of N. 51st Blvd across from McGovern Park.

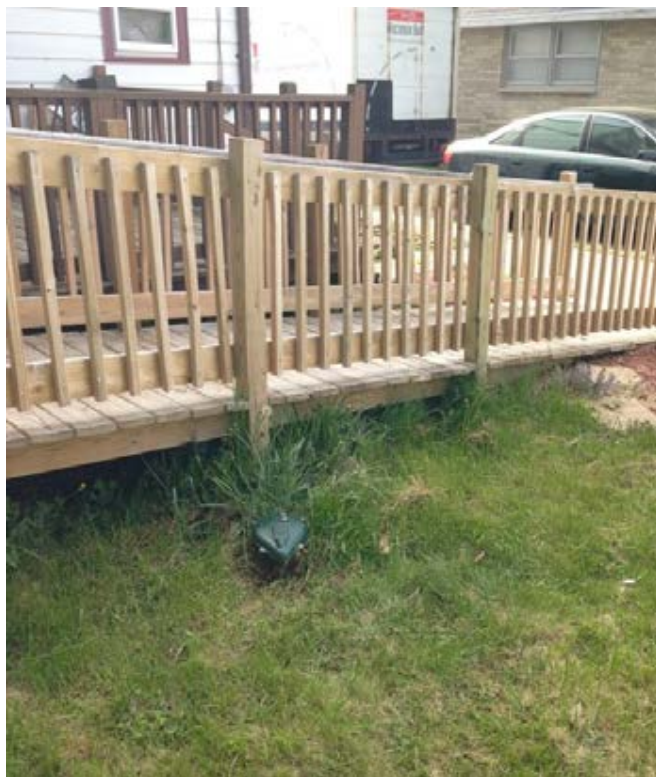


Figure 46. ML-118 well head located in the backyard of the private property directly next to wooden ramp. Photo courtesy of U.S. Geological Survey.

Initial work planned

This well was initially proposed under objective 5 for well drilling. Slug testing on December 15, 2015, prior to the start of this project, documented a good hydraulic connection between ML-118 and the surrounding Silurian aquifer (fig. 47); however, difficult site access and deterioration of the well led to the decision by the WGNHS, USGS-UMWSC, and WDNR to drill a replacement well nearby in the same aquifer. WGNHS planned to perform concurrent monitoring between ML-118 and the nearby replacement well to establish an overlapping water-level record. WGNHS also planned to contract with a well service company to remove the blockage in ML-118 prior to filling and sealing.

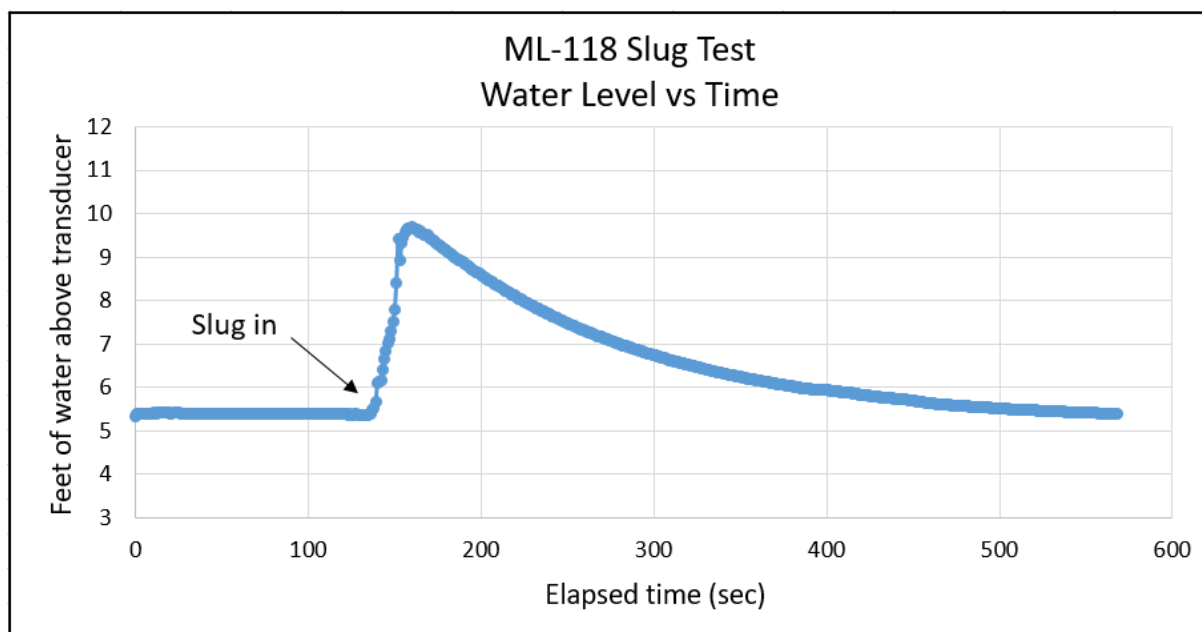


Figure 47. Slug test results for ML-118, performed prior to this project, on December 15, 2015. Data courtesy of U.S. Geological Survey.

Description of work completed

On November 7th, 2018, WGNHS collected a video log of ML-118 to characterize the obstruction in the well. The video revealed a hole in the casing wall, the buildup of biofilm along the casing wall, and appreciable debris accumulation towards the base of the well (fig. 48). The hole in the casing sidewall is believed to be the former water lateral where a pit-less adapter would have attached to provide a sanitary and frost-proof seal between the well casing and the water line to the home. The video camera was unable to descend past an obstruction, measured by the video cable at approximately 104 ft-BTOC, which is consistent with the depth of 104.5 ft-BTOC recorded by Rauman and others (1999).



Figure 48. Still shots from borehole video log of ML-118, collected on November 7, 2018, showing a hole in the casing wall (left) and a large amount of biofilm and debris in the well (right). The camera stopped at a blockage around 104 ft bls (as measured by video cable).

WGNHS identified nearby Havenwoods State Forest, that is managed by the WDNR, as an ideal location for siting a replacement well for ML-118. WGNHS worked closely with WDNR staff at Havenwoods State Forest to review site maps and in September 2019, permission was granted to drill a replacement well near the visitor center. On March 10, 2020, Subsurface Exploration Services, LLC drilled replacement well ML-8032 to a reported total depth of 137 ft bls. The well was built with a 2-in. PVC casing to a reported depth of 127 ft bls, and a 10 ft PVC screened interval from 127 to 137 ft bls. During well development and subsequent slug testing, ML-8032 was determined to be in poor hydraulic connection to the surrounding aquifer and WGNHS decided to drill a new well in another location at Havenwoods. The poor aquifer connection measured in ML-8032 was attributed to low hydraulic conductivity of the Silurian carbonate bedrock aquifer over the 10 ft screened interval.

ML-8032 was filled and sealed on June 3, 2021, and the new replacement well, ML-8035, was completed on June 6, 2021. To ensure improved aquifer connectivity, ML-8035 was constructed as an open borehole into Silurian bedrock, was drilled. ML-8035 effectively replaced ML-118 in both the WGLMN and NGWMN. Details about replacement well ML-8035 are presented below.

Suggestions for future work

WGNHS did not fill and seal ML-118 due to challenges accessing the site and working with the landowner. The private landowner is responsible for filling and sealing the unused well on their property as detailed in Wisconsin Administrative Code NR 812.26 (4). Otherwise, no future work remains to be done at this site.

ML-8035 (Milwaukee County, WI) - replaces ML-118

USGS Site Number: 430742087581102

USGS Site Name: ML-08/21E/26-8035

WGNHS Well ID: 41008035

WDNR Well Number: AAK181

Well information

Following the unsuccessful installation of ML-8032 the previous year (see above), ML-8035 was drilled June 3, 2021, by Sam's Well Drilling to replace ML-118. ML-8035 is located about 100 ft east of ML-8032 at the same Havenwoods State Forest property in Milwaukee, Wisconsin (fig. 49) ^[1]. A 6-in. borehole was drilled to a total depth of 122.4 ft blsd. 6-in. steel casing was installed to 100.3 ft blsd, below which the borehole was left open to the Silurian bedrock aquifer from 100.3 to 122.4 ft blsd. Monitoring of ML-8035 began in July 2021 ^[2] and the well is considered to be in good condition.

Latitude, longitude: 43°07'42.33", -87°58'09.52" (NAD83) ^[2]

Land surface datum: 704.5 feet above mean sea level (NAVD88) ^[2]

Hydrologic Unit (USGS Watershed Code): 04040003 ^[2]

Well completed in: USGS national aquifer N400SLRDVN (Silurian-Devonian aquifer system) and local aquifer 355NGRN (Niagaran Series) ^[2]

Current well depth: 124.8 ft-BTOC (122.4 ft blsd) ^[1,3]

Current casing depth: 102.7 ft-BTOC (100.3 ft blsd) ^[1,4]

^[1] Well details obtained from WDNR Monitoring Well Construction Form (form 4400-113A)

^[2] Well details obtained from the USGS

^[3] Well details incorporate USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

^[4] Well details incorporate WGNHS geophysical log measurements from

Recent documentation for this well is included in appendix 10

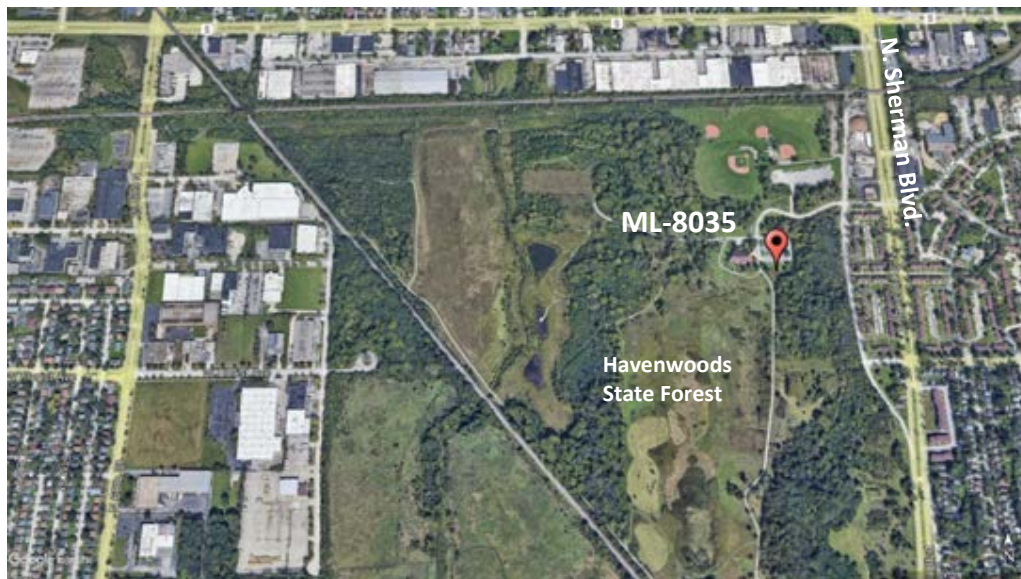


Image NOAA, Landsat/Copernicus

Figure 49. Location of well ML-8035 (red marker), replacement well for ML-118 in Milwaukee County, Wisconsin. The site is in the Havenwoods State Forest approximately 200 feet southeast of the visitor's center and approximately 60 feet south of the parking lot.

Initial work planned

Work planned to include drilling a replacement well, constructed similarly to ML-118 with an open interval within the Silurian bedrock aquifer. 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 WGNHS Research Collections and Education Center (Core Repository) in Mt. Horeb, Wisconsin. Due to access challenges at ML-118, concurrent water-level monitoring was not planned.

Description of work completed

In the fall of 2020, following the unsuccessful installation of ML-8032 earlier in the year, WGNHS received permission to drill another well on Havenwoods State Forest property. ML-8035 was drilled by Sam's Well Drilling to replace ML-118 on June 3, 2021 (fig. 50). A 6-in. borehole was drilled using reverse air rotary to a total depth of 122.4 ft bldsd^[1]. Drill cuttings were collected every 5 feet (fig. 50) and used to generate a lithologic description of the well borehole. Cuttings were archived at the WGNHS Core Repository in Mt. Horeb, Wisconsin. 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 50. Drilling ML-8035 (left) and carbonate bedrock cuttings (right).

6-in. steel casing was installed to 100.3 ft blsd, below which, the 6-in. borehole was left open to the carbonate bedrock aquifer from 100.3 to 122.4 ft blsd. The well was complete with a locking well head cover. Unlike ML-8032, ML-8035 was constructed as an open borehole well in bedrock, without a PVC well screen, to improve hydraulic connection to the Silurian aquifer. The WGNHS subsequently developed ML-8035 using a submersible pump on July 9, 2021 and collected a borehole video. The borehole video showed that the casing is well-seated into bedrock and the bottom of the hole is relatively clean (figs. 51 and 52).

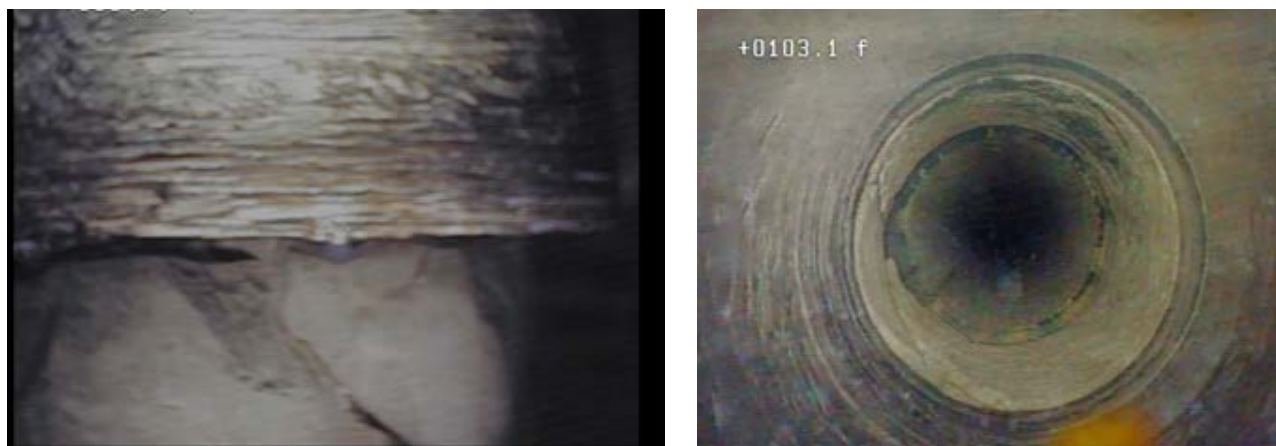


Figure 51. Still shots from borehole video log of ML-8035, collected July 9, 2021, showing bottom of casing. Sideview of borehole wall at bottom of casing (left) and down-hole view of bottom of casing (right).

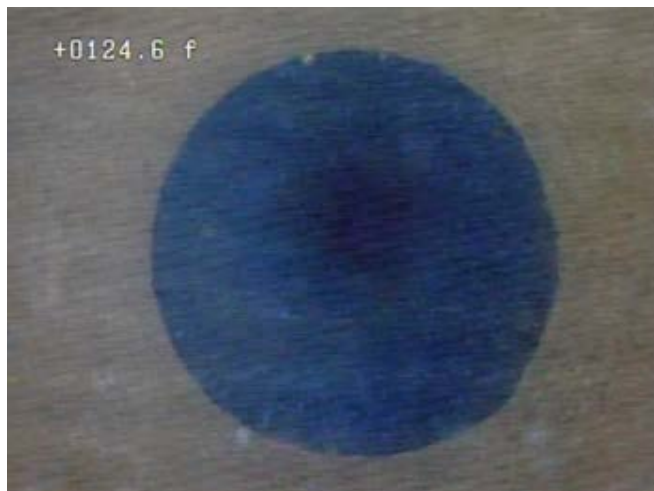


Figure 52. Still shot from borehole video for ML-8035 showing the bottom of the borehole.

Geophysical logs were collected by the WGNHS on July 12, 2021, which confirmed the bottom of casing at 100.3 ft blsd.

On July 15, 2021, the USGS-UMWSC surveyed the well using RTN GPS, installed a pressure transducer to record continuous water-level data, and performed a slug test using a 3 -in.-diameter, 5-ft-long solid PVC slug. The water column was displaced by approximately 2 feet and showed a good hydraulic response, suggesting it is well connected to the surrounding aquifer (fig. 53). Monitoring at ML-8035 began on July 15, 2021.

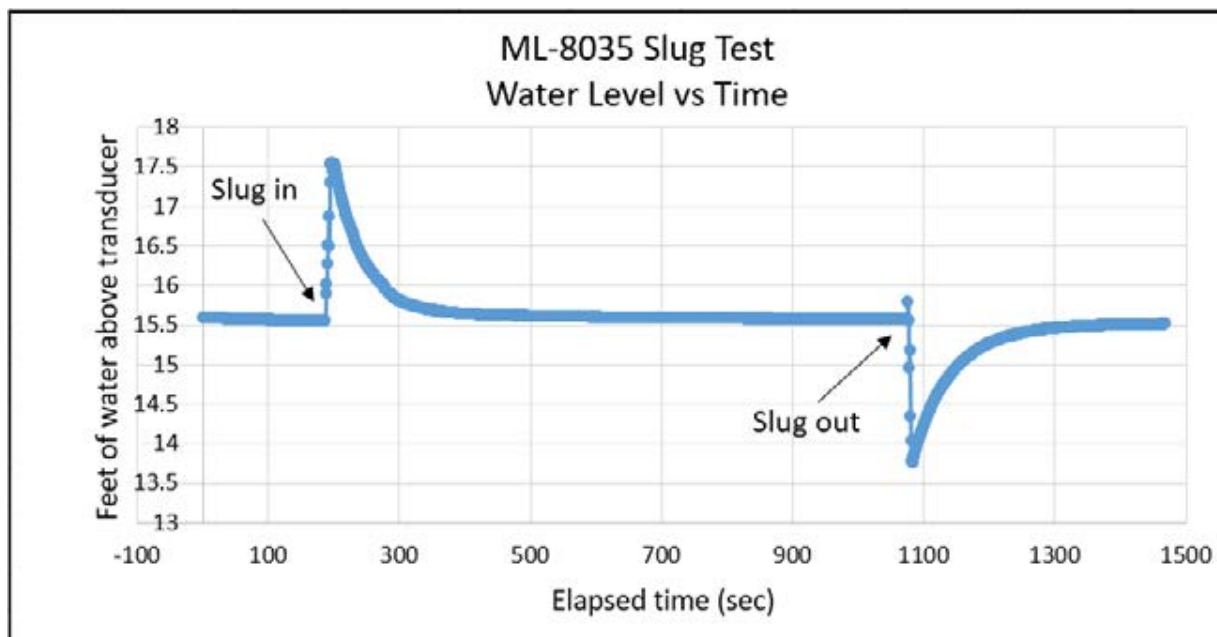


Figure 53. Slug test results for ML-8035. Slug testing was performed on July 15, 2021. Data courtesy of U.S. Geological Survey.

In June 2021 an educational sign was installed next to the completed well head (fig. 54).



Figure 54. Well head of newly constructed ML-8035 (left) and educational sign installed next to well head (right).

Suggestions for future work

ML-8035 successfully replaced ML-118. No future work is anticipated for this well except for routine monitoring and maintenance by the USGS-UMWSC.

ML-148 (Milwaukee County, WI)

Site Number: 425613088014301

Site Name: ML-06/21E/32-0148

WGNHS Well ID: 41000148

WDNR Well Number: None

Well information

ML-148 was drilled in 1933 to a total reported depth of 179.5 ft bls as an observation well in Milwaukee County Whitnall Park ^[1]. A 4-in. soil pipe was installed above a sealed 6-in.-diameter ^[2] steel casing that extended to 43 ft bls, below which the borehole was left open to the carbonate aquifer ^[1]. Inside the soil pipe, a ¼-in. PVC access port was attached to the steel plate sealing the 6-in. steel casing. Monitoring began in 1946 ^[3]. In 2017, the WGNHS reconstructed the well head to allow for routine access to the well ^[2]. The well is still located on Milwaukee County property in Whitnall Park (figs. 55 and 56). Based on this most recent well investigation, ML-148 has been repaired and is considered in good condition.

Latitude, longitude: 42°56'12.55", -88°01'44.28" (NAD83) ^[3]

Land surface datum: 774.6 feet above mean sea level (NAVD88) ^[3]

Hydraulic Unit (USGS Watershed Code): 04040002 ^[3]

Well completed in: USGS national aquifer N400SLRDVN (Silurian-Devonian aquifers) and local aquifer 355NGRN (Niagaran Series) ^[3]

Current well depth: 181.5 ft-BTOC (181.5 ft blsd) ^[4]

Current casing depth: 41 ft-BTOC (41 ft blsd) ^[4]

^[1] Well details obtained from 1946 USGS Well Schedule

^[2] Well details obtained from NGWMN Round II project work (Guenther and others, 2017)

^[3] Well details obtained from the USGS

^[4] Well details from work completed for this funding opportunity. Casing and well depths are interpreted from geophysical logs; well depth incorporates 5/29/20 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 WGNHS Open-File Report 2017-04 (Guenther and others, 2017), appendix E; a list of these documents is provided in appendix 11 of this report. Additional historical documents and recent documentation for this well are also included in appendix 11 of this report.



Image Landsat/Copernicus

Figure 55. Location of well ML-148 (red marker) in Milwaukee County, Wisconsin. The site is located in a parking lot west of S. 92nd St and south of Boerner Drive, within Whitnall Park, a public park owned by Milwaukee County.



Figures 56. ML-148 flush-mounted protective well cap (left) and PVC well head located below ground surface within a steel protective cover flush-mounted with the parking lot (right). Photos courtesy of U.S. Geological Survey.

Initial work planned

This well was initially proposed under objective 4 for well maintenance. In 2016-2017, the WGNHS, as part of our NGWMN Round II project work (Guenther and others, 2017) improved well access by installing a casing extension using a 6-inch to 4-inch rubber coupling, a 4-in. PVC riser pipe with screw top. The WGNHS and USGS-UMWSC also characterized the well with geophysical logs, a video log, and a slug test. Logging data indicated the well depth to be 174 ft blsd, suggesting approximately 5.5 feet of accumulated material at the bottom of the well. Work planned to include redevelopment of the well by removing the accumulated material, characterizing the well with a full suite of geophysical logs and a video log, and testing the well-aquifer connection by performing a slug test.

Description of work completed

In 2019, WGNHS established a new right-of-entry permit with Milwaukee County Parks and contracted with CTW Corporation to complete the well redevelopment. On December 3, 2019, CTW Corporation, overseen by the WGNHS, redeveloped the well and successfully removed approximately 7.5 feet of accumulated material from the bottom of the well (fig. 57) using an air-lift method. The material removed included sediment, disintegrated casing, and biofouling debris. Tape down measurements following redevelopment shows the total well depth is 181.5 ft blsd, which is 2 feet deeper than recorded on the 1946 USGS well schedule.



Figure 57. (Left) Debris airlifted from ML-148 on December 3, 2019. Note the discoloration of the water due to the removal of biofoul build-up along the borehole wall. (Right) Pieces of disintegrated and rusted metal casing that were air lifted from well during development.

On April 21, 2020, a borehole video and full suite of geophysical logs were collected by the WGNHS. Logging confirmed a casing depth of 41 ft blsd, that the casing is in adequate condition despite rusted pieces being found during redevelopment, and that the bottom of well is largely clear of debris (fig. 58).

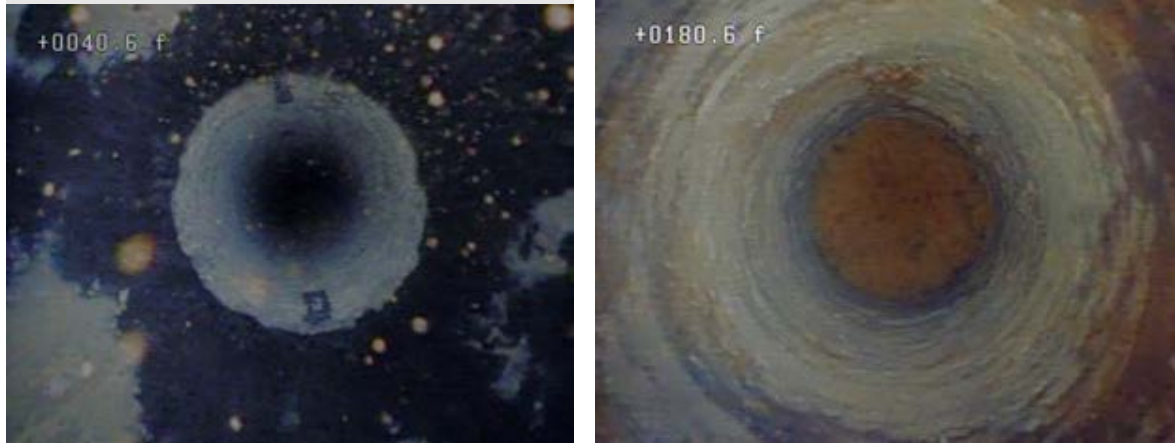


Figure 58. Still shots from borehole video log of ML-148, collected April 21, 2020, showing bottom of casing (left) and bottom of well (right).

The USGS-UWMSC performed a slug test on ML-148 on May 29, 2020, using a 3 -in.-diameter, 5-feet long solid PVC slug. The water column was displaced by approximately 1.5 feet and showed a good hydraulic response, suggesting it is well connected to the surrounding aquifer (fig. 59).

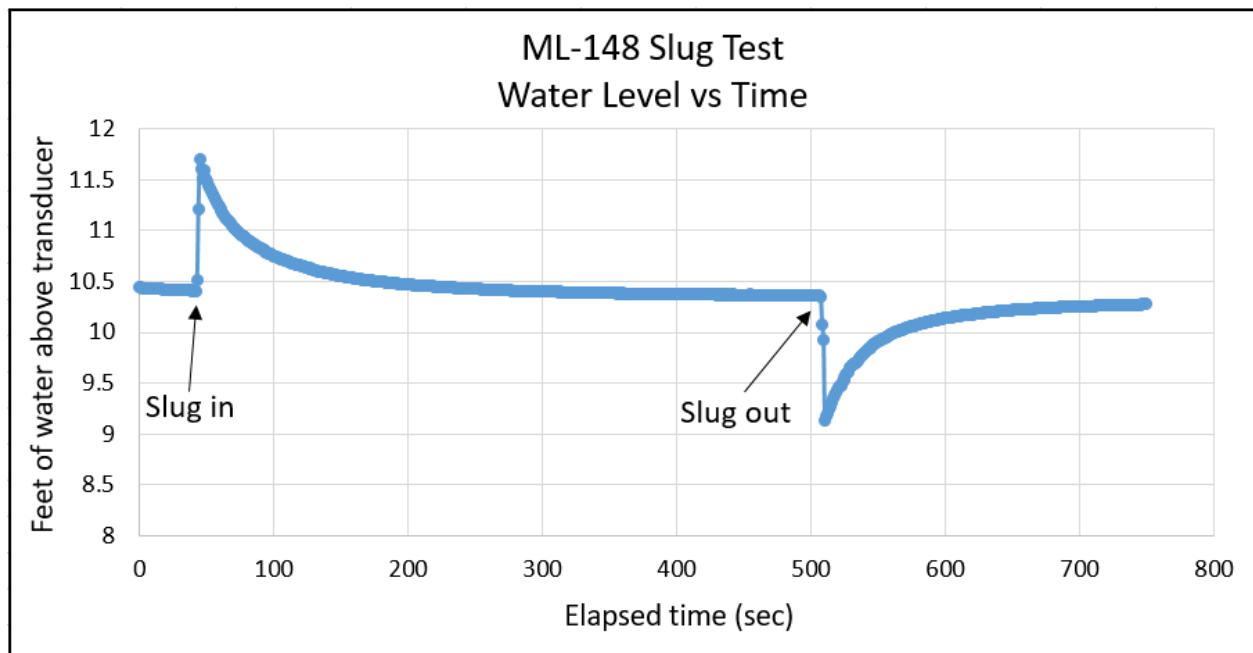


Figure 59. Slug test results for ML-148. Slug testing was performed on May 29, 2020. Data courtesy of U.S. Geological Survey.

Suggestions for future work

After completing work on ML-148, the well is considered to be in good condition. No future work is anticipated for this well with the exception of routine monitoring and maintenance by the USGS-UMWSC.

MN-28 (Manitowoc County, WI)

USGS Site Number: 440430087420401

USGS Site Name: MN-19/23E/35-0028

WGNHS Well ID: 36000028

WDNR Well Number: IY078

Well information

MN-28 was drilled by Sterling E. & Son in 1959 to a reported total depth of 147 feet below land surface (ft bls) for the Wisconsin Highway Commission to supply water to a roadside park ^[1]. A 10-in.-diameter steel casing was installed to a reported depth of 21 ft bls, and 6-in. casing was subsequently installed from the land surface to a reported 133 ft bls. Below the casing, the 6-in. hole was left open to the carbonate bedrock aquifer from 133 to 147 ft bls. Monitoring began in 1968 ^[2]. The well is located in the City of Manitowoc and the current landowner is the City of Manitowoc (figs. 60 and 61). The well was characterized by the USGS-UMWSC and WGNHS in 2016 ^[3]. Based on this most recent well investigation, MN-28 is considered to be in good condition.

Latitude, longitude: 44°04'25.46", -87°42'06.14" (NAD83) ^[2]

Land surface datum: 682.5 feet above mean sea level (NAVD88) ^[2]

Hydrologic Unit (USGS Watershed Code): 04030101 ^[2]

Well completed in: USGS national aquifer N400SLRDVN (Silurian-Devonian aquifers) and local aquifer 350SLRN (Silurian system) ^[2]

Current well depth: 144.6 ft-BTOC (143.4 ft blsd) ^[4]

Current casing depth: 130.5 ft-BTOC (129.3 ft blsd) ^[4]

^[1] Well details obtained from 1959 well construction report

^[2] Well details obtained from USGS

^[3] Well details obtained from WGNHS Open-File Report 2017-04 (Guenther and others, 2017)

^[4] Well details obtained from work completed for this funding opportunity. Casing and well depths are interpreted from geophysical logs; well depth incorporates 10/2/18 USGS-UWMSU 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 WGNHS Open-File Report 2017-04 (Guenther and others, 2017), appendix D; a list of these documents is provided in appendix 12 of this report. Recent documentation for this well is also included in appendix 12 of this report.



Image @ 2022 TerraMetrics

Figure 60. Location of well MN-28 (red marker) in Manitowoc County, Wisconsin. The site is located under a picnic shelter behind the Manitowoc Area Visitor and Convention Bureau building approximately 200 feet south of Calumet Ave. (U.S. Highway 151) and 250 feet west of Dewey St. in southwest Manitowoc, Wisconsin.



Figure 61. MN-28 well head located under picnic shelter. Photo courtesy of U.S. Geological Survey.

Initial work planned

This well was initially proposed under objective 4 for well maintenance. In 2016, as part of our NGWMN Round II project work, the WGNHS removed accumulated material from the well bottom and redeveloped this well (Guenther and others, 2017). A video log and slug test were completed after redevelopment in 2016. Work for this round of funding planned to include characterization of the well with a full suite of geophysical logs to supplement the data collected in 2016.

Description of work completed

In 2018, WGNHS established contact with the Manitowoc Area Visitor and Convention Bureau and gained permission to complete work on the well, which is located behind the visitor center building. On November 8, 2018, the WGNHS collected a full suite of geophysical logs, indicating a well depth of 143.4 ft bld and casing depth of 129.3 ft bld, which is largely consistent with historical records. During geophysical logging, elevated fluid conductivity values were measured near the bottom of the well, indicating brackish groundwater in the deeper portions of this well. While the elevated water conductivity does not affect water-level monitoring at this site, we wanted to document the finding. The USGS-UMWSC performed a slug test on April 1, 2021, using two 3-in.-diameter, 5-ft-long solid PVC slugs. The water column was displaced approximately 1 foot and shows a good hydraulic response, suggesting MN-28 is well connected to the surrounding aquifer (fig. 62).

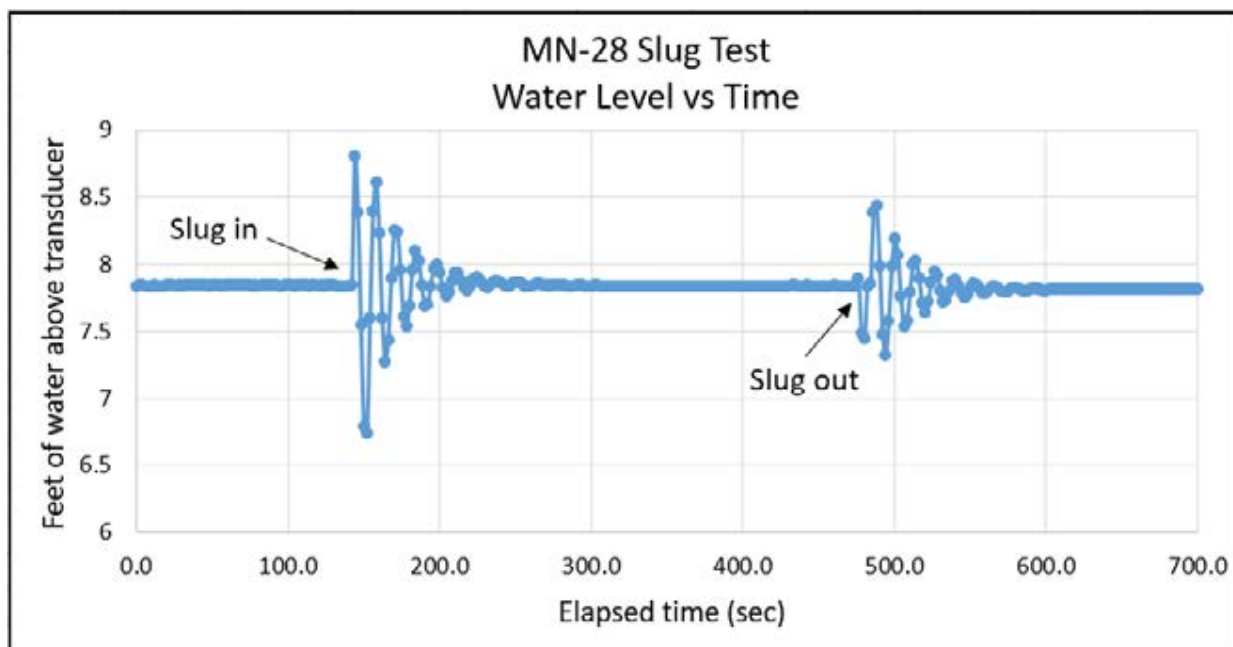


Figure 62. Slug test results for MN-28. Slug testing was completed on April 1, 2021. Data courtesy of U.S. Geological Survey.

Suggestions for future work

After completing work on MN-28, the well is considered to be in good condition. No future work is anticipated for this well with the exception of routine maintenance and monitoring by the USGS-UMWSC.

MO-02 (Monroe County, WI)

USGS Site Number: 434342090495601
 USGS Site Name: MO-15/04W/34-0002
 WGNHS Well ID: 42000002
 WDNR Well Number: None

Well information

There is no known well construction report for MO-02; however, USGS records indicate that MO-02 was drilled in 1895 to a reported total depth of 44.1 ft bls as a private well on private property ^[1]. A 5-in.-diameter steel casing was installed to an un-reported depth ^[1]. At some point before 1994, a 3-in.-diameter PVC casing was suspended from the top of the well, presumably for the purpose of guiding the rise and fall of a Sutron shaft-encoder float that was deployed for measuring water levels ^[2]. WGNHS geophysical logs collected between 1994 and 1996 (Dunning and others, 1996), recorded a 3-in.-diameter orifice to a depth of 16.5 ft bls (presumably the PVC casing insert) and a 5-in.-diameter orifice to a depth of 29 ft bls (presumably the original well casing) ^[3]. Below the steel casing, the well is considered open to the sandstone bedrock aquifer ^[4]. Monitoring began in 1934 ^[4]. The well is currently located on private property in the flood plain of a stream valley that is difficult to access (fig. 63). Based on this most recent investigation, MO-02 is considered well connected to the aquifer; however, due to the lack of historical well construction records and difficult access conditions on private property, WGNHS recommends replacing this well at some point in the future.

Latitude, longitude: 43°43'43.35", -90°49'55.16" (NAD83) ^[2]

Land surface datum: 1,132.3 feet above mean sea level (NAVD88) ^[4]

Hydrologic Unit (USGS Watershed Code): 07060001 ^[4]

Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDSDA (Sandstone Aquifer) ^[4]

Current well depth: 47.8 ft-BTOC (42.6 ft blsd) ^[5]

Current casing depth: Unknown; most likely 29 ft bls ^[3]

^[1] Well details obtained from 1946 USGS Well Schedule

^[2] Well details obtained from USGS

^[3] Well details obtained from Dunning and others (1996); note that the land surface datum (lsd) was updated for this work, the lsd, in 1994-1996, was 0.5 ft- below top of casing

^[4] Well details obtained from 1967 USGS well schedule

^[5] Well details obtained from USGS-UMWSC 10/2/18 tape-down

Historical documentation for this well is included in appendix 13. No new documentation was generated as part of this project.



Image Landsat/Copernicus

Figure 63. Location of well MO-02 (red marker) in Monroe County, Wisconsin. This site is located in the flood plain of a river valley on private property, 3000 ft west of County Rd. PC and 1000 ft north of Octagon Ave., approximately 3 miles southwest of Cashton, Wisconsin.

Initial work plan

This well was initially proposed under objective 4 for well maintenance. The plan was to replace the existing well-head shelter with a more secure weatherproof flip-top shelter. Due to the remote location of this well, it was decided that a complete geophysical evaluation would not be performed.

Description of work completed

In late 2018, the WGNHS began working with the USGS-UMWSC to purchase a replacement shelter for MO-02. In spring 2019, the USGS-UMWSC decided the well would be easier to operate if the existing monitoring equipment (Sutron shaft encoder with float) was replaced with a pressure transducer. Since a larger flip-top shelter would no longer be needed, on August 20, 2019, the USGS-UMWSC removed the large, galvanized well shelter and Sutron unit (fig. 64). The 3-in.-diameter PVC pipe (fig. 64), on which the Sutron was mounted, was also removed from inside the 5-in.-diameter steel casing. A 6-in.-diameter protective steel well head cover was then cemented into place over the 5-in.-diameter casing (fig. 65) and a pressure transducer was deployed to the well. A new land surface datum and measurement point were also established using RTN-GPS.



Figure 64: MO-02 well shelter and equipment before replacement (left) and old 3-in.-diameter PVC casing insert, exposed after shelter and equipment was removed (right). Photos courtesy of U.S. Geological Survey



Figure 65. MO-02 with new protective steel well-head cover placed over the 5-in.-diameter casing. Work was completed in August of 2019. Photos courtesy of U.S. Geological Survey.

The USGS-UMWSC performed a slug test on MO-02 August 20, 2019, using a 1.5 -in.-diameter, 6-ft-long solid PVC slug. The water column was displaced approximately 0.5 feet and showed a good hydraulic response, suggesting MO-02 is well connected to the surrounding aquifer (fig. 66).

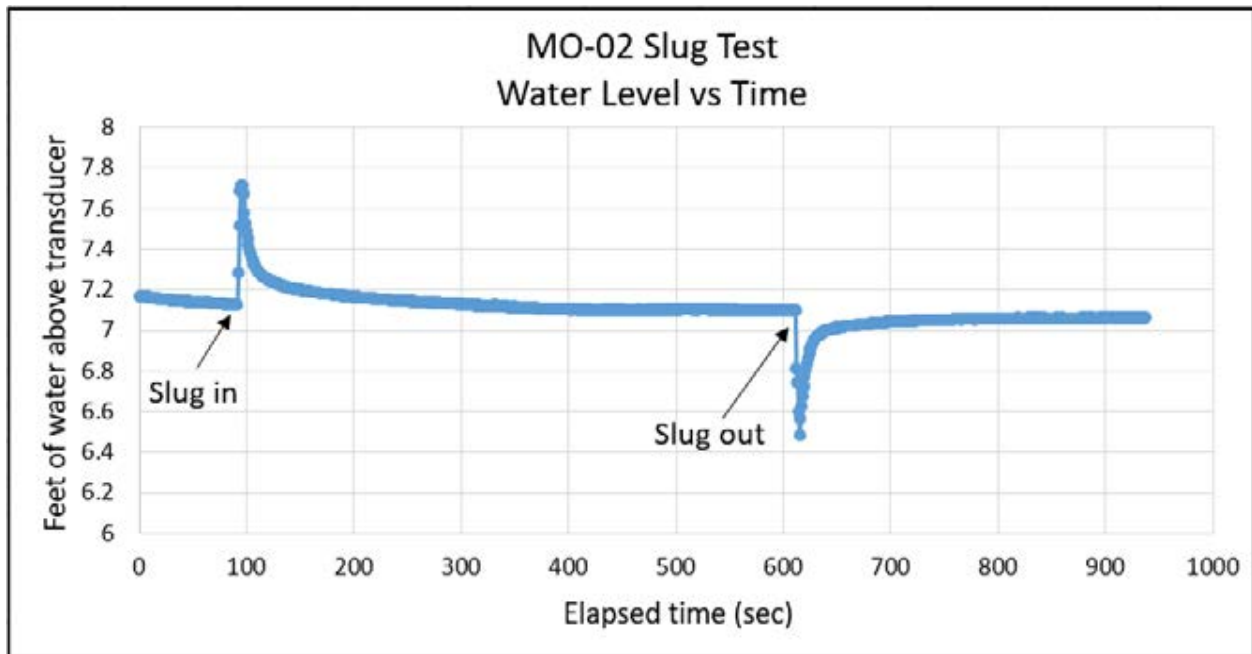


Figure 66. Slug test results for MO-02. Slug testing was performed on August 20, 2019. Data courtesy of U.S. Geological Survey

Suggestions for future work

While the upgrades to MO-02 were successful, ensuring better operation and protection for the well, and the slug test demonstrated a good hydraulic response, we recommend replacing MO-02 with a new well at another nearby site. The lack of original well records and poor access make it unfeasible to fully evaluate or service the well and the location so close to a stream on private property is also not ideal for long-term monitoring.

MO-17 (Monroe County, WI)

USGS Site Number: 440026090390101
USGS Site Name: MO-18/02W/29-0017
WGNHS Well ID: 42000017
WDNR Well Number: None

Well information

MO-17 well was drilled on U.S Army property by M. F. Baley in 1940 ^[1] to a reported total depth of 192 ft bls to supply water for Fort McCoy ^[2]. The 1940 lithologic log reports the well depth to be 190 ft bls; however, USGS measurements and work done for this most recent well evaluation indicate the well was drilled to 192 ft bls. A 10-in.-diameter steel casing was installed in the 10-in.-diameter borehole to a reported total depth of 109 ft bls ^[1]. Some older records report a 9-in.-diameter casing; however, this is incorrect. Below the casing, the borehole was left open to the sandstone bedrock aquifer. Monitoring began in 1950 ^[3]. The well is currently located on the U.S. Army property in a difficult to access area in the woods (fig. 67). Based on this most recent investigation, MO-17 was found to contain excessive bio-film deposits within the well and exhibit poor aquifer connectivity. Due to these findings and the difficult access conditions within the tree line, WGNHS recommends replacing this well at some point in the future.

Latitude, longitude: 44°00'25.40", -90°39'01.81" (NAD83) ^[3]
Land surface datum: 905.5 feet above mean sea level (NAVD88) ^[3]
Hydrologic Unit (USGS Watershed Code): 07040006 ^[3]
Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 300SNDAS (Sandstone Aquifer) ^[3]
Current well depth: 191.5 ft-BTOC (191 ft blsd) ^[4]
Current casing depth: 109 ft-BTOC (108.5 ft blsd) ^[4]

^[1] Well details obtained from 1940 lithologic log

^[2] Well details obtained from 1949 USGS well schedule

^[3] Well details obtained from USGS

^[4] Well details obtained from work completed for this funding opportunity. Casing and well depths are interpreted from geophysical logs; well depth incorporates 11/18/20 USGS tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Historical and recent documentation for this well is included in appendix 14.



Image Landsat/Copernicus

Figure 67. Location of well MO-17 (red marker) in Monroe County, Wisconsin. The site is located on Fort McCoy U.S. Army property approximately 135 feet south State Highway 21 and 540 feet east of X Rd.

Initial work planned

This well was initially proposed under objective 4 for well maintenance. Work planned to include replacement of a shelf in the well shelter that houses the water-level monitoring equipment (fig. 68), followed by characterization of the well with a full suite of geophysical, a borehole video, and a slug test to evaluate well-aquifer connectivity.



Figure 68: MO-17 galvanized well shelter (left) with shelf holding shafter encoder and float (right), before replacement. Photos courtesy of U.S. Geological Survey.

Description of work completed

The WGNHS obtained permission to access MO-17 and perform necessary work at the site. Upon initial inspection, the USGS-UMWSC decided it would be best to replace the entire shelter with a weatherproof flip-top shelter to provide better protection for the well and the water-level monitoring equipment. During summer 2019, the USGS-UMWSC removed the large, galvanized well shelter and reinstalled the Sutron shaft encoder with float (fig. 69). On January 29, 2020, the USGS-UMWSC replaced the Sutron unit with a submersible pressure transducer to collect water levels.



Figure 69: New flip-top well shelter (left) installed at MO-17. The shaft encoder was reinstalled when the flip-top shelter was installed in summer 2019 but eventually replaced with a pressure transducer (right) in January 2020. Photos courtesy of U.S. Geological Survey.

Geophysical and video logging of the well was completed by WGNHS on April 29, 2020. The borehole video equipment could not descend past approximately 124 ft-BTOC, as measured by the video equipment, and therefore unable to reach the bottom of the well. The borehole video was also unable to image the bottom of casing due to extremely high turbidity and bio-film debris covering the borehole wall below approximately 108 ft-BTOC, as measured by the video equipment (fig. 70). Geophysical logging confirmed depth of casing at 108.5 ft blsd, and a well depth of 191.5 ft blsd, which are consistent with historical records.

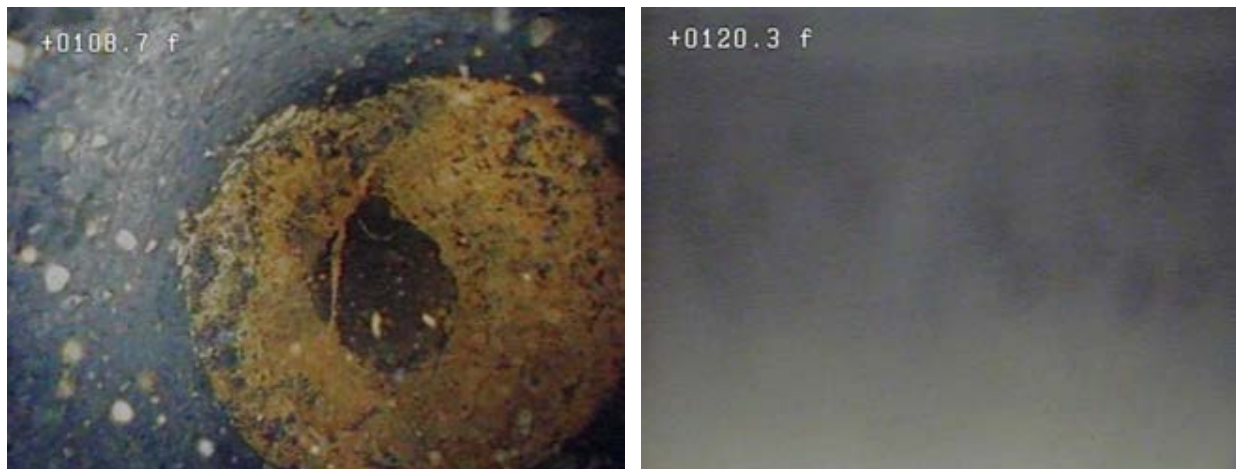


Figure 70. Still shots from borehole video log of MO-17, collected August 29, 2020, showing a large amount of accumulated debris restricting the borehole (left) and the poor visibility within the borehole below the shown restricted point (right). The bottom of casing is not visible in the video log and video equipment could not reach the bottom of well.

The USGS-UMWSC performed a slug test on MO-17 January 9, 2020, using two 3 -in.-diameter, 5-ft-long solid PVC slugs bolted together (fig. 71). The slow recovery times for a well that was constructed with 80 ft of open borehole in a hydraulically conductive sandstone aquifer, suggest the well is poorly connected to the aquifer.

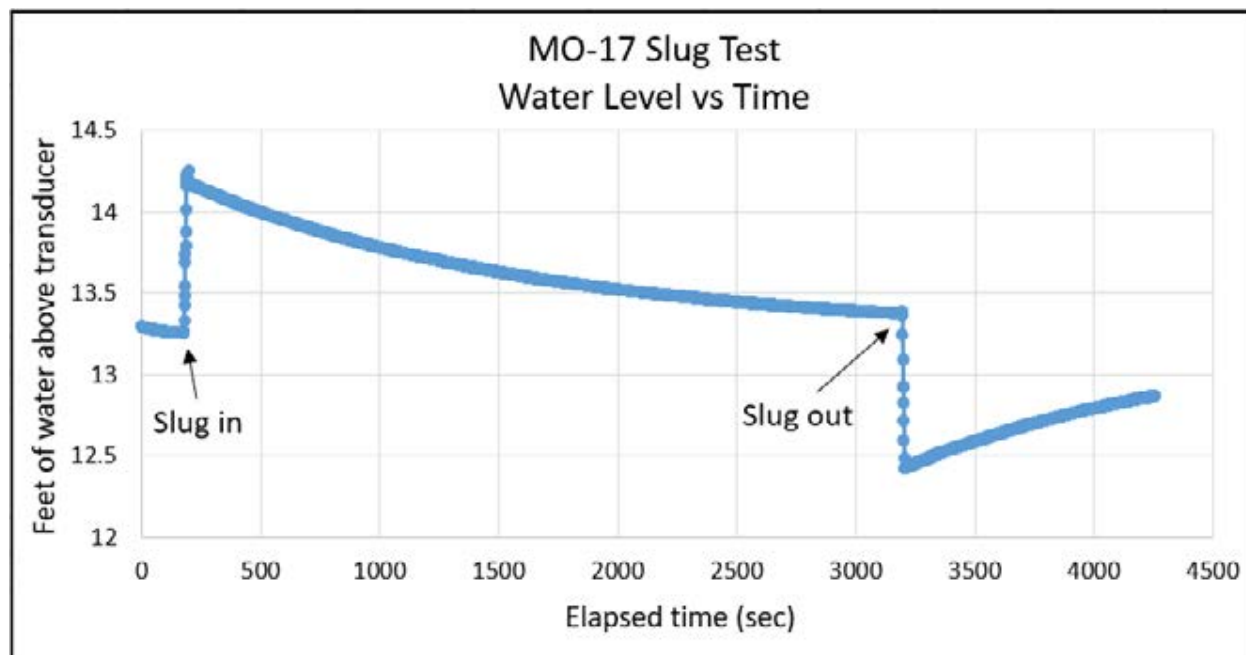


Figure 71. Slug test results for MO-17. Slug testing was performed on January 9, 2020. Data courtesy of U.S. Geological Survey.

Suggestions for future work

Based on the observation of extensive biofouling and sediment accumulation in the well, difficulty in lowering equipment down the well, poor hydraulic conductivity of the well, and challenging access conditions within the tree line of this property, WGNHS recommends replacing MO-17 at some point in the future.

MQ-09 (Marquette County, WI)

USGS Site Number: 435244089293401

USGS Site Name: MQ-16/08E/12-0009

WGNHS Well ID: 39000009

WDNR Well Number: None

Well information

MQ-09 was drilled in 1949 as a fire well for the Village of Westfield ^[1]. The well was drilled to a reported total depth of 274 ft bls with 6-in.-diameter steel casing set to an unreported depth. Below the 6-in. steel casing, the 6-in.-diameter borehole was left open to the sandstone bedrock aquifer. Monitoring began in 1949 ^[2]. The well is located within a drainage ditch on village property at the southeast side of the intersection of S. Main St. and E. 7th St. in Westfield, Wisconsin (fig. 72). This most recent well investigation indicates the well is in good condition.

Latitude, longitude: 43°52'45.37", -89°29'35.34" (NAD83) ^[3]

Land surface datum: 873.0 feet above mean sea level (NAVD88) ^[3]

Hydrologic Unit (USGS Watershed Code): 04030201 ^[3]

Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 370CMBR (Cambrian System) ^[3]

Current well depth: 251 ft-BTOC (248.6 ft blsd) ^[4]

Current casing depth: 123.5 ft-BTOC (121 ft blsd) ^[4]

^[1] Well details obtained from 1949 USGS well schedule

^[2] Well details obtained from 1967 USGS well schedule

^[3] Well details obtained from the USGS

^[4] Well details from work completed for this funding opportunity. Casing and well depths are interpreted from geophysical logs; Well depth incorporates 10/2/19 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing, ft blsd = feet below land surface datum

Historical and recent documentation for this well is included in appendix 15.



Image Landsat/Copernicus

Figure 72. Location of well MQ-09 (red marker) in Marquette County, Wisconsin. The site is located within a drainage ditch on village property at the southeast side of the intersection of S. Main St. and E. 7th St. in Westfield, Wisconsin.

Initial work planned

This well was initially proposed under objective 4 for well maintenance. Historical records for this well indicate the original well depth to be 274 ft bls and the depth of casing was never recorded. In 2016, the USGS measured the well to be 249.4 ft bls, indicating that well was accumulating material or the original records were incorrect. Work at this site planned to include confirmation of the well bottom and casing depth, characterization of the well with a full suite of geophysical logs and borehole video, and a slug test to evaluate the well-aquifer connection.

Description of work completed

WGNHS obtained permission from the Village of Westfield to access the site and perform necessary work. During the initial site visit, WGNHS determined the well head was too low to the ground within the drainage ditch (fig. 73), making it vulnerable to inundation. On July 2, 2019, the well-head cover was removed, and a steel well-head extension was welded on top of existing casing (fig. 73).



Figure 73. The MQ-09 well head, located just inches above grade, in a drainage ditch (left) and after an extension pipe was welded on (right). The WGNHS geophysical logging van is present in the background (right). Photo on left courtesy of U.S. Geological Survey.

WGNHS completed geophysical and video logging of MQ-09 on December 4, 2019. Logging shows that the 6-in.-diameter steel casing extends to 121 ft blsd and is well seated into bedrock (fig. 74). Logging also shows that the well depth is 248.6 ft blsd. The 1949 USGS well schedule is the oldest historical record known to exist for this well and reports a well depth of 274 ft bls; however, no subsequent measurements have confirmed this depth. Routine USGS tape-downs and measurements by WGNHS as part of this investigation consistently record an approximate well depth of 250 ft bls. Without redeveloping the well WGNHS was not able to confirm the total depth; however, it seems plausible that 24 ft of sediment may have accumulated over 70 years given the well's reported open interval of 152.5 ft (i.e., 274 ft – 121.5 ft).



Figure 74. Still shots from borehole video log of MQ-09, collected December 4, 2019, showing bottom of casing, looking at the borehole wall, at 121 ft blsd (left) and bottom of well at 248.6 ft blsd looking directly down the borehole (right).

The USGS-UMWSC performed a slug test on January 24, 2020, using two 3 -in.-diameter, 5-ft-long solid PVC slugs bolted together. The water column was displaced by approximately 2 feet and showed a good hydraulic response, suggesting MQ-09 is well connected to the surrounding aquifer (fig. 75).

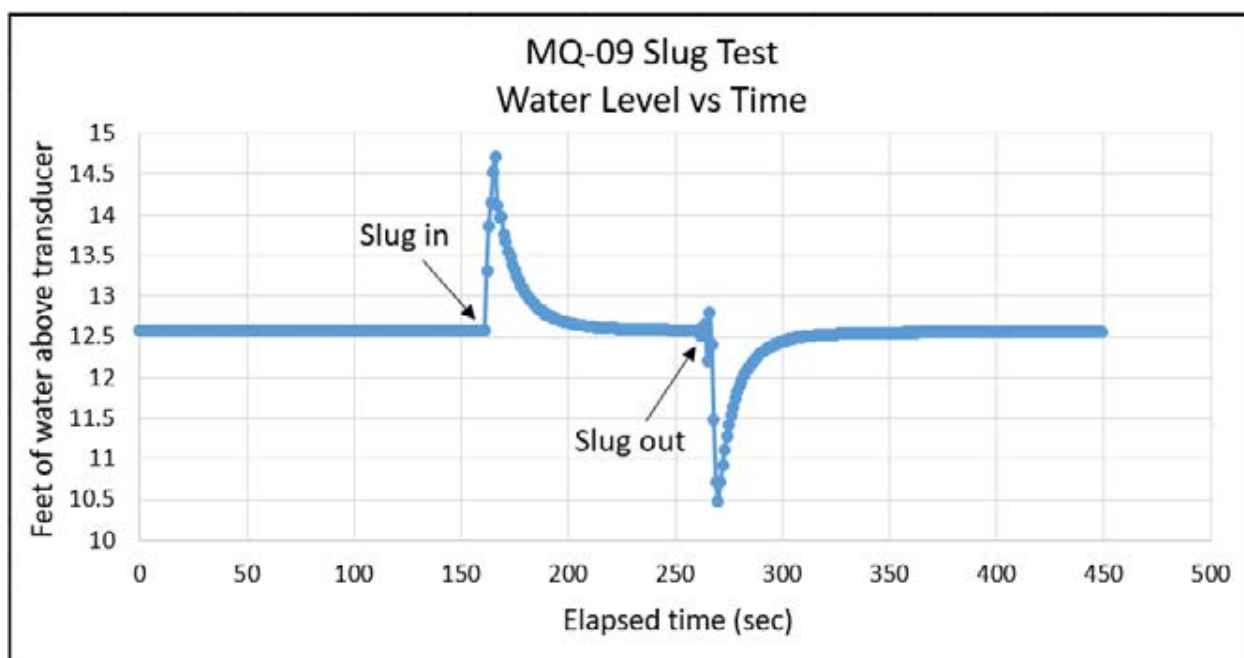


Figure 75. Slug test results for MQ-09. Slug testing was performed on January 24, 2020. Data courtesy of U.S. Geological Survey.

Suggestions for future work

After completing work on MQ-09, the well is considered to be in good condition and better protected due to the extension of protective casing further above grade. Although the total well depth of 274 ft bls was not confirmed, the slug test demonstrated a good hydraulic response, and the lack of appreciable biofilms or other obstructions suggest that sediment accumulation has not compromised the well's integrity. For these reasons, well development is considered unnecessary, and no future work is anticipated for this well besides routine maintenance and monitoring by the USGS-UMWSC.

SH-27 (Shawano County, WI)

USGS Site Number: 444627088321401

USGS Site Name: SH-27/16E/34-0027

WGNHS Well ID: 59000027

WDNR Well Number: JC778

Well information

SH-27 was drilled by Gillett Co. in 1970 for the Wisconsin Department of Transportation (WisDOT) as a wayside water supply well ^[1]. A 10-in.-diameter borehole was drilled to a total reported depth of 51 ft bls, below which a 6-in.-diameter borehole was drilled to a reported total depth of 95 ft bls. A 6-in.-diameter steel casing was installed to a reported total depth of 51 ft bls. Below the steel casing, the 6-in.-diameter borehole was left open to the sandstone bedrock aquifer. Monitoring began in 1974 ^[2]. The well is located east of Shawano, WI, in the Town of Wescott (figs. 76 and 77). Based on discussions with WisDOT and Shawano County Register of Deeds in late 2018, it is understood that WisDOT sold the wayside property (parcel 048-3442000200) to Shawano County when State Highway 29 became County Rd. BE. In 2007, Shawano County then sold the land to the Samanta Roy Institute of Science and Technology under the landholding name "USA International Raceway". Based on this most recent well investigation, WGNHS, USGS-UMWSC, and WDNR decided that SH-27 was not well suited for continued monitoring and the well was removed from the NGWMN and WGLMN.

Latitude, longitude: 44°46'27", -88°32'14" (NAD27) ^[3]

Land surface datum: 840 feet above mean sea level (NGVD29) ^[3]

Hydrologic Unit (USGS Watershed Code): 04030202 ^[3]

Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 372SCRX (St. Croixan Series) ^[3]

Current well depth: 94.68 ft blsd ^[4]

Current casing depth: 51 ft bls ^[1]

^[1] Well details obtained from 1970 well construction report

^[2] Well details obtained from 1977 USGS well schedule

^[3] Well details obtained from the USGS

^[4] Well details obtained from 3/31/16 USGS-UMWSC tape-down

Historical documentation for this well is included in appendix 16. No new documentation was generated as part of this project.



Image Landsat/Copernicus

Figure 76. Location of well SH-27 (red marker) in Shawano County, Wisconsin. The site is located approximately 200 feet northeast of County Rd. BE (State Highway 29) and 1,100 feet northwest of County Rd. E, east of Shawano, WI.



Figure 77. Well SH-27 on the former wayside property. The well shelter and hand-pump are barely visible in the background (yellow circle and arrow). Image taken from parking lot. Photo courtesy of U.S. Geological Survey.

Initial work Planned

This well was initially proposed under objective 4 for well maintenance. Work planned to include removing the hand pump and piping, which are no longer in use and prevent routine

well evaluation and maintenance. Once removed, WGNHS planned to perform a preliminary well evaluation followed by redevelopment and installation of an above-grade well-head protector. The final step included full characterization of the well with geophysical logging, borehole video, and a slug test to evaluate the well-aquifer connection.

Description of work completed

Beginning in fall 2018, WGNHS contacted the landowner to confirm ownership status of the monitoring well. Given the ownership history of this property, where ownership changed hands several times from WisDOT to Shawano County and the current private party, it was not clear if an earlier landowner may have reserved ownership rights to the well. The Shawano County Register of Deeds confirmed that no deed restrictions had been registered for the property to suggest the well was owned by any party besides the current landowner.

Given the location of the well on private property and the concern about long-term access and sustainability of the site, the WGNHS, USGS-UMWSC, and WDNR decided that it would be best to discontinue monitoring at this site. The last water-level measurement was recorded on October 3, 2018, and the well was subsequently removed from both the WGLMN and NGWMN. The landowner was informed of this decision and satisfied with the outcome.

Suggestions for future work

WGNHS did not fill and seal SH-27 due to challenges accessing the site and working with the landowner. The private landowner is responsible for filling and sealing the unused well on their property as detailed in Wisconsin Administrative Code NR 812.26 (4). Otherwise, no future work remains to be done at this site.

TA-01 (Taylor County, WI)

USGS Site Number: 450947090483902

USGS Site Name: TA-31/04W/13-0001

WGNHS Well ID: 61000001

WDNR Well Number: None

Well information

TA-01 was drilled by Midwest Engineering Co. in 1950^[1] for the Village of Gilman as a public city supply well^[2]. The borehole was reportedly drilled to 28.5 ft bls and backfilled with approximately 5 ft of soil, bringing the total well depth to 24 ft bls^[1,2]. The well construction details included in the geologic log are vague; however, it appears that an 18-in.-diameter casing was installed to a depth of 16 ft bls with a concrete screen extending from 16 to 24 ft bls^[1,2]. A geophysical log from 1996 confirms the casing diameter of 18-in. and records a gradual reduction in well diameter to 16-in. between 17 to 22 ft bls^[3]. Monitoring began in 1949^[4]. The well is located in Gilman Village Park and owned by the Village of Gilman, WI (fig. 78). A borehole video^[6] from this most recent well investigation observed deposits along the well's sidewall that are consistent with the reduced well diameter from 17-22 ft bls^[3] and confirmed the total well depth.

Latitude, longitude: 45°09'47.20", -90°48'40.84" (NAD83)^[4]

Land surface datum: 1209.0 feet above mean sea level (NAVD88)^[4]

Hydrologic Unit (USGS Watershed Code): 07050005^[4]

Well completed in: USGS national aquifer N100GLCIAL (Sand and gravel aquifers (glaciated regions)) and local aquifer 110QRNR (Quaternary System)^[4]

Current well depth: 26.5 ft-BTOC (24.4 ft blsd)^[5,6]

Current depth of screened interval: between 13 and 18 ft blsd^[1,2,3,6]

^[1] Well details obtained from 1950 geologic log

^[2] Well details obtained from USGS well schedules (1957, 1967)

^[3] Well details obtained from Dunning and others (1996)

^[4] Well details obtained from USGS

^[5] Well details obtained from 4/3/13 USGS-UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below surface datum

^[6] Well details obtained from borehole video log performed for this funding opportunity on 5/8/20.

Historical documentation for this well is included in appendix 17. No new documentation was generated as part of this project.



Figure 78. Location of well TA-01 (red marker) in Taylor County, Wisconsin. The site is located just outside the southern edge of a baseball field in Gilman Village Park and approximately 110 ft east of the railroad tracks in Gilman, WI.

Initial work planned

This well was initially proposed under objective 4 for well maintenance. Work planned to include the installation of a new protective well shelter followed by characterization of the well with a borehole video and full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection.

Description of work completed

In 2018, WGNHS obtained permission to complete necessary work at this site. In November 2018, the USGS-UMWSC installed the new weatherproof, flip-tip shelter (fig. 79), replacing the old well shelter.

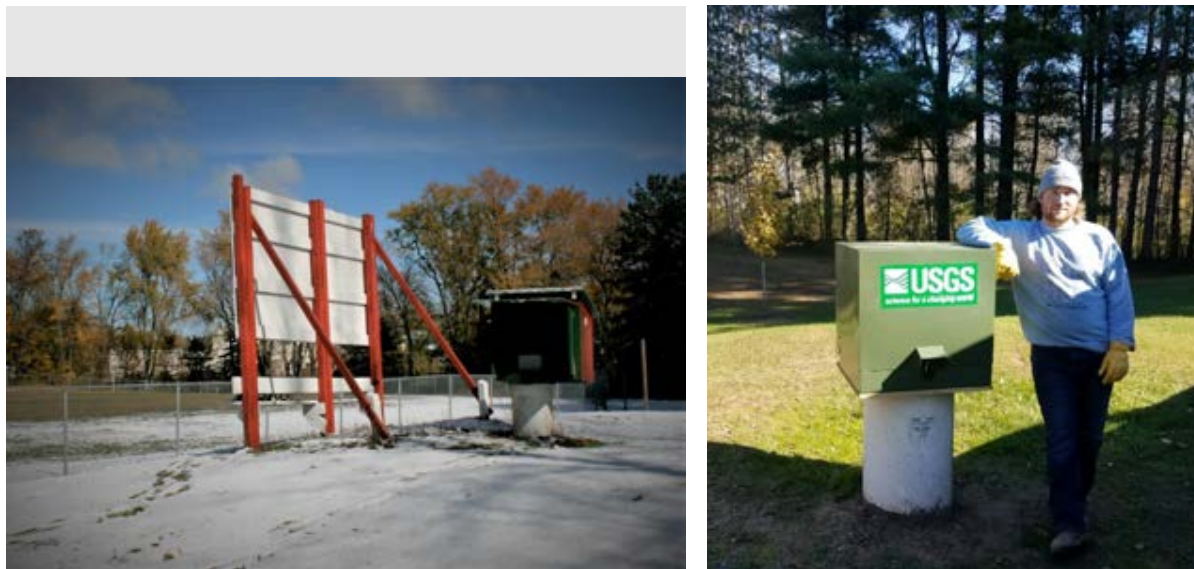


Figure 79: TA-01 well shelter before replacement (left) and newly installed shelter with USGS staff member (right). Work was complete in November 2018. Photos courtesy of U.S. Geological Survey.

WGNHS collected a borehole video on May 8, 2020. In the upper section of the casing, at about 7 ft bls, a pitless adapter is visible, which is connected to piping that runs down the well to a pump intake near the well's base (figs. 80 and 81). Deposits along the sidewall of the well, starting about 16 or 17 ft bls (fig. 80), appear consistent with the reduced well diameter observed from 17-22 ft bls during geophysical logging in the mid-1990s (Dunning and others, 1996). These deposits may in fact be mineral deposits precipitating inwards through slots in the well screen, which could also substantiate the depth of the screened interval. The video verified a well depth the USGS-measured well depth of 24.4 feet (fig. 81), but the bottom of casing (top of screened interval) was not directly visible. Geophysical logs were not collected due to the pump and piping suspended in the well and a slug test was not performed due to the large borehole diameter. On May 8, 2020, the USGS-UMWSC also replaced the old Sutron shaft recorder and float monitoring equipment with a pressure transducer for recording water levels.



Figure 80. Still shots from borehole video taken May 8, 2020, in well TA-01, showing pit-less adapter and piping above water level (left) and deposits along the well's sidewall (right).



Figure 81. Still shots from borehole video taken May 8, 2020, in well TA-01, showing pump intake at base of well and slots in screen (left). Well bottom (right).

Suggestions for future work

Although there were some deposits along the well's side wall the well was determined to be in good condition. No future work is anticipated for this well besides routine maintenance and monitoring by the USGS-UMWSC.

TR-71 (Trempealeau County, WI)

USGS Site Number: 441743091153101

USGS Site Name: TR-21/07W/17-0071

WGNHS Well ID: 62000071

WDNR Well Number: None

Well information

No driller records or well construction details were found for the original well; however, records show the well was reconstructed in 1967 by Fisher Well Drilling Co., Inc to serve as a wayside well for the Wisconsin Highway Commission ^[1]. In 1967, the well was filled with sand to the bottom of casing (42 ft bls), a 4-in.-diameter casing was placed inside the 8-in.-diameter well to the top of sand, and the annular space between was filled with cement grout. Once the cement grout hardened, the sand was bailed from the base of the well, extending the newly constructed well to a total reported depth of 83 ft bls. Below the 4-in. casing and cement grout, the borehole is recorded as 6-in. in diameter and open to the sandstone bedrock aquifer ^[2]. Monitoring began in 1979 ^[3]. The well is located on WisDOT property at a wayside along U.S. Highway 53, west of Blair, WI (fig. 82). Based on this most recent well investigation, TR-71 has been repaired and is considered in good condition.

Latitude, longitude: 44°17'43.66", -91°15'31.18" (NAD83) ^[3]

Land surface datum: 885.7 feet above mean sea level (NAVD88) ^[3]

Hydrologic Unit (USGS Watershed Code): 07040003 ^[3]

Well completed in: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 370CMBR (Cambrian system) ^[3]

Current well depth: 80.1 ft-BTOC (78.5 ft blsd) ^[4]

Current casing depth: 42 ft-BTOC (40.4 ft blsd) ^[5]

^[1] Well details obtained from 1967 well construction report

^[2] Well details obtained from 1979 USGS well schedule

^[3] Well details obtained from USGS

^[4] Well details obtained from 4/4/22 USGS-UMWSC tape-down

^[5] Well details obtained from work completed for this funding opportunity. Casing depth is interpreted from geophysical logs collected on 11/6/19; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Historical and recent documentation for this well is included in appendix 18.



Image Landsat/Copernicus

Figure 82. Location of well TR-71 (red marker) in Trempealeau County, Wisconsin. The site is located at a WisDOT wayside approximately 140 ft northeast of U.S. Highway 53 and 1,300 ft southwest of Trempealeau River, 1-mi west of Blair, WI.

Initial work planned

This well was initially proposed under objective 4 for well maintenance. Work planned to include the removal and replacement of the old hand-pump (fig. 83) and pipes from the well and retrofitting with a locking cover to secure the well head and improve future access. The old hand pump prevented regular inspections, measurements, and maintenance, and had been out of service for several years. Following this, work planned to include redevelopment and characterization of the well, with a borehole video, full suite of geophysical logs, and a slug test to evaluate the well-aquifer connection.



Figure 83. TR-71 located under a shelter at the WisDOT wayside along U.S. Highway 53 (left) and a close-up of the inoperable hand pump prior to removal (right).

Description of work completed

WGNHS established a site access and work agreement with WisDOT in November 2018 and CTW Corporation completed the repair work in June 2019. The hand-pump and 73 ft of well pipe was removed down to the connection point of the submersible pump chamber. The submersible pump and 5 to 10 ft of pipe below the pump chamber is believed to have broken off during removal due to heavy rusting and could not be retrieved from the bottom of the well. CTW Corporation returned on July 2, 2019, to redevelop the well using an air-lift technique (fig. 84), which removed 1 ft of material from the bottom of the well.



Figure 84. Air-lifting equipment in place over TR-71 on July 2, 2019.

After redevelopment was complete, a new protective well cover was installed, the USGS' pressure transducer was redeployed for water-level monitoring, and the well was locked (fig. 85).



Figure 85. Newly installed wellhead with cover and lock for well TR-71.

Geophysical logging of the borehole was completed by WGNHS on November 6, 2019. A borehole video was not collected because of the small diameter of the casing. Geophysical logging indicates that the steel casing extends to 40.4 ft blsd but the geophysical logging equipment could only extend to a depth of 74.1 ft blsd. Since 5-10 feet of pump and piping is believed to be resting vertically at the base of the well, the USGS-UMWSC returned to the site on April 4, 2022 and recorded a confirmation tape-down measurement of 78.5 ft blsd for the bottom of well. USGS-UMWSC reported that the weighted tape bounced off something solid at the well's base, suggesting that unretrieved pump and pipe is resting vertically from 78.5 ft blsd to the original well bottom at 83 ft bls.

The USGS-UMWSC performed a slug test on January 9, 2020, using a 3 -in.-diameter, 5-ft-long solid PVC slug. The water column was displaced by approximately 3 feet and showed a good hydraulic response (fig. 86), suggesting TR-71 is well connected to the surrounding aquifer.

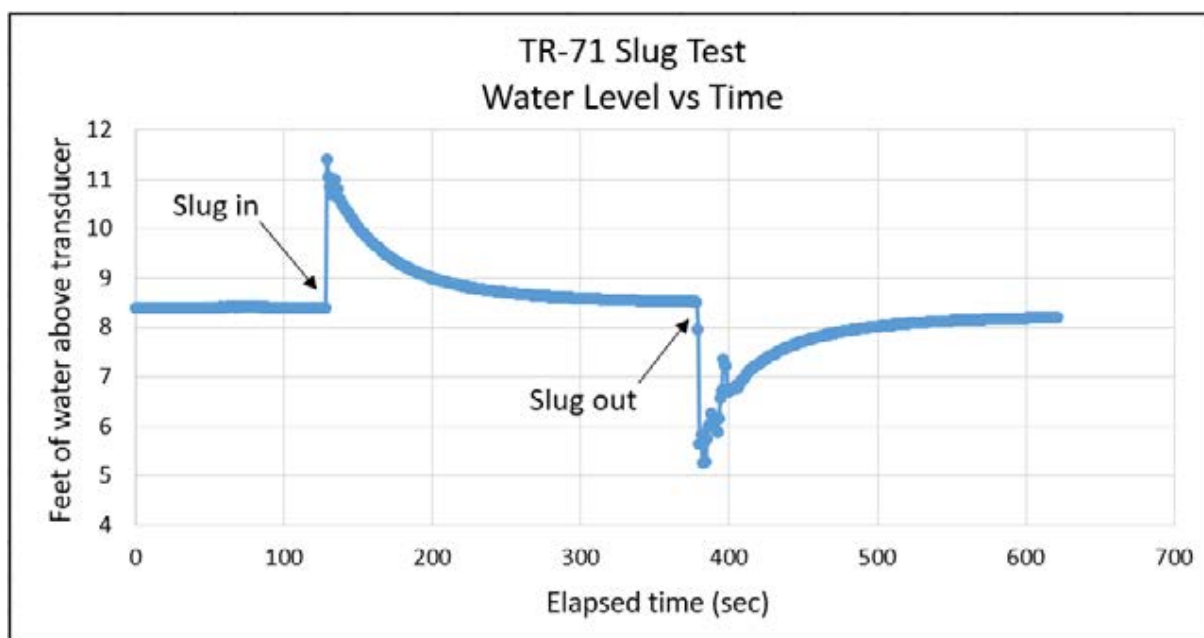


Figure 86. Slug test results for TR-71, performed on January 9, 2020. Data courtesy of U.S. Geological Survey.

Suggestions for future work

After completing work on TR-71, the well is considered to be in good condition. Slug test results suggest that TR-71 is well connected to the surrounding aquifer and that water-level monitoring is not compromised by the pump chamber and piping that could not be removed from the bottom of the well. At this point in time, additional well development is considered unnecessary, and no future work is anticipated for this well besides routine maintenance and monitoring by the USGS-UMWSC.

VE-117/271/272 (Vernon County, WI)

USGS Site Numbers: 433921091132 [101], [102], [103]

USGS Site Names: VE-14/07W/28- [0117], [0271], [0272]

WGNHS Well IDs: 63000117, 63000271, 63000272

WDNR Well Number: None

Well information

This site contains a nest of piezometers: VE-117, VE-271, and VE-272. Piezometers VE-271 and 272 are artesian. The original well, also named VE-117, was drilled by Layne-Western Co., Inc in November 1980 to a reported total depth of 633 feet below the land surface datum (ft blsd) ^[1]. Piezometers VE-117, VE-272, and VE-272 were subsequently constructed by USGS-UMWSC in September 1982 ^[2]. The monitoring station is located on U.S. Army Corps of Engineers (USACE) property, which is under a longstanding use agreement with the U.S. Fish and Wildlife Service (USFWS) for management of the Upper Mississippi River National Wildlife Fish Refuge. The site is west of Prairie Ln in the Town of Bergen, just south of the village of Stoddard, WI (fig. 87). A 10-in.-diameter steel casing was installed from 0 to 163 ft blsd. Below the 10-in. steel casing, the borehole was left open to bedrock from 163 to 198 ft blsd. Below the open borehole interval are a series of cement plugs and pea gravel intervals were constructed to contain piezometer screens open to discrete intervals of the surrounding aquifer. VE-117 is a 1.5-in.-diameter piezometer; however, the piezometer does not have a screen and ends well above the bottom of casing. VE-117 measures water levels associated with the open bedrock interval extending from the bottom of casing (163 ft blsd) to the cement plug at 198 ft blsd. This piezometer corresponds to the Eau Claire Formation aquifer. VE-271 is a 1.5-in.-diameter piezometer (screened from 603.63 to 618.63 ft blsd) that measures water levels associated with the pea gravel interval from 590-633 ft blsd (Mount Simon Sandstone aquifer). VE-272 is a 1.5-in.-diameter piezometer (screened from 298.63 to 313.63 ft blsd) that measures water levels associated with the pea gravel interval from 274 to 524 ft blsd (Mount Simon Sandstone aquifer). Monitoring for original well VE-117 began in October 1981 and later piezometers VE-117, VE-271, and VE-272 in November 1982 ^[3]. The monitoring station is currently located in the Town of Bergen on USACE property. Based on this most recent well investigation, VE-117/271/272 has been repaired and is considered in good condition.

Latitude, longitude: 43°39'19.81", -91°13'21.19" (NAD83) ^[3]

Land surface datum: 648.5 feet above mean sea level (NAVD88) ^[3]

Hydrologic Unit (USGS Watershed Code): 07060001 ^[3]

Well completed in:

VE-117: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 372ECLR (Eau Claire Formation) ^[3]

VE-271: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local aquifer 372MNSN (Mount Simon Sandstone) ^[3]

VE-272: USGS national aquifer S300CAMORD (Cambrian-Ordovician aquifer system) and local

aquifer 372MNSN (Mount Simon Sandstone) ^[3]

Current well depth: see above paragraph for details

Current casing depth: see above paragraph for details

^[1] WGNHS Geologic Log, 1980

^[2] Well details from USGS piezometer construction sketch, 1982

^[3] Well details from USGS

Historical and recent documentation for this well is included in appendix 19.



Image Landsat/Copernicus

Figure 87: Location of piezometer nest (red marker) with wells VE-117, VE-271, and VE-272 in Vernon County, Wisconsin. The site is located approximately 70 ft west of Prairie Lane, 1100 ft east of the Mississippi River and ½ mile southwest of Stoddard, WI.

Initial work planned

This site was originally proposed under objective 4 for well maintenance. The USGS-UMWSC identified this site as a concern since the piezometers were artesian and the monitoring shelter was uninsulated, creating the potential for piezometers to freeze at this site (fig. 88). Work planned to include the installation of an insulated shelter with a thermostat and heaters and the trenching of electricity to the shelter from a nearby building. This design was based on similar installations the USGS-UMWSC had deployed at other monitoring stations in Wisconsin.



Figure 88. Monitoring shelter (left) and piezometer heads for VE-117, VE-271, and VE-272 (right) before work was completed. Work was completed from summer to winter 2019. Photo courtesy of U.S. Geological Survey.

Description of work completed

The WGNHS and USGS-UMWSC worked with the U.S. Army Corp of Engineers to obtain permission to access the site and perform all necessary work. Since the site is located near effigy mounds, USACE conducted a routine environmental and archeological assessment prior to the start of trenching activities at the site. In May 2019, the local utility company Xcel Energy flagged the location of the proposed electrical trench and a subsequent evaluation by USACE cleared the site for trenching. In August 2019, the USGS-UMWSC established a new well agreement with USACE and in September 2019, USGS-UMWSC installed a cement pad and insulated shelter around the piezometers (fig. 89). In October and November 2019, WGNHS contracted with Poellinger Electric, Inc. to trench underground electrical service from a nearby Xcel Energy utility pole to the shelter and install a meter socket for electrical service to the shelter. The USGS-UMWSC subsequently connected the shelter's thermostat and heater system and Poellinger Electric, Inc. returned in November 2019 to inspect and connect the electrical supply.



Figure 89. New insulated and heated monitoring shelter (left) and new piezometer heads for VE-117, VE-271, and VE-272 in the shelter (right). Work was completed in November of 2019. Photos courtesy of U.S. Geological Survey.

Suggestions for future work

As part of this project, WGNHS improved electrical service to the monitoring site and replaced the shelter but did not perform a more extensive evaluation and is therefore not aware of any additional repair needs. No future work is anticipated for this well apart from routine monitoring and maintenance by the USGS-UMWSC.

WK-31 (Waukesha County, WI)

USGS Site Number: 425535088131701

USGS Site Name: WK-05/19E/02-0031

WGNHS Well ID: 68000031

WDNR Well Number: None

Well information

WK-31 was drilled in 1944 to a reported total depth of 508 ft bls as a private water-supply well on a farm in what was then considered Vernon, WI^[1]. A 6-in. steel casing was grouted in with mud to a reported depth of 429 ft bls. Below the 6-in. casing the well was left open to the bedrock aquifer. Monitoring began in 1947^[2]. The well is currently located in the Village of Big Bend, 3-mi south of Waukesha, WI, on land owned by Bahl Investments LP (fig. 90). After this most recent well investigation and repair effort, WK-31 is considered to be in good working condition.

Latitude, longitude: 42°55'35.76", -88°13'18.33" (NAD83)^[2]

Land surface datum: 975.3 feet above mean sea level (NAVD88)^[2]

Hydrologic Unit (USGS Watershed Code): 07120006^[2]

Well completed in: USGS national aquifer N400SLRDVN (Silurian-Devonian aquifers) and local aquifer 355NGRN (Niagaran Series)^[2]

Current well depth: 499 ft-BTOC (498 ft blsd)^[3]

Current casing depth: 429 ft-BTOC (426.5 ft blsd)^[3]

^[1] Well details obtained from 1944 well construction report

^[2] Well details obtained from the USGS

^[3] Well details obtained from work completed for this funding opportunity. Casing and well depths are interpreted from geophysical logs; well depth incorporates 2/24/20 USGS tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Historical and recent documentation for this well is included in appendix 20.



Image Landsat/Copernicus

Figure 90. Location of well WK-31 (red marker) in Waukesha County, Wisconsin. The site is located on privately owned property approximately 775 ft west of Big Bend Dr. and 1,800 ft east of State Highway 164 in the Village of Big Bend, Wisconsin.

Initial work planned

This well was initially proposed under objective 4 for well maintenance. Historical geophysical logging by the WGNHS in 1957 indicated the well depth to be 220 ft bls, creating a large discrepancy with the originally reported well depth of 508 ft bls and indicating a possible obstruction or a large amount of accumulated material at the bottom of the well. A USGS tape-down measurement from 2016 reported bottom of hole at 288 ft bls, again indicating an obstructed well. Work at this site planned to first include a borehole evaluation and slug test to determine the nature of the obstruction and test the well-aquifer connection, followed by well redevelopment. Once redeveloped, a borehole video and full suite of geophysical logs was planned to fully characterize the well. An additional slug test was planned post-redevelopment to ensure the obstruction had been cleared and the well demonstrated a good hydraulic response.

Description of work completed

The WGNHS established site access and permission to perform necessary work on this well in late 2018. On December 18, 2018, WGNHS collected a borehole video to determine the depth of the well and evaluate potential blockages in the well. The video confirmed an obstruction at approximately 190 feet below top of casing (as measured by video equipment) (fig. 91), which is approximately 318 feet shallower than the original well depth of 508 ft bls, confirming the well is significantly obstructed.



Figure 91. Still shots from borehole video log of WK-31 collected on December 18, 2018, showing the location of the blockage in the well at approximately 190 ft-BTOC as measured by the video equipment.

WGNHS contracted with S&K Pump and Plumbing, Inc. on September 24, 2019, the well was redeveloped using a metal bailer. S&K Pump & Plumbing, Inc. broke through the obstruction with the metal bailer and no other obstructions were encountered to a depth of 300 ft bls. A casing locator was then lowered down the well to 450 ft bls (maximum capable depth of casing locator) and again found no additional obstructions were encountered. S&K Pump & Plumbing, Inc. then chlorinated the well and sealed it with a 6-in.-diameter lockable well cap (fig. 92). Instead of redeploying their Sutron shaft encoder and float (fig. 93), the USGS-UMWSC decided to remove the large, galvanized well shelter (figs. 92 and 93) and replaced the Sutron equipment with a submersible pressure transducer for collecting water levels.

On November 8, 2019, geophysical logs collected by WGNHS confirmed bottom of casing at 426.5 ft blsd and bottom of well at 498 ft blsd.



Figure 92. New locking wellhead (left) after old equipment was removed and well WK-31 after old shelter was removed. All work was completed by December 2020. Photos courtesy of U.S. Geological Survey.

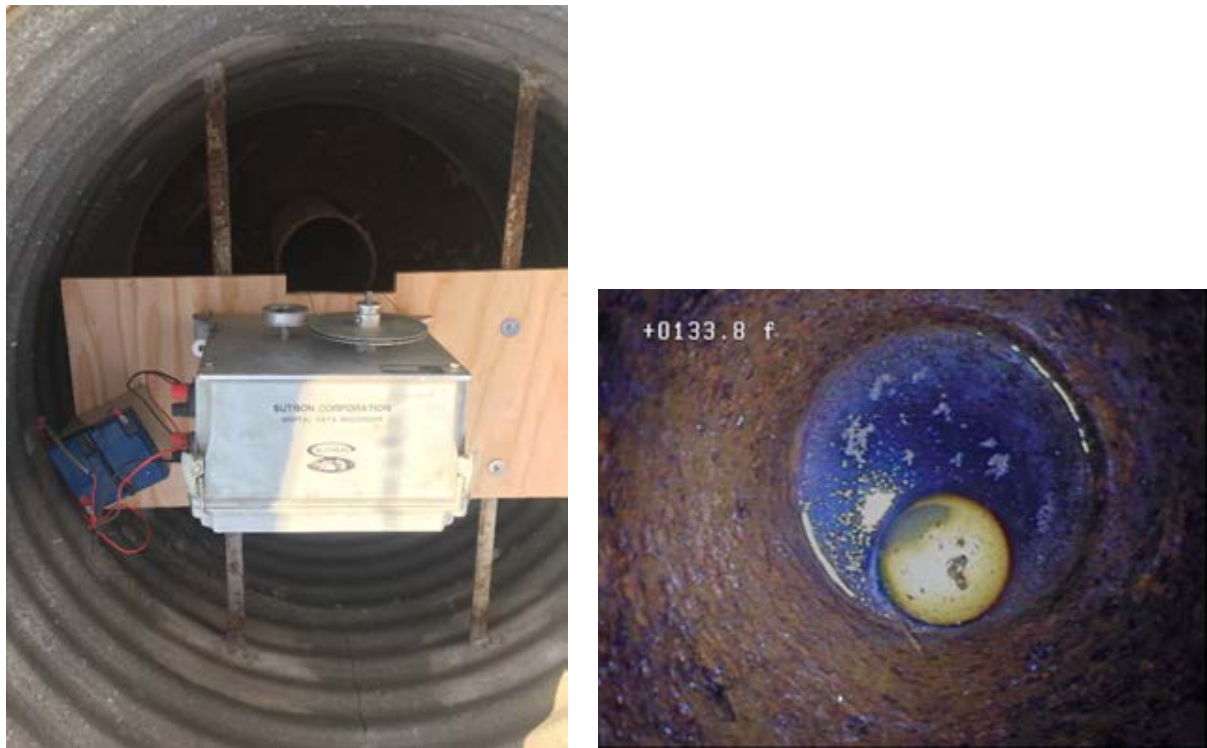


Figure 93: Old WK-31 well shelter and Sutron equipment (left) and Sutron float (right), before repairs. Photo on left courtesy of U.S. Geological Survey.

The USGS-UMWSC performed a slug test for this well on March 4, 2020, using 5 gallons of deionized water. The water column was displaced by approximately 2.5 feet and showed a good hydraulic response, suggesting it is well connected to the surrounding aquifer (fig. 94).

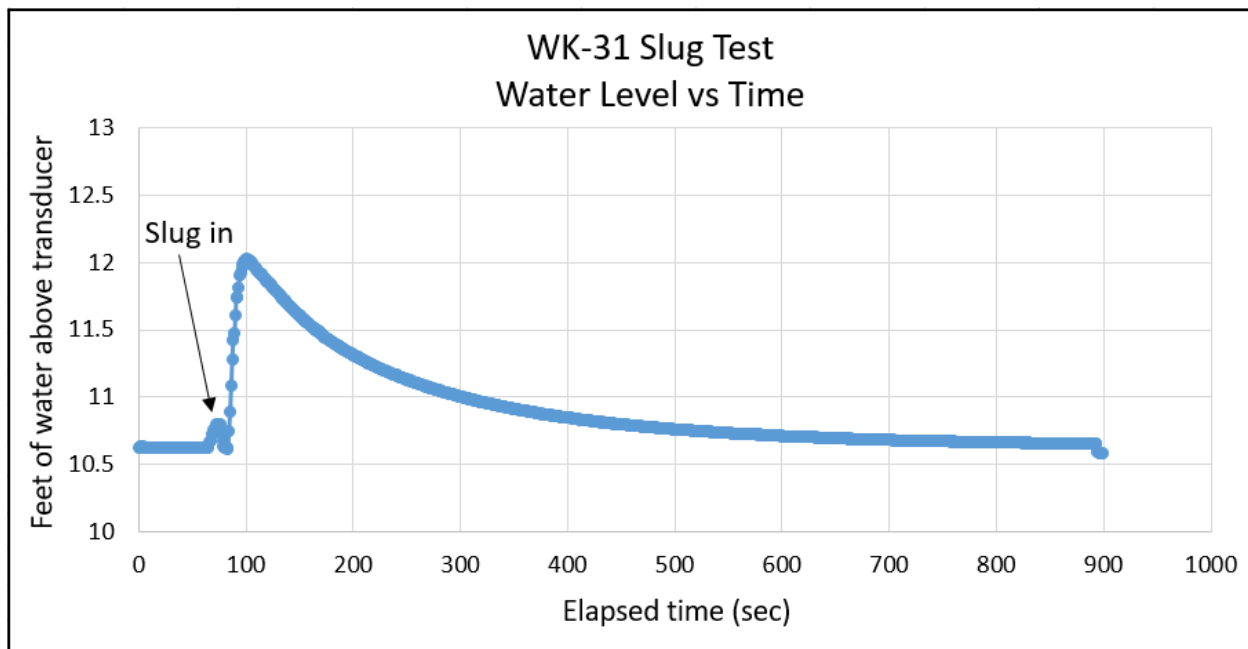


Figure 94. Slug test results for WK-31. Slug testing was performed on March 4, 2020. Data courtesy of U.S. Geological Survey.

Suggestions for future work

After completing work on the well, it was determined to be in good condition. No future work is anticipated for this well with the exception of routine monitoring and maintenance by the USGS-UMWSC.

WW-83 (Walworth County, WI) – replaced by WW-2194

USGS Site Number: 423315088350301

USGS Site Name: WW-01/16E/10-0083

WGNHS Well ID: 65000083

WDNR Well Number: None

Well information

WW-83 was drilled by Miller Well & Pump Co. in 1956 to a reported total depth of 149 feet below land surface (ft bls) to supply water for the Village of Fontana-on-Geneva Lake sewage disposal plant ^[1]. A 6-in.-diameter casing was installed to 134 ft bls and a 4-in.-diameter well screen was installed from 134 to 144 ft bls. An unscreened, 4-in.-diameter sump was extended from 144 to 149 ft bls. Monitoring began in 1980 ^[3]. The well is currently located on Village of Fontana-on-Geneva Lake property (fig. 95). As part of this well investigation, WW-83 was found to be obstructed and unrepairable. Well WW-2194 was drilled as a replacement well and WW-83 was filled and sealed July 9, 2021 ^[2]. New well WW-2194 effectively replaced WW-83 in both the WGLMN and NGWMN.

Latitude, longitude: 42°33'12.07", -88°35'04.79" (NAD83) ^[3]

Land surface datum: 1,042.4 feet above mean sea level (NAVD88) ^[3]

Hydrologic Unit (USGS Watershed Code): 07120006 ^[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: n/a well filled and sealed

Current casing depth: n/a well filled and sealed

^[1] Well details obtained from 1964 USGS well schedule

^[2] Well details obtained from 2021 fill and seal report

^[3] Well details obtained from USGS

Historical and recent documentation for this well is included in appendix 21.



Image Landsat/Copernicus

Figure 95. Location of well WW-83 (red marker) in Walworth County, Wisconsin. The site is located on public property approximately 450 ft south of Wild Duck Rd. in the Village of Fontana-On-Geneva Lake, Wisconsin.

Initial work plan

This well was originally proposed under objective 4 for well maintenance. In 2017, the USGS-UMWSC measured a well depth of 132.14 ft bls, suggesting that the well was obstructed at depth with upwards of 17 feet of accumulated material covering the entire screen at the base of the well. Work at this site planned to include an initial borehole video and slug test to determine the nature of the obstruction and the well-aquifer connection, followed by well redevelopment. Once redeveloped, a borehole video and full suite of geophysical logs were planned to fully characterize the well. An additional slug test was planned post-redevelopment to ensure the well demonstrated a good hydraulic response.

Description of work completed

The WGNHS obtained site access and work permission from the Village of Fontana-On-Geneva Lake. On October 25, 2018, the WGNHS completed an initial slug test, which provided strong evidence that the well was plugged at depth and poorly connected to the sand and gravel aquifer (fig. 96). On November 15, 2018, WGNHS performed a video log, which also identified an obstruction in the well at approximately 133 ft bls (fig. 97).

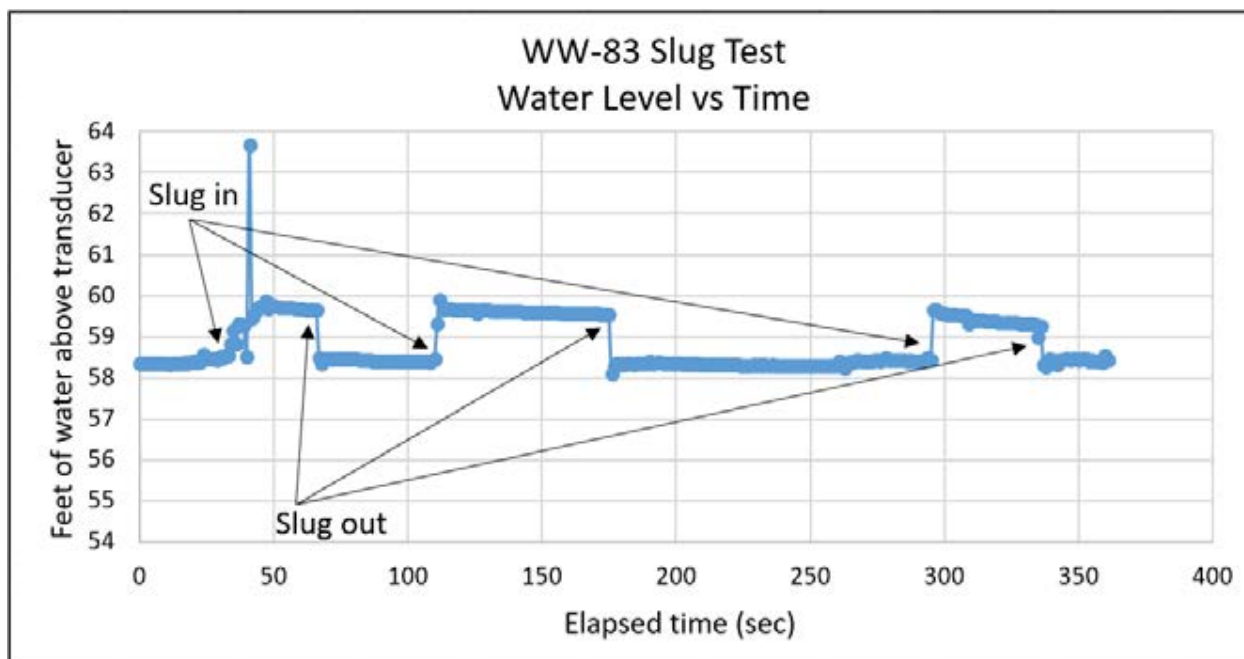


Figure 96. Initial slug test results for WW-83 showing poor hydraulic connection between the well and surrounding aquifer. Three successive tests showed similar responses. Slug testing was performed on October 25, 2018. Data courtesy of U.S. Geological Survey.



Figure 97. Still shot from borehole video log of WW-83 showing obstruction at about 133 ft bls, at which point the camera could not go any deeper.

On May 3, 2019, Maas & Sons Pump, Well, & Plumbing unsuccessfully attempted to remove excess material from the bottom of the well, using air lifting methods. Little debris was

removed, and water levels never rose to an appropriate height. Based on this work, the well screen had collapsed, and the well was considered obstructed and unrepairable. The WGNHS subsequently obtained approval from USGS-NGWMN in autumn 2019 to apply unused objective 5 funds to drill a replacement well for WW-83 to ensure continued monitoring at this site. Well WW-2194 was drilled in October 2019 to replace WW-83.

WW-2194 was monitored concurrently with WW-83 to ensure continuity in the water-level record, then WW-83 was subsequently filled and sealed on July 9, 2021. WGNHS completed a fill and seal report for WW-83, saved a copy in the WGNHS statewide subsurface database, and submitted a copy to the WDNR in satisfaction of state well drilling codes. WW-2194 effectively replaced WW-83 in both the WGLMN and NGWMN. Details about replacement well WW-2194 are presented below.

Suggestions for future work

WW-83 was filled and sealed on June 9, 2021. No future work remains to be done.

WW-2194 (Walworth County, WI) - replaces WW-83

USGS Site Number: 423312088350401

USGS Site Name: WW-01/16E/10-2194

WGNHS Well ID: 65002194

WDNR Well Number: VQ875

Well information

WW-2194 was drilled October 8, 2019, by Ground Source, Inc. to replace WW-83. The 6-in. borehole was drilled to a reported total depth of 150 feet below land surface (ft bls) ^[1]. A 2-in.-diameter PVC casing was installed to a reported depth of 131 ft bls, below which is a 15 ft PVC-screened interval from 131 to 146 ft bls. Monitoring began in November 2019 ^[2]. The well is located on the same publicly owned property in the Village of Fontana-On-Geneva Lake (fig. 98) as WW-83 and considered to be in good condition.

Latitude, longitude: 42°33'11.77", -88°35'04.36" (NAD83) ^[2]

Land surface elevation: 1,045.5 feet above mean sea level (NAVD88) ^[2]

Hydrologic Unit (USGS Watershed Code): 07120006 ^[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: 148.7 ft-BTOC (146 ft blsd) ^[1,3]

Current screened interval: 133.7 to 148.7 ft BTOC (131 to 146 ft blsd) ^[1,3]

^[1] Well details obtained from WDNR Monitoring Well Construction Form (form 4400-113A)

^[2] Well details obtained from the USGS

^[3] Well details incorporate 4/22/19 USGS_UMWSC tape-down; ft-BTOC = feet below top of casing; ft blsd = feet below land surface datum

Recent documentation for this well is included in appendix 21.



Image Landsat/Copernicus

Figure 98. Location of well WW-2194 (larger red marker), replacement well for WW-83 (also shown), in Walworth County, WI. The well is located on Village of Fontana-On-Geneva Lake property, roughly 50 feet southeast of WW-83.

Description of work completed

On October 7, 2019, Ground Source, Inc. drilled a new well using air rotary to a total depth of 150 ft bls. Drill cuttings were collected every 5 feet, used to generate a lithologic description, and archived at the WGNHS Research Collections and Education Center (Core Repository) in Mt. Horeb, Wisconsin. 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. A 5-ft-long, 4-in.-diameter protective cover pipe was installed to 1 ft bls and a 2-in.-diameter PVC casing was installed to 146.6 ft bls with a 15 ft screened interval from 131 to 146 ft bls. The well was filter-packed with #40 red flint around the screened interval, from 129 to 150 ft bls and the casing was sealed in with bentonite. WW-2194 (fig. 99) is located approximately 50 feet from the well it replaced (WW-83) and constructed within the same sand and gravel glacial-aquifer system to ensure continuity with the monitoring record at WW-83. The well was subsequently developed on November 20, 2019, by surging and bailing.



Figure 99. Complete well WW-2194.

In late November 2019, the USGS-UMWSC surveyed the well using RTN GPS and installed a pressure transducer to begin recording continuous water-level data. On February 24, 2020, the USGS-UMWSC performed a slug test using a 1 and 3/8 -in.-diameter, 5-ft-long solid PVC slug. The water column was displaced by approximately 1.25 feet and showed a good hydraulic response suggesting WW-2194 is well connected to the surrounding aquifer (fig. 100). The USGS-UMWSC reported that the slug briefly snagged the transducer line while removing the slug (i.e., slug out), which is believed to explain the jump in the response curve during slug out. Despite this jump, the oscillatory nature of the water-level fluctuation is characteristic of a highly permeable sand and gravel aquifer. Geophysical and video logs were not collected for new well WW-2194 due to the well construction and presence of a grouted PVC casing.

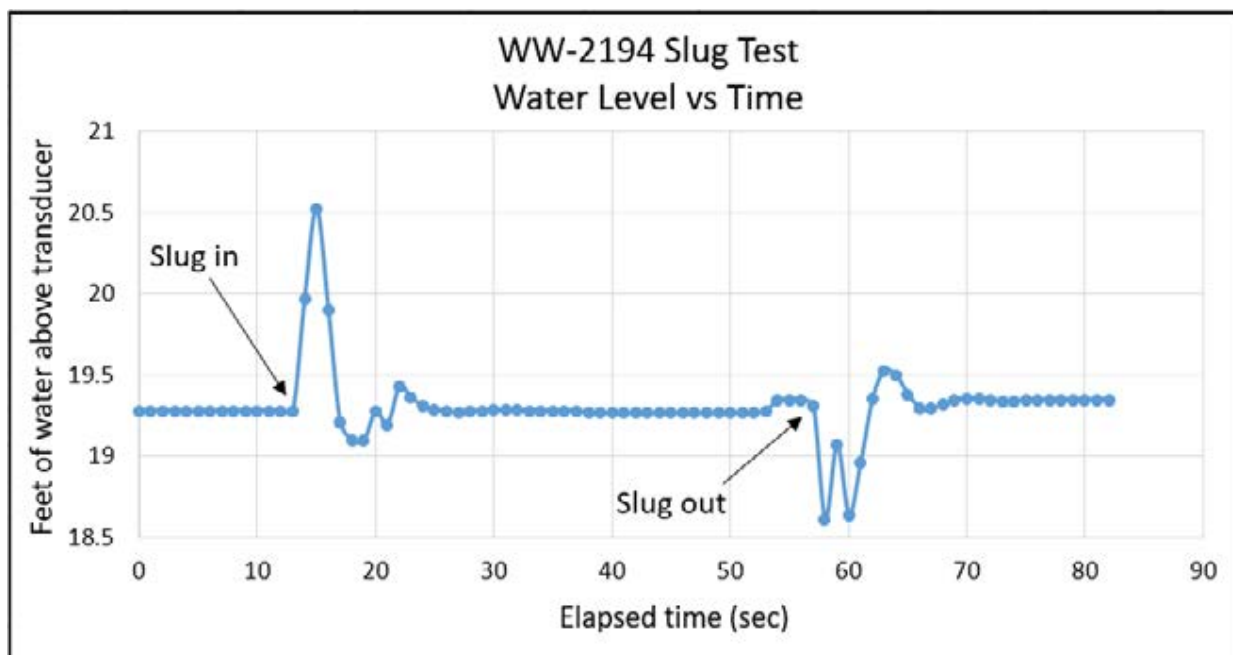


Figure 100. Slug test results for WW-2194. Slug testing was performed on February 24, 2020. Data courtesy of U.S. Geological Survey.

Monitoring for WW-2194 began in November 2019 and concurrent water-level measurements were collected for WW-83 and WW-2194 to ensure continuity of the record at this site (fig. 101). Concurrent water-level monitoring demonstrates that the response trend for new well WW-2194 closely resembles that of WW-83. Accounting for land surface datum of each well, the average difference in water-level elevations was 0.39 feet over the duration of the concurrent monitoring period. Based on this evaluation, water-level data from WW-2194 appears to provide excellent data continuity at this site and could be combined with historical records for WW-83 to extend the long-term monitoring record.

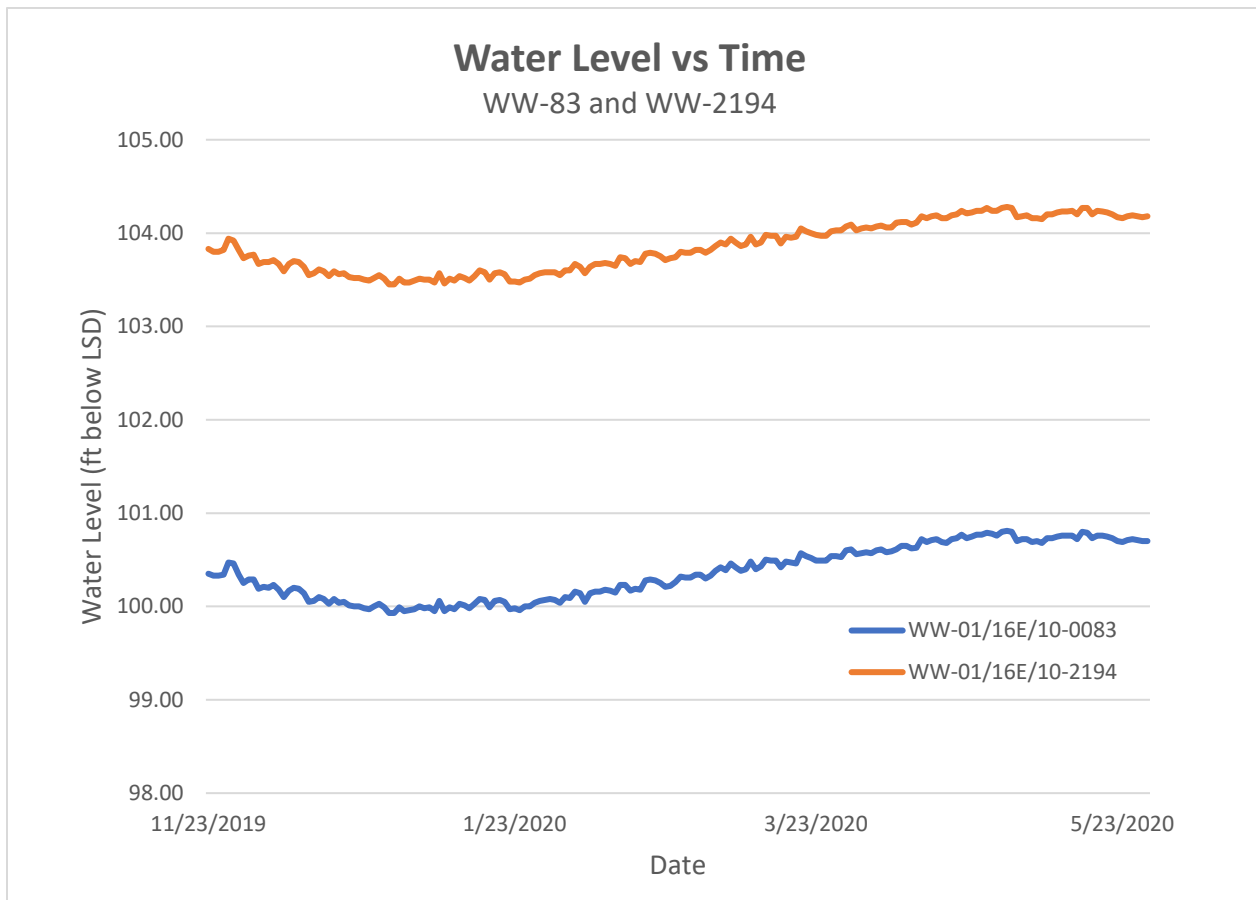


Figure 101. Concurrent water level data for well WW-83 and its replacement well, WW-2194. Accounting for land surface datum of WW-83 (1042.4 ft-msl) and WW-2194 (1045.5 ft-msl), the difference in water-level elevation between the two wells averaged 0.39 feet over this period. Data courtesy of U.S. Geological Survey.

Suggestions for Future Work

WW-2194 successfully replaced WW-83. No future work is anticipated for this well with the exception of 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 Daryll Pope and Sara Roser for remaining a steadfast partner before and especially following the onset of the COVID-19 pandemic in spring 2020. 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, Eric Dantoin, and Jim Rauman 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 Jeff Helmuth gave input regarding repair and well drilling priorities, while Nicki Clayton and Renee Kerska led the effort to establish easements for multiple wells on WDNR property. For wells in Brown County Wisconsin, Dave Johnson, Sara Fry, and Wendy Anderson (WDNR) provided site-specific expertise regarding monitoring and high-capacity wells.

In Brown County, Wisconsin, Mark Metcalf (WEC energy), Tom Landwehr (Green Bay Water Utility), and Dr. John Luczaj (UW-Green Bay) shared historical water-level data and assisted siting monitoring wells in Brown County Wisconsin. In Chippewa County, Dan Masterpole (Chippewa County, retired) and Christien Huppert (formerly with Chippewa County) helped contact private property owners and access monitoring sites and Louis and Steve Raether graciously provided site access to their property. In Columbia County, Brian Clepper, Bill Bunke and Nate Sievers of Alliant Energy assisted in granting approval for a new monitoring well on Alliant Energy property. In Iowa County, Landon Baumgartner (Iowa County), Jon Callaway (American Transmission Company), and landowner Jim Lee were instrumental in siting a replacement well on private property. In Langlade County, Chuck Bolte (Ag Source Laboratories) and Josh Walker (Langlade County Airport) played a key role in establishing a new monitoring well near Antigo, Wisconsin. In Milwaukee County, Beth Mittermaier (formerly with Havenwoods State Forest) and Samantha Kueffler (Havenwoods State Forest) worked closely with WGNHS to drill a replacement well at Havenwoods State Forest. Brad Drepcinski, Erin Fischer, Dave Wanniger, Mike Wrench, and Renee MacDonald of Milwaukee County Parks helped establish a site access agreement and facilitate repairs to a well at the Boerner Botanical Gardens property in Whitnall County Park. Richard Johnson with the Village of Gilman in Taylor County assisted in accessing a well on Village property. In Vernon County, Tim Miller (U.S. Fish and Wildlife Service - La Crosse District) and Ken Peterson, Brad Perkl, and Randy Urich, with the U.S. Army Corps of Engineers, were instrumental in helping secure site access and approve work authorization for repairs to a monitoring station near Stoddard, Wisconsin. Kevin Day with

the Village of Fontana-On-Lake Geneva in Walworth County assisted in accessing a well on Village property.

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Appendix 1: Well AS-380 documents

Historical documents

USGS well construction record for Ackley Monitoring Well #1 (AS-380), 1998, 1 page
measurements and schematic diagram from Dunning (2005), pp24

USGS geophysical logs, flow log, and flow analysis for Ackley Monitoring Well #1 (AS-380), 1998, 3 pages

natural gamma, resistivity, heat pulse flow meter, caliper, estimated capacity, total transmissivity, and zone permeability from Dunning (2005), pp33-35

datum is not specified, top of casing is reported to be 2.0 ft above land surface in 1998, data courtesy of U.S. Geological Survey

USGS core descriptions for Ackley Monitoring Well #1 (AS-380), 1998, 1 page
description of sandstone core from Dunning (2005), pp13

USGS split-spoon samples for Ackley Monitoring Well #1 (AS-380), 1998 1 page
description of split-spoon samples from glacial deposits from Dunning (2005), pp12

Documentation of work done for this report

One-day site access agreement, 2019, 2 pages
Bad River National Resources Department Access Permit

WGNHS geophysical log, 2019, 1 page
gamma, self-potential, single point resistivity, fluid temperature, fluid conductivity, caliper
datum is top of casing (1.6 ft above land surface datum in 2019)

WELL CONSTRUCTION RECORD

SITE: Ackley core site
County: Ashland
Well #: Ackley MW #1

Site Name: _____
Grid Coordinates: Northing _____ Easting _____

Drilling Contractor: Luser Drilling
Date Drilling Started: May 7, 1998
Date Coring Started: June 15, 1998

Driller: _____
Geologist: C. Dunning
Date Drilling Ended: May 7, 1998
Date Coring Ended: June 16, 1998

Drilling Method: Rotary
Drilling Fluid Type: Air and water

ANNULAR SPACE DETAILS:

Type of Surface Seal: _____

Amount of Surface Seal: # of Bags _____ lbs per Bag _____

Type of Annular Sealant: Portland Cement from surface to 100 feet TOC

Amount of Annular Seal: # of Bags _____ lbs per Bag _____

Type of Filter Pack: none

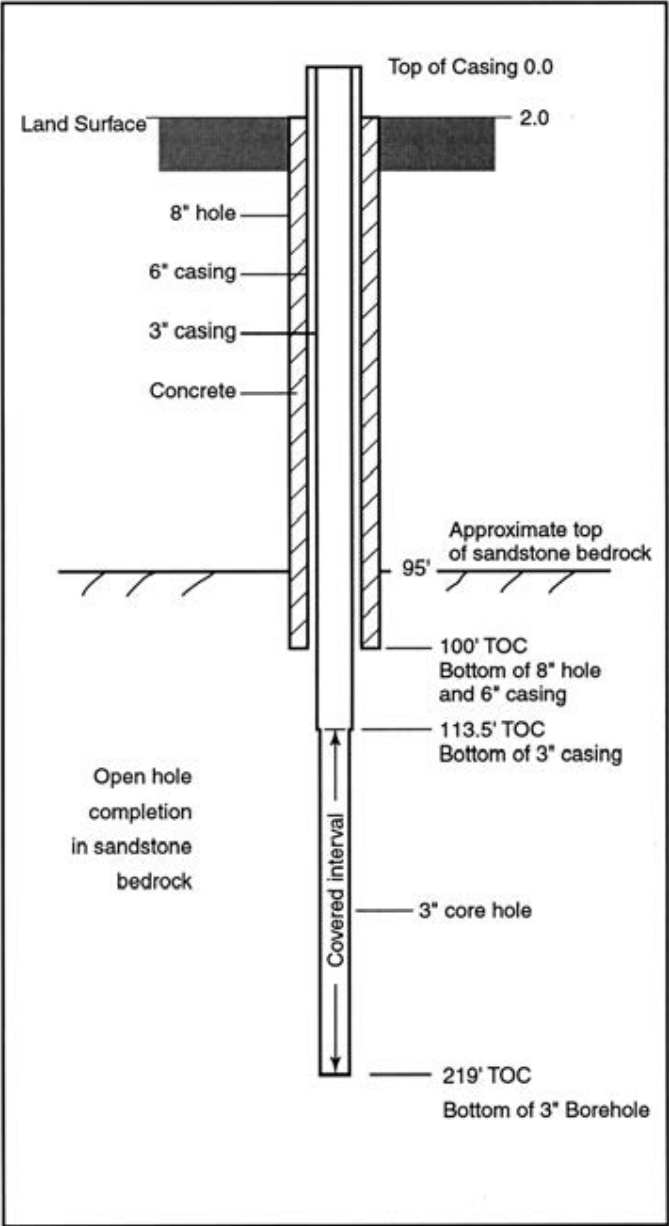
Amount of Filter Pack: # of Bags _____ lbs per Bag _____

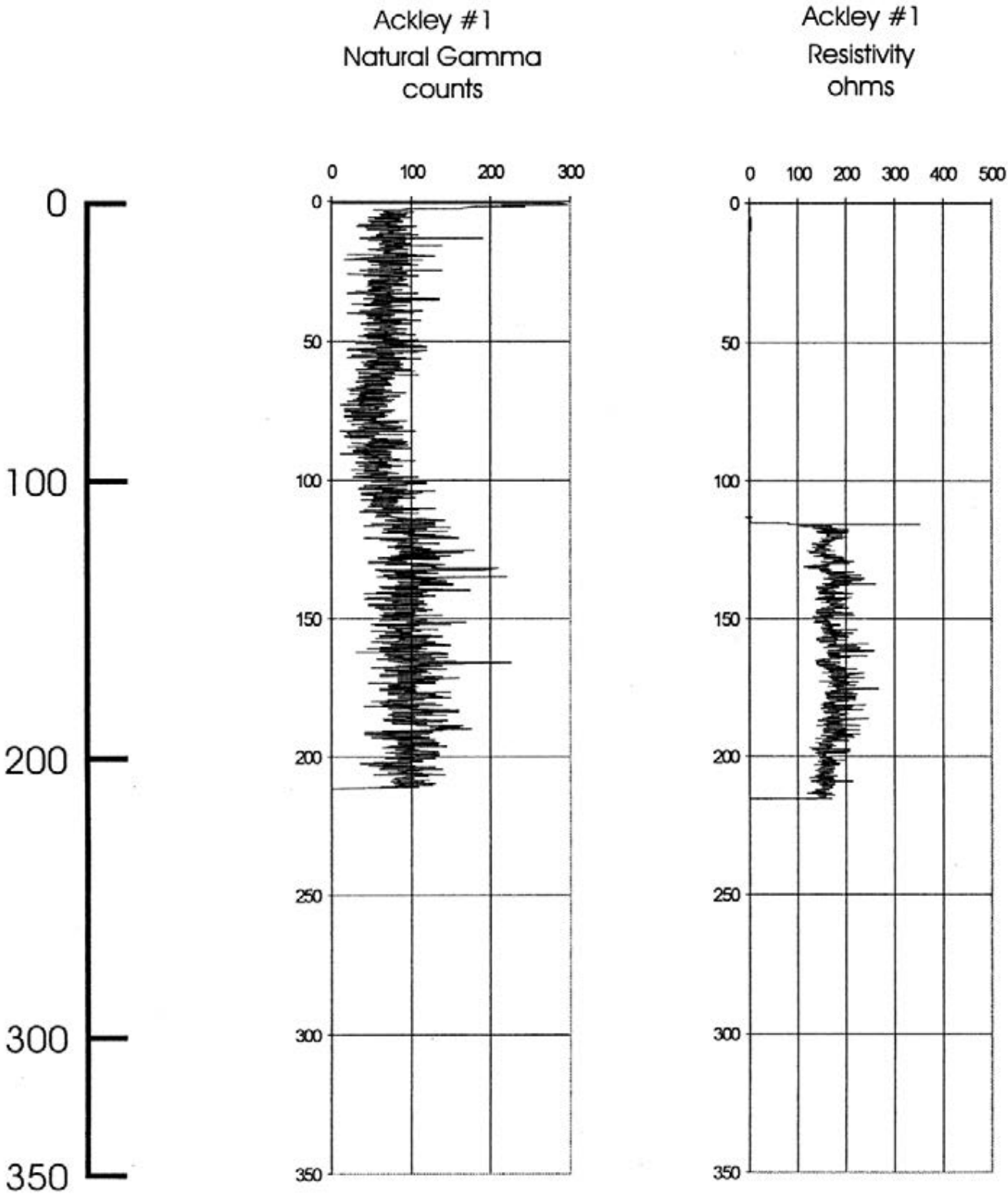
WELL CONSTRUCTION MATERIALS:

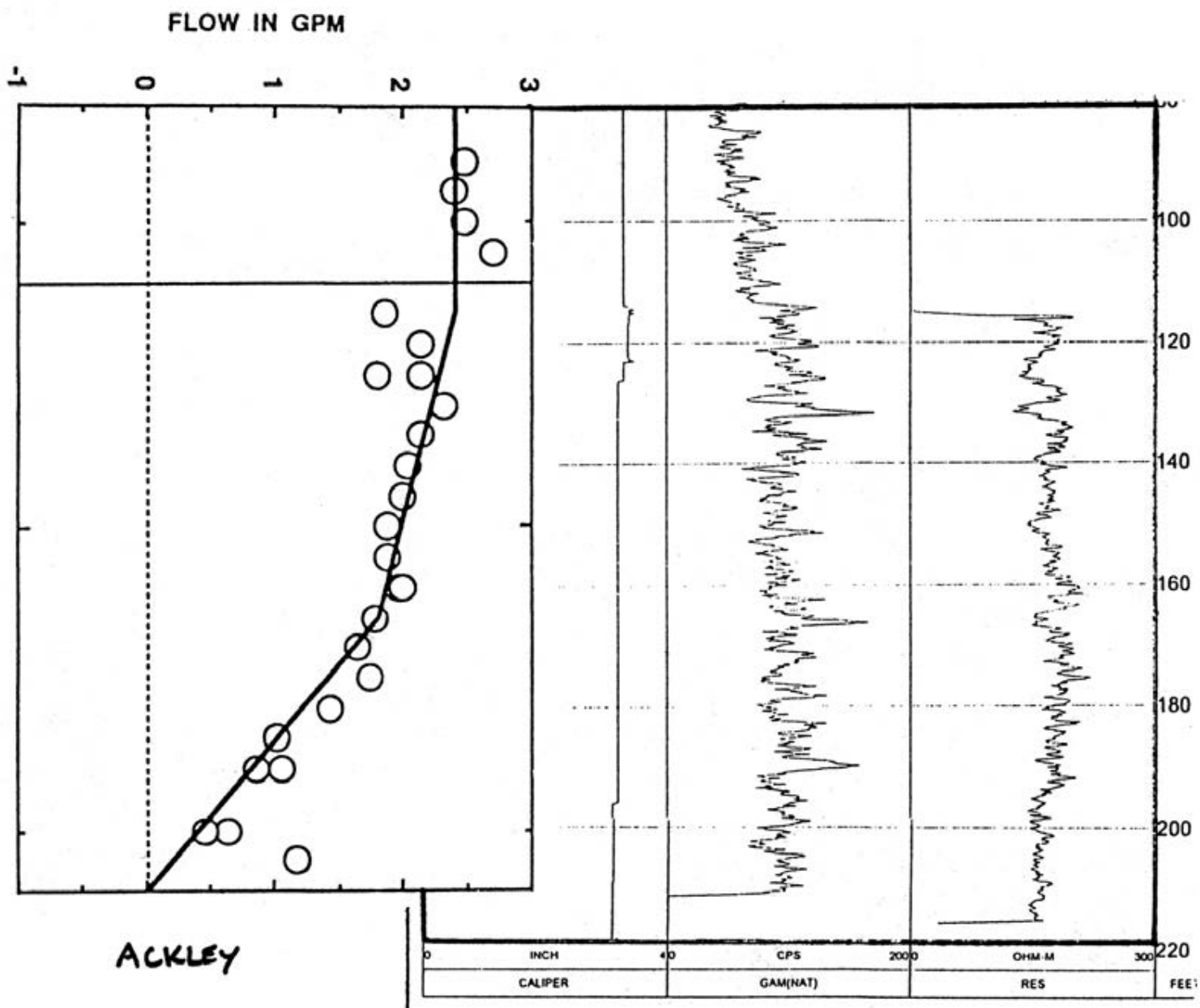
Date of Construction:	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser Coupling				
Riser Pipe Above WT				
Riser Pipe Below WT				
Screen Coupling				
Screen				
Surface Casing				
Protective Casing				

MEASUREMENTS: To 0.01 ft. (where applicable)

Dimensions of Bore Hole	8" to 100' TOC
	3" 100' to 219' TOC
Dimensions of Surface Casing	6" ID
Riser Pipe Length	
ID of Riser Pipe	
Top of Screen to First Joint	<div>Open Hole</div>
Screen Length	
Screen Slot Size	
Number of Openings in Screen	
Bottom of Screen to End Cap	
Dimensions of Protective Casing	







FLOW LOG ANALYSIS

1. ACKLEY WELL (3 inch diameter)

ESTIMATED CAPACITY: 5 gpm

TOTAL TRANSMISSIVITY: $0.00037 \text{ m}^2/\text{s} = 34.4 \text{ ft}^2/\text{day}$

ZONE PERMEABILITY:

190-240 ft	0.053 m/day or 0.17 ft/day
240-300 ft	0.013 m/day or 0.43 ft/day

Appendix 1: Well AS-380 documents, USGS core description for Ackley Monitoring Well #1 (AS-380), 1998, from Dunning (2005)

Core	Cored interval (feet below ground surface)	Description
A	114.4 – 117	Sandstone, fine to med grained, reddish brown with light brown mottling, bedding plane parting, single high-angle fracture, competent but friable.
B	117 – 127	Sandstone, fine to med grained, light brown at top grading into mottled reddish brown and light brown, lower 8 ft is uniformly reddish brown, at ~ 123 feet a sandy clay interval, occasional bedding plane parting, several rubbled zones, single high angle fracture.
C	127 – 137	Sandstone, fine to med grained, transition to generally light brown mottled with reddish brown, between ~ 130.0 and 130.5 a section of brownish red sandstone, to 137.0 is uniform light brown and reddish brown, competent but friable.
D	137 – 147	Sandstone, fine to med grained, uniform reddish brown interbedded and mottled with light brown, several low angle fractures or bedding partings.
E	147 – 157	Sandstone, fine to med grained, continued uniform reddish brown, competent but less friable than above, increasing light brown mottling ~153.0 to 156.
F	157 – 167	Sandstone, fine to med grained, continued reddish brown, competent, occasional red clay or silt inclusions and thin layers, low angle fractures or bedding partings.
G	167 – 177	Sandstone, fine to med grained, many distinct reddish brown and light brown alternating layers, also light brown mottling, ~174 to 177 more uniform reddish brown, low angle fractures and bedding partings, competent.
H	177 – 187	Sandstone, fine to med grained, reddish brown, several intervals of course poorly sorted sandstone with high angle bedding and darker red brown color.
I	187 – 197	Sandstone, fine to med grained, grading to slightly lighter reddish brown, distinct reddish brown and light brown alternating layers, occasional red clay or silt inclusions, low angle fracture and bedding partings.
J	197 – 207	Sandstone, fine to med grained, generally uniform reddish brown, several light brown bands and mottling.
K	207 – 217	Sandstone, fine to med grained, reddish brown as above, low angle fracture and bedding partings.

Table 4. Description of split-spoon samples of glacial deposits at Ackley Monitoring Well #1 site, Ashland County, Wis

Core	Cored interval (ft below ground surface)	Recovery (ft)	Description
A	0.0 – 4.5	2.9 ft	Red clay till with < 10% sand.
B	4.5 – 9.5	5.0 ft	Red clay till with sand lenses. Relatively more moist and compact than core A.
C	9.5 – 14.5	none	
D	14.5 – 19.5	2.2 ft	Red clay till with significant abundance of pebbles.
E	19.5 – 24.5	2.4 ft	Red clay till with significant abundance of pebbles.
F	24.5 – 29.5	1.9 ft	Red clay till with pebbles and cobbles, less sandy than core E.
G	29.5 – 34.5	1.4 ft	Red clay till, sandier with relatively fewer pebbles and cobbles.
H	34.5 – 39.5	5.0 ft	Red clay till with few cobbles, lenses of white Quartz grains.
I	39.5 – 44.5	1.6 ft	Red clay till with less clay and generally less coarse material, but some large pebbles (> 10 mm).
J	44.5 – 49.5	5.0 ft	Red clay till with relatively more clay, core has become wetter.
K	49.5 – 54.5	3.0 ft	Red clay till, silty, with common pebbles (1–10 mm).
L	54.5 – 59.5	4.8 ft	Red clay till, relatively sandier, small pebbles in core end.
M	59.5 – 61.3	1.8 ft	Red clay till, very sandy.
--	61.3 – 64.0	2.7 ft	Drill through interval due to difficulty augering.
N	64.0 – 65.3	1.3 ft	Red clay till, very sandy (coarse sand) with clasts of broken sandstone.
--	65.3 – 70.3	5.0 ft	Because of refusal of the auger beyond 65.3 ft, the hole was drilled through this interval. Due to hole conditions operations were ended at 70.3 ft.

[ft, feet; mm, millimeters; %, percent; --, interval drilled, not cored]

Access Permit: Click here

Date: 12/5/2018

PERMITTEE CONTACT INFORMATION			
Name:	Ana Genthe		
Agency:	Wisconsin Geological and Natural History Survey		
Address	3817 Mineral Point Road Madison, Wisconsin 53705-5100		
Phone:	(608) 263-4004	Cellular Phone:	(262) 391-2781
ACTIVITY DATES			
Start Date: 5/1/2019		End Date: 5/1/2019	
LOCATION OF ACTIVITY			
Access Type Requested (please indicate one by strikethrough)	<input type="checkbox"/> project requires crossing and/or accessing Tribally-controlled lands <input checked="" type="checkbox"/> project will be within Reservation, but not cross/access Tribally-controlled lands		
Narrative Location of Activity:	Corner of HWY 2 and Ackley Rd		
Location of Activities (GPS):	46.60959722, -90.8117		
TRS:	T48N	R04W	25
ACTIVITY			
Narrative Description of Activity:			
<p>The well is at the intersection of HWY 2 and Ackley Road and is strictly used to monitor groundwater levels as part of the Wisconsin Groundwater-Level Monitoring Network (WGLMN) and the National Ground Water Monitoring Network (NGWMN). The United States Geological Survey (USGS), Department of Natural Resources (DNR), and WGNHS maintain this network. Routine monitoring is done by the USGS, but to better understand and document the well WGNHS would like to use borehole geophysical instruments to evaluate the wells integrity and well construction. This entails backing a truck up to the well in order to use the instruments. The impact to the area of work would be minimal to none.</p>			
PERMIT CONDITIONS ON ACCESS (to be filled out by natural resources office only)			
Standard Conditions on Access			
<ul style="list-style-type: none"> All Tribal codes and ordinances must be adhered to when completing access activities unless a specific exemption has been issued for the project activity. All work must be completed using best management practices (BMPs). All equipment (including any materials used for crossing water resources) must be cleaned prior to entering the Reservation to eliminate the spread of invasive species. Please contact our Invasive Species Coordinator at 715-979-1071 or invasives@badriver-nsn.gov to set up a time for equipment to be inspected prior to it being unloaded at the site. Please see attached Equipment Inspection Guidance for details. Remove all waste, construction, or other non-natural materials introduced or resulting from the activity upon completion of the project. All chemical spills should be isolated and cleaned up following approved BMPs. All equipment should be fueled off-site to prevent accidental spills. The BRNRD should be notified within two hours of any spill occurring. If any additional activity needs to be performed once permittee is onsite (other than that specifically listed on this access permit) then the permittee must notify the BRNRD and postpone any additional work until approval has been issued. Questions from the community should be referred to the BRNRD. All geographic information generated or referenced throughout any work done on Reservation needs to be submitted to Bad River Natural Resources Department within 30 days of completion. This includes, but is not limited to, all maps, reports, datasets, and spatial analyses. All geospatial data must be submitted in a format compatible with ArcGIS version 10.3.1, with supporting metadata documentation. Reports, data, or analyses generated from the visit must be submitted to the BRNRD within 30 calendar days of completing the survey work, which includes documented locations of any United States Indian Service (USIS) monuments. This permit is for lands owned/controlled by the Bad River Band. The permittee is responsible for acquiring permissions to lands they wish to access not owned/controlled by the Bad River Band. Lands identified as Trust ownership should always be reviewed by the Bureau of Indian Affairs Great Lakes Agency, Ashland, Wisconsin to identify Tribal and individual ownership. 			
Special Conditions on Access			
<ul style="list-style-type: none"> White birch and cedar are protected species and may not be cut (including branches) without first receiving approval from the Department. 			

Additional Persons (Name, Cell Phone): Pete Chase, (608) 333-3785**Vehicles/Equipment:** logging van, borehole video logger, measuring tape, and geophysical loggers

Authorized Signature: _____ Date: _____

Permittee Signature: Analiess Genthe Date: 2/21/2019

Bad River NRD • P.O. Box 39 • Odanah, WI 54861 • (715)682-7123

Comments: *Unless noted, (1) all depths are in feet; (2) casing depth is interpreted from geophysical logs; (3) well depth incorporates 3/18/20 USGS tape-down; (4) water depth is interpreted from WGNHS on day of logging; (5) datum is top of casing at 646 ft., NAV88; (6) Elevation is USGS land surface datum (lsl); (7) stick up is feet of casing above lsl*

<input checked="" type="checkbox"/> Gamma	<input checked="" type="checkbox"/> Self Potential	<input checked="" type="checkbox"/> Fluid Conductivity	<input type="checkbox"/> Optical Borehole Imager
<input checked="" type="checkbox"/> Caliper	<input type="checkbox"/> Normal Resistivity	<input type="checkbox"/> Flow Meter- HeatPulse	<input type="checkbox"/> Acoustic Borehole Imager
<input checked="" type="checkbox"/> Single Point Resistivity	<input checked="" type="checkbox"/> Fluid Temperature	<input type="checkbox"/> Flow Meter- Spinner	<input type="checkbox"/> OTHER

Header file: WGNHSGeoPhysHeader6_2021_NGWMN.wcf



Appendix 2: Well BN-76 and BN-99 documents

Well BN-99 replaced well BN-76

Historical documents: BN-76

Basic well information, 1981; well evaluation, 1981; well location map; hydrograph, 1950-1959, 4 pages

well information historically compiled by WGNHS

USGS well schedule, 1949, 1 page

USGS well schedule, 1968, 1 page

USGS geologic card, date unknown, 1 page

USGS modification schedule, date unknown, 1 page

USGS hydrograph, 1950-2015, 1 page

from Luczaj and others (2017), pp11

Documentation of work done for this report: BN-76

WDNR fill and seal report, 2020, 2 pages

Historical documents for BN-99

WDNR well construction report for BF195 (BN-99), 1952, 2 pages

WGNHS Geologic Log, 1952, 2 pages

USGS hydrograph, 1985-2017, 1 page
from Luczaj and others (2017), pp17

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number Bn 76
 Owner Wisconsin Public Service Corp.
 Location (Co., T/R.sec) Brown, T24/R20E/Sec 24 SE 4 NE 4;
in the NW corner of the power plant
 Land surface altitude 590'
 Drainage basin LAKE MICHIGAN; Green Bay
 distance to the nearest perennial stream: 150 ft of the lake

WELL DATA

Depth 500'
 Casing depth 150'
 Screened interval ? open hole
 Diameter 5"
 Aquifers open to well ? Cambrian ss & St. Peter ss
 Geologic log available? no
 Construction report available? no
 Use of well unused industrial
 Access to measure well

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Green Bay WSO AP 7 mi SW
Oconto 25 mi N
 Streamgaging stations Kewaunee 25 mi ESE
04072150 Duck Creek near Howard, WI - 5.5 mi W
 Observation wells Bn 109 - 5 mi S Bn 13 - 5.7 mi W
Bn 143 - 5.5 mi SE Bn 131 - 6.7 mi SW
Bn 98 - 7 mi ENE
 Other

EXISTING RECORD

Measuring point Top of 3" pipe, 4.00 ft above lsd.
 Measuring equipment tape
 Frequency of measurement monthly from 01/06/65 (quart. 02/05/52-12/03/64 and 11/28/56-08/06/57;
weekly 08/06/57-12/23/57; B.M. 04/26/50-11/28/56)
 Period of record -- 1950 to present
 Started 04/26/50
 Ended
 Volume of missing record 104% for monthly

Recorded by

April 3, 1981

on

A. Zimmerman

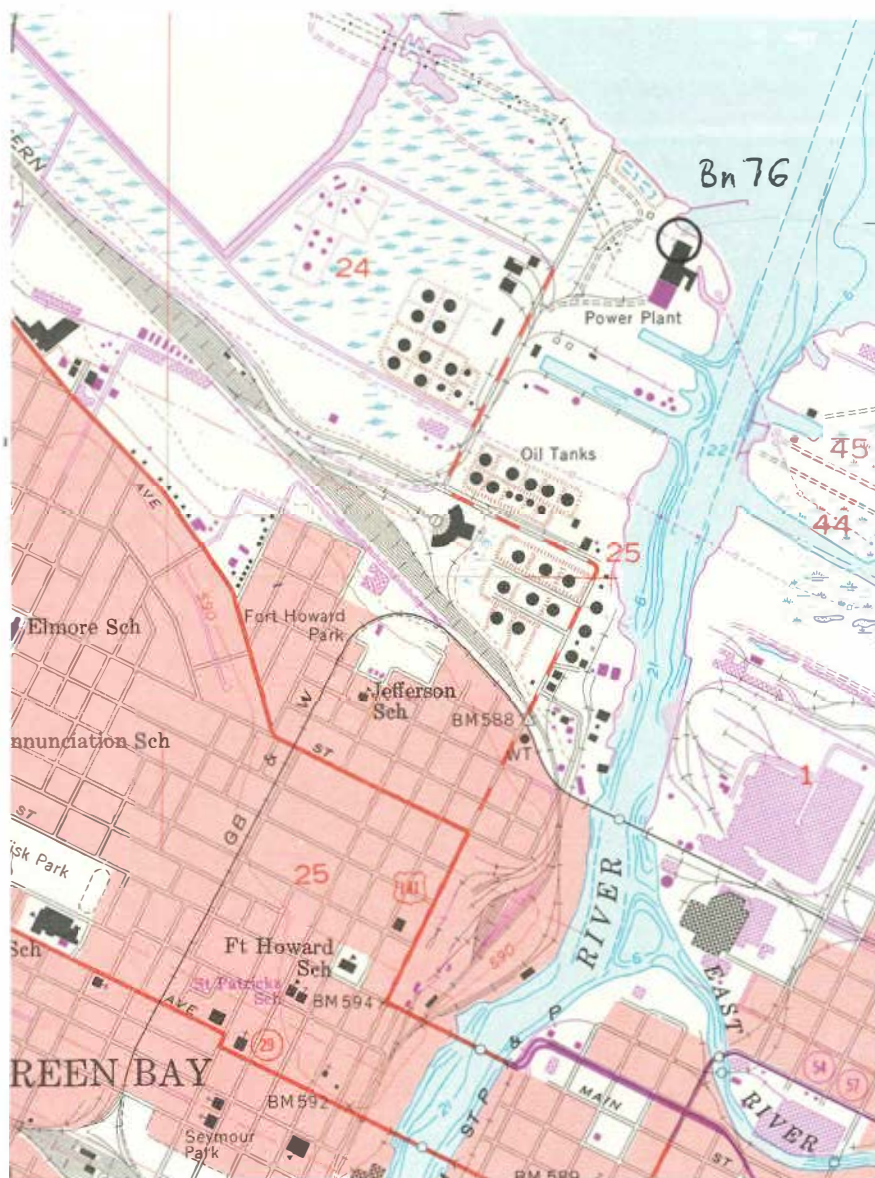
Appendix 2: Well BN-76 and BN-99 documents, well evaluation for BN-76, 1981

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

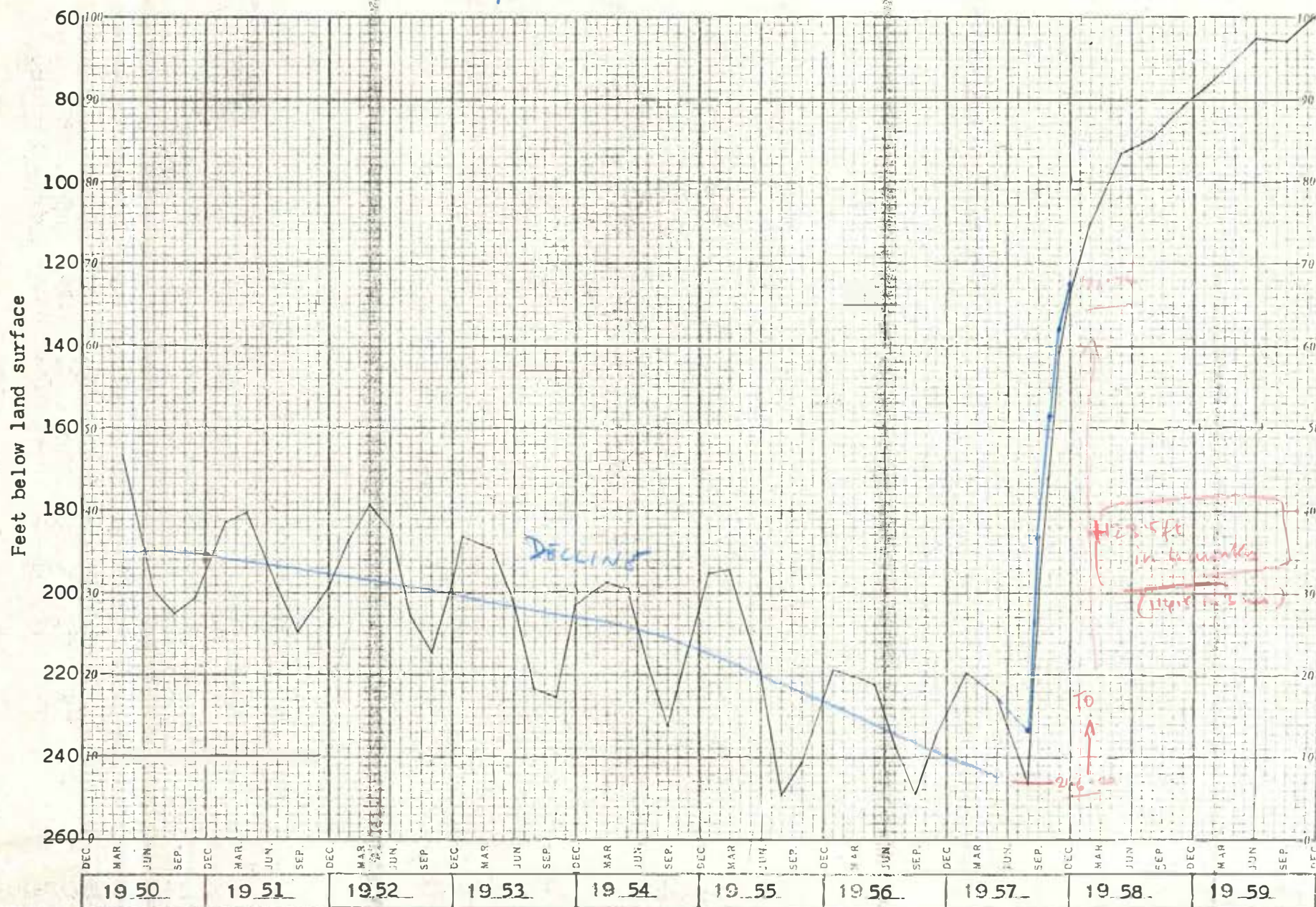
1. Areal spacing -- distance from any observation well 5 mi
-- distance from observation well in same aquifer 5 mi
2. Ownership: private -- public
3. Use of well unused industrial
4. Access -- physical Good
-- owner's permission
5. Condition of well -- casing
-- housing
6. Geologic log: yes -- no
7. Construction report: yes -- no
Well completion date: 1926
8. Diameter (4 in. minimum for recorder)
9. Aquifer: single -- multiple
10. Good hydraulic connection with aquifer yes
11. Knowledge of pumping effect yes (declining to 1957; recovery in 1957-58)
+ local pumping
12. Range and character of w.l. fluctuations large seasonal (>20 ft); gradual decline
from 1961
13. Length of record 31 years
14. Missing record 1.04% for monthly
15. Adequacy of current measuring frequency Good; upgrade to weekly
if key well
16. Probability of permanence Good
17. Recommendations/Improvements
- compare to Bm 109
- potential key well for monitoring changes
in the pumping area of Green Bay

Evaluated by A. J. Jorgensen on 4/17/81

Appendix 2: Well BN-76 and BN-99 documents, well location map for BN-76



Bn-24/20/24-76. Wisconsin Public Service Corp. SE $\frac{1}{4}$ NE $\frac{1}{4}$. Drilled unused artesian well in sandstone of Cambrian age and St. Peter Sandstone, diam 5 in, reported depth 500 ft, cased to 150. MP top of 3-in pipe, 4.00 ft above lsd. Affected by cessation of pumping from Green Bay municipal wells, August 1957, and by local pumping.



July 1935
visedUNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

Bn-24/20/24-76

WELL SCHEDULE

Date 4-1, 1949 Field No. Bn-76
 Record by WJD Office No. _____
 Source of data M. F. Brooks, Ch. engr.

1. Location: State: Wis County: Brown
 Map SE 1/4 NE 1/4 sec. 24 T 24 N R 20 E

2. Owner: Wis Pub Serv Corp Address _____
 Tenant Bar Side Steam Plant Address _____
 Driller _____ Address _____

Topography _____

Elevation 590 ft. above mslType: Dug, drilled, driven, bored, jetted 1936Depth: Rept. 500 ft. Meas. _____ ft.Casing: Diam. 5 in., to _____ in., Type _____Depth 150 ft., Finish _____Chief Aquifer E SS & ST. Pt. ss From _____ ft. to _____ ft.here Prairie du Chien, Galena, Plattevilleter level 30 ft. (rept.) 1936 above LS belowwhich is 4 ft. above surface10. Pump: Type Air lift Capacity 60 G. M.

Power: Kind _____ Horsepower _____

11. Yield: Flow _____ G. M., Pump _____ G. M., Meas., Rept. Est. _____

Drawdown _____ ft. after _____ hours pumping _____ G. M.

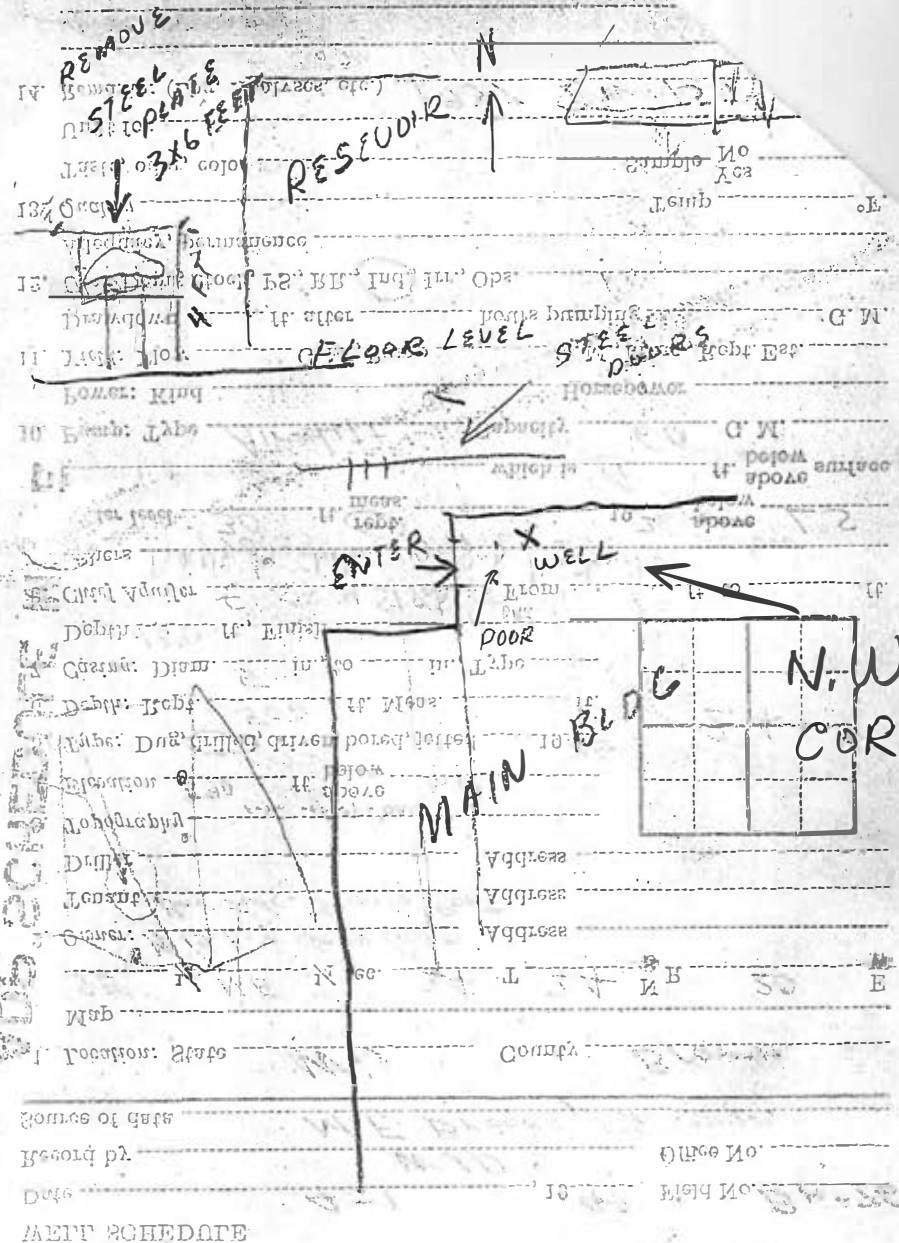
12. Use: Dom., Stock, PS., RR., Ind., Irr., Obs. all

Adequacy, permanence _____

13. Quality _____ Temp _____ °F.

Taste, odor, color _____ Sample Yes _____ No _____

Unfit for _____

14. Remarks: (Log, Analyses, etc.) 1937 DW 155'AL set at 280 Alld in spring 1949

WATER RESOURCES BRANCH
 GEOLOGICAL SURVEY
 DEPARTMENT OF THE INTERIOR
 UNITED STATES

1949
 1949 1932

WRD Exp. (GW)
April 1966Well No. BN-24/20/24-76

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR

GEOLOGICAL SURVEY

Verified FCH
WATER RESOURCES DIVISION

MASTER CARD

Record by E. J. DASPIR Source of data M.F. BROOKS date 26 Oct 67 Map GREEN BAY 1:62,500

State WISCONSIN County BROWN City or town BROWN Sequence number 1

Latitude: 44° 32' 28" N Longitude: 088° 00' 31" W

Local well number: 24 Other number: 4

Local use: B.N. 20/24 Owner or name: WISC PUBLIC SERV CORP

Ownership: County, Fed Gov't, City, Corp or Co, Private, State Agency, Water Dist

Use of well: Air cond, Bottling, Comm, Dowater, Power, Fire, Dom, Irr, Med, Ind, P, S, Rec, Stock, Inst, Unused, Repressure, Recharge, Desal-P S, Desal-other, Other

DATA AVAILABLE: Well data 8 Freq. W/L meas.: MONTHLY Field aquifer char. U

Hyd. lab. data: 1950

Qual. water data; type: yes

Freq. sampling: yes Pumpage inventory: no period: yes

Aperture cards: yes

Log data: yes

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD depth well: 500 ft Meas. 500 ft accuracy 6

Depth cased; (first perf.) 150 ft Casing type: 11.50 in Diam. 5 in

Finish: porous concrete, gravel v. concrete, (perf.), gravel v. (screen), horz. open end, (G) (F) (H) (P) (S) (T) (W) (X) (Z)

Method: (A) (B) (C) (D) (H) (J) (P) (R) (T) (V) (W) (Z)

Date drilled: 1920 Pump intake setting: 926 ft

Driller: name W. J. DRESCHER address 41149

Life: (type) after bucket, cent, jet, multiple, multiple, none, piston, rot, submerg, turb, other Deep A Shallow D

Power: (type) nat Trans. or meter no. 594

Descr. MP TOP OF PIPE (3") 4' ft above LSD, Alt. MP 594

Alt. LSD: 590 Accuracy: TOP 10' CT

Water Level: 170.33 ft above MP; Ft below LSD 766 Accuracy: TAPE

Date meas: 26 APR 50 Yield: 450 gpm Method determined 60

Drawdown: ft Accuracy: ft Pumping period: hrs

QUALITY OF WATER DATA: Iron ppm Sulfate ppm Chloride ppm Hard. ppm

Sp. Conduct K x 10⁶ Temp F Date sampled 11/1/68

Taste, color, etc. punched line

Well No. BN-24/20/24-76Latitude-longitude 44° 32' 28" N 88° 00' 31" W

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD Physiographic Province: CENT. LOW Section: F.L.S.

Drainage Basin: GR. LACS. Subbasin: WOLF FOX

Topo of well site: (D) (C) (E) (F) (H) (K) (L) depression, stream channel, dunes, flat, hilltop, sink, swamp

MAJOR AQUIFER: CAMB UP C3 CAMB 9B

Lithology: SAND STONE Origin: MAR Aquifer Thickness: 6 ft

Length of well open to: ft Depth to top of: ft

MINOR AQUIFER: ORDV. Low 01 PRAIRIE DU CHIEN 9P

Lithology: Dolomite Origin: MAR Aquifer Thickness: 6 ft

Length of well open to: ft Depth to top of: ft

Intervals Screened: yes

Depth to consolidated rock: ft Source of data: 64

Depth to basement: ft Source of data: 69

Surficial material: yes Infiltration characteristics: 72

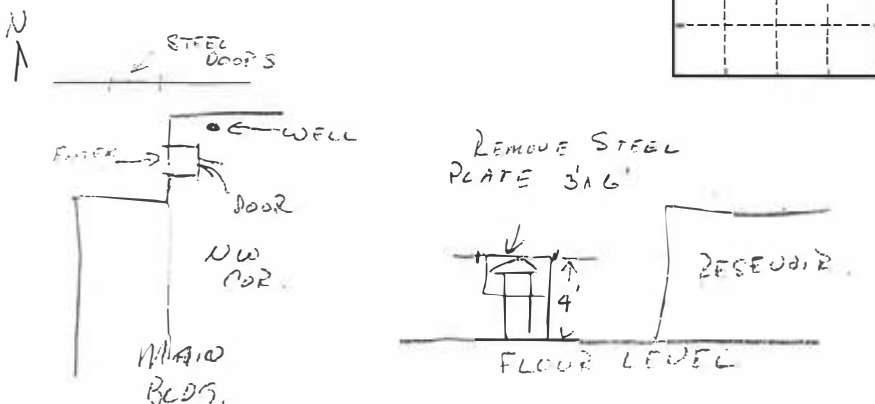
Coefficient Trans: gpd/ft Coefficient Storage: 75

Perm: gpd/ft² Spec cap: gpm/ft Number of geologic cards: 1

M.F. BROOKS, CH. ENGR.

TENANT: BAY SIDE STEAM PLANT

M.P. 10' ab. BAY



ABANDONED - SPRING 1949

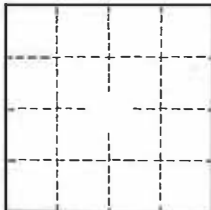
Appendix 2: Well BN-76 and BN-99 documents, USGS geologic card for BN-76, date unknown

Well No. BN-24/20/24-76

Latitude-longitude 44 32.28° 88.00.30

GEOLOGIC CARD

☐ SAME AS ON MASTER CARD
 Physiographic Province: CENT. LOW Section: E.L.S
 Drainage Basin: GR.T. LAKES Subbasin: WOLF-FOX
 Topo of well site: (D) depression, stream channel, dunes, flat, hilltop, sink, swamp, (P) offshore, pediment, hillside, terrace, undulating, valley flat
 MAJOR AQUIFER: ORDIV MID Ø:2 ST. PETER 9:5
 Lithology: SANDSTONE V Origin: MAR C Aquifer Thickness: _____ ft
 Length of well open to: _____ ft Depth to top of: _____ ft
 MINOR AQUIFER: ORDIV MID Ø:2 GALENA-PLATTEVILLE 8:A
 Lithology: DOLOMITE D Origin: MAR C Aquifer Thickness: _____ ft
 Length of well open to: _____ ft Depth to top of: _____ ft
 Intervals Screened:
 Depth to consolidated rock: _____ ft Source of data: _____
 Depth to basement: _____ ft Source of data: _____
 Surficial material: _____ Infiltration Characteristics: _____
 Coefficient Trans: _____ gpd/ft Coefficient Storage: _____
 Coefficient Perm: _____ gpd/ft² Spec cap: _____ gpm/ft; Number of geologic cards: 2



Punched ERC

BN-24/20E/24-0076
BN-76

Site Ident. No. 443228088003101

Check One ☐ English ☒ Metric Units

MODIFICATION TRANSACTIONS

SUBMISSION

Date	Initials	Done (✓)
------	----------	-------------

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																			
1	R=183* T=A* 185='C234/AFFECTED BY REGIONAL PUMPING'																																																																															
2	R=183* T=A* 185='C234/GREEN BAY, USES BAY WATER, 08/57'																																																																															
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0 = ZERO 0 = ALPHA 0 1 = ONE 1 = ALPHA 1 2 = TWO 2 = ALPHA 2 / = SLASH / = VERT.BAR / = MINUS - = HORZ.BAR

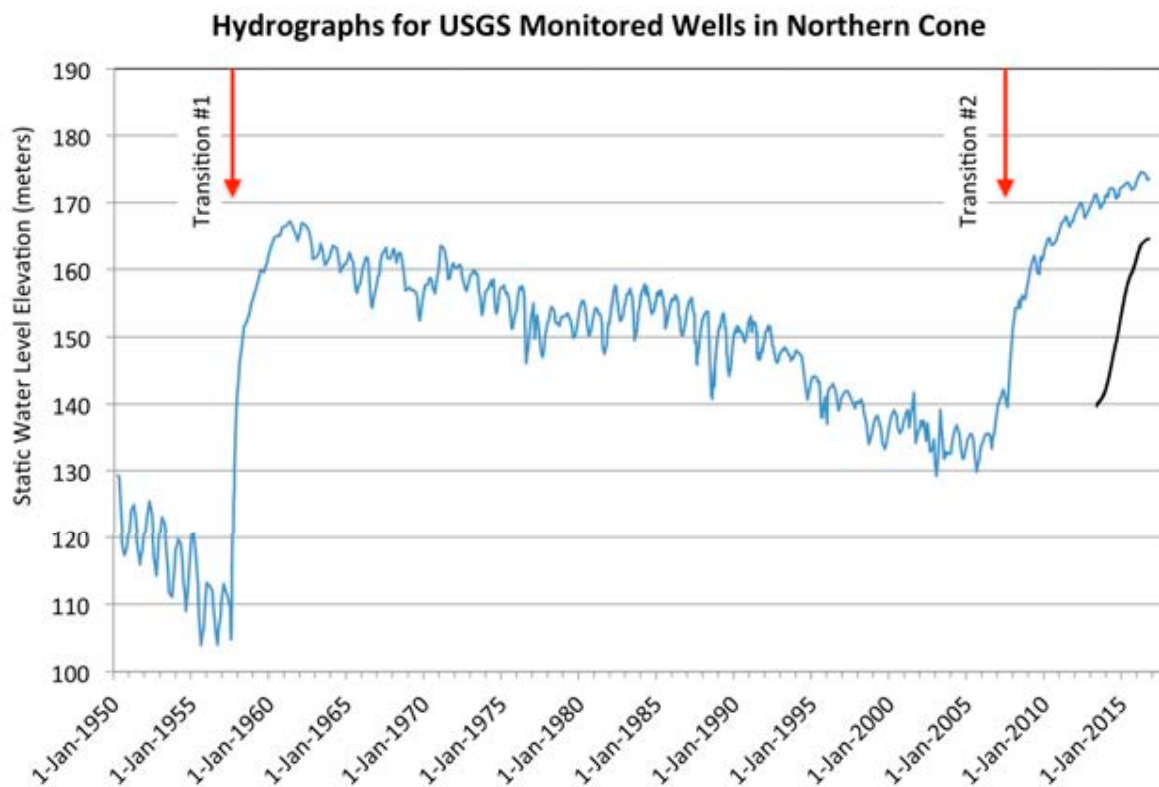


Figure 7. Long-term hydrographs of USGS monitoring wells in Green Bay region (central Brown County) from [41]. Red arrows indicate the two major transitions from groundwater to surface water supplies by Brown County municipalities in 1957 and 2007. **Blue line is well BN-076**, and Black line is well BN-0435. Note that the drawdown for BN-076 was not as significant at this location because it is on the northern edge of the cone of depression, and by 2005, the northern cone had moved southward to De Pere. BN-0435 is located near the center of the northern cone, but was not installed until after most of the recovery had already occurred.

12/16/2020

BN-76 abandoned and replaced with existing well BN-99 (BF195)

Well / Drillhole / Borehole Filling & Sealing

Wisconsin Department of Natural Resources

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295 and 299, Wis. Stats., and ch. NR 141 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.

Date of Filling & Sealing: 07/10/2020

Rec #: 165601

Verification. Check only if well filling & sealing was done previously and you are just verifying that work.: Yes

1. Well Location Information

County: Brown		WI Unique Well #: none found		DNR Hicap Well #:	
Latitude: (DD.DDDDD°) 44.5412 °N		Longitude: (DD.DDDDD°) 88.0082 °W		GPS Method Code: GPS008	
Gov't Lot #:	Qtr/Qtr: SE/NE	Quarter:	Section #: 24	Township #: North	Range #: 20E
Well Street Address: 1530 NORTH BYLSBY AVE				Subdivision Name:	
Well City/Village/Town: City of GREEN BAY		Well Zip Code: 54303	Lot #:	Does a new well replace this well? No	
Reason for Filling & Sealing: NO LONGER USE				WI Unique Well # of Replacement Well:	

2. Facility / Owner Information

Facility Name: WISCONSIN PUBLIC SERVICE		FID #:	Well Name: 05000076 (aka BN-76)		
Original Well Owner:		Service Category:			
Present Well Owner: WISCONSIN PUBLIC SERVICE		Mailing Address of Present Owner: 700 NORTH ADAMS ST.			
		City: GREEN BAY	State: WI	Zip Code: 54307-9001	

3. Well / Drillhole / Borehole Information

Well Type: Water Well	Original Construction Date: (mm/dd/yyyy)	Construction Type: Drilled
Formation Type: Bedrock	Total Well Depth From Ground Surface (ft.): 284.00	(specify Other):
Casing Diameter (in.): 6.00	Lower Drillhole Diameter (in.): 6.00	Casing Depth (ft.): 126.00
Was well annular space grouted? Unknown	If yes, to what depth (ft.)?	Depth to Water (ft.): 2.00

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

Pump and piping removed?	Yes	Liner(s) removed? If no liner mark as N/A	N/A	If no, was liner perforated?	N/A
Screen removed?	N/A	Well casing (or loop if geothermal) left in place?	Yes	Was casing cut off below surface?	No
Did sealing material rise to surface?	Yes	Did material settle after 24 hours?	No	If yes, was hole retopped?	N/A

If bentonite chips/pellets were used, were they hydrated from a known water source?

Yes

Method of Placing Sealing Material: Screened & Poured (Bentonite Chips)	(Explain Other):
Well Sealing Materials: Bentonite Chips	Product Name and Manufacturer: Enviroplug Wyo-Ben
Other Drillholes:	

5. Material Used to Fill Well / Drillhole

Material:	From (ft.):	To (ft.):	# and Units of Sealant:	Mix Ratio or Mud Weight:
BENTONITE CHIPS	Surface	284.00	65	

6. Comments

THEY(WPS) HAD RECORDS THAT THIS WELL NAME WAS BN76, THEY GAVE ME A WELL LOG WHICH WAS 5"DIAMETER, 500' DEPTH AND 150' CASING. WHICH THIS WELL CLEARLY IS NOT.

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: GERALD L COOPER	License #: 6211	Phone: 920-619-9355
5050 BROWN RD LITTLE SUAMICO WI 54141	Email Address: COOPERWATERWELLSERVICE@GMAIL.COM	

8. DNR Use Only

Signed On: 07/13/2020	Submitted By: mjcooper	Received On: 07/13/2020	Approved On: 08/05/2020
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The Official Internet site for the Wisconsin Department of Natural Resources
101 S. Webster Street . PO Box 7921 . Madison, Wisconsin 53707-7921 . 608.266.2621

Well Construction Report WISCONSIN UNIQUE WELL NUMBER				BF195		Drinking Water and Groundwater - DG/5 Department of Natural Resources, Box 7921 Madison WI 53707				Form 3300-077A					
Property Owner GREEN BAY, CITY OF						Phone # (920)448-3480		1. Well Location				Fire # (if avail.)			
Mailing Address 631 S ADAMS ST						City of GREEN BAY									
City GREEN BAY				State WI		Zip Code 54301									
County Brown		Co. Permit #		Notification #		Completed 01-01-1952		Subdivision Name				Lot #		Block #	
Well Constructor (Business Name) LAYNE CHRISTENSEN COMPANY				Lic. # 582		Facility ID # (Public Wells) 405035620				Method Code GPS008					
Address W229 N5005 DUPLAINVI PEWAUKEE WI 53072				Well Plan Approval #		or Govt Lot #		Section 33		Township 24 N		Range 20 E			
Hicap Permanent Well # 75565				Common Well # 008		Specific Capacity				2. Well Type New Well					
3. Well serves # of Municipal/Community				Hicap Well ?		of previous unique well #				constructed in					
Heat Exchange ___ # of drillholes				Hicap Property ?		Reason for replaced or reconstructed well ?				Construction Type Drilled					
Hicap Potable ?															
4. Potential Contamination Sources - ON REVERSE SIDE															
5. Drillhole Dimensions and Construction Method															
Dia. (in.)		From (ft.)		To (ft.)		Upper Enlarged Drillhole				Lower Open Bedrock					
20		Surface		107		Rotary - Mud Circulation									
19		107		777		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)									
6. Casing, Liner, Screen															
Dia. (in.)		Material, Weight, Specification Manufacturer & Method of Assembly				From (ft.)		To (ft.)							
20						Surface		107							
16						107		235							
Dia. (in.)		Screen type, material & slot size				From (ft.)		To (ft.)							
7. Grout or Other Sealing Material															
Method															
Kind of Sealing Material				From (ft.)		To (ft.)		# Sacks Cement							
CEMENT				Surface		235		S							
8. Geology Type, Caving/Noncaving, Color, Hardness, etc...															
Geology Codes		N		S		L		SAND				From (ft.) Surface		To (ft.) 30	
P		C		M		CLAY				30		80			
U		L		DOLOMITE GAL PLAT				80		210					
		N		L		SANDSTONE GAL PLAT				210		220			
		L		N		DOLOMITE @ SS LMAGN				220		330			
		L		DOLOMITE LMAGN				330		405					
		L		R		DOLOMITE LMAGN				405		435			
P		N		SANDSTONE TREMP				435		445					
		H		N		M		SILTSTONE TREMP				445		460	
		N		L		SANDSTONE FRANOC				460		590			
G		N		L		SANDSTONE DRESB				590		640			
		N		SANDSTONE DRESB				640		775					
P		Q		GRANITE PC				775		777					

9. Static Water Level 0 ft. _____ ground surface	11. Well Is 0 in. _____ grade
10. Pump Test Pumping level _____ ft. below surface Pumping at 1120 GP for _____ Hrs. Pumping Method ?	Developed ? Disinfected ? Capped ?

12. Notified Owner of need to fill & seal ?

Filled & Sealed Well(s) as needed?

13. Constructor / Supervisory Driller	Lic #	Date Signed
Drill Rig Operator	Lic or Reg #	Date Signed

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

Comment:
Water Quality Text:
Water Quantity Text:
Difficulty Text:

Created On: 11-05-1998 Created by: HFRC LOAD Updated On: 11-05-1998 Updated by: MIGRATION

HIGHLAND AVENUE WELL, GREEN BAY, WIS.

SW $\frac{1}{4}$, SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 33, T. 24 N., R. 20 E.

Jerry Donohue Engineering Co., Engineers

Layne-Northwest Co., Contractors, 1952

Samples examined by F. T. Thwaites, Nos. 157315-157360

A15. - 642' ETM

D R I F T	80	0-30	30		sand, fine, light gray, dolomitic	
		30-70	40		Clay, silty, pink-gray, dolomitic	20" pipe
		70-80	10		No sample	16" pipe cemented
G A L L E N A - P L A 140		80-105	25		Dolomite, light gray, some blue-gray	107
		105-125	20		Dolomite, light gray, gray, blue-gray	
		125-145	20		Dolomite, gray, some blue-gray	
		145-165	20		Dolomite, dark blue-gray	
		165-180	15		Dolomite, light gray, some white	235
		180-200	20		Dolomite, light gray	
		200-210	10		Dolomite, lt. gy; sandstone, fine, lt. gy, dol.	
		210-220	10		Sandstone, fine to med., lt. gy, dol; dol, bug	
		220-235	15		Dolomite, light gray	
		235-240	5		Sandstone, med. to fine, lt. gy, dol; dol, lts	
		240-270	30		Dolomite, light gray; some sandstone, med. to fine, light gray, very dolomitic	
		270-280	10		Dolomite, light gray	
		280-300	20		Dolomite, light gray, some brown, dark gray	
		300-310	10		Dolomite, lt. gy; ss, fine to med, lt. gy, dol.	
		310-330	20		Dolomite, light gray; little sandstone	
		330-395	65		Dolomite, light gray	
L O W E R M A G N E S I A N 215		395-405	10		Dolomite, light pink, gray	19" hole
		405-415	10		Dolomite, light pink, gray, sandy	
		415-435	20		Dolomite, pink, gray, sandy; chert, gy, oolit	
		435-445	10		Sandstone, fine to med, pink; siltstone, red	
		445-460	15		Siltstone, sandy, dark red, very dolomitic	
		460-485	25		Sandstone, fine, dark pink-gray, glauconitic, dolomitic	
		485-490	5		Ss, fine to very fine, lt. gray, lt. pink, d, g	
		490-510	20		Sandstone, fine, light pink, dolomitic	
		510-520	10		Sandstone, fine to coarse, light gy, dolomitic	
		520-550	30		Sandstone, fine to medium, light gray, dolomitic	
F R A N C O N I A 130		550-575	25		Sandstone, fine to medium, light gray, sl. dol.	50# shots
		575-580	5		Sandstone, fine, silty, lt. gray, dolomitic	
		580-590	10		Sandstone, fine to coarse, lt. gray, dolomitic	
		590-610	20		Sandstone, fine to medium, light gray	
		610-630	20		Sandstone, fine to medium, light gray, dol.	
		630-640	10		Sandstone, fine, light gray, dolomitic	
		640-675	35		Sandstone, fine to medium, light gray	
		675-695	20		Sandstone, medium to fine, light gray	
		695-735	40		Sandstone, fine to medium, light gray	
		735-750	15		Sandstone, fine, silty, light gray	
D R E S B A C H						515
						535
						555
						575
						595
						615
						635
						655
						675
						695
						715
						735

Highland Ave. well, Green Bay, p. 2

	750-760	10		Sandstone, fine to medium, silty, lt. gray
185	760-770	10		Sandstone, fine to medium, light gray
	770-775	5		Sandstone, medium to coarse, hard, red
H 2	775-777	2		granite, pink

755

Formations: Drift; Galena-Platteville; Lower Magnesian (Prairie du Chien); Trempealeau;
 Franconia; Dresbach (may include some Eau Claire); pre-Cambrian

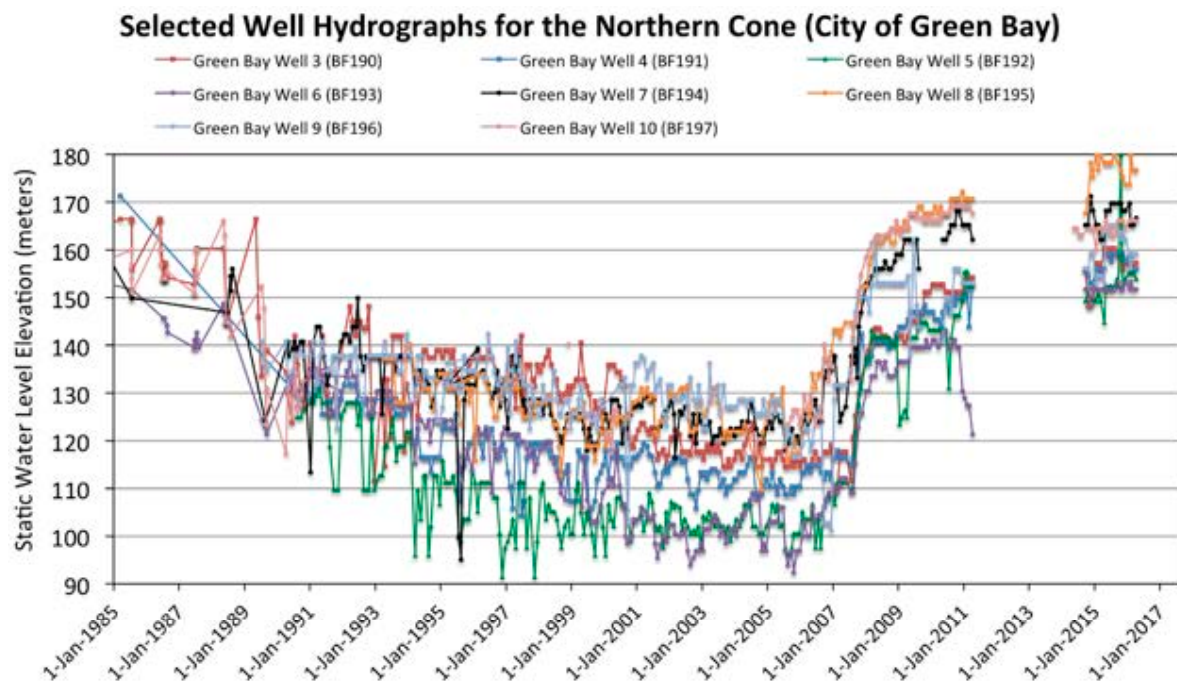


Figure 13. Hydrographs of selected wells in the Northeast GMA over the past 30 years.
 (a) Hydrographs the northern cone show a steady decline until 2006–2007 when the second transition from groundwater to surface water occurred and water levels rebounded dramatically. Data from April 2011 through mid-2014 were missing from the Green Bay Water Utility (GBWU) records.

Appendix 3: Well CH-142 documents

Historical Documents

Basic well information, 1980; well evaluation, 1980; well location map; hydrograph, 1991-2000, 5 pages

well information historically compiled by WGNHS

Well construction report, 1967, 2 pages

two copies submitted by driller that are slightly different

WGNHS geologic log, 1967, 1 page

USGS well schedule, 1968, 1 page

USGS water-level record, 1969, 1 page

Geophysical, hydrological, and well construction information from Dunning and others (1996), 1 page

hydrograph (1958 - 1995), slug test, horizontal hydraulic conductivity, geophysical logs, and well measurements from unpublished report to DNR (DNR project number 118) by Dunning and others (1996)

datum is top of casing, approximately 2.2 ft above land surface in 1996, data courtesy of U.S. Geological Survey

Documentation of work done for this report

WGNHS Geophysical Log, 2019, 1 page

gamma, optical borehole image, fluid temperature, fluid conductivity, caliper

datum is top of casing (1.75 ft above land surface in 2019)

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number Ch 142

Owner Wis. DOT

Location (Co., T/R.sec) Chippewa Co., T28N, R7W, Sec. 17 - NW/4;
wayside on STH 29 nr. Cadott

Land surface altitude 965 ft above msl

Drainage basin CHIPPEWA R.: Paint Cr. (2,000 ft of the right bank)
BASIN

WELL DATA

Depth 60 ft

Casing depth 39 ft

Screened interval open hole 39-60

Diameter 6 in.

Aquifers open to well sandstone aquifer (Mt. Simon)

Geologic log available? yes

Construction report available? yes

Use of well wayside well

Access to measure well good

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Chippewa Falls - 6.4 mi W STANLEY - 17 mi ENE
Eau Claire - 11.4 mi ESE BLOOMER - 17 mi NW

Streamgaging stations 05365500 Chippewa R. at Chippewa Falls - 6.8 mi W

Observation wells EC 211 - 11 mi SW CH 284 - 17.5 mi NNE
Ch 120 - 9 mi WSW Du 113 - 27.5 mi W

Other

EXISTING RECORD

Measuring point 1 1/4" hole in pump base, 2.20 ft above land surface

Measuring equipment tape

Frequency of measurement monthly

Period of record -- 12 yrs

Started Jan. 6, 1968

Ended

Volume of missing record 20% ; measured on average 9-10 times a year

93

08/11/80

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

1. Areal spacing -- distance from any observation well 9 mi
-- distance from observation well in same aquifer 11 mi
2. Ownership: private -- public
3. Use of well *wayside well*
4. Access -- physical good
-- owner's permission
5. Condition of well -- casing
-- housing
6. Geologic log: yes -- no
7. Construction report: yes -- no
Well completion date: 08/16/67
8. Diameter (4 in. minimum for recorder) 6 in.
9. Aquifer: single -- multiple
10. Good hydraulic connection with aquifer yes
11. Knowledge of pumping effect *some lows apparently reflect pumping*
12. Range and character of w.l. fluctuations *6 ft (27.5-33.5), small fluct.,
long-term trends*
13. Length of record *12 yrs.*
14. Missing record *20%*
15. Adequacy of current measuring frequency OK
16. Probability of permanence good point
17. Recommendations/Improvements
 - improve the regularity of measurements
 - potential key well
 - select better time for measurements (early morning)

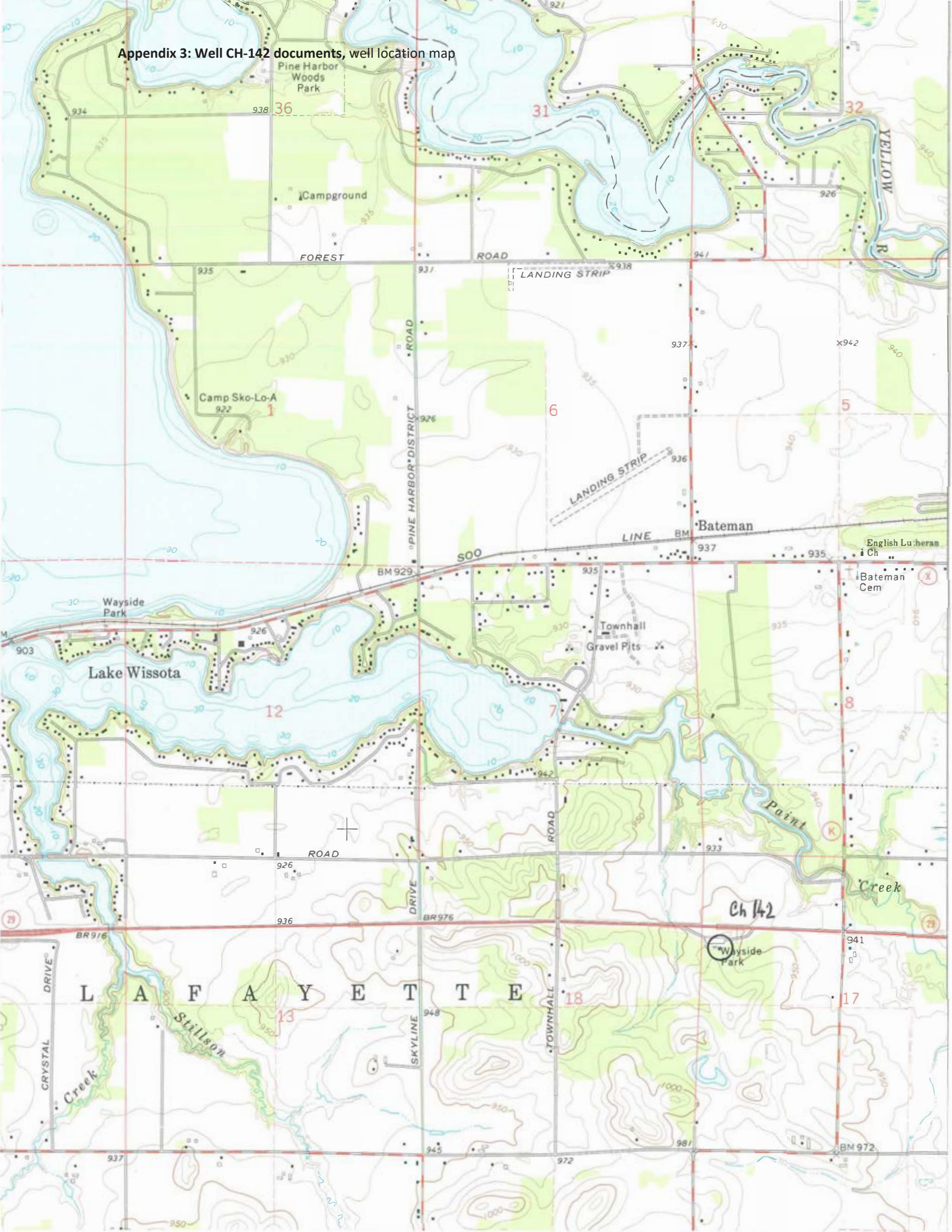
Evaluated by

43

on

8/15/80

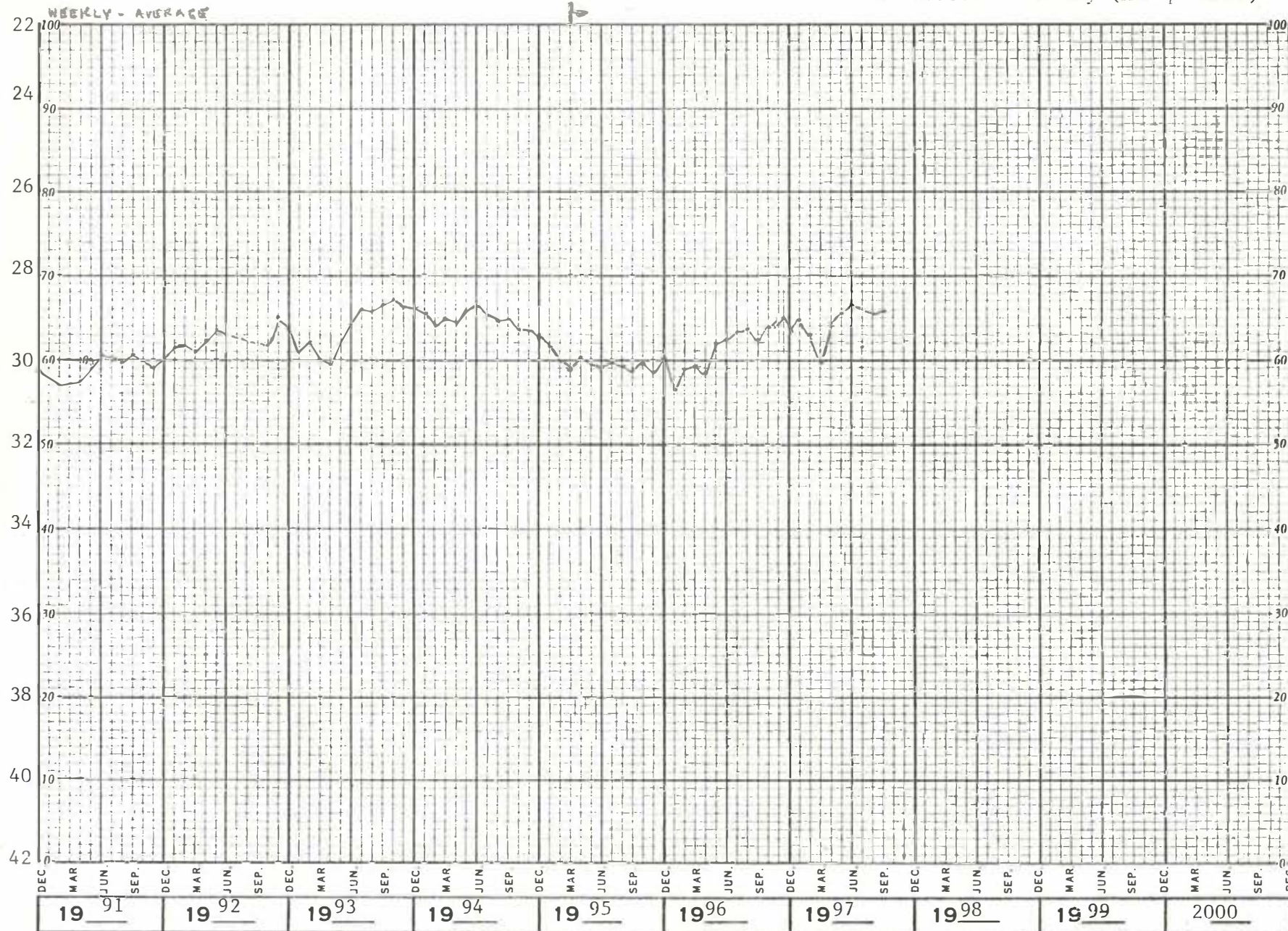
Appendix 3: Well CH-142 documents, well location map



Appendix 3: Well CH-142 documents, hydrograph

CH-28/07W/18-0142. Wis. Dept. of Transportation. NW $\frac{1}{4}$ NW $\frac{1}{4}$. Drilled domestic artesian well in sandstone of Cambrian age, diam 6 in, depth 60 ft, cased to 39. Lsd 930 ft above msl. MP $\frac{1}{4}$ -in hole in pump base, 2.20 ft above lsd.

Measured monthly (All plotted)



WELL CONSTRUCTOR'S REPORT

DEPARTMENT OF RESOURCE DEVELOPMENT

1. COUNTY <i>Chippewa</i>		CHECK ONE <input checked="" type="checkbox"/> Town <input type="checkbox"/> Village <input type="checkbox"/> City <i>LaFayette</i>		NAME <i>CH-142-G</i>	
2. LOCATION (Number and Street or 1/4 section, section, township and range. Also give subdivision name, lot and block numbers when available.) <i>Sec 17, T28 N, R7 W</i> <i>NW, SW, NW, Sec 17</i>					
3. OWNER AT TIME OF DRILLING <i>State Highway Commission</i>					
4. OWNER'S COMPLETE MAIL ADDRESS <i>Eau Claire (Office)</i>					
5. Distance in feet from well to nearest: (Record answer in appropriate block)		BUILDING C.I.		SANITARY SEWER FLOOR DRAIN C.I. TILE	
				FOUNDATION DRAIN SEWER CONNECTED INDEPENDENT	
				WASTE WATER DRAIN C.I. TILE	
CLEAR WATER DRAIN C.I. TILE	SEPTIC TANK	PRIVY	SEEPAGE PIT	ABSORPTION FIELD	BARN
		<i>200</i>			
OTHER POLLUTION SOURCES (Give description such as dump, quarry, drainage well, stream, pond, lake, etc.)					

6. Well is intended to supply water for:

Wayside Rest Area

7. DRILLHOLE

Dis. (in.)	From (ft.)	To (ft.)	Dis. (in.)	From (ft.)	To (ft.)
<i>10</i>	<i>Surface</i>	<i>30</i>			
<i>6</i>	<i>30</i>	<i>60</i>			

10. FORMATIONS

Kind	From (ft.)	To (ft.)
<i>Clay Sand & Gravel</i>	<i>Surface</i>	<i>35</i>
<i>Sandstone</i>	<i>35</i>	<i>60</i>

8. CASING, LINER, CURBING, AND SCREEN

Dis. (in.)	Kind and Weight	From (ft.)	To (ft.)
<i>10</i>	<i>Steel 35#</i>	<i>Surface</i>	<i>20</i>
<i>6</i>	<i>Steel 19.18</i>	<i>Surface</i>	<i>39</i>

Mostly Clay with some sand & Gravel mixed in.

9. GROUT OR OTHER SEALING MATERIAL

Kind	From (ft.)	To (ft.)
<i>Cement</i>	<i>Surface</i>	<i>30</i>

11. MISCELLANEOUS DATA

Yield test: <i>6</i> Hrs. at <i>17</i> GPM	Well construction completed on <i>8/16</i> 1967
Depth from surface to normal water level <i>25</i> ft.	Well is terminated <i>24</i> inches <input checked="" type="checkbox"/> above final grade <input type="checkbox"/> below
Depth to water level when pumping <i>35</i> ✓ ft.	Well disinfected upon completion <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Water sample sent to <i>Madison</i>	Well sealed watertight upon completion <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	laboratory on: <i>Aug 16</i> 1967

Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, type of casing joints, method of finishing the well, amount of cement used in grouting, blasting, sub-surface pumprooms, access pits, etc., should be given on reverse side.

SIGNATURE

COMPLETE MAIL ADDRESS

Ralph J Faherty

Registered Well Driller

1190 Seventh Ave Platteville, Wis

Please do not write in space below

COLIFORM TEST RESULT

GAS - 24 HRS.

GAS - 48 HRS.

CONFIRMED

REMARKS

9/2/67
cc: M.E. Ostrom
Jim Anderson
S. Hus Egan

CONSTRUCTOR'S REPORT

DEPARTMENT OF RESOURCE DEVELOPMENT

5-Ch-142 Wel 6

COUNTY <i>Clark</i>	CHECK ONE <input checked="" type="checkbox"/> Town <input type="checkbox"/> Village <input type="checkbox"/> City	NAME <i>Wayne</i>
------------------------	--	----------------------

2. LOCATION (Number and Street or 1/4 section, township and range. Also give subdivision name, lot and block numbers when available.)

3. OWNER AT TIME OF DRILLING

4. OWNER'S COMPLETE MAIL ADDRESS

5. Distance in feet from well to nearest: (Record answer in appropriate block)	BUILDING	SANITARY SEWER C. I.	TILE	FLOOR DRAIN C. I.	TILE	FOUNDATION DRAIN SEWER CONNECTED	INDEPENDENT	WASTE WATER DRAIN C. I.	TILE
	-	-	-	-	-	-	-	-	-

CLEAR WATER DRAIN C. I.	TILE	SEPTIC TANK	PRIVY	SEEPAGE PIT	ABSORPTION FIELD	BARN	SILO	ABANDONED WELL	SINK HOLE
-	-	-	-	-	-	-	-	-	-

OTHER POLLUTION SOURCES (Give description such as dump, quarry, drainage well, stream, pond, lake, etc.)

6. Well is intended to supply water for:

7. DRILLHOLE

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
10	Surface	20			
6	-	60			

10. FORMATIONS

Kind	From (ft.)	To (ft.)
clay and gravel	Surface	35
sandstone	35	60

8. CASING, LINER, CURBING, AND SCREEN

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
10	Reinforced 35 lb	Surface	20
6	" " 19 lb	-	39

9. GROUT OR OTHER SEALING MATERIAL

Kind	From (ft.)	To (ft.)
Cement	Surface	39

11. MISCELLANEOUS DATA

Yield test: *12* Hrs. at *20* GPMDepth from surface to normal water level *20* ft.Depth to water level when pumping *40* ft.

Water sample sent to

laboratory on:

19

Well construction completed on *Aug 4* 1967Well is terminated *2* inches ☒ above ☐ below final gradeWell disinfected upon completion ☒ Yes ☐ NoWell sealed watertight upon completion ☒ Yes ☐ No

Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, type of casing joints, method of finishing the well, amount of cement used in grouting, blasting, sub-surface pumprooms, access pits, etc., should be given on reverse side.

SIGNATURE <i>Robert J. Liberty</i>	COMPLETE MAIL ADDRESS <i>Clark County</i>
Registered Well Driller	

Please do not write in space below

COLIFORM TEST RESULT	GAS - 24 HRS.	GAS - 48 HRS.	CONFIRMED	REMARKS

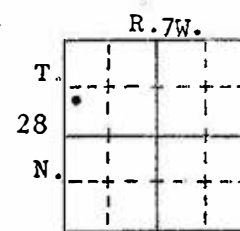
UNIVERSITY OF WISCONSIN GEOLOGICAL & NATURAL HISTORY SURVEY
3817 Mineral Point Road, Madison, Wisconsin 53705

Log No. 5-Ch-142

Well name Chippewa Co. Wayside #14 Well
Lafayette Township
Owner... Wis. Dept. of Transportation
Address.. 4802 Sheboygan Ave.
Madison, WI 53702
Driller.. Ralph Faherty
Engineer.

County: Chippewa

Completed... 8/4/67
Field check U.S.G.S. - R.E.
Altitude... 965' ETM
Use... Wayside
Static w.l... 20'
Spec. cap... 1 GPM/ft



Sec. 17

Location: center, NW $\frac{1}{4}$, SW $\frac{1}{4}$, NW $\frac{1}{4}$, sec. 17, T28N, R7WQuad. Lake Wissota 7 $\frac{1}{2}$ '

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	20'				10"	Steel New						
6"	20'	60'					& C 35lb	0	20'				
						6"	Steel New						
							19.18	+2"	39'				

Grout: Kind

from to

Cement

0 39'

Samples from 0 to 60' Rec'd: 1/7/69

Studied by: M. Roshardt

Issued: Aug. 1969
Reissued: 3/27/86

Formations: Drift, Mt. Simon

Remarks: Well tested for 6 hours at 20 gpm with 20 feet of drawdown.

Another Well Constructor's Report gives completion date of 8/16/67, static water level of 25', and pump test for 6 hours at 17 GPM with 10 feet of drawdown.

LOG OF WELL:

	Depths	Graphic Section	Rock Type	Color	Grain Size		Miscellaneous Characteristics
					Mode	Range	
D R I F T	0-5		Silt	Or br	Silt	Silt/Clay	Mch clay. Ltl quartz snd. Tr qtz granules & small pebbles.
	5-10		"	"	"	"	Same plus trace granite small pebbles.
	10-15		Sand	"	M	VC/Vfn	Quartz. Tr silt & clay. Few grans to L pebs of granite & qtz.
	15-20		"	"	"	"	Quartz. Ltl clay & silt. Few grans to L pebs of grnt, rhyolite, qtz.
	20-25		"	"	"	"	Quartz. Mch clay. Ltl silt. Few grans & small pebs of grnt & rhyolite.
S I M O N	25-30		Clay	"	Clay	--	Tr silt. Mch quartz snd. Tr oolitic chert. Few grans & mpebs grnt & rhyolite.
	30-35		Sand	Yl gry	M	VC/Vfn	Quartz. Little clay & silt. Trace granules. /rhyolite.
	35-40		Sandstone	"	Fn/C	VC/fn	--
	40-45		"	Or gry	"	"	Ltl micaceous grn & rd clays. Few qtz granules.
	45-50		"	Yl gry	C	VC/Vfn	Mch micaceous green clays. Ltl silt. Few quartz granules.
25'	50-55		"	"	"	"	Mch micaceous yellow & rd clays, silt. Few qtz grans. Tr sil can.
	55-60		"	"	M	VC/fn	Trace limonite stain.

END OF LOG

Appendix 3: Well CH-142 documents, USGS well schedule, 1968

WSD Exp. (G)
April 1966

Well No. CH 28/7W/8-142

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR
CORRECTIONS BY BME

GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

MASTER CARD

Record by G.E. WERNER Source of data CONST. REPT Data 23 FEB 68 Map Chippewa Falls
State WISCONSIN 518 County CHIPPEWA CH
Latitude: 44 55 44 N Longitude: 091 15 57 W Sequential number: 1
Lat-long accuracy: 3 28 0.7 Sec 817 NW 4
Local well number: 28 N 07 W 08 B 88 L
Local use: CH 0142
Owner or name: STATE HWY COMMISSION Address: EAU CLAIRE, WIS
Ownership: County, Fed Gov't, City, Corp or Co, Private, State Agency, Water Dist 5
Use of water: (A) Air cond, Bottling, Comm, Domestic, Power, Fire, Irr, Ind, P S, Rec, (S) Stock, Instt, Unused, Repressure, Recharge, Desal-P S, Desal-other, Other WAYSIDE
Use of well: (A) Anode, Drain, Seismic, Heat Res, Obs, Oil-gas, Recharge, Test, Unused, Wash, Waste, Destroyed W
DATA AVAILABLE: Well data 76 Freq. W/L meas.: Sept 67 M Field aquifer char. 73
Hyd. lab. data: 73
Qual. water data: type: 74
Freq. sampling: 76 Pumpage inventory: yes no, period: 76
Aperture cards: 77
Log data: DRILLER'S LOG, WGS L G.D.

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 60 ft 60 Meas. DRILLER 23
Depth cased: 39 ft 39 Casing type: STEEL Diam. 6 in 6
Finish: (C) porous concrete, (P) gravel w. gravel, (H) horz. open, (S) screen, (T) sd. pt., (X) shored, (O) other, (N) none
Method: (A) air bored, (B) cable, (C) dug, (H) jetted, (P) air, (R) reverse, (T) trenching, (V) drive, (W) wash, (O) other
Date drilled: 16 AUG 67 9:17 Pump intake setting: 17 ft 17
Drilled by: RALPH J. FAHERTY 1190 SEVENTH AVE. PLATTEVILLE, MO
Life: (A) air, (B) bucket, (C) cent. jat., (H) multiple, (N) nose, (P) piston, (R) rot., (S) submerg., (T) turb., (O) other
Power: (C) diesel, (E) elec, (G) gas, (N) gasoline, (H) hand, (L) LP, (M) motor, (W) wind, (O) other
Descript. HP 2.20 ft 2.20 Accuracy: 932.2
Alt. LSD: 932.2 Accuracy: 70 ft 20' cont. 5
Water Level: 25 ft 25 Accuracy: DRILLER 0
Date: 16 AUG 67 8:17 Yield: 17 gpm 17 Method determined: 6
Drawdown: 10 ft 10 Accuracy: DRILLER 3 Pumping period: 6 hrs 6
QUALITY OF WATER DATA: Iron ppm Sulfate ppm Chloride ppm Hard. ppm
Sp. Conduct. K x 10⁶ Temp. °F Dst. ppm sampled
Taste, color, etc.

INCHED and VERIFIED
WELLA COMPUTATION BRANCH

Well No. CH 28/7W/8

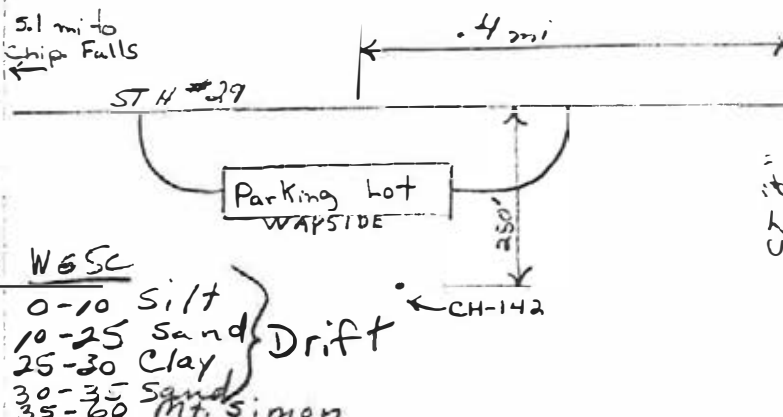
Latitude-Longitude 44 55 44 N 91 15 57 W

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD Physiographic Province: Cent Lowlands 113 Section: WIS. DR. 113
Drainage Basin: Upper Miss 17 C Subbasin: Chippewa 10
Topo of well site: (D) depression, stream channel, dunes, flat, hilltop, sink, swamp, (P) offshore, pediment, hillside, terrace, undulating, valley flat
MAJOR AQUIFER: Cambrian, UPPER C3 CAMB. AR 9.3
Lithology: Sandstone 11 Origin: Marine 6 Aquifer Thickness: ft
Length of well open to: 21 ft 21 Depth to top of: 35 ft 35
MINOR AQUIFER: 11
Lithology: 11 Origin: 11 Aquifer Thickness: ft
Length of well open to: 11 ft 11 Depth to top of: 11 ft 11
Intervals Screened: 11
Depth to consolidated rock: 35 ft 35 Source of data: Driller's log 11
Depth to basement: 11 ft 11 Source of data: 11
Surficial material: 11 Infiltration characteristics: Poor 11
Coefficient Trans: 11 Spd/ft 11 Coefficient Storage: 11
Coefficient Perm: 11 Spd/ft² 11 Spd/ft: 11 Number of geologic cards: 11

DRILLER'S LOG:

0'-35' CLAY WITH SAND & GRAVEL
35'-60' SANDSTONE
Water Level 10/9/67 34.02
Proj. # LSF-020-1(4)



WGS
0-10 silt
10-25 sand
25-30 clay
30-35 sand
35-60 Mt. Simon

FORM 9-148

**UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY**

Report Page No. _____

WATER RESOURCES DIVISION

COUNTY ChippewaSTATE Wisconsin

WATER LEVELS IN OBSERVATION WELLS

445544N0911557.1. Wis. Dept. of Transportation. Drilled domestic artesian well in sandstone of Cambrian age, diam 6 in, depth 60 ft, cased to 39. Lsd 930 ft above msl. MP $\frac{1}{4}$ -in hole in pump base, 2.20 ft above lsd.

Highest water level _____ 19 _____; lowest _____ 19 _____
Records available 1968- _____ Water level _____ below lsd

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1968		July 8	30.45	Feb. 8	31.10	Feb. 8	30.14
Jan. 6	32.20	Aug. 7	30.01	Mar. 18	31.46	Mar. 29	30.78
Feb. 6	32.25	Sept. 8	30.42	May 6	30.70	Apr. 13	30.56
Mar. 6	32.06	Oct. 14	31.50	June 29	30.38	May 15	27.82
Apr. 5	32.61	Nov. 5	30.33	July 22	31.19	June 28	28.43
May 22	32.58	Dec. 9	30.74	Sept. 1	30.61	July 10	27.72
June 20	32.48	1970		Oct. 12	31.96	Aug. 20	28.25
July 26	32.07	Jan. 6	30.81	1972		Sept. 28	28.84
Aug. 28	32.06	Feb. 9	31.06	Jan. 10	30.01	Nov. 2	28.52
Sept. 24	31.60	Mar. 9	31.06	Feb. 29	29.97	1974	
Oct. 22	31.15	Apr. 17	31.60	Apr. 5	31.08	Jan. 8	29.14
Dec. 3	31.21	May 21	31.26	May 23	32.58	Feb. 19	29.05
1969		June 30	31.10	July 7	31.29	Apr. 1	29.28
Jan. 7	31.29	July 31	30.97	Aug. 4	32.22	May 6	29.49
Feb. 11	31.00	Sept. 16	31.39	Sept. 8	31.52	June 12	28.97
Mar. 11	31.23	Oct. 27	31.23	Oct. 10	32.13	July 29	29.01
Apr. 15	30.56	Dec. 8	30.83	Nov. 14	29.59	Sept. 11	29.09
May 6	30.57	1971		1973		Oct. 17	29.57
June 10	30.20	Jan. 8	30.91	Jan. 3	29.61	Nov. 21	29.97

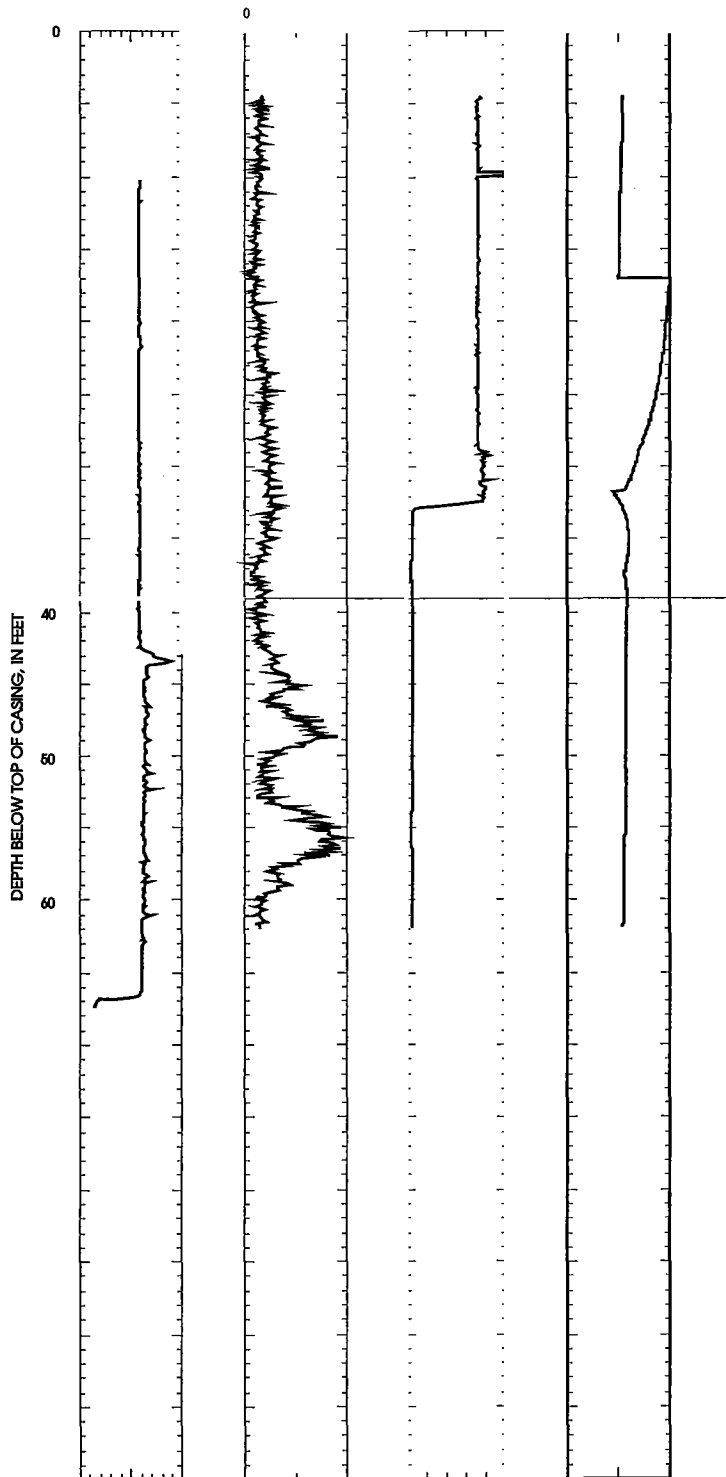


Chippewa County

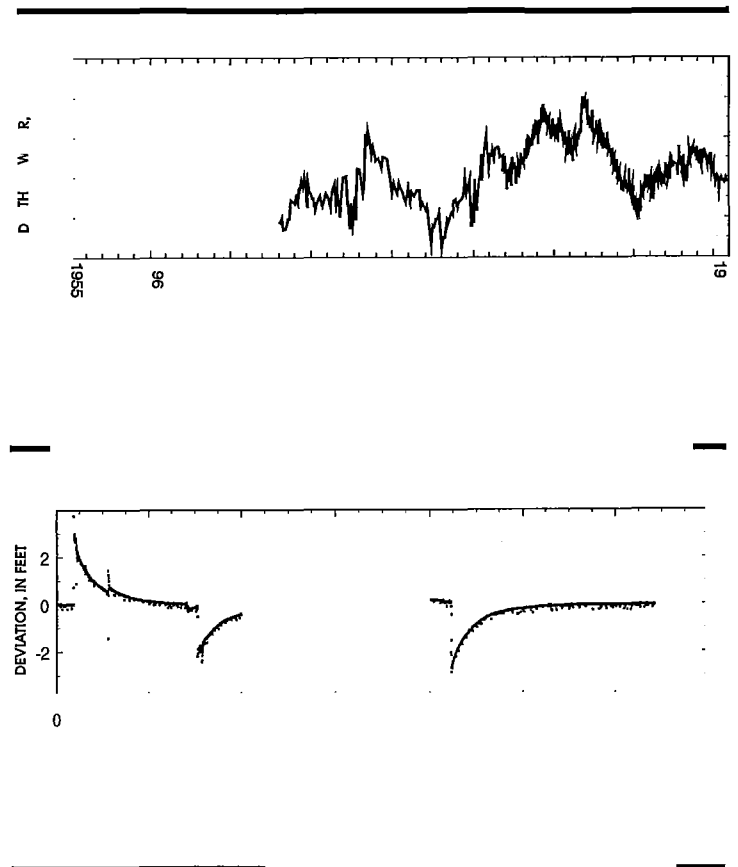
CH-28/07W/17-0142


SANDSTONE AQUIFER

Geophysical Logs



Well Information





Wisconsin Geological
and Natural History Survey

DIVISION OF EXTENSION

UNIVERSITY OF WISCONSIN-MADISON

BOREHOLE GEOPHYSICAL LOG

WGNHS ID

9000142

SITE NAME

USGS CH-28/07W/17-0142

WUWN

COUNTY

Chippewa

DATE

11/14/2019

LOGGED BY

PMChase

LATITUDE

44.910744

LOCATION

2900' ESE of STH 29 @ 195 St.Chippewa, Co., WI

LONGITUDE

-91.2659

LOC METHOD

GPS, survey grade

LOC CONF

0.3m/1ft

ELEVATION

965.8

WELL DEPTH

62

CASING DEPTH

38

ELEV. METHOD

USGS GPS NAVD88

DEPTH TO WATER

29

CASING STICK UP

1.75

Comments:

Cable touches ground between winch and well so Self Potential and Single Point Resistivity results are invalid. Unless noted, (1) all depths are in feet; (2) casing depth is interpreted from geophysical logs; (3) well depth incorporates 4/16/19 USGS tape-down; (4) water depth is reported from WGNHS on day of logging; (5) datum is top of casing at 967.6 ft., NAV88; (6) elevation is USGS land surface datum (lsd); (7) stick up is feet of casing above lsd

LOGS COLLECTED:

☒ Gamma

☐ Self Potential

☒ Fluid Conductivity

☒ Optical Borehole Imager

☒ Caliper

☐ Normal Resistivity

☐ Flow Meter- HeatPulse

☐ Acoustic Borehole Imager

☐ Single Point Resistivity

☒ Fluid Temperature

☐ Flow Meter- Spinner

☐ OTHER

(up is negative; down is positive)

For more information or to obtain collected data not shown, please contact:

data@wgnhs.wisc.edu

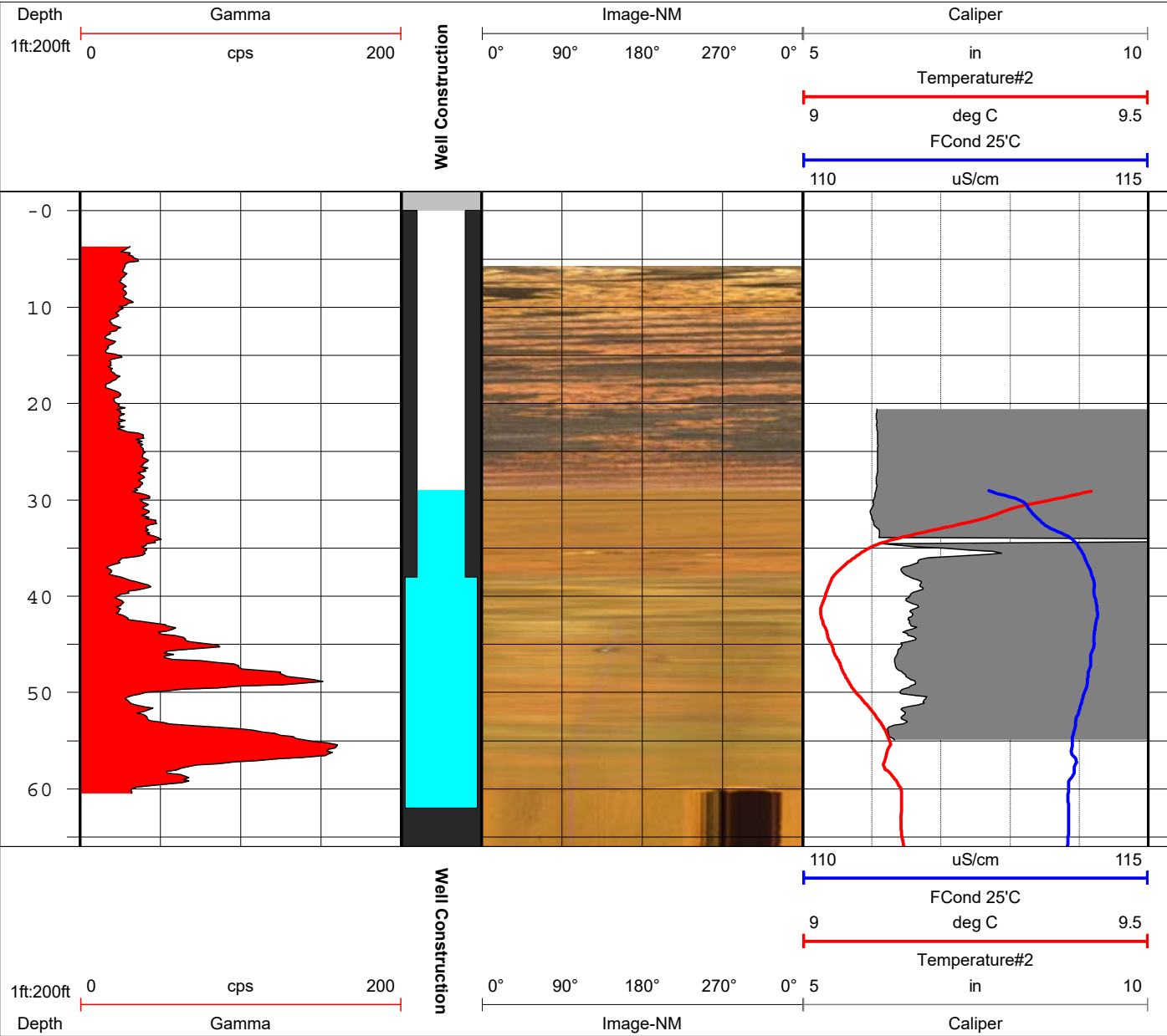
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11/11/2021

By:

AMB

Header file: WGNHSGeoPhysHeader6_2021_NGWMN.wcf



Appendix 4: Well CO-620 and CO-5921 documents

Well CO-5921 replaced well CO-620

Historical documents: CO-620

Basic well information, 1980; well evaluation, 1980; well location map; hydrograph, 1975-1990, 5 pages

well information historically compiled by WGNHS

USGS site schedule for CO-620, 1977, 4 pages

Hydrological and well construction information from Dunning and others (1996), 1 page
hydrograph (1975 - 1995) and well measurements from unpublished report to DNR (DNR project number 118) by Dunning and others (1996)

Documentation of work done for this report, CO-620

WDNR fill and seal report, 2021, 1 page

Documentation of work done for this report, CO-5921

Well site easement, 2020, 6 pages

WDNR monitoring well construction form, 2019, 1 page
4400-113A

WDNR monitoring well development form, 2019, 1 page
4400-113B

WDNR soil boring form, 2019, 4 pages
4400-112

CO-0620

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number 20-12/09E/21-620
 Owner Wm. Powell & LIGHT Co.
 Location (Co., T/R.sec) Columbia Co.
 T. 12N., R. 9E., Sec. 27 NE 1/4 SW 1/4
 Land surface altitude 820 ft.
 Drainage basin Lower Wisconsin River Basin
 Dist. to nearest perennial stream: 1200 ft to Columbia Lake

WELL DATA

Depth 50 ft.
 Casing depth 78 ft.
 Screened interval 78-80 ft.
 Diameter 1 1/4 in.
 Aquifers open to well
 Geologic log available? No
 Construction report available?
 Use of well Observation
 Access to measure well

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations PORTAGE - 4 mi NNW BARABOO - 16 mi W
 ARLINGTON UNIV FARM - 10.5 mi S DALTON - 15 mi NE
 Streamgaging stations 05405000 BARABOO R. near BARABOO - 11 mi W
 Observation wells CO 134 - 12 mi ESE SK 6 - 16 mi W
 Other MQ 26 - 13 mi N

EXISTING RECORD

Measuring point
 Measuring equipment
 Frequency of measurement
 Period of record --
 Started
 Ended
 Volume of missing record

CO-0620

July 1980
R. D. Cotter

CRITERIA FOR EVALUATION OF WATER-LEVEL OBSERVATION WELLS IN WISCONSIN

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

NOTES

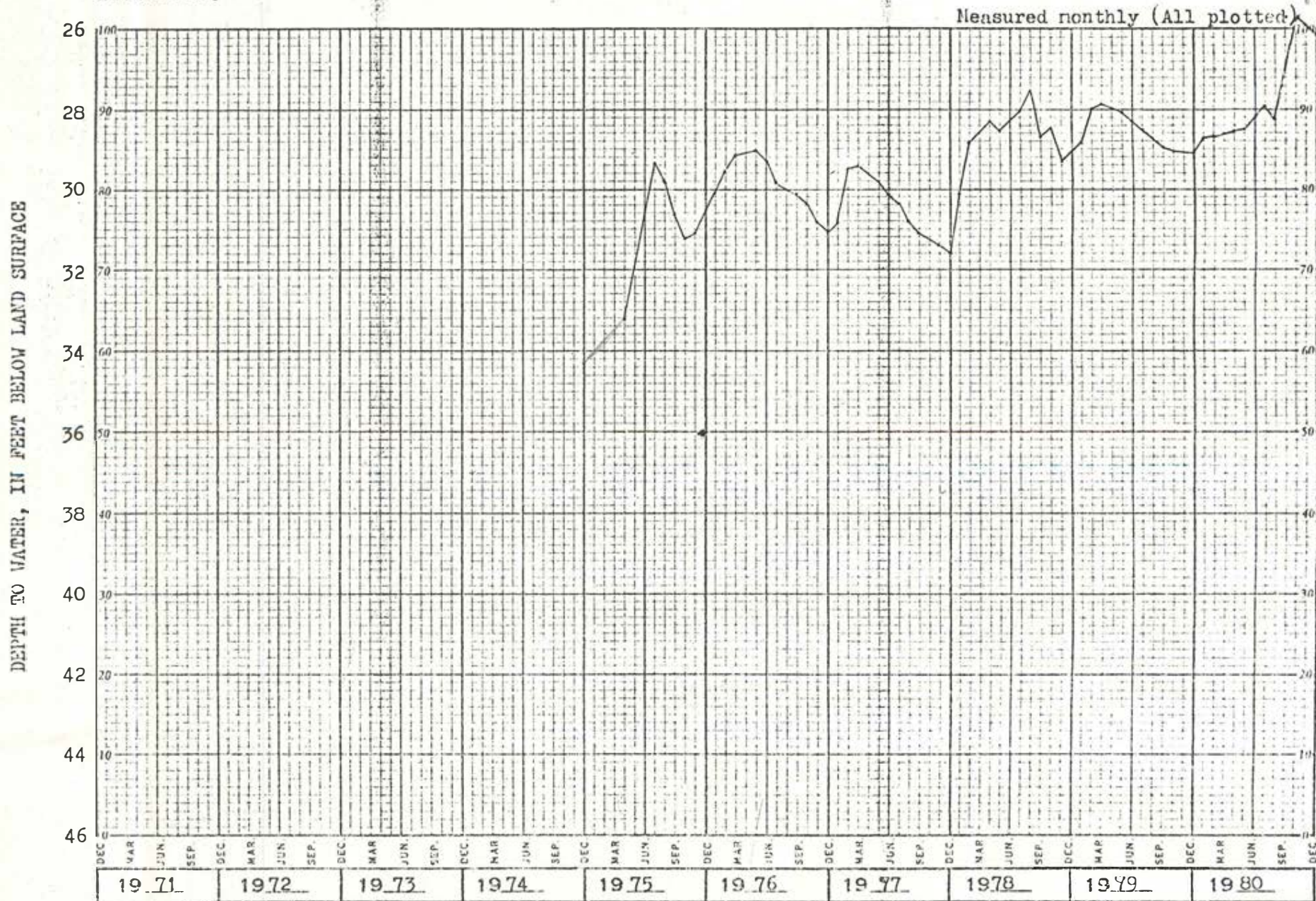
Recommendations

Madison, Wisconsin



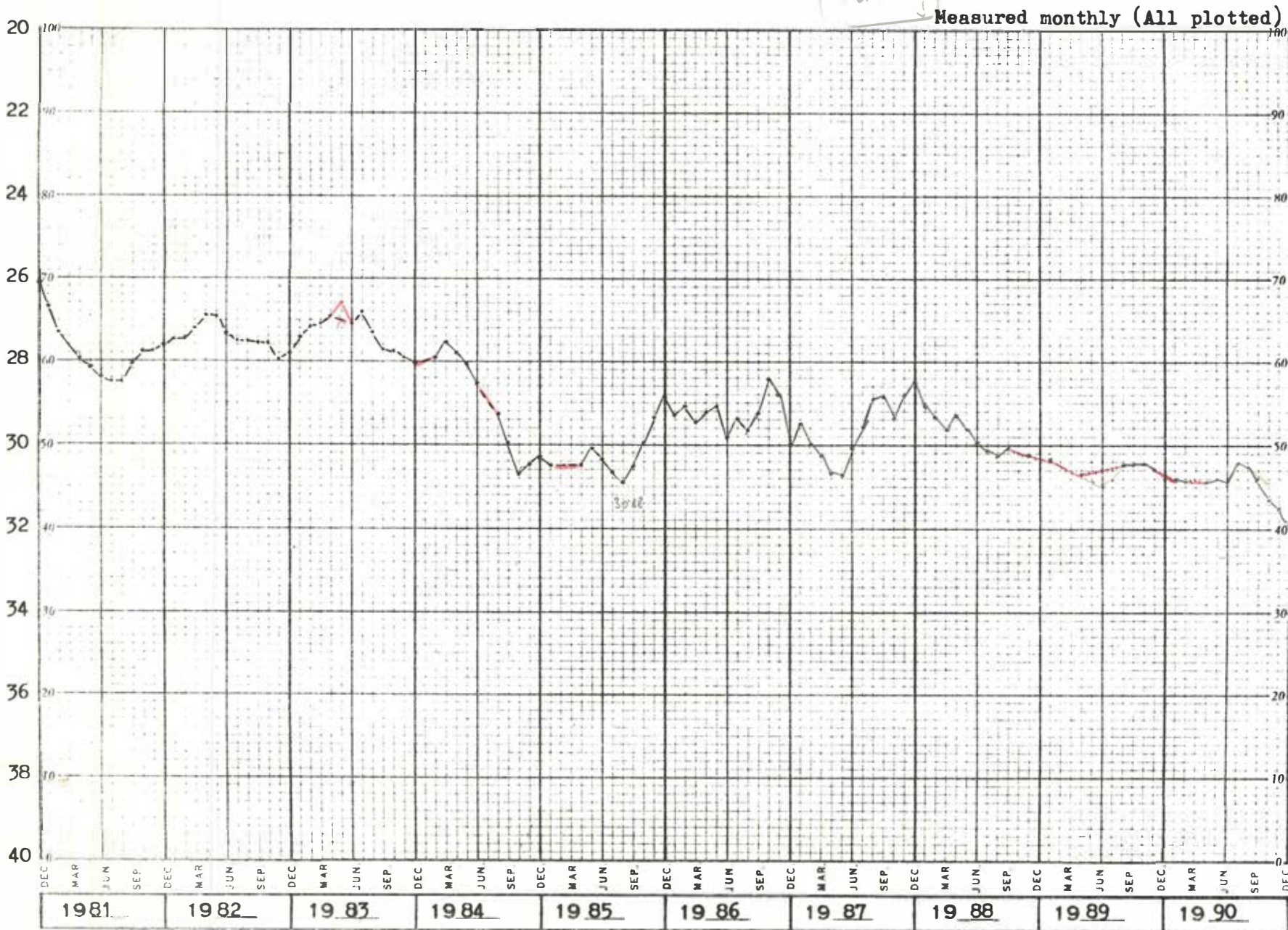
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Co-12/09E/27-0620. Wis. Power & Light Co. NE $\frac{1}{4}$ SW $\frac{1}{4}$. Driven observation artesian well in sandstone of Cambrian age, diam 1 $\frac{1}{4}$ in, depth 80 ft, cased to 78, screened 78-80. Lsd 820 ft above msl. MP top of casing, 2.00 ft above lsd.



CO-12/09E/27-0620. Wis. Power & Light Co. NE $\frac{1}{4}$ SW $\frac{1}{4}$. Driven observation artesian well in sandstone of Cambrian age, diam $1\frac{1}{4}$ in, depth 80 ft, cased to 78, screened 78-80. Lsd 820 ft above msl. MP top of casing, 2.00 ft above lsd.

DEPTH TO WATER, IN FEET BELOW LAND SURFACE



FORM NO 9-1904-A

SITE NO.

C-12/09E/27-0620

Recorded by R.M. EricksonU.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
GROUND WATER SITE INVENTORY
SITE SCHEDULEDate 12/14/1977

Check One

☒ English☐ Metric Units

GENERAL SITE DATA (0)

Site Ident No 432921089245901 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 * Data Reliability 3=C U L M * Reporting Agency 4=USGS *
 collector, drain, sinkhole, connector, multiple, pond, tunnel or well shaft field checked, unchecked, location not, minimal accurate data
 Project No. 5= District 6=55 State 7=65 County (or town) COLUMBIA 8=021 *
 Latitude 9=432921 * Longitude 10=10892459 * Lat-Long Accuracy 11=S F 7 M *
 dag min sec dag min sec sec, 5 sec, 10 sec, Min
 Local Number 12=C-12/09E/27-0620 * Land Net 13=NENESW 27 T 012N R 009E 4 *
 Loc. 1/4 1/4 1/4 section, township, range, merid
 Location Map 14=POYNETTE * Scale 15=62500 *
 Altitude 16=820 * Method of Measurement 17=A L M * Accuracy 18=20 *
 altimeter, level, map
 Topo Setting 19=D C E F H K L Ø P S T U V W * Hydrologic Unit (OWDC) 20= *
 depression, stream, dunes, flat, hilltop, sink, swamp, offshore, pediment, hillside, terrace, undulating, valley, upland channel flat draw
 Date of First Construction/Completion 21=12/20/1974 * Use of Site 23=A D E G H Ø M P R S T U W X Z *
 month day year anode, drain, geo-seism, cheat, observ-mine, oil or recharge, repress, test, un use d, with - water, destroyed drawal, gas
 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, devater, power, fire, domestic, irrigation, medicinal, industrial, public, recreation, stock, institution, unused, desal, other supply
 Secondary Water Use 25= * Tertiary Use of Water 26= * Depth of Hole 27=80 * Depth of Well 28=80 * Source of Depth Data 29=R *
 Water Level 30=36.29 * Date Measured 31=12/20/1974 * Source 33=S *
 month day year
 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, electric, calibrated, other airline gage pressure gage logs tape tape electric tape
 Site Status 37=D F G H Ø P R S T V X Z *
 dry, flowing, nearby, flowing obstruction, pumping, recently, nearby, foreign surface water other recently, pumped pumping pumped pumping pumped substance effects
 Source of Geohydrologic Data 36= * Pump Used 35= * Measuring Point 266=2.00 * Measuring Point Date 267=12/20/1974 *
 no month day year

OWNER IDENTIFICATION (1)

R=158 * T=A D M * Date of Ownership 159#12/20/1974 *
 add, delete, modify month day year
 Name: Last 161=WISCONSIN * First 162=POWER & LIT * Middle Initial 163= *

OTHER SITE IDENTIFICATION NUMBERS (1)

R=189 * T=A D M * Ident 190#C-0620 * Assigner 191=USGS *
 add, delete, modify
 New Card Same R & T Ident 190# * Assigner 191= *

SITE VISIT DATA (1)

R=186 * T=A D M * Date of Visit 187#12/20/1974 * Name of Person 188=ERICKSON R M *
 add, delete, modify month day year

FIELD WATER QUALITY MEASUREMENTS (1)

R=192 * T=A D M * Date 193# / / * Geohydro-logic Unit 195# *
 add, delete, modify month day year
 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, drifter, owner, other gov't, other logs, geologist, other agency reported.

In 2K Data Base verified

Appendix 4: Well CO-620 and CO-5921 documents, USGS site schedule for CO-620, 1977 continued

WELL CONSTRUCTION DATA (1)

R = 58 * T = A D M * Entry No 59 # 1 * Date of Construction Completion 60 = 12/20/1974 * Source of Const. Data 64 = D *

Name of Contractor/Driller 63 = D. W. LLARD * PRD. DANIEL LLARD ADDRESS UNKNOWN

Method of Construction 65 = A B C D H J P R T W Z *
 air, rotary, bored, or augered, cable, tool, dug, hydraulic, rotary, jetted, air-per-cussion, reverse, rotary, trenching, driven, drive, wash, other

Finish 66 = C F G H Ø P S T W X Z *
 porous, concrete, gravel w. perl, gravel, screen, horizontal, gallery, open, and, perforated, or slotted, screen, sand point, walled, open, hole, other

Bottom of Seal 68 = * Method of Development 69 = A B C J N P S Z *
 air-lift, bailed, compressed, jetted, none, other, surged, other pump, air, pump

Special Treatment During Development 71 = C D E F H M Z *
 chemicals, dry ice, explosives, deflocculent, hydrofracturing, mechanical, other

Type of Seal 67 = B C G Z *
 bentonite, clay, cement, other grout

Number of Hours in Development 70 = *

DIMENSIONS OF THE HOLE CONSTRUCTED (2)

R = 72 * T = A D M * Construction Entry No 59 # 1 *

New Card for Each Hole Segment Same R, T & Field 59

Top of Hole Segment Below LSD	Bottom of Hole Segment below LSD	Diameter of Hole Segment
73 # 0.0 *	74 = 80.0 *	75 = 1.25 *
73 # *	74 = *	75 = *
73 # *	74 = *	75 = *
73 # *	74 = *	75 = *
73 # *	74 = *	75 = *

CASING SCHEDULE (2)

R = 76 * T = A D M * Construction Entry No 59 # 1 *

New Card for Each Casing With Same R, T & Field 59

Top of Casing Segment Below LSD	Bottom of Casing Segment Below LSD	Diameter of Casing Segment	Casing Material ⑤	Thickness of Casing
77 # 0.0 *	78 = 76.0 *	79 # 1.25 *	80 = G *	81 = *
77 # *	78 = *	79 # *	80 = *	81 = *
77 # *	78 = *	79 # *	80 = *	81 = *
77 # *	78 = *	79 # *	80 = *	81 = *
77 # *	78 = *	79 # *	80 = *	81 = *

OPENINGS SCHEDULE (2)

R = 82 * T = A D M * Construction Entry No 59 # 1 *

New Card for Each Open Section With Same R, T and Field 59

Top of Section Below LSD	Bottom of Section Below LSD	Type of Openings	Type of Material ⑦	Diameter of Open Section	Width of Opening	Length of Opening
83 # 78.0 *	84 = 80.0 *	85 = *	86 = *	87 = 1.25 *	88 = *	89 = 2.0 *
83 # *	84 = *	85 = *	86 = *	87 = *	88 = *	89 = *
83 # *	84 = *	85 = *	86 = *	87 = *	88 = *	89 = *
83 # *	84 = *	85 = *	86 = *	87 = *	88 = *	89 = *
83 # *	84 = *	85 = *	86 = *	87 = *	88 = *	89 = *

FOOT NOTES:

① Source of Data Codes:

S	D	Ø	A	R	L	G	Z
---	---	---	---	---	---	---	---

reporting, driller, owner, other gov't, agency, other logs, geologist, other reported,

⑤ Casing Material Codes

B	C	G	I	M	P	R	S	T	U	W	Z
---	---	---	---	---	---	---	---	---	---	---	---

brick, concrete, galv, wrought, other, PVC or, rock or, steel, tile, coated, wood, other iron iron metal plastic stone steel

⑥ Type of Openings Codes

F	L	M	P	R	S	T	W	X	Z
---	---	---	---	---	---	---	---	---	---

fracture, louvered, mesh, perforated, wire-screen, sand, walled, open, other shuttered or slotted wound (unknown) point hole

⑦ Type of Material Codes for Open Sections

B	C	G	I	M	P	R	S	T	Z
---	---	---	---	---	---	---	---	---	---

brass or, concrete, galv, wrought, other, PVC or, stainless, steel, tile, other bronze iron iron metal plastic steel

Appendix 4: Well CO-620 and CO-5921 documents, USGS site schedule for CO-620, 1977 continued

PRODUCTION DATA (1)

R = 134 146 * T = A D M * Entry No 147 # * Date 148 = / / *
flowing, pumped add, delete, modify month day year

Discharge: 150 = * Source of Data 151 = *

Method of Measurement 152 = B C E F M O P R T U V W Z *
bailer, current, estimated, flume, totalling, orifice, pitot-tube, reported, trajectory, venturi, volumetric, weir, other

Production Level 153 = * Static Level 154 = * Source of Data 155 = * Specific Capacity 272 = *
airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel, electric, calibrated, other

Method of Measurement 156 = A C E G H L M R S T V Z * Pumping Period 157 = *
airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel, electric, calibrated, other

LIFT DATA (1)

R = 42 * T = A D M * Type of Lift 43 # A B C J P R S T U Z * Entry No 254 # *
add, delete, modify air, bucket, centrifugal, jet, piston, rotary, submersible, turbine, unknown, other

Pump Intake Setting 44 = * Type of Power 45 = D E G H L N W Z *
diesel, electric, gasoline, hand, LP gas, natural, windmill, other

Date 38 = / / * Horsepower 46 = *

MAJOR PUMP DATA (2)

R = 47 * T = A D M * Type of Lift 43 # * Lift Entry No 254 # * Manufacturer of Pump 48 = *
add, delete, modify

Serial No of Pump 49 = * Name of Power Company 50 = *

Power Company Account No 51 = * Power Meter No 52 = * Pump Rating 53 = *

Person or Company Who Maintains the Pump 54 = * Additional Lift 255 = * Rated Pump Capacity 268 = *

STANDBY POWER DATA (2)

(See LIFT DATA for codes of fields 43 and 56 below)

R = 55 * T = A D M * Type of Lift 43 # * Type of Power 56 = * Horsepower 57 = * Lift Entry No 254 # *
add, delete, modify

AVAILABLE LOG DATA (1)

R = 198 * T = A D M * New Card for Each Log Type Same R & T

Type of Log 2	Begin Depth	End Depth	Source of Data
199 #	200 =	201 =	202 =
199 #	200 =	201 =	202 =
199 #	200 =	201 =	202 =
199 #	200 =	201 =	202 =

WATER QUALITY DATA COLLECTION (1)

R = 114 * T = A D M * Begin Year 115 # * End Year 116 = * Source Agency 117 = *
add, delete, modify

Frequency of Collection 118 = * Network Site 257 = * Type of Analyses 120 = *

WATER LEVEL DATA COLLECTION (1)

R = 121 * T = A D M * Begin Year 122 # 1974 * End Year 123 = * Source Agency 124 = WISCONSIN *
add, delete, modify

Frequency of Collection 125 = M * Network Site 258 = Y *

WATER PUMPAGE/WITHDRAWAL DATA COLLECTION (1)

R = 127 * T = A D M * Begin Year 128 # * End Year 129 = * Source Agency 130 = *
add, delete, modify

Frequency of Collection 131 = * Network Site 259 = * Method of Collection 133 = C E M U Z *
calculated, estimated, metered, unknown, other

OTHER DATA AVAILABLE (1)

R = 180 * T = A D M * Type of Data 181 # * Loc 182 = C D Z * Format 261 = F M P Z *
add, delete, modify cooperator, district, other files, machine, published, other

New Card Same R & T Type of Data 181 # * Loc 182 = C D Z * Format 261 = F M P Z *
readable

FOOT NOTES:

① Source of Data Codes:

S D Ø A R L G Z
reporting, driller, owner, other gov't, other logs, geologist, other agency reported,

③ Frequency of Collection Codes

A B C D F I M Ø Q S W Z
annual, bi-monthly, continuous, daily, semi, intermittent, monthly, one time, quarter, semi-, weekly, other only, annual annual

② Type of Log Codes

A B C D E F G H I J K L M N Ø P Q
time, collar, caliper, driller's, electric, fluid, geologist, magnetic, induction, gamma, dipmeter, laterlog, microlog, neutron, µ later, photo, radio-, active

S T U V Z
sonic, temp, gamma, fluid, other gamma velocity

④ Type of Quality Analyses Codes

A B C D E F G H J K L M Z
physical, common, trace, pesticides, nutrients, sanitary, codes, codes, codes, codes, codes, all or, other chemical elements B&D B&E B&F D&E C,D&E most

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 # * % Water Contributed 132 = *

Date 95 # / / * month day year Water Level 126 = * month day year

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 # * % Water Contributed 132 = *

Date 95 # / / * month day year Water Level 126 = * month day year

PERTINENT REMARKS

C94/AQUIFER - 300SND5

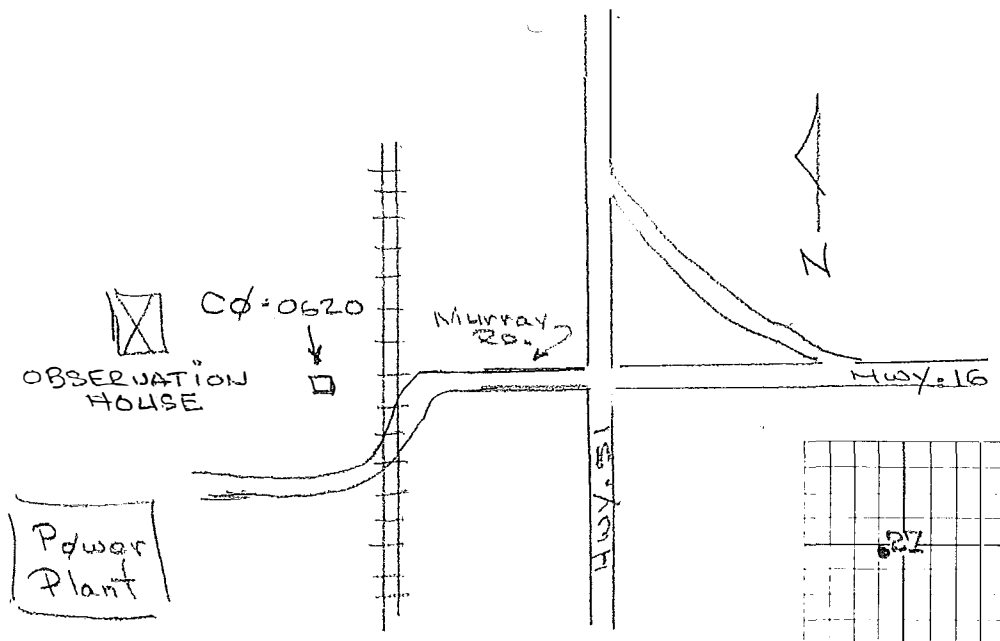
R = 183 * T = (A) * add 185 = 'C60/ACTUAL DATE CONSTRUCTED UNKNOWN' *

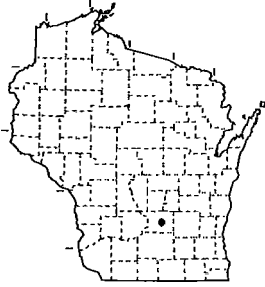
New Card Same R&T 185 = 'C186/MONTHLY VISITS FOR W L NETWORK' *

185 = 'C256/TOP OF CASING' *

C158/PORTAGE POWER PLANT

NOTES:





Columbia County

CO-12/09E/27-0620

SANDSTONE AQUIFER

Geophysical Logs

No Logs Available

Well Information

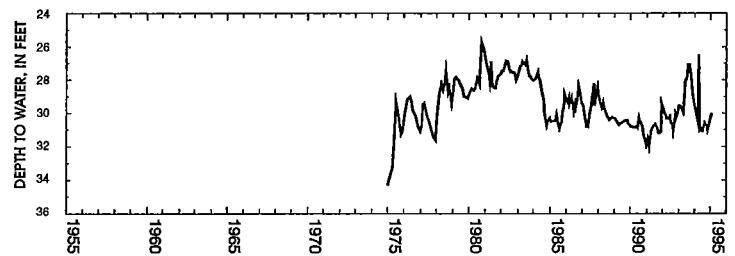
Total Depth 80 feet

Cased Depth 78 feet

Casing Diameter 1.25 inches

Use of Well Non-pumping

Depth to Water Below Land Surface For Period of Record



CO-620 abandoned and replaced with CO-5921 (VQ849)

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 Columbia WI Unique Well # of Removed Well not found Hicap # n/a
 Latitude / Longitude (see instructions) 43.4893 N -89.4156 W Format Code ☐ DD ☐ GPS008 ☐ SCR002 ☐ OTH001
1/4 NENE 1/4 SW Section 27 Township 12 N Range 9 ☒ E ☐ W
 or Gov't Lot # _____

Well Street Address W 8375 Murray Rd
 Well City, Village or Town Portage WI Well ZIP Code 53901
 Subdivision Name Portage Power Plant Lot # _____

Reason for Removal from Service Replaced w/ 2" well WI Unique Well # of Replacement Well VQ 849

Original Construction Date (mm/dd/yyyy) ~ 1974
 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.) 80.5 Casing Diameter (in.) 1.25
 Lower Drillhole Diameter (in.) 1.25 Casing Depth (ft.) 78

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

If yes, to what depth (feet)? NA Depth to Water (feet) 34

5. Material Used to Fill Well / Drillhole
1/4" Bentonite Pellets

From (ft.) Surface To (ft.) 80.5 No. Yards, Sacks Sealant or Volume (circle one) 1.5 pairs Mix Ratio or Mud Weight _____

6. Comments

7. Supervision of Work
 Name of Person or Firm Doing Filling & Sealing Peter M Chesc License # _____ Date of Filling & Sealing or Verification (mm/dd/yyyy) 06/25/2021

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

City Madison State WI ZIP Code 53705 Signature of Person Doing Work P. M. Chesc Date Signed _____

2. Facility / Owner Information

Facility Name _____

Facility ID (FID or PWS) _____

License/Permit/Monitoring # Well name: 11000620 (aka CO-620)

Original Well Owner Unknown

Present Well Owner USGS

Mailing Address of Present Owner 8551 Research Way

City of Present Owner Middleton State WI ZIP Code 53562

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

THIS GROUNDWATER MONITORING STATION EASEMENT (hereinafter referred to as "Easement") made by and between the **Wisconsin Power and Light Company** (hereinafter referred to as "Grantor"), and the **Board of Regents of the University of Wisconsin System** operating as the **Wisconsin Geological and Natural History Survey** (hereinafter referred to as "Grantee").

RECITALS:

WHEREAS, the Grantee desires to install a long term monitoring station and collect groundwater level data;

WHEREAS, the Grantee requests an Easement in order collect groundwater data by constructing, installing, operating and maintaining, removing and replacing a monitoring station consisting of a well on Grantor's following described property (hereinafter referred to as "Premises") more particularly described as:

Premises:

Part of the Southeast Quarter of the Northeast Quarter of Section 27, Township 12 North, Range 9 East, Town of Pacific, Columbia County, Wisconsin, described as follows: Commencing at the SW corner of the Southeast Quarter of the Northeast Quarter of Section 27, thence in a Ely direction 16 rods; thence Nly 10 rods; thence Wly 16 rods, and thence Sly 10 rods to place of beginning, except lands heretofore conveyed for highway purposes and subject to restrictions set forth in Document recorded at 412 of records at Page 508.

Easement Area:

The existing Monitoring Well near Portage located at:

Lat: 43.4901 Long: -89.4081

Near the northeast corner of the intersection of Murray Rd and USH 51

Part of the SE $\frac{1}{4}$ of the NE $\frac{1}{4}$, Section 27, Township 12 North, Range 9 East, Town of Pacific, Columbia County, Wisconsin;

WHEREAS, the Grantor is willing to allow the Grantee to access, construct, install, operate, maintain, repair, remove and replace a monitoring station.

NOW, THEREFORE, in consideration of mutual covenants, promises, and agreements herein expressed and for other good and valuable consideration, the receipt of which is hereby specifically acknowledged, Grantor and Grantee, for and on behalf of themselves and their respective successors and assigns, do hereby covenant, promise and agree as follows:

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 hereby grants and conveys to the Grantee a non-exclusive perpetual easement upon the Easement Area for the construction, installation, operation, maintenance, repair, replacement and removal of the monitoring station consisting of drilled wells which shall be constructed in compliance with Ch. NR 141, Wis. Adm. Code for collecting data, including, but not limited to water-level measurements, geologic samples and geophysical measurements, along with a non-exclusive

perpetual access easement for vehicular and foot access over and across portions of the Premises as may be reasonably necessary to access the Easement Area for the purposes set forth above. Notwithstanding anything to the contrary, the Grantee acknowledges and agrees that the Grantee shall have no right to utilize the samples taken from the Easement Area for the purposes of performing testing or evaluation of environmental contamination without the prior written consent of the Grantor, which consent may be granted or withheld in the Grantor's sole and absolute discretion. The Grantee shall share all information gained from said monitoring upon the written request of the Grantor.

3. This Easement is limited to the Grantee, its successors and permitted assigns. Notwithstanding anything to the contrary in this Easement, Grantee acknowledges and agrees that Grantee's rights under this Easement are not transferrable to any third party, except with prior written consent of the Grantor, which may be granted or withheld in Grantor's sole discretion. The Grantee shall not have the right to allow co-location under this Easement or within the Easement Area.

4. The Easement shall be non-exclusive and the Grantor may use and occupy the Premises consistent with its ownership of the Premises, including, without limitation, 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 materially and adversely 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 15 herein at least thirty (30) days prior to the initiation of any work on the Premises. Grantee shall not commence said work until the Grantor informs the Grantee that Grantor has approved the commencement of such work in writing. If an emergency situation arises within the Premises, as determined in Grantee's reasonable discretion, 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. Grantor grants to the Grantee the right to enter upon limited portions of the Premises necessary for the purpose of gaining access to the Easement Area in the event direct access to the Easement Area is not practical for the purpose of constructing, installing, operating, maintaining, repairing, removing, replacing and inspecting the monitoring station.

7. All signage placed by the Grantee for purposes of project activities shall have prior written approval from the Grantor, which approval shall not be unreasonably withheld, delayed or denied.

8. 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.

9. The Grantee is responsible for 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.

10. 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.

11. 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.

12. The Grantee may abandon, remove, fill and/or plug according to and in compliance with federal, state and local regulations, at its own expense and shall properly abandon the monitoring well and restore the Easement Area and Premises to pre-existing conditions prior to installation of the monitoring station. Upon removal and proper abandonment, this Easement shall terminate. The obligations of this paragraph 12 shall survive the termination of this Easement.

13. The Easement shall automatically terminate upon Grantee's abandonment of the Easement Area or upon non-use of the same for a period of 2 years. The Grantee's duties as reflected in paragraph 12 shall survive the reversion.

14. 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 this Easement, the Grantee's exercise of its rights under this Easement, or the default by the Grantee of its obligations 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. The obligations of this paragraph 14 shall survive the termination of this Easement.

15. 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:

Wisconsin Power and Light Company
c/o Alliant Energy
Attn: Brian Clepper, Environmental Specialist
W8375 Murray Road.
Pardeeville, WI 53954

b. To the Grantee:

Wisconsin Geological and Natural History Survey (WGNHS)
c/o: Sushmita Lotikar, Administrative Manager
3817 Mineral Point Road
Madison, WI 53705-5100

c. The address to which any notice, demand, or other writing may be given, made or sent to any party as above provided may be changed by written notice given by such party as above provided.

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

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

[Signatures on Following Pages.]

IN WITNESS WHEREOF, the parties have caused this Easement to be executed as of the date first written above.

GRANTOR:

WISCONSIN POWER AND LIGHT COMPANY

By: Heather Dee
Name: Heather Dee
Title: Real Estate Manager

STATE OF WISCONSIN)
) SS
COUNTY OF DANE)

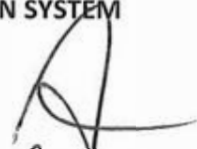
Personally came before me this 12th day of September, 2019 the above-named Heather Dee, as Real Estate Manager of **Wisconsin Power and Light Company**, the person who executed the foregoing document and acknowledged the same on behalf of said entity.

BRIAN S. COOKE
NOTARY PUBLIC
STATE OF WISCONSIN

Brian S. Cooke
Print Name: Brian S. Cooke
Notary Public, State of Wisconsin
My commission: Expires August 1, 2021

GRANTEE:


BOARD OF REGENTS OF THE UNIVERSITY OF
WISCONSIN SYSTEM

By: 
Name: DANIEL LANGER
Title: UW-MADISON AVC/Controller

STATE OF WISCONSIN)
) SS
COUNTY OF DANE)

Personally came before me this 23rd day of September, 2019 the above-named Dan Langer, as Assistant Vice Chancellor for Business Services and Controller of the **Board of Regents of the University of Wisconsin System** operating as the **Wisconsin Geological and Natural History Survey**, the person who executed the foregoing document and acknowledged the same on behalf of said entity.




Print Name: Eric S. Thompson
Notary Public, State of Wisconsin
My commission: 01/12/2020

Appendix 4: Well CO-620 and CO-5921 documents, WDNR monitoring well construction form for CO-5921, 2019

State of Wisconsin
Department of Natural Resources

Route To:

Watershed/Wastewater ☐

Waste Management ☐

MONITORING WELL CONSTRUCTION

Form 4400-113A

Rev. 7-98

SES Project Number 507.86

Remediation/Redevelopment ☐

Other ☐

Facility/Project Name

WI Groundwater-Level
Monitoring Network
CO-620 replacement well

Local Grid Location of Well

ft. ☐ N. ☐ S. ☐ E. ☐ W.

Grid Origin Location (estimated: ☐)

Lat. 43.490044 Long. -89.408117

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.

Location of Well Relative to Waste/Source

u ☐ Upgradient s ☐ Sidegradient

d ☐ Downgradient n ☐ Not Known

Gov. Lot Number

Well Name

11005921 (AKA: CO-5921)

Wis. Unique Well No. DNR Well Number

VQ849

Date Well Installed

10/23/2019

Well Installed By: Name (first, last) and Firm

Steve Hunger

Soils & Engineering Services, Inc.

Type of Well

Well Code 11 / mw

Distance From Waste/Source

ft.

Enf. Stds. Apply ☐

A. Protective pipe, top elevation

831.1 ft. MSL

B. Well casing, top elevation

831.0 ft. MSL

C. Land surface elevation

828.6 ft. MSL

D. Surface seal, bottom

823.6 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:

GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐

SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐

Bedrock ☒ OL/OH ☐ PT ☐

13. Sieve analysis attached?

☐ 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):

City of Madison

E. Bentonite seal, top

785.7 ft. MSL or 42.9 ft.

F. Fine sand, top

778.7 ft. MSL or 49.9 ft.

G. Filter pack, top

776.6 ft. MSL or 52.0 ft.

H. Screen joint, top

773.3 ft. MSL or 55.3 ft.

I. Well bottom

762.9 ft. MSL or 65.7 ft.

J. Filter pack, bottom

762.9 ft. MSL or 65.7 ft.

K. Borehole, bottom

762.9 ft. MSL or 65.7 ft.

L. Borehole, diameter

8.3 in.

M. O.D. well casing

2.38 in.

N. I.D. well casing

2.07 in.

1. Cap and lock?

☒ Yes ☐ No

2. Protective cover pipe:

a. Inside diameter:

4.0 in.

b. Length:

7.0 ft.

c. Material:

Steel ☒ 04

Other ☐

d. Additional protection?

☒ Yes ☐ No

If yes, describe: 2 - 3-inch by 7-foot steel posts

3. Surface seal:

Bentonite ☒ 30

Concrete ☐ 01

Other ☐

4. Material between well casing and protective pipe:

Bentonite ☐ 30

#15 filter sand 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. 13 ft³ 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. 80 lbs coated bentonite pellets Other ☒

7. Fine sand material: Manufacturer, product name and mesh size

a. Red Flint Sand and Gravel, #15 well slot

b. Volume added 0.71 ft³

8. Filter pack material: Manufacturer, product name and mesh size

a. Red Flint Sand and Gravel, #40 well slot

b. Volume added 4.5 ft³

9. Well casing:

Flush threaded PVC schedule 40 ☒ 23

Flush threaded PVC schedule 80 ☐ 24

Other ☐

10. Screen material: Flush threaded PVC schedule

40

a. Screen Type: 40

Factory cut ☒ 11

Continuous slot ☐ 01

Other ☐

b. Manufacturer Baker Water Systems

c. Slot size: (Monoflex) 0.010 in.

d. Slotted length: 9.5 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

Craig M. Bower

Firm

Soils & Engineering Services, Inc.

1102 Stewart Street, Madison, Wisconsin 53713

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.

State of Wisconsin
Department of Natural ResourcesMONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98Route to: Watershed/Wastewater ☐Waste Management ☐Remediation/Redevelopment ☐Other ☐

Facility/Project Name WI GROUNDWATER-LEVEL MONITORING NETWORK CO-620 REPLACEMENT WELL	County Name Columbia	Well Name 11005921 (AKA: CO-5921)
	County Code 11	Wis. Unique Well Number 0849
		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 (Submersible pump) ☒ 51
 pumped slowly ☐ 50
 Other ☐ _____

3. Time spent developing well **20** min.4. Depth of well (Below land Surf.) **65.7** ft.5. Inside diameter of well **2.07** in.6. Volume of water in filter pack and well casing **4.2** gal.7. Volume of water removed from well **90.0** 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)

17. Additional comments on development:

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 44.04 ft.	44.03 ft.
Date	b. 10/23/2019 m m d d y y y y	10/23/2019 m m d d y y y y
Time	c. 3:35 <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	4:30 <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.
12. Sediment in well bottom	0.6 inches	0.0 inches
13. Water clarity	Clear <input type="checkbox"/> 10 Turbid <input checked="" type="checkbox"/> 15 (Describe) _____	Clear <input checked="" type="checkbox"/> 20 Turbid <input type="checkbox"/> 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:	Michael	Last Name: Parson
Firm:	WGNHS	

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: **Michael G. Parson**Print Name: **Michael Parson**Firm: **WGNHS**

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

State of Wisconsin
Department of Natural Resources☒ 2-inch-outside-diameter, split-barrel
☒ sampler**SOIL BORING LOG INFORMATION**
Form 4400-122 Rev. 7-98Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐SES Project Number **507.86**

Page 1 of 4

Facility/Project Name **WI GROUNDWATER-LEVEL MONITORING NETWORK**
CO-620 REPLACEMENT WELL Well Name **11005921 (AKA: CO-5921)**Boring Drilled By: Name of crew chief (first, last) and Firm
Steve J. Hunger
Soils & Engineering Services, Inc. Date Drilling Started **October 23, 2019** Date Drilling Completed **October 23, 2019** Drilling Method **HSA**WI Unique Well No. **VQ849** DNR Well ID No. **CO-5921** Final Static Water Level **786.96 FT-MSL** Surface Elevation **828.6 ft** Borehole Diameter **8.25 in**Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane ☐ ft. N, ☐ ft. E, S/C/N Lat **43.490044** Local Grid Location ☐ N ☐ E
☐ 1/4 of ☐ 1/4 of Sec. ☐ T. ☐ N, R. ☐ E/W Long **-89.408117** Feet ☐ S Feet ☐ WFacility ID ☐ County **Columbia** County Code **11** Civil Town/City/ or Village **Civil Township of Pacific**

Sample		Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID Readings	Soil Properties						RQD/ Comments
Number and Type	Length Att. & Recovered (in)							Blow Counts	Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200	
			Total Depth = 65.7' below land surface											
1	18"	6	POORLY-GRADED SAND WITH SILT (SP-SM) — fine grained, non-plastic to low plasticity fines, dark brown, moist, TOPSOIL-[10" thick]	SP-SM										
2	18"	13	POORLY-GRADED SAND WITH GRAVEL (SP) — fine grained, brown, moist to wet, medium dense relative density	SP										
3	18"	8												

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

Signature **Craig M. Lower**Firm **Soils & Engineering Services, Inc.**
1102 Stewart Street Madison, Wisconsin 53713Tel: 608-274-7600
Fax: 608-274-7511

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.

State of Wisconsin
Department of Natural Resources

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

SES Project Number **507.86**

WELL CO-5921 / VQ849

Use only as an attachment to Form 4400-122.

Page **2** of **4**

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID Readings	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200	
			16	POORLY-GRADED SAND WITH GRAVEL (SP) — fine grained, brown, moist to wet, medium dense relative density (continued)	SP									
			17											
			18											
4	18 14	3 4 7	19											
			20											
			21											
			22											
			23											
5	18 14	9 9 15	24											
			25											
			26											
			27											
			28											
6	18 16	5 9 20	29											
			30											
			31											
			32											
			33											
7	18 18	9 11 17	34											
			35											
			36											
			37											
			38											
		9	39											

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT

Form 4400-122A

Rev. 7-98

WELL CO-5921 / VQ849SES Project Number **507.86**

Use only as an attachment to Form 4400-122.

Page **3** of **4**

Sample			Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID Readings	Soil Properties						RQD/ Comments
Number and Type	Length Att. & Recovered (in)	Blow Counts							Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200		
8	18	11	40	POORLY-GRADED SAND WITH GRAVEL (SP) — fine grained, brown, moist to wet, medium dense relative density (continued)	SP										
	16	15	41												
			42												
			43												
9	18	6	44												
	16	14	45												
		18	46												
			47												
			48												
10	18	3	49												loose relative density at 49'-8"
		4	50												
		4	51												
			52												
			53	SANDSTONE — slightly- to moderately-weathered, brown, wet, dense to very dense relative density											
11	4	20	54												
		25/2"	55												
			56												
			57												
			58												
12	4	50/5"	59												
			60												
			61												
			62												
			63												

State of Wisconsin
Department of Natural Resources

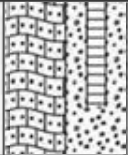
SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A Rev. 7-98

WELL CO-5921 / VQ849

SES Project Number **507.86**

Use only as an attachment to Form 4400-122.

Page **4** of **4**

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID Readings	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200	
13	2	50/2	64	SANDSTONE — <i>slightly- to moderately-weathered, brown, wet, dense to very dense relative density</i> (continued)										
<p>The Notes and Legend Record is considered a part of the WDNR Soil Boring Log Information form(s) for Boring CO-5921.</p> <p>All depths in feet below land surface</p>														
			65											
			66											
			67											
			68											
			69											
			70											
			71											
			72											
			73											
			74											
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			76											
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			83											
			84											
			85											
			86											
			87											

Appendix 5: Well DN-1297 documents

Historical Documents: DN-1297

Appendix A cover sheet from Guenther and others (2017)

historical records for DN-1297 can be found in WGNHS Open-File Report 2017-04, appendix A (Guenther and others, 2017).

APPENDIX A OF REFERENCE DOCUMENTS DN-1297

USGS Basic Data and Maps 1981

USGS personnel went through in 1980 to combine observation well records

USGS Water Resources Water Level Records 1978-1986

USGS water level measurements from 1982 to 1983, handwritten, DN-1297 was once 1099

Alex Zaporozec City of Madison Static Water Levels 1982

Alex Zaporozec requested the water level measurements 1978-1982 from the City of Madison

Alex Zaporozec Graphs of Water Levels 1978-1999

water levels graphed onto paper

DN-1297 Geophysical log 2017

Gamma log at 10ft/min and 3ft/min

DN-36 Geologic log 1924

Nearby well Geologic log

DN-47 Geologic log 1924

Nearby well Geologic log

DN-6067 Geophysical log 2012

Nearby well Geophysical log

Appendix 6: Well FR-87 documents

Historical Documents

Basic well information, 1980; well evaluation, 1980; well location map; historical water-level data, 1967-1989; hydrograph, 1991-2000, 5 pages
well information historically compiled by WGNHS

USGS well schedule, 1972, 1 page

USGS modification schedule, date unknown, 1 page

USGS site schedule, 1979, 5 pages

Geophysical, hydrological, and well construction information from Dunning and others (1996), 1 page

hydrograph (1968 - 1995), slug test, horizontal hydraulic conductivity, geophysical logs, and well measurements from unpublished report to DNR (DNR project number 118) by Dunning and others (1996)

datum is top of casing, approximately 1.66 ft above land surface in 1996, data courtesy of U.S. Geological Survey

Documentation of work done for this report

WGNHS geophysical log, 2019, 1 page

gamma only

datum is top of casing (0.02 ft above land surface in 2019)

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number **Fr 87**Owner **U.S. FOREST SERVICE**Location (Co., T/R.sec) **Forest Co., T40N, R12E, Sec. 21 (~~SW-NE~~ - NW-SE - NE 1/4 ?)**
in the Franklin L. CampgroundLand surface altitude **1780**Drainage basin **MENOMINEE R. : Pine R. : North Br. : Franklin Lake**
Distance to the nearest perennial stream: **(no stream)**

WELL DATA

Depth **102'**

Casing depth

Screened interval

Diameter **6"**Aquifers open to well **? Pleistocene**Geologic log available? **no**Construction report available? **no**Use of well **OBSERVATION**

Access to measure well

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations **Long Lake - 8.5 mi WSW Phelps - 10.5 mi NNW**
Engle River - 12.5 mi WStreamgaging stations **- 04063700 Popple River near Fence, WI - 2.8 mi WNW**Observation wells **Vi 40 - 3 mi W Vi 3 - 14 mi WNW****Fr 2 - 10 mi ENE Fc 4 - 19 mi ESE****Vi 21 - 11 mi W Fc 19 - 25 mi ESE**Other **Vi 33 - 13 mi WSW**

EXISTING RECORD

Measuring point **top of casing; at 1 sd**Measuring equipment **recorder**Frequency of measurement **continuous (daily)**Period of record -- **1967 - present**Started **10/31/80**

Ended

Volume of missing record **13.6% - very poor for a recorder**Recorded by **A. Jorgensen** on **9/12/80**

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

1. Areal spacing -- distance from any observation well 3 mi.
-- distance from observation well in same aquifer 3 mi.
2. Ownership: private -- public
3. Use of 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: unknown
8. Diameter (4 in. minimum for recorder) 6"
9. Aquifer: single -- multiple (? may be multiple)
10. Good hydraulic connection with aquifer yes
11. Knowledge of pumping effect no
12. Range and character of w.l. fluctuations 4 ft (73.5-77.5); good seasonal and long-term fluctuations
13. Length of record 12 yrs.
14. Missing record 14%
15. Adequacy of current measuring frequency recorder not needed
16. Probability of permanence good
17. Recommendations/Improvements
 - improve regularity
 - correlate with V:40 and drop one of them (drop V:40)
 - transfer recorder to other station (Fr 56?)
 - field check location, altitude

Evaluated by G. J. Jorgensen on 9/19/80

Appendix 6: Well FR-87 documents, well location map



Appendix 6: Well FR-87 documents, historical water-level data

WRD/Mad-29

FR-0087 (1989)

Site Ident. No. 455620088593901U.S. DEPT. OF INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISIONHIGHEST WATER LEVEL 73.32 JUNE 8, 19 78LOWEST WATER LEVEL 71.54 MAR. 29, 19 77

WATER LEVELS IN OBSERVATION WELLS

RECORDS AVAILABLE 1967-89

R = 234 *

T = A *

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	77.25	77.33	77.40	77.39 ✓	77.02 ✓	76.76 ✓	76.53	76.64	76.89	77.08	77.36	77.52
2	77.25	77.33	77.40	77.38	77.01	76.74	76.52	76.64	76.89	77.12	77.37	77.54
3	77.26	77.33	77.40	77.37	77.00	76.74	76.52	76.64	76.90	77.12	77.37	77.54
4	77.26	77.33	77.41	77.37	76.99	76.73	76.52	76.65	76.90	77.12	77.38	77.56
5	77.26	77.33	77.41	77.37	76.98	76.72	76.52	76.66	76.90	77.13	77.40	77.58
6	77.27	77.34	77.42	77.36	76.97	76.71	76.52	76.67	76.90	77.15	77.40	77.58
7	77.27	77.34	77.42	77.34	76.96	76.70	76.52	76.67	76.90	77.16	77.40	77.59
8	77.28	77.35	77.42	77.33	76.94	76.69	76.52	76.68	76.92	77.17	77.41	77.59
9	77.27	77.35	77.42	77.32	76.94	76.68	76.52	76.69	76.92	77.18	77.42	77.60
10	77.28	77.35	77.42	77.31	76.93 ✓	76.68	76.53 ✓	76.71	76.93	77.20	77.43	77.60
11	77.28	77.36	77.43	77.30	76.92	76.67	76.53	76.72	76.94	77.22	77.44	77.60
12	77.28	77.36	77.43	77.29	76.91	76.66	76.53	76.72	76.94	77.23	77.44	77.61
13	77.28	77.36	77.43	77.28	76.90	76.65	76.54	76.73	76.95	77.23	77.45	77.61
14	77.28	77.37	77.43	77.26	76.90	76.65	76.54	76.74	76.96	77.24	77.45	77.62
15	77.29	77.37	77.44	77.26	76.89	76.64	76.50	76.74	76.97	77.25	77.45	77.62
16	77.28	77.37	77.43	77.24	76.89	76.63	76.50	76.74	76.97	77.26	77.45	77.62
17	77.29	77.37	77.43	77.24	76.89	76.62	76.50	76.76	76.98	77.27	77.47	77.63
18	77.29	77.37	77.43	77.23	76.88	76.61	76.52	76.76	76.99	77.27 ✓	77.48	77.63
19	77.30	77.37	77.43	77.21	76.86	76.61	76.52	76.76	77.00	77.27	77.48	77.63
20	77.30	77.37	77.44	77.19	76.86	76.59	76.57	76.72	77.01	77.27	77.49	77.64
21	77.29	77.38	77.44	77.18	76.85	76.58	76.58	76.77	77.01	77.29	77.49	77.64
22	77.30	77.39	77.44	77.16	76.84	76.58	76.59	76.79	77.03	77.29	77.49	77.64
23	77.31	77.38	77.44	77.15	76.82	76.57	76.60	76.80	77.03	77.30	77.50	77.64
24	77.31	77.38	77.44	77.13	76.84	76.57	76.60	76.80	77.03	77.31	77.50	77.65
25	77.30	77.39	77.44	77.10	76.82	76.56	76.61	76.81	77.02	77.32	77.51	77.67
26	77.31	77.39	77.44	77.10	76.79	76.54	76.62	76.82	77.05	77.33	77.51	77.67
27	77.31	77.39	77.44	77.08	76.79	76.54	76.62	76.83	77.05	77.33	77.51	77.67
28	77.32	77.40 ✓	77.44	77.06	76.77	76.54	76.63	76.84	77.02	77.34	77.51	77.67
29	77.31		77.44 ✓	77.05	76.78	76.54	76.63	76.82	77.00	77.34	77.51	77.67
30	77.32		77.41	77.04	76.77	76.54	76.63	76.87	77.08 ✓	77.35	77.52 ✓	77.67
31	77.33 ✓		77.40		76.77		76.64 ✓	76.88 ✓		77.35 ✓		77.68 ✓

Report Page No. _____

FR-40/12E/21-0087.

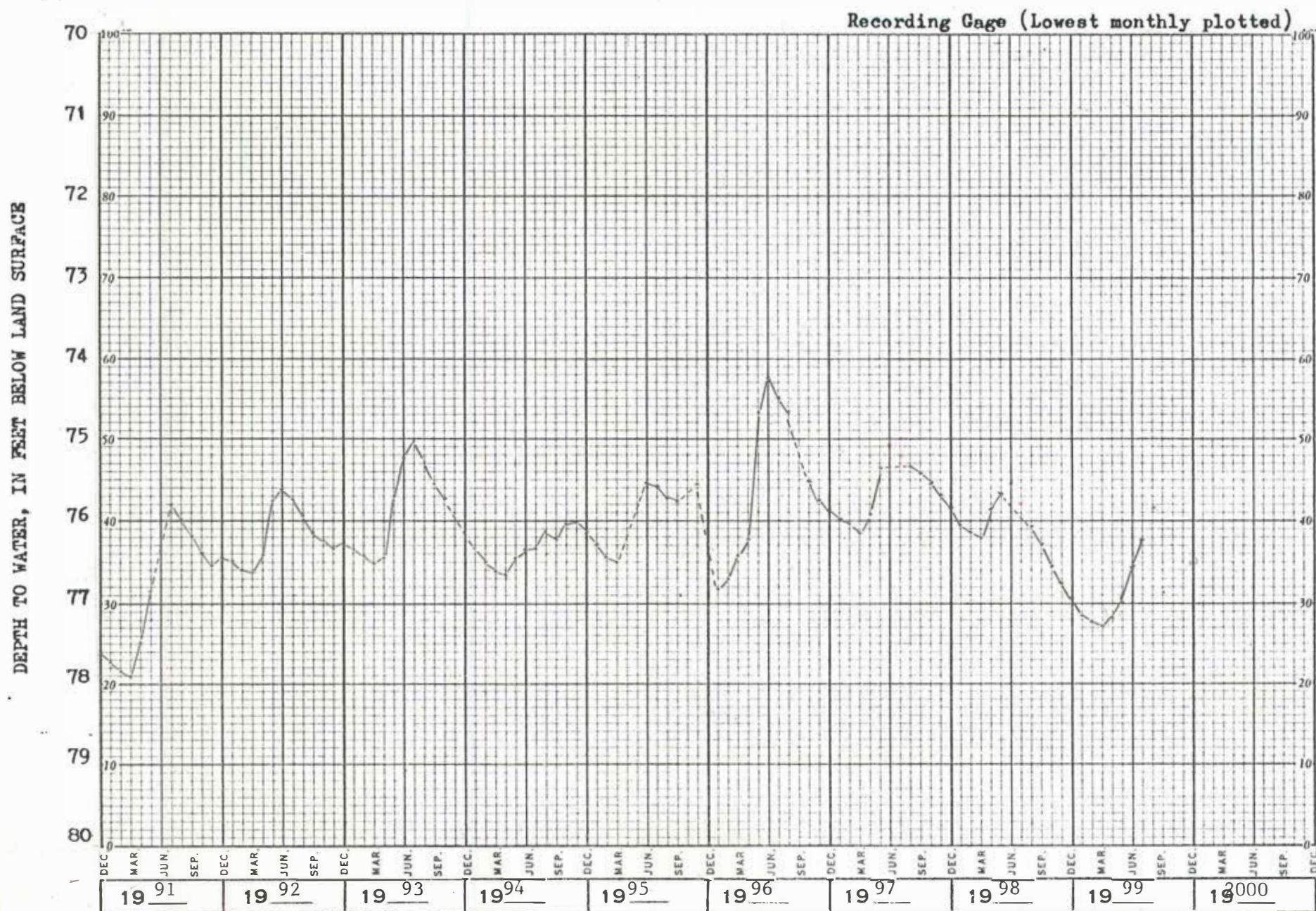
@ 1sd.

Appendix 6: Well FR-87 documents, hydrograph

CLEARPOINT CHARTS

PRINTED IN U.S.A. ON CLEARPOINT TECHNICAL PAPER NO. 10-5

FR-40/12E/21-0087. U. S. Forest Service. NE¹/₄NE¹/₄. Drilled unused water-table well in sand and gravel of Pleistocene age, diam 6 in, depth 102 ft. Lsd 1,750 ft above msl. MP top of casing, at lsd.



Appendix 6: Well FR-87 documents, USGS well schedule, 1972

WRD Exp.
April 1968

Well No.

Fr-40/12/21-87

Well No.

Fr-40/12-87

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR

GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

MASTER CARD

Source S. Field
Record by R.M. Erickson of data R. B. Miller Date 2/4/72 Map
State Wisconsin 58 County Forest F.R.
Latitude: 45 52 02 N Longitude: 88 54 30 Sequential number: 1
Lat-long accuracy: 40 S, R 12 W, Soc 21
Local well number: 40 N 12 E 21
Local use: F.R. 0087
Owner or name: U.S. Forest Service
Ownership: County, Fed Gov't, City, Corp or Co, Private, State Agency, Water Dist. F
Use of water: (S) (T) (U) (W) (X) (Y) (Z) Stock, Instl, Unused, Repressure, Recharge, Desal-P S, Desal-other, Other U
Use of well: (A) (D) (G) (H) (I) (P) (R) (T) (U) (W) (X) (Z) Anode, Drain, Seismic, Heat Res, Obs, Oil-gas, Recharge, Test, Unused, Withdraw, Waste, Destroyed B
DATA AVAILABLE: Well data Freq. W/L meas.: Contin. 1012 Field aquifer char. 73
Hyd. lab. data: 73
Qual. water data: TYPE: 74
Freq. sampling: 75 Pumpage inventory: no, period: 76
Aperture cards: 77
Log data: 78 79

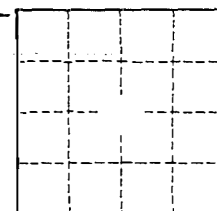
WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 102 ft 102 Head 2/4/72 24
Depth cased: (first perf.) ft 35 Casing type: 36 Diam. 6 in 30
Finish: porous gravel v. gravel v. horiz. open perf., screen, sd. pt., shored, open hole, other 31
Method: (A) (B) (C) (D) (H) (J) (P) (R) (T) (V) (W) (Z) air bored, cable dug, hyd jetted, air reverse trenching, driven, drive rot., percussive, rotary, wash, other 32
Date Drilled: 33 Pump intake setting: ft 34
Driller: 35
Lift: (A) (B) (C) (J) multiple, multiple (N) (P) (R) (S) (T) (Z) Deep 39 Shallow 40
Power: (type): diesel, elec, gas, gasoline, hand, gas, wind; H.P. 41
Descrip. MP Top of casing @ ft 42 Alt. MP 43
Alt. LSD: 44 Accuracy: (source) 47
Water Level: 95.28 ft 45 MP; F.R. LSD 46 Accuracy: TADE 52
Date meas: 31 Oct 67 53 Yield: gpm 54 Method determined 51
Drawdown: ft 55 Accuracy: 56 Pumping period: hrs 57
QUALITY OF WATER DATA: Iron ppm 58 Sulfate ppm 59 Chloride ppm 60 Hard. ppm 61
Sp. Conduct K x 10⁶ 62 Temp. °F 63 Date sampled 64
Taste, color, etc. 65

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD Physiographic Province: 19 Section: 20
Drainage Basin: 21 Subbasin: 24
Topo of well site: (D) (C) (E) (F) (H) (K) (L) depression, stream channel, dunes, flat, hilltop, sink, swamp, (P) (S) (T) (U) (V) offshore, pediment, hillside, terrace, undulating, valley flat 27
MAJOR AQUIFER: system 28 series 29 aquifer, formation, group 30 31
Lithology: 32 Origin: 33 Aquifer Thickness: ft 34
Length of well open to: ft 35 Depth to top of: ft 36
MINOR AQUIFER: y tem 44 series 45 aquifer, formation, group 46 47
Lithology: 48 Origin: 49 Aquifer Thickness: ft 50
Length of well open to: ft 51 Depth to top of: ft 52
Intervals Screened: 53
Depth to consolidated rock: ft 54 Source of data: 55
Depth to basement: ft 56 Source of data: 57
Surficial material: 58 Infiltration characteristics: 59
Coefficient Trans: gpd/ft 60 Coefficient Storage: 61
Coefficient Perm: gpd/ft² 62 Spec cap: 63 gpm/ft; Number of geologic cards: 64

S2K schedule card 1-8-79 elb



NEW COPY MADE

FORM. NO. 4-C

FR-81

FR-40/12E/21-87

Site Ident. No.

4	5	5	6	2	0	0	8	8	5	9	3	9	0	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Check One

English

— Metric Units

[illegible]

 = ZERO
 = ALPHA
 = ONE
 = ALPHA 1
 = TWO
 = ALPHA Z
 = SLASH
 = VERT. BAR
 = MINUS
 = HORZ. BAR

FORM NO 9-1904-A

SITE NO. FR-40/2E/21-87

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

Date 1/8/79Check One ☒ English ☐ Metric Units

GENERAL SITE DATA (1)

Recorded by Boyd
Copied from ABC schedule by
R.M. Erickson

Site Ident No. 20 39 4556 088.59 01 19

RG Number R=0 *

Transaction T= A D M V *

Site-Type 2= C D H I M P T W *

Reliability 3= C U L M *

Reporting Agency 4= USGS *

Project No. 5= 4455081600 *

District 6= 55 *

State 7= 55 *

County (or town) FOREST

Latitude 9= 45 57 04 *

Longitude 10= 088 59 30 *

Lat-Long Accuracy 11= S F T M *

Local Number 12= FR-40/12E/21-0087 *

Land Net Loc. 13= N 9 N 2 1 T 0 4 0 N R 0 1 2 E 4 *

Location Map 14= 4455081600 *

Scale 15= 24000 *

Altitude 16= 1750 *

Method of Measurement 17= A L M *

Accuracy 18= 5 *

Topo Setting 19= D C E F H K L O P S T U V W *

Hydrologic Unit (OWDC) 20= *

Date of First Construction/Completion 21= 1 1 1967 *

Use of Site 23= A D E G H M P R S T U W X Z *

Use of Water 24= A B C D E F H I M N P R S T U Y *

Secondary Water Use 25= *

Tertiary Use of Water 26= *

Depth of Hole 27= 102 *

Depth of Well 28= 102 *

Source of Depth Data 29= A *

Water Level 30= 175.88 *

Date Measured 31= 10 31 1967 *

Source 33= S *

Method of Measurement 34= A C E G H L M R S T V Z *

Site Status 37= D F G H O P R S T V X Z *

Source of Geohydrologic Data 36= *

Pump Used 35= *

Measuring Point 266= 01 *

Measuring Point Date 267= 10 31 1967 *

OWNER IDENTIFICATION (1)

R=158 * T= A D M *

Date of Ownership 159# 00 10 01 1967 *

Name: Last 161= US FOREST *

First 162= S ERVICE *

Middle Initial 163= *

OTHER SITE IDENTIFICATION NUMBERS (1)

R=189 * T= A D M *

Ident 190# FR-0087 *

Assigner 191= USGS *

New Card Same R & T

Ident 190# *

Assigner 191= *

SITE VISIT DATA (1)

R=186 * T= A D M *

Date of Visit 187# 10 31 1967 *

Name of Person 188= ERICKSON, R.M. *

FIELD WATER QUALITY MEASUREMENTS (1)

R=192 * T= A D M *

Date 193# 1 1 1979 *

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 O A R L G Z

reporting, driller, owner, other gov't, other logs, geologist, other agency reported,

Data Date Valid

Appendix 6: Well FR-87 documents, USGS well schedule, 1979 continued

WELL CONSTRUCTION DATA (1)

R = 58 *	T = <u>A</u> D M *	Entry No <u>59</u> # <u>1</u> *	Date of Construction Completion <u>60</u> = <u>00</u> / <u>00</u> / <u>1967</u> *	Source of ^① Const. Data <u>64</u> = <u>A</u> *
Name of Contractor/Driller <u>63</u> = _____ *				
Method of Construction <u>65</u> = <u>A</u> <u>B</u> <u>C</u> <u>D</u> <u>H</u> <u>J</u> <u>P</u> <u>R</u> <u>T</u> <u>V</u> <u>W</u> <u>Z</u> *				
<small>air, rotary bored, or augered cable, tool dug, hydraulic, rotary jetted, air-per, cussion reverse, rotary trenching, driven, drive, wash other</small>				
Finish <u>66</u> = <u>C</u> <u>F</u> <u>G</u> <u>H</u> <u>Ø</u> <u>P</u> <u>S</u> <u>T</u> <u>W</u> <u>X</u> <u>Z</u> *	Type of Seal <u>67</u> = <u>B</u> <u>C</u> <u>G</u> <u>Z</u> *			
<small>porous, concrete gravel w, perf gravel, screen horizontal, gallery, open, end perforated, or slotted screen, sand point, walled, open, other hole bentonite, clay, cement, other grout</small>				
Bottom of Seal <u>68</u> = _____ *	Method of Development <u>69</u> = <u>A</u> <u>B</u> <u>C</u> <u>J</u> <u>N</u> <u>P</u> <u>S</u> <u>Z</u> *		Number of Hours in Development <u>70</u> = _____ *	
<small>air-lift, bailed, compressed, air pump jotted, none, other, surged, other pump</small>				
Special Treatment During Development <u>71</u> = <u>C</u> <u>D</u> <u>E</u> <u>F</u> <u>H</u> <u>M</u> <u>Z</u> *				
<small>chemicals, dry ice, explosives, deflocculent, hydrofracturing, mechanical, other</small>				

DIMENSIONS OF THE HOLE CONSTRUCTED (2)

R = 72 *	T = <u>A</u> D M *	Construction Entry No <u>59</u> # _____ *
New Card for Each Hole Segment Same R, T & Field 59		
Top of Hole Segment Below LSD		Bottom of Hole Segment below LSD
<u>73</u> # _____ *	<u>74</u> = _____ *	Diameter of Hole Segment
<u>73</u> # _____ *	<u>74</u> = _____ *	<u>75</u> = _____ *
<u>73</u> # _____ *	<u>74</u> = _____ *	<u>75</u> = _____ *
<u>73</u> # _____ *	<u>74</u> = _____ *	<u>75</u> = _____ *
<u>73</u> # _____ *	<u>74</u> = _____ *	<u>75</u> = _____ *

CASING SCHEDULE (2)

R = 76 *	T = <u>A</u> D M *	Construction Entry No <u>59</u> # _____ *	New Card for Each Casing With Same R, T & Field 59		
Top of Casing Segment Below LSD		Bottom of Casing Segment Below LSD	Diameter of Casing Segment	Casing Material ^⑤	Thickness of Casing
<u>77</u> # _____ *	<u>78</u> = _____ *	<u>79</u> # _____ *	<u>80</u> = <u>S</u> *	<u>81</u> = _____ *	
<u>77</u> # _____ *	<u>78</u> = _____ *	<u>79</u> # _____ *	<u>80</u> = _____ *	<u>81</u> = _____ *	
<u>77</u> # _____ *	<u>78</u> = _____ *	<u>79</u> # _____ *	<u>80</u> = _____ *	<u>81</u> = _____ *	
<u>77</u> # _____ *	<u>78</u> = _____ *	<u>79</u> # _____ *	<u>80</u> = _____ *	<u>81</u> = _____ *	
<u>77</u> # _____ *	<u>78</u> = _____ *	<u>79</u> # _____ *	<u>80</u> = _____ *	<u>81</u> = _____ *	

OPENINGS SCHEDULE (2)

R = 82 *	T = <u>A</u> D M *	Construction Entry No <u>59</u> # _____ *	New Card for Each Open Section With Same R, T and Field 59		
Top of Section Below LSD		(Openings Data)		(Openings Data)	
Bottom of Section Below LSD	<u>83</u> # _____ *	<u>83</u> # _____ *	<u>84</u> = _____ *	<u>84</u> = _____ *	<u>85</u> = _____ *
Type of Openings ^⑥	<u>85</u> = _____ *	<u>85</u> = _____ *	<u>86</u> = _____ *	<u>86</u> = _____ *	<u>87</u> = _____ *
Type of Material ^⑦	<u>86</u> = _____ *	<u>86</u> = _____ *	<u>87</u> = _____ *	<u>88</u> = _____ *	<u>88</u> = _____ *
Diameter of Open Section	<u>87</u> = _____ *	<u>87</u> = _____ *	<u>88</u> = _____ *	<u>89</u> = _____ *	<u>89</u> = _____ *
Width of Opening	<u>88</u> = _____ *	<u>88</u> = _____ *	<u>89</u> = _____ *		
Length of Opening	<u>89</u> = _____ *	<u>89</u> = _____ *			

FOOT NOTES:

① Source of Data Codes:

S	D	Ø	A	R	L	G	Z
reporting, driller, owner, other gov't, agency	other logs, geologist, other reported,						

⑤ Casing Material Codes

B	C	G	I	M	P	R	S	T	U	W	Z
brick, concrete, iron	galv, wrought, iron	other, metal	PVC or plastic	rock or stone	steel, tile, coated, wood, other steel						

⑥ Type of Openings Codes

F	L	M	P	R	S	T	W	X	Z
fracture, shuttered	louvered, mesh, wire, or slotted	screen, wound (unknown)	sand, point	walled, open, hole					

⑦ Type of Material Codes for Open Sections

B	C	G	I	M	P	R	S	T	Z
brass or bronze	concrete, galv, wrought, iron	other, metal	PVC or plastic	stainless, steel, tile, other steel					

SITE NO. FR - 40/12/21 - 0027

GEOLOGIC LOG SCHEDULE

GENERAL SITE DATA

Site Ident No 455620088593A01Recorded by HIRTDate 3-1-79

GEOLOGIC UNIT DESCRIPTIONS

R = 90 *	T = <u>A</u> D M *	Entry No 256 =	Depth to Top 91 = <u>0.</u> *	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 = <u>11.0SDGV</u> *	Lithology 96 = <u>SDGL</u> *	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		
R = 90 *	T = A D M *	Entry No 256 =	Depth to Top 91 =	Depth to Bottom 92 =
add, delete, modify				
Unit Identifier 93 =	Lithology 96 =	Lithologic Modifier 97 =		

SITE NO.

R = 134 146 *	T = A D M *	Entry No 147 # *	Date 148 = / / * month day year
flowing, pumped	add, delete, modify		
Discharge: 150 = *	Source of Data ① 151 = *		
Method of Measurement 152 = B C E F M O P R T U V W Z *	bailer, current, estimated, flume, totalling, orifice, pitot-tube, reported, trajectory, venturi, volumetric, weir, other meter meter		
Production Level 153 = *	Static Level 154 = *	Source of Data ① 155 = *	Specific Capacity 272 = *
Method of Measurement 156 = A C E G H L M R S T V Z *	airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel, electric, calibrated, other airline gage pressure gage logs tape tape electric tape		
	Pumping Period 157 = *		

R = 42	*	T = A D M	*	Type of Lift	43 #	A B C J P R S T U Z	*	Entry No	254 #	*
		add, delete, modify				air, bucket, centrifugal, jet, piston, rotary, submergible, turbine, unknown, other				
Pump Intake Setting		44 =	*	Type of Power	45 =	D E G H L N W Z	*			
						diesel, electric, gasoline, hand, LP gas, natural, windmill, other gas				
Date		38 =	/	/	*	Horsepower	46 =	.	*	
		month	day	year						

R = 4 7	*	T =	A	D	M	*	Type of Lift	4 3 #	*	Lift Entry No	254 #	*	Manufacturer of Pump	4 8 =	*	
add, delete, modify																
Serial No of Pump	4 9 =	*														
Name of Power Company	5 0 =	*														
Power Company Account No	5 1 =	*														
Power Meter No	5 2 =	*														
Pump Rating	5 3 =	*														
Person or Company Who Maintains the Pump	5 4 =	*														
Additional Lift	255 =	*														
Rated Pump Capacity	268 =	*														

R =	55	*	T =	A	D	M	*	Type of Lift		43#	*	Type of Power		56=	*	Horsepower		57=	*	Lift Entry No.		254 #	*
								add, delete, modify															

The diagram illustrates the layout of a log type card. It is divided into several sections:

- Top Left:** A box containing "R = 198" followed by an asterisk (*).
- Top Center:** A box containing "T = A D M" followed by an asterisk (*). Below this box is the text "add, delete, modify".
- Top Right:** A box containing "New Card for Each Log Type Same R & T".
- Bottom Left:** A section labeled "Type of Log ②" with a table:

199 #	*
199 #	*
199 #	*
199 #	*
- Bottom Center:** A section labeled "Begin Depth" with a table:

200 =	| | | | | | | | | | *
200 =	| | | | | | | | | | *
200 =	| | | | | | | | | | *
200 =	| | | | | | | | | | *
- Bottom Right:** A section labeled "End Depth" with a table:

201 =	| | | | | | | | | | *
201 =	| | | | | | | | | | *
201 =	| | | | | | | | | | *
201 =	| | | | | | | | | | *
- Far Right:** A section labeled "Source of Data ①" with a table:

202 =	| | | | | | | | | | *
202 =	| | | | | | | | | | *
202 =	| | | | | | | | | | *
202 =	| | | | | | | | | | *

R = 114 * T = A D M * Begin Year 115 # End Year 116 = Source Agency 117 =

add, delete, modify

Frequency of Collection ③ 118 = * Network Site 257 = * Type of Analyses ④ 120 = *

R = 1 2 1 * T = A D M *
 add, delete, modify
 Frequency of Collection ③ 1 2 5 = 1 *
 Network Site 2 5 8 = Y *

R = 127 *	T = A D M * add, delete, modify	Begin Year 128# *	End Year 129 = *	Source Agency 130 = *
Frequency of Collection ③ 131 = *	Network Site 259 = *	Method of Collection 133 = C E M U Z * calculated, estimated, metered, unknown, other		

R = 180 *	T = A D M *	Type of Data 181 #	Loc 182 = C D Z *	Format 261 = F M P Z *
add, delete, modify			cooperator, district, other	files, machine, published, other readable
New Card Same R & T	Type of Data 181 #	Loc 182 = C D Z *	Format 261 = F M P Z *	

S	D	Ø	A	R	L	G	Z
reporting, driller, owner, other gov't, agency				other	logs, geologist, other reported,		

A	B	C	D	F	I	M	Ø	Q	S	W	Z
annual, bi-monthly, continuous, daily, semi-monthly, intermittent, monthly, one time, quarter, semi-annual, weekly, other											

A	B	C	D	E	F	G	H	I	J	K	L	M	N	Ø	P	Q
time,	collar,	caliper,	driller's,	electric,	fluid,	geologist,	magnetic,	induction,	gamma,	dipmeter,	laterlog,	microlog,	neutron,	μ later,	photo,	radio-
					conduct				ray							active

A	B	C	D	E	F	G	H	J	K	L	M	Z
physical,	common,	trace,	pesticides,	nutrients,	sanitary,	codes,	codes,	codes,	codes,	codes,	all or,	other
	chemical	elements				B&D	B&E	B&F	D&E	C,D&E	most	

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 *	T = A D M *	Entry No 256 # 100 *	Depth to Top 91 = 0 . *	Depth to Bottom 92 = *
add, delete, modify				
Unit Identifier 93 = 100SDGV *	Lithology 96 = SDGL *	Lithologic Modifier 97 = *		

AQUIFER DATA (2)

R = 94 *	T = A D M *	Geohydrologic Unit Entry No 256 # 100 *
add, delete, modify		
Date 95 # 10 / 31 / 1976 *	Water Level 126 = 75.28 *	% Water Contributed 132 = 100 *
month day year		

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 *	T = A D M *	Entry No 256 # *	Depth to Top 91 = *	Depth to Bottom 92 = *
add, delete, modify				
Unit Identifier 93 = *	Lithology 96 = *	Lithologic Modifier 97 = *		

AQUIFER DATA (2)

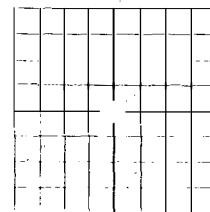
R = 94 *	T = A D M *	Geohydrologic Unit Entry No 256 # *
add, delete, modify		
Date 95 # / / *	Water Level 126 = *	% Water Contributed 132 = *
month day year		

PERTINENT REMARKS

R = 183 *	T = A *	185 = 'C26.6/TOP OF CASING' *
add		
New Card Same R&T		185 = 'C90/LOG ESTABLISHED BY USGS' *
		185 = 'C60/ACTUAL DATE CONSTRUCTED UNKNOWN' *

NOTES:

This is determined by S. Field for Pineapple study.



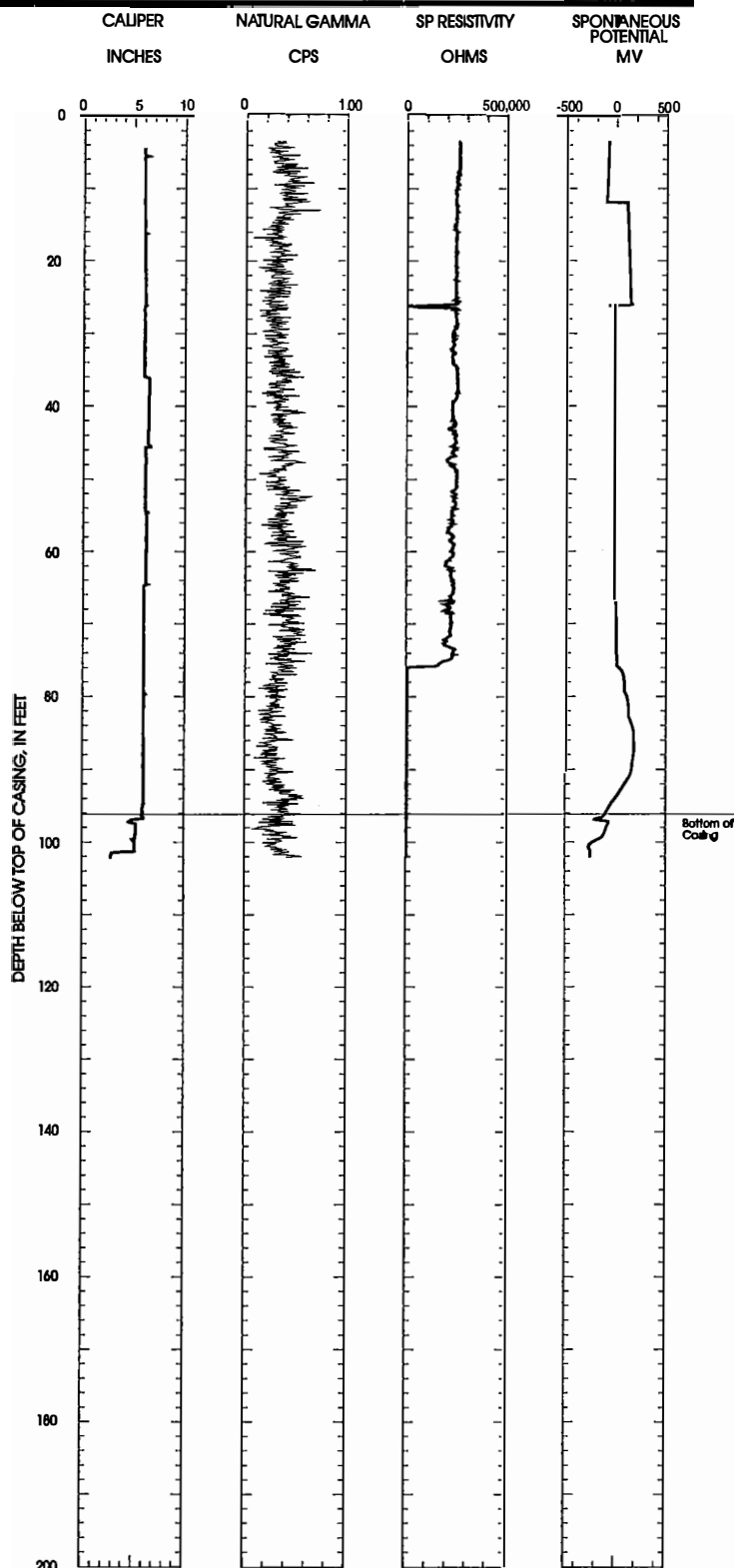


Forest County

FR-40/12E/21-0087

SAND AND GRAVEL AQUIFER

Geophysical Logs

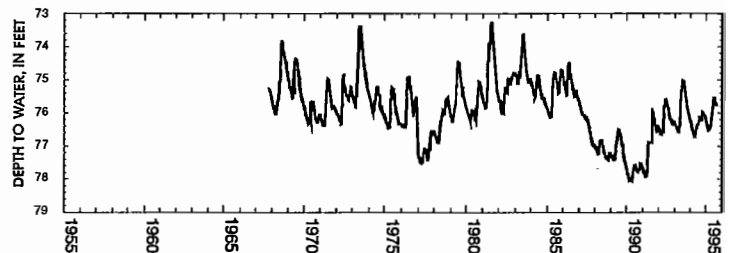


Well Information

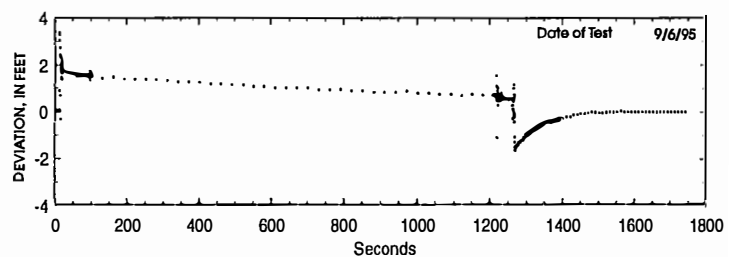
Total Depth 102 feet
 Cased Depth 96 feet *
 Casing Diameter 6 inches
 Use of Well Non-pumping

* Picked from geophysical logs

Depth to Water Below Land Surface For Period of Record



Deviation From Static Water Level During Displacement/Recovery Test



Horizontal Hydraulic Conductivity

Hvorslev K
 10.0 ft/day

BOREHOLE GEOPHYSICAL LOG

WUWN _____ **COUNTY** Forest **DATE** 10/11/19 **LOGGED BY** PMChase

LONGITUDE -88.991083 **LOC METHOD** GPS, survey grade **LOC CONF** 3m/10ft

ELEV. METHOD USGS GPS NAVD88 **DEPTH TO WATER** 74.7 **CASING STICK UP** 0.02

Comments: *Unless noted, (1) all depths are in feet; (2) casing depth is interpreted from geophysical logs; (3) well depth incorporates 4/7/2020 USGS tape-down; (4) water depth is reported from WGNHS on day of logging; (5) datum is top of casing at 1775.2 ft., NAV88; (6) Elevation is USGS land surface datum (lsd); (7) stick up is feet of casing above lsd.*

LOGS COLLECTED:

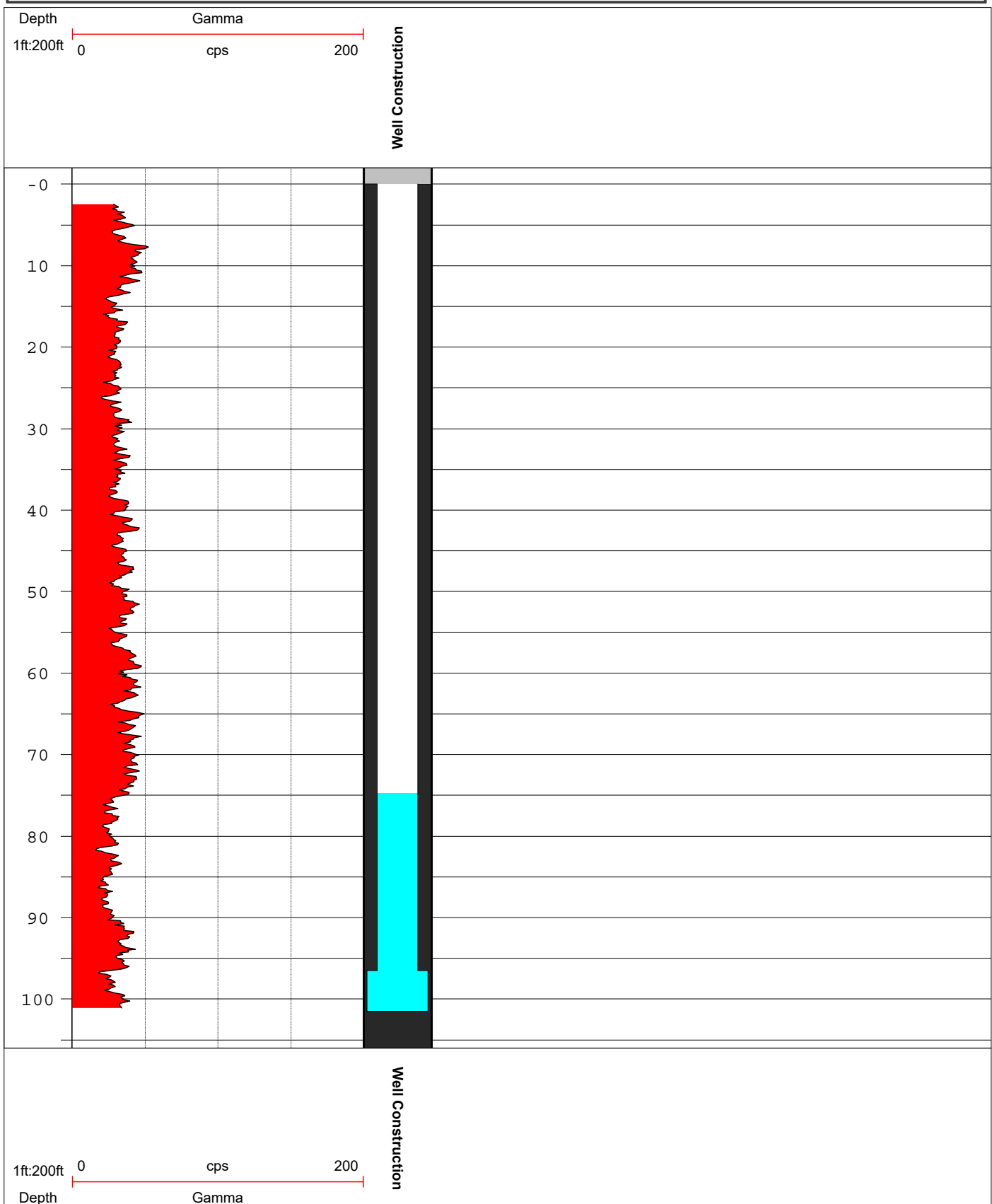
<input checked="" type="checkbox"/> Gamma	<input type="checkbox"/> Self Potential	<input type="checkbox"/> Fluid Conductivity	<input type="checkbox"/> Optical Borehole Imager
<input type="checkbox"/> Caliper	<input type="checkbox"/> Normal Resistivity	<input type="checkbox"/> Flow Meter- HeatPulse	<input type="checkbox"/> Acoustic Borehole Imager
<input type="checkbox"/> Single Point Resistivity	<input type="checkbox"/> Fluid Temperature	<input type="checkbox"/> Flow Meter- Spinner	<input type="checkbox"/> OTHER

(up is negative; down is positive)

For more information or to obtain collected data not shown, please contact: ***data@wgnhs.wisc.edu*** File Created on: 11/11/2021

By: AMB

Header file: WGNHSGeoPhysHeader6_2021_NGWMN.wcf



Appendix 7: Well GR-29/132/133/134 documents

Historical Documents*

Basic well information for original well GR-29, 1981, updated 1987; well evaluation for original well GR-29, 1981; well location maps; water-levels for piezometer GR-29, 1982-1984; hydrograph for piezometer GR-29, 1991-1999; hydrograph for GR-132, 1982-1989; hydrograph for GR-133, 1982-1989; hydrograph for GR-134, 1982-1989, 9 pages
well information historically compiled by WGNHS

USGS site schedule for original well GR-29, 1981, 3 pages

USGS well construction information for well nest (original well GR-29 and piezometers GR-29, GR-132, GR-133, and GR-134), 1982, 8 pages
includes handwritten notes and sketches detailing the construction of original well and four piezometers

WGNHS lithological description for original GR-29, 1994, 1 page

WGNHS Geologic log for Lancaster City Well #2 (GR-87), 1967, 6 pages
the stratigraphy for this well is comparable to that of GR-29/132/133/134 well nest

** Note: Due to the non-unique naming convention for this site, both the original well and the shallow piezometer were assigned the name: GR-29.*

Based on available records for this site, drilling and construction of original well GR-29 was completed on 3/3/1981. This well was subsequently outfitted with four piezometers (i.e., GR-29, GR-132, GR-133, and GR-134) sometime between 3/3/1981 and the first recorded water-level measurement for these piezometers was on 11/9/1982. Sketches detailing the construction of the piezometer nest are dated 12/13/1982.

Figure 3.

7/11/80

Fig 3 - BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number GR-0029

Owner U.S. GEOLOGICAL SURVEY

Location (Co., T/R.sec)

NE NE SW 05/06W/27

Land surface altitude 635'

Drainage basin (intermittent branch of) Pecatonica - Sugar River Basin

SANDY CREEK - 150'
 Nearest stream: none - Sandy Cr. distance - 0.7 mi

WELL DATA

Depth 1428'

Casing depth 90'

Screened interval NONE

Diameter 10"

Aquifers open to well SAND STONE

Geologic log available? NO (has)

Construction report available? NO (has)

Use of well DOMESTIC (? has)

Access to measure well GOOD

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations LANCASTER 4 WSW, 16 MILES E OF WELL

Guttenberg, IA - 6 mi SSW Prairie du Chien - 12 mi N

Streamgaging stations 05413500, GRANT RIVER AT BURTON, 16 MILES SE OF WELL

05413449 Rattlesnake Ck near N. Andover - 10 mi SE

Observation wells GR 5 - 22 mi E from well GR 72 - 37 mi NE

CR 59 - 23.5 mi N

Other piezometers: Gr 132, Gr 133, Gr 134

EXISTING RECORD

Measuring point TOP OF PPF COUPLING

Measuring equipment STEEL TAPE, PRESSURE GAUGE

Frequency of measurement MONTHLY

Period of record --

Started NOVEMBER 9, 1982

Ended CONTINUING

Volume of missing record

LSD: ?

Elev:

1st measurement: 7.93 ft LSD
alt

Figure 2.

Appendix 7: GR-29/132/133/134 documents, well evaluation for original well GR-29, 1981

Gr-29

July 1980
R. D. Cotter

Fig 2 - 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 DOMESTIC ← ? nas
4. Access - physical
- owner's permission
5. Condition of well - casing GOOD
- housing
6. Geologic log - yes
- no
7. Construction report - yes
- no
8. Diameter (4 inch minimum for recorder) 10"
9. Aquifer - single
- multiple
10. Hydraulic connection with aquifer ?
11. Knowledge of pumping effects ?
12. Range and character of water level fluctuations ?
13. Length of record
14. Missing record
15. Adequacy of current measuring frequency
16. Probability of permanence GOOD

NOTES

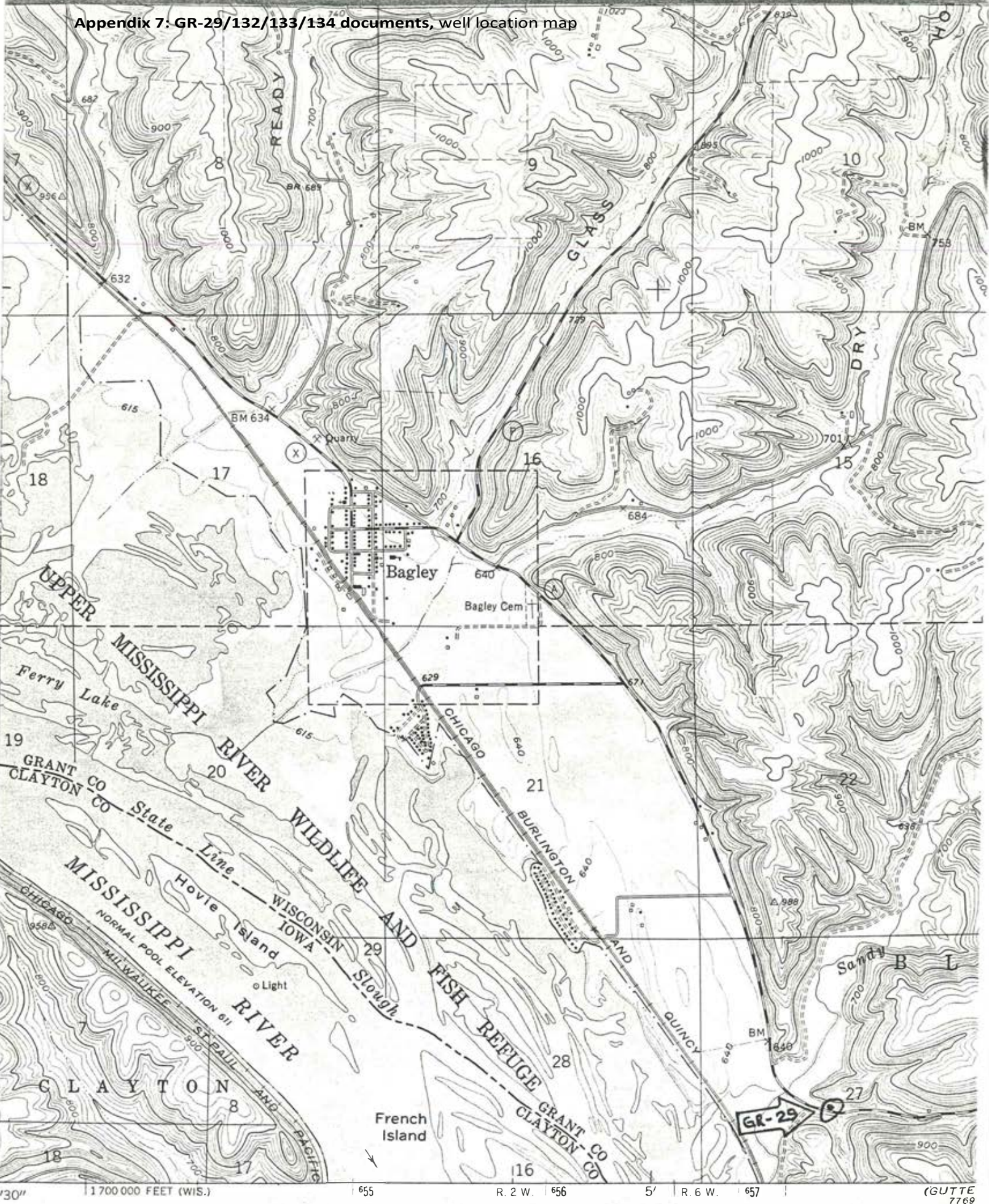
Recommendations

1E

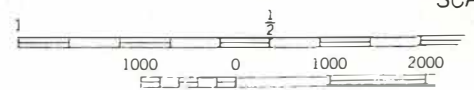
Appendix 7: GR-29/132/133/134 documents, well location map



Appendix 7: GR-29/132/133/134 documents, well location map



Maped, edited, and published by the Geological Survey
 control by USGS, USC&GS, and USCE
 topography by photogrammetric methods from aerial



SCAL' 7769

Appendix 7: GR-29/132/133/134 documents, water-level data for piezometer GR-29

GR-0029

WRD/Mad-26

Site Ident. No. 4 2 5 2 4 6 0 9 1 0 4 2 1 0 1

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

GROUND WATER SITE INVENTORY
WATER-LEVEL DATA

HIGHEST WATER LEVEL _____ 19____

LOWEST WATER LEVEL _____ 19____

RECORDS AVAILABLE 1982-

R = 234 * T = A *

DATE	WATER LEVEL (BELOW LSD)	STATUS	METHOD	DATE	WATER LEVEL (BELOW LSD)	STATUS	METHOD
235 # 11/09/1982 *	237 - 7.93 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 11/17/1982 *	237 - 7.60 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 12/16/1982 *	237 - 7.61 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 01/13/1983 *	237 - 7.26 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 02/16/1983 *	237 - 8.32 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 03/17/1983 *	237 - 4.98 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 04/20/1983 *	237 - 5.59 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 05/12/1983 *	237 - 6.05 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 06/16/1983 *	237 - 7.12 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 07/14/1983 *	237 - 7.19 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 08/24/1983 *	237 - 8.18 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 09/15/1983 *	237 - 8.27 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 10/14/1983 *	237 - 8.36 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 11/17/1983 *	237 - 8.38 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 12/21/1983 *	237 - 7.56 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 01/18/1984 *	237 - 8.05 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 02/15/1984 *	237 - 8.41 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 03/14/1984 *	237 - 7.95 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 04/11/1984 *	237 - 7.20 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 05/16/1984 *	237 - 5.75 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 06/13/1984 *	237 - 6.96 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 07/17/1984 *	237 - 6.60 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 08/21/1984 *	237 - 8.00 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 09/11/1984 *	237 - 8.51 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 10/10/1984 *	237 - 9.86 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *
235 # 11/08/1984 *	237 - 8.00 *	238 - *	239 - S *	235 # / /	237 -	238 - *	239 - *

Method of Measurement	238 =	A	C	E	G	H	L	M	R	S	T	V	Z	
		airline	collected, airline	collected	pressure gage	collected pressure gage	pressure gage	manometer	reported	steel, tape	electric, tape	calibrated electric tape	other	
Site Status	238 =	D	E	F	G	H	S	P	R	S	T	V	X	Z
		dry	flow, recently	flowing	flowing	flowing, recently	pumping	recently, pumped	recently, pumped	recently, pumped	foreign, substances	earthen, water, other	effect	

GR-05/06W/27-0029. U. S. Geol. Survey. NE+SW+

MP → 3.13 above bed.

CLEARPRINT PAPER CO. NO. C350. 15H. 14ARS BY MONTHS X 100 DIVISIONS.

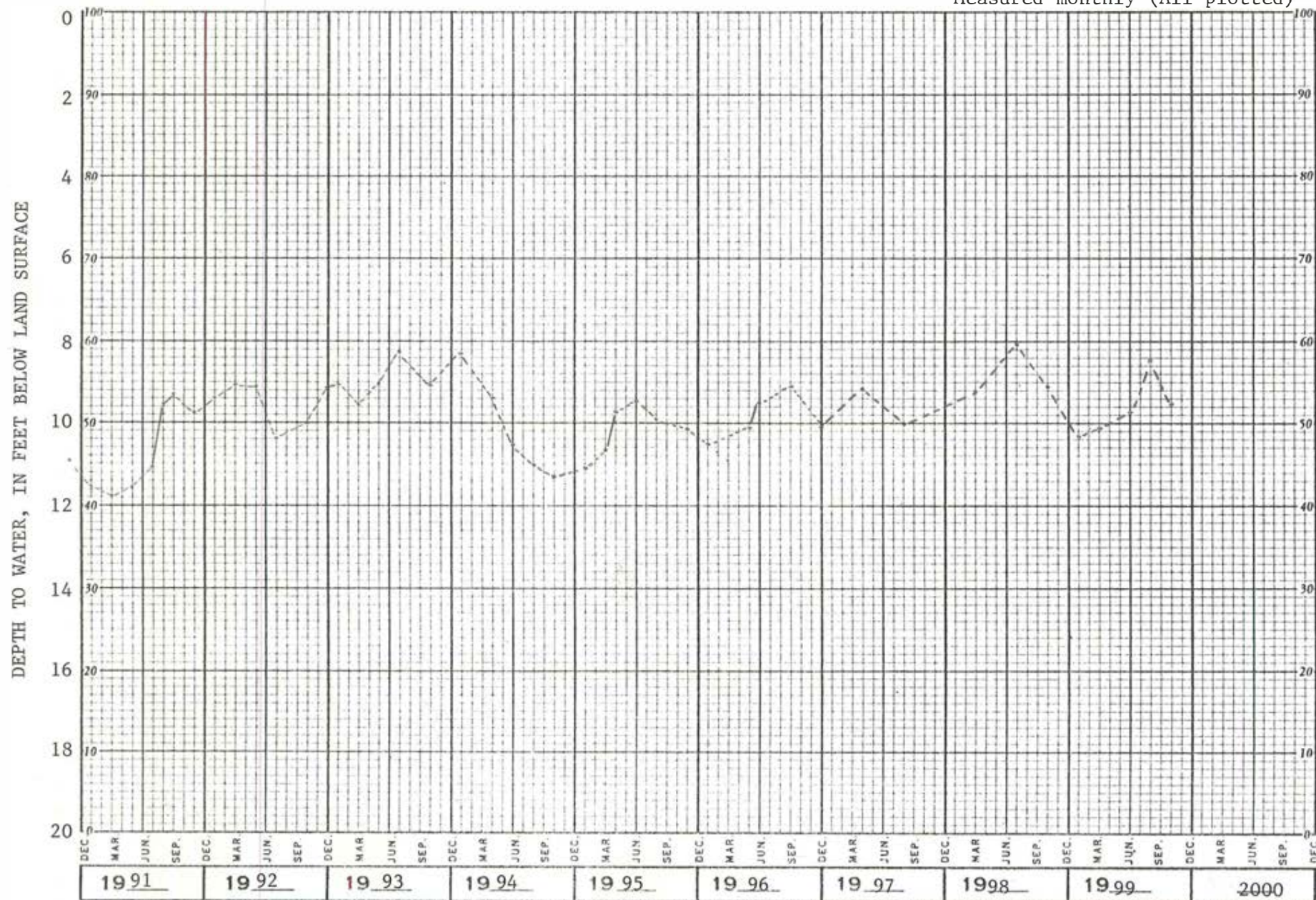
PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015

CLEARPRINT CHARTS

GR-05/06W/27-0029. U.S. Geological Survey. NE $\frac{1}{4}$ SW $\frac{1}{4}$. Drilled test and observation well in the sandstone aquifer. Diameter 10 in., depth 1428 ft, cased to 90 ft. Lsd 635 ft above msl. MP 3.13 ft above lsd.

Bagley Test Well for RASA Study

Measured monthly (All plotted)



Appendix 7: GR-29/132/133/134 documents, hydrograph for piezometer GR-132

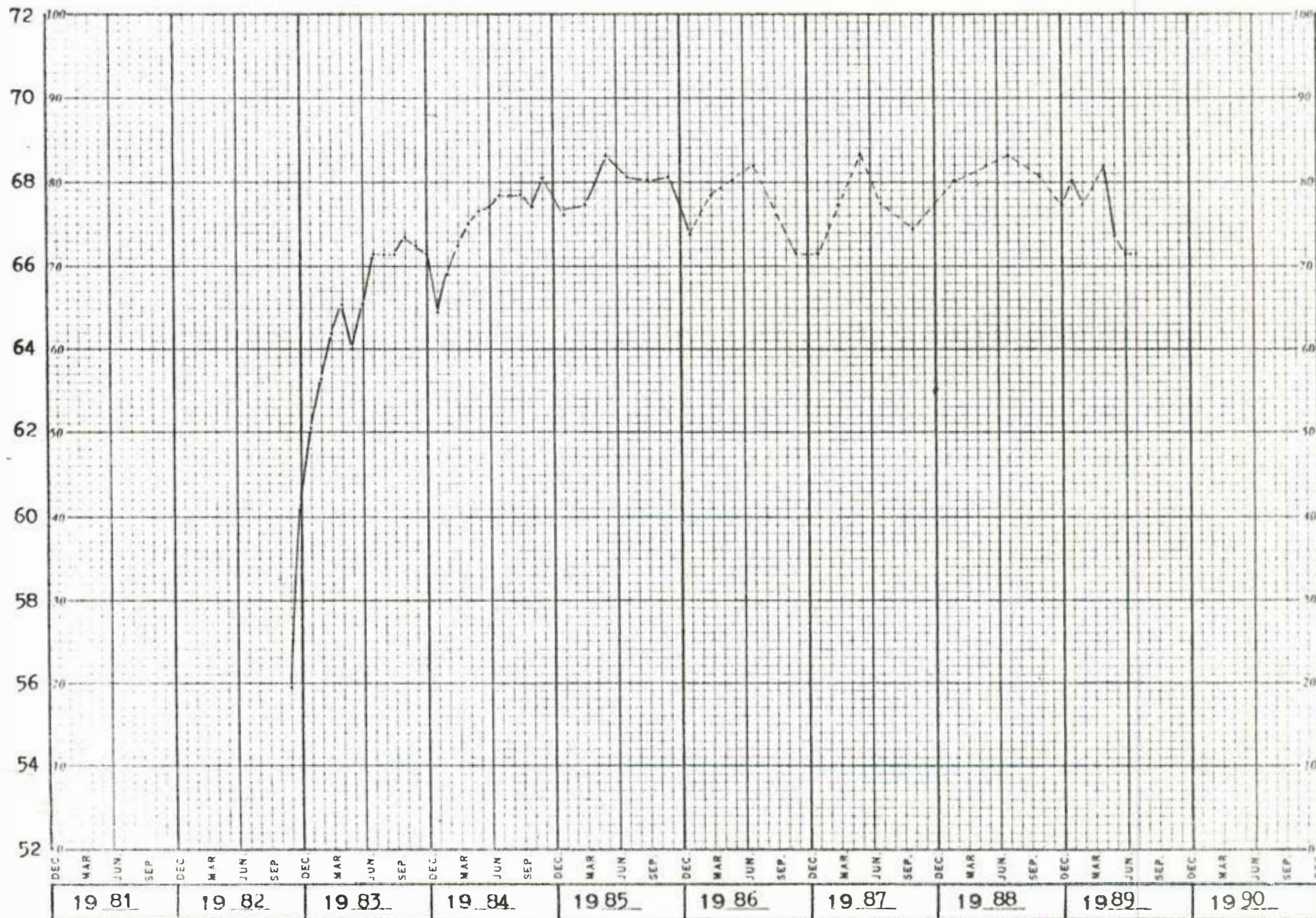
CLEARPRINT PAPER CO. NO. C358 TEN YEARS BY MONTHS X 100 DIVISIONS.

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015

CLEARPRINT CHARTS

GR-05/06W/27-0132. U. S. Geol. Survey. NE $\frac{1}{4}$ SW $\frac{1}{4}$.

WATER LEVEL, IN FEET ABOVE LAND SURFACE



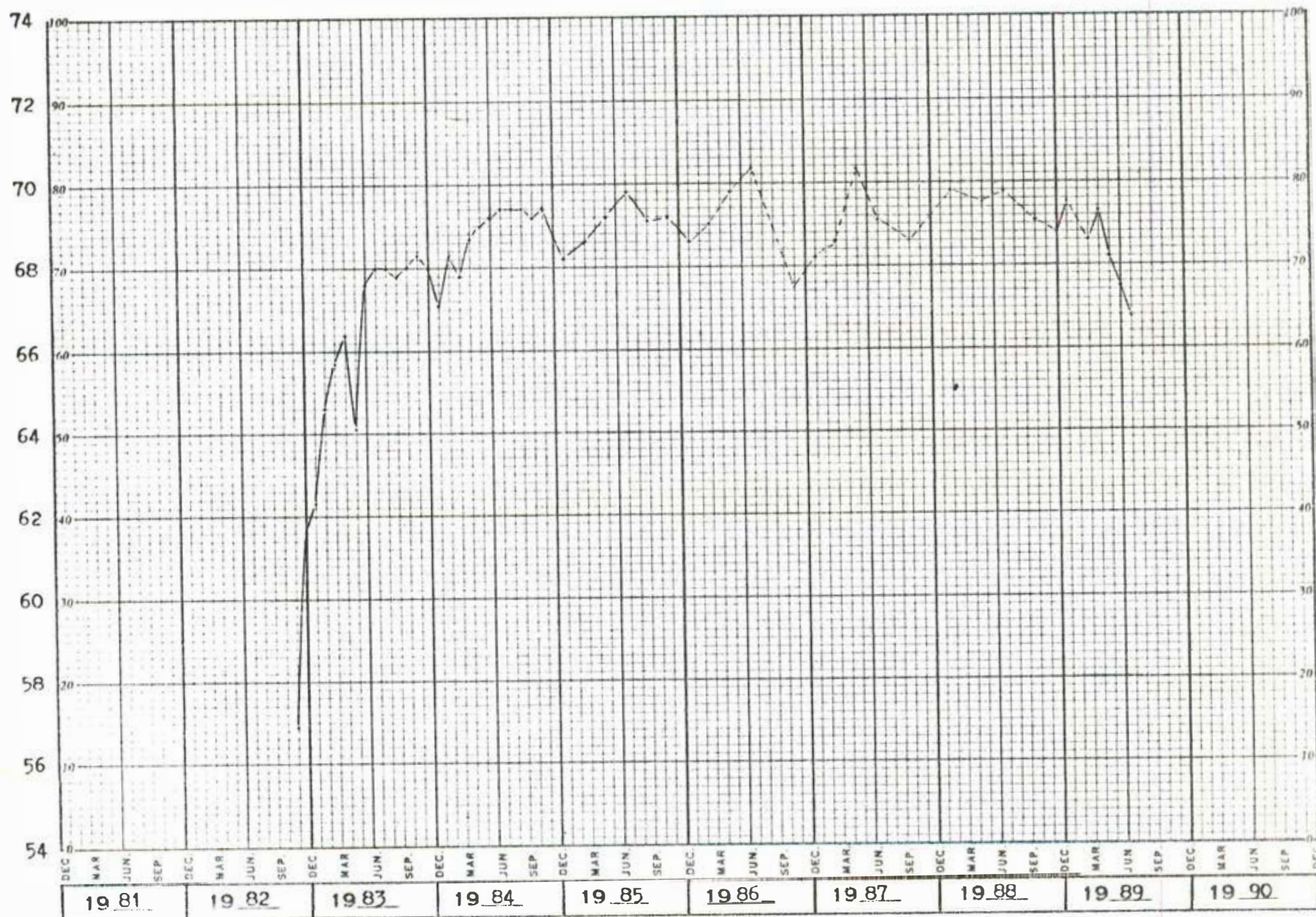
Appendix 7: GR-29/132/133/134 documents, hydrograph for piezometer GR-133

CLEARPRINT PAPER CO. NO. C356. TEN YEARS BY MONTHS X 100 DIVISIONS.

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CLEARPRINT CHARTS

GR-05/06W/27-0133. U. S. Geol. Survey. NE $\frac{1}{4}$ SW $\frac{1}{4}$.



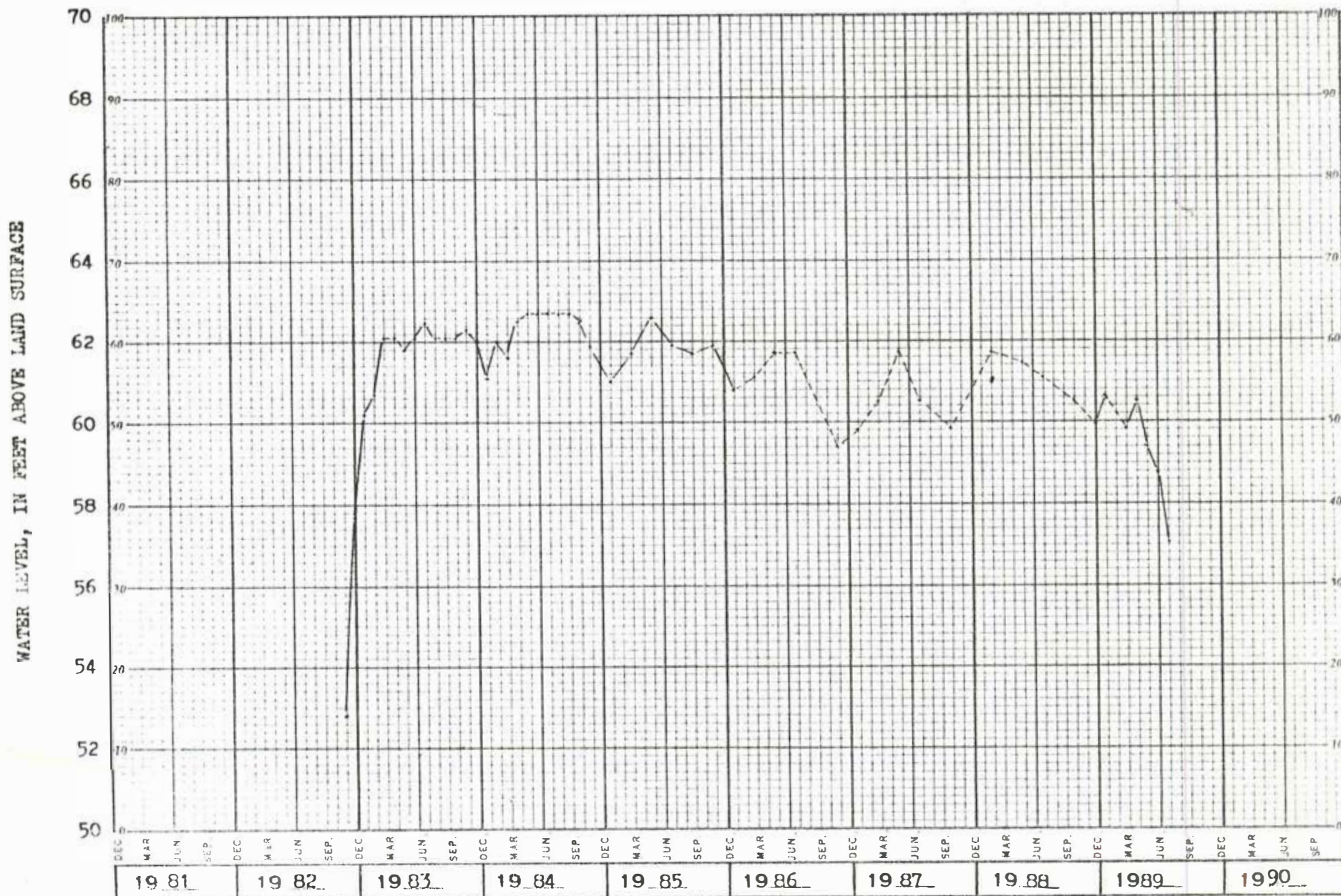
Appendix 7: GR-29/132/133/134 documents, hydrograph for piezometer GR-134

CLEARPRINT PAPER CO. NO. C356. TEN YEARS BY MONTHS X 100 DIVISIONS.

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015

CLEARPRINT

GR-05/06W/27-0134. U. S. Geol. Survey. NE $\frac{1}{4}$ SW $\frac{1}{4}$.



SITE NO. GR-05/06W/27-0029
(Bagley Test Well)Recorded by P. EmmensU.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
SITE SCHEDULEDate 12/2/81

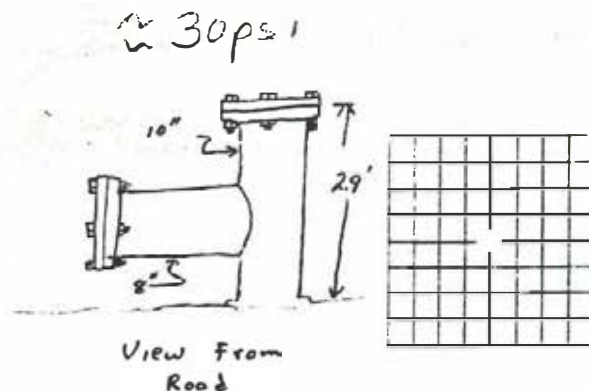
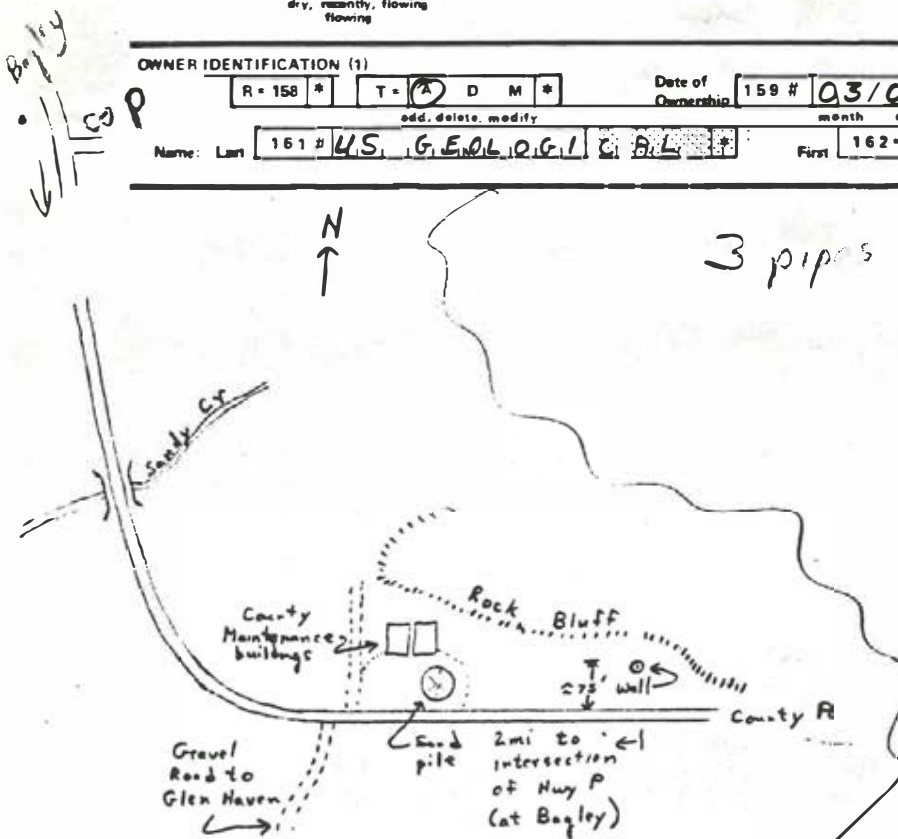
GENERAL SITE DATA (0)

Check One ☒ English ☐ Metric Units

Site Ident No 425246091042101 RG Number R-0* Transaction T- (A) D M V *
 Site-Type 2- C D E H I M P S T W * Data 3- (C) U L M * Reporting Agency 4- U.S.G.S. *
 Project No. 5- 445509700 * District 6- 55 * State 7- 55 * County (or town) Grant 8- 043 *
 Latitude 9- 42 52 46 * Longitude 10- 09 10 42 1 * Lat-Long Accuracy 11- (S) F T M *
 Local Number 12- GR-05/06W/27-0029 * Land Net Loc. 13- N.E.N.E.S.W.S. 27 T.00.5N R.00.6W. 4 *
 Location Map 14- BAGLEY * Scale 15- 240.00 *
 Altitude 16- 635.0 * Method of Measurement 17- A L (M) * Accuracy 18- 1.0 *
 Topo Setting 19- A B C D E F G H K L M P S T U V (W) * Hydrologic Unit (OWDC) 20- *
 Use of Site 23- A C D E G H (O) M P R S T U W X Z * Secondary Site Use 301- * Tertiary Site Use 302- *
 Use of Water 24- A B C D E F H I J K M N P Q R S T (U) Y Z *
 Secondary Water Use 25- * Tertiary Use of Water 26- * Depth of Hole 27- 1428.0 * Depth of Well 28- 1428.0 * Source of Depth Data 29- (1) S *
 Water Level 30- -3.5 * Data Measured 31- 03/03/1981 * Source 33- (1) S *
 Method of Measurement 34- A B C E (G) H L M N R S T V Z *
 Site Status 37- D (E) F * Source of Geohydrologic Data 36- (1) S * Pump Used 35- (X) * Date of First Construction/Completion 21- 03/03/1981 *

OWNER IDENTIFICATION (1)

R-158 * T- (A) D M * Date of Ownership 159 # 03/03/1981 *
 Name: Last 161 # U.S. GEOLOGICAL SURVEY * First 162 # SURVEY * Middle Initial 163- *



CONSTRUCTION DATA (1)

R = 58 * T = A D M * Entry No 59 # 1 * Date of Construction Completion 60 = 03 / 03 / 1981 * Source of Const. Data 64 = S *

Name of Contractor/Driller 63 = LAYNE, W. CO. Layne - Western Co., Inc., Aurora, ILL.

Method of Construction 65 = A B C D H J P R T V W Z *
air, rotary, bored, or augered, cable, tool, dug, hydraulic, rotary, jetted, air-per, cushion, reverse, rotary, trenching, driven, drive, wash, other

Finish 66 = C F G H B P S T W X Z * Type of Seal 67 = B C G Z *
porous, concrete, gravel w. screen, gravel, horizontal, open, perforated, screen, sand point, walled, open, other, hole, bentonite, clay, cement, other grout

Bottom of Seal 68 = 9.0 * Method of Development 69 = A B C J N P S Z * Number of Hours in Development 70 = 1 *
air-lift, bailed, compressed, jetted, none, other, surged, other pump, air pump

Special Treatment During Development 71 = C D E F H M Z *
chemicals, dry ice, explosives, deflocculant, hydrofracturing, mechanical, other

DIMENSIONS OF THE HOLE CONSTRUCTED (2)

R = 72 * T = A D M * Construction Entry No 59 # 1 *

New Card for Each Hole Segment Same R, T & Field 59

Top of Hole Segment Below LS D	Bottom of Hole Segment below LS D	Diameter of Hole Segment
73 # 0. * *	74 = 2.6. * *	75 = 1.6. * *
73 # 26. * *	74 = 9.0. * *	75 = 1.5. * *
73 # 90. * *	74 = 14.28. * *	75 = 1.0. * *
73 # . * *	74 = . * *	75 = . * *
73 # . * *	74 = . * *	75 = . * *

CASINGS SCHEDULE (2)

R = 76 * T = A D M * Construction Entry No 59 # 1 *

New Card for Each Casing With Same R, T & Field 59

Top of Casing Segment Below LS D	Bottom of Casing Segment Below LS D	Diameter of Casing Segment ②	Casing Material	Thickness of Casing
77 # 0. * *	78 = 2.6. * *	79 # 1.6. * *	80 = S * *	81 = .375 * *
77 # -3. * *	78 = 9.0. * *	79 # 1.0. * *	80 = S * *	81 = .375 * *
77 # . * *	78 = . * *	79 # . * *	80 = * *	81 = . * *
77 # . * *	78 = . * *	79 # . * *	80 = * *	81 = . * *
77 # . * *	78 = . * *	79 # . * *	80 = * *	81 = . * *

OPENINGS SCHEDULE (2)

R = 82 * T = A D M * Construction Entry No 59 # 1 *

New Card for Each Open Section With Same R, T and Field 59

Top of Section Below LS D	Bottom of Section Below LS D	Type of Openings ③	Type of Material ④	Diameter of Open Section	Width of Opening	Length of Opening
83 # 9.0. * *	84 = 14.28. * *	85 = X * *	86 = * *	87 = . * *	88 = . * *	89 = . * *
83 # . * *	84 = . * *	85 = * *	86 = * *	87 = . * *	88 = . * *	89 = . * *
83 # . * *	84 = . * *	85 = * *	86 = * *	87 = . * *	88 = . * *	89 = . * *
83 # . * *	84 = . * *	85 = * *	86 = * *	87 = . * *	88 = . * *	89 = . * *

PRODUCTION DATA (1)

R = 134 146 * T = A D M * Entry No 147 # 1 * Date 148 = / / *
flowing, pumped, add, delete, modify, month, day, year

Discharge 150 = . * Source of Data 151 = * Draw down 152 = 309. * *

Method of Measurement 153 = B C E F M O P R T U V W Z *
bailer, current, estimated, flume, totaling, orifice, piston-tube, reported, trajectory, venturi, volumetric, weir, other meter

Production Level 154 = . * Static Level 155 = . * Specific Capacity 272 = . * *

Method of Measurement 156 = A B C E G H L M N R S T V Z * Pumping Period 157 = . * *

AVAILABLE LOG DATA (1)

R = 198 * T = A D M * New Card for Each Log Type Same R & T

Type of Log ⑤

Begin Depth	End Depth	Source of Data ①
199 # C * *	201 = 141.8. * *	202 = S * *
199 # D * *	201 = 14.28. * *	202 = S * *
199 # E * *	201 = 14.16. * *	202 = S * *
199 # F * *	201 = 14.00. * *	202 = S * *

G
J
T
V

0
0
0
0

1428
1416
1414
1400

A
S
S
S

0000-0000-0000-0000

AQUIFER DATA (2)

% Water	132 *	1.00 *
Contributed		

AQUIFER DATA (2)

% Water Contributed	132 ± 1	*
---------------------	---------	---

FOOT NOTES:

Type of Log Codes

Network Codes

Site Status

9	D	F	G	H	I	P	R	S	T	Z	
	dry, flowing,	nearby,	nearby,	obstruction,	pumping,	recently,	nearby,	nearby,	other		
		flowing	recently			pumped	pumping	recently	aimed		
			flowing								

Method of Measurement

10	A	C	E	G	H	L	M	R	S	T	Z	*
	airline	calibrated	estimated	pressure	calibrated	geophysical	manometer	reported	steel	electric	other	
	airline		tape	pressure	tape	loss			tape	tape		

Type of Quality Analyses Codes

[illegible]

PIEZOMETER CONSTRUCTION IN BAGLEY TEST WELL - GR-05/06/1/27-0029

County Well no.	Gr-132	Gr-133	Gr-134	Gr-29
PIEZOMETER No.	1	2	3	4
COLOR	RED	GREEN	YELLOW	BLUE
MP* ABOVE LSD (ft)	3.13'	3.19'	3.19'	3.13'
DEPTH BELOW LSD (ft)	1413.73'	834.05'	534.05'	37.38'
SCREEN INTERVAL ^{LSD} (ft)	1398.73' - 1413.73'	819.05' - 834.05'	519.05' - 534.05'	NONE
UOP - JOHNSON SS WIRE-WOUND				
WELL POINT TYPE	304	304	304	NONE
SCREEN DIAMETER (in)	1.25	1.25	1.25	
SCREEN SLOT (in)	0.020	0.020	0.020	
FORMATION	Lower Mt. Simon	Upper Mt. Simon	Waverly	Jordan-Pewee
DATE COMPLETED	26 Oct 82	29 Oct 82	2 Nov 82	2 Nov 82
CASING DETAILS (BELOW MP)				
STEEL ADAPTER (DIA, LENGTH)	1.5", 21.29'	2.0", 21.35'	2.0", 21.35'	PVC ADAPTER 2.0", 0.51'
2" Times Sch. 80 PVC		21.35' - 421.35'	21.35' - 361.35'	0.51' - 40.51'
2.0" - 1.5" REDUCTION FITTING		421.35' - 421.67'	361.35' - 361.67'	
1.5" Times Sch. 80 PVC	21.29' - 1401.29'	421.67' - 821.67'	361.67' - 521.67'	
Times TO SCREEN ADAPTER	1401.29' - 1401.86'	821.67' - 822.24'	521.67' - 522.24'	
SCREEN INTERVALS	1401.86' - 1416.86'	822.24' - 837.24'	522.24' - 537.24'	

STEEL CASING - 3' to 90' (10")

CEMENT PLUG - 229' to 469'

PEA GRAVEL - 469' to 665'

CEMENT PLUG - 665' to 770'

PEA GRAVEL - 770' to 1237'

CEMENT PLUG - 1237' to 1351'

PEA GRAVEL - 1351' to 1425'

*MP = TOP OF PPF COUPLING

9-213H

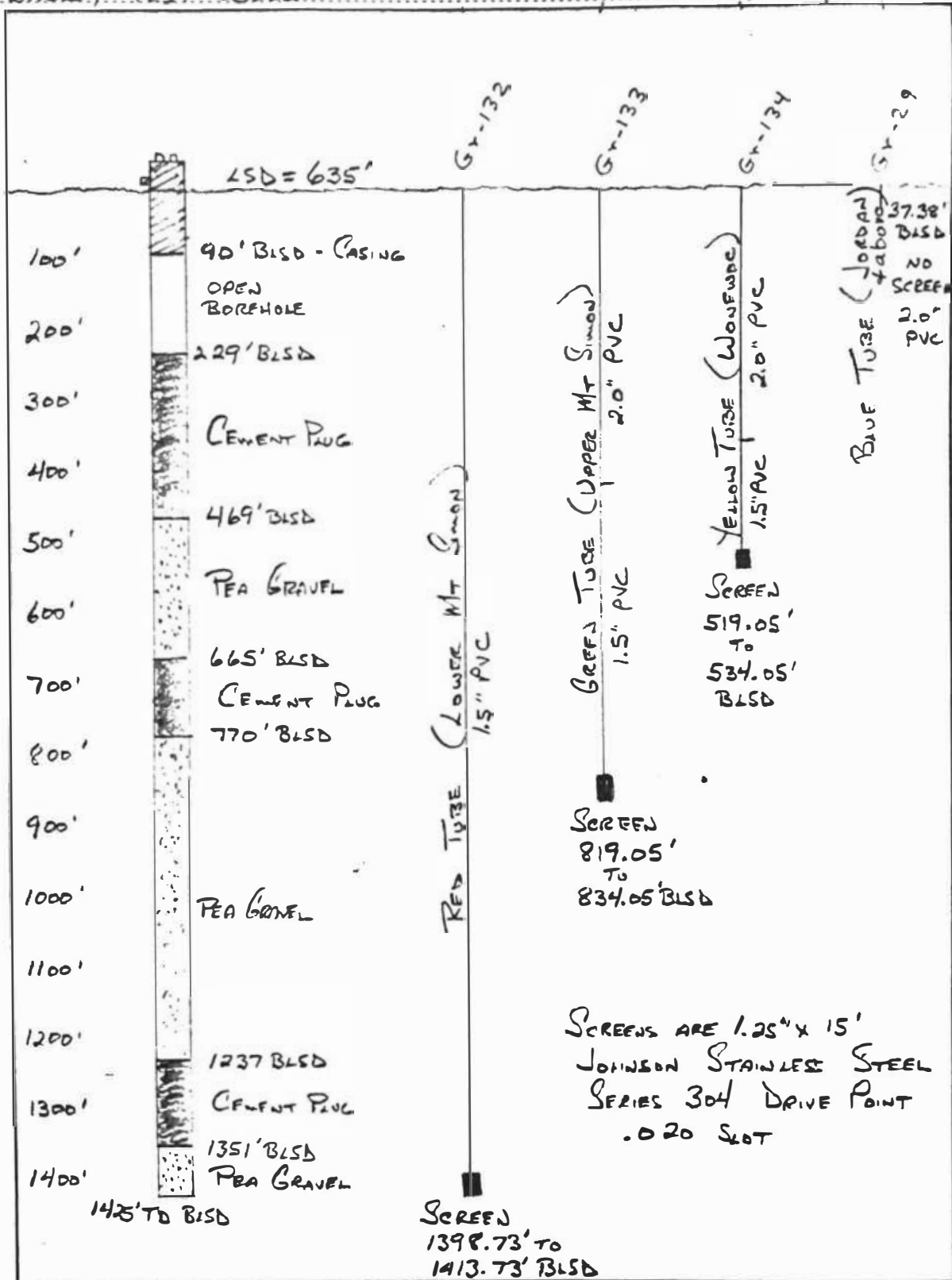
UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File

BAGLEY TEST WELL

Gr-05/06W/27-0029



Sheet No. of Sheets. Prepared by P. Gifford Date 10 Dec 82. Checked by Date

GPO: 1980 OF 320-636
HFA, 1984

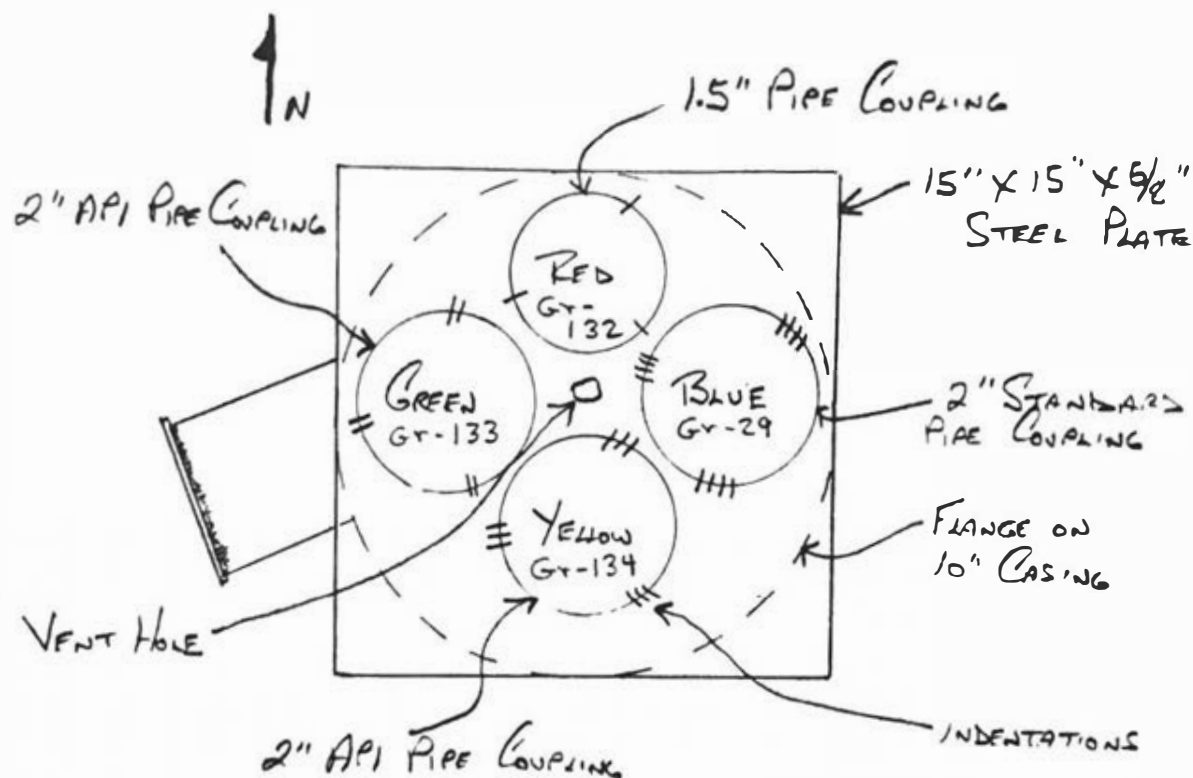
9-213H

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File

BAGLEY TEST WELL

Gr-05/D6W/27-0029

TOP VIEW OF PERZOMETERS (NOT TO SCALE)

RED, GREEN & YELLOW COUPLINGS ARE TACK WELDED TO PLATE

BLUE COUPLING IS HELD BY A TACK BRAZED CLAMP

COUPLINGS ARE PHYSICALLY MARKED (SHALLOW INDENTATIONS)
AS SHOWN AND COLOR CODED

RED COUPLING - LOWER Mt. Simon

GREEN COUPLING - UPPER Mt. Simon

YELLOW COUPLING - WONEGOC

BLUE COUPLING - JORDAN & PRAIRIE du CHIEN

9-21311

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

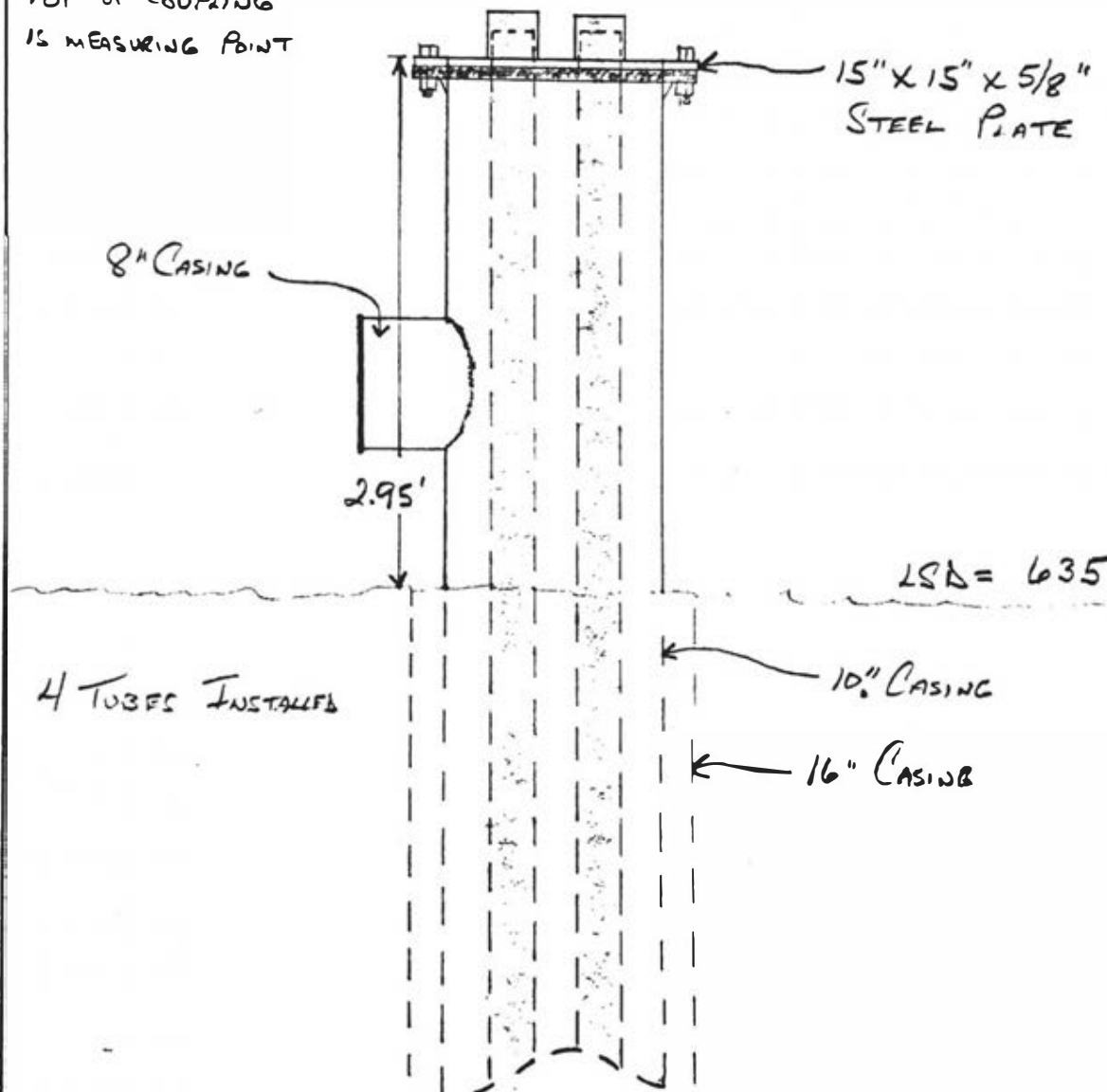
File

BAGLEY TEST WELL

GR-05/06W/27-0029

PIEZOMETER STRUCTURE RELATIONSHIPS (NOT TO SCALE)

TOP OF COUPLING
IS MEASURING POINT



W-213H

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File

BAGLEY TEST WELL

GR-05/06W/27-0029

PIEZOMETER TUBE CONSTRUCTION DETAILS

BLUE TUBE (JORDAN & PRAIRIE DU CHIEN)

2" GALVANIZED PIPE COUPLING	0.12'
2" TIE ROD TO 2" PIPE THREAD ADAPTER (PVC)	0.33'
2" TIE ROD SCH. 80 PVC PIPE	40.00'
	<u>40.51'</u>
STEEL PLATE & COUPLING	0.23'
	<u>40.28'</u>
CASING TO LSD	290'
	<u>37.38'</u>

NO SCREEN

END OF PIPE OPEN

40.51' BELOW TOP OF COUPLING (MEASURING POINT)
37.38' BELOW LAND SURFACE DATUM

9-213H

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File

BAGLEY TEST WELL

GR-05/06W/27-0132

PIEZOMETER TUBE CONSTRUCTION DETAILS

RED TUBE (LOWER MT SIMON)

1.5" GALVANIZED STEEL PIPE ADAPTER	21.11'
1.5" Timco SCH. 20 PVC PIPE	1380.00'
1.5" Timco TO 1.5" PIPE THREAD ADAPTER(STEEL)	0.57'
	1401.68'
STEEL PLATE	- 0.05'
	1401.63'
CASING TO LID	- 2.90'
	1398.73'

TOP OF SCREEN

1401.86' BELOW TOP OF COUPLING
1398.73' BELOW LAND SURFACE DATUM
- 763.73' MSL

BOTTOM OF SCREEN

1416.86' BELOW TOP OF COUPLING
1413.73' BELOW LAND SURFACE DATUM
- 778.73' MSL

9-213H

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File

BAGLEY TEST WELL

GR-05/06W/27-0133

PIEZOMETER TUBE CONSTRUCTION DETAILS

GREEN TUBE (UPPER MT. SIMON)

2.0" GALVANIZED STEEL PIPE ADAPTER	21.11'
2.0" Times SCH. 80 PVC PIPE	400.00'
2.0" TO 1.5" Times PVC REDUCTION FITTING	0.32'
1.5" Times SCH. 80 PVC PIPE	400.00'
1.5" Times TO 1.5" PIPE THREAD ADAPTER (STEEL)	0.57'
	<u>822.00'</u>
STEEL PLATE	- 0.05'
	<u>821.95'</u>
CASING TO LSL	- 2.90'
	<u>819.05'</u>

TOP OF SCREEN

822.24' BELOW TOP OF COUPLING
 819.05' BELOW LAND SURFACE DATUM
 - 184.05' MSL

BOTTOM OF SCREEN

837.24' BELOW TOP OF COUPLING
 834.05' BELOW LAND SURFACE DATUM
 - 199.05' MSL

9-213H

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File

BAGLEY TEST WELL

Gr-05/064/27-0134

PIEZOMETER TUBE CONSTRUCTION DETAILS

YELLOW TUBE (WONEWOC)

2.0" GALVANIZED STEEL PIPE ADAPTER	21.11'
2.0" Timco SCH. 80 PVC PIPE	340.00'
2.0" TO 1.5" Timco PVC REDUCTION FITTING	0.32'
1.5" Timco SCH. 80 PVC PIPE	160.00'
1.5" Timco TO 1.5" PIPE THREAD ADAPTER (STEEL)	0.57'
	<u>522.00'</u>
STEEL PLATE	- 0.05'
	<u>521.95'</u>
CASING TO LSL	2.90'
	<u>519.05'</u>

TOP OF SCREEN

522.24'	BELOW TOP OF COUPLING
519.05'	BELOW LAND SURFACE DATUM
115.95'	MSL

BOTTOM OF SCREEN

537.24'	BELOW TOP OF COUPLING
534.05'	BELOW LAND SURFACE DATUM
100.95'	MSL

Appendix 7: GR-29/132/133/134 documents, WGNHS lithologic description for original GR-29, 1994

GR-29 Lithologic Description

Lithology Top*	Lithology Bottom*	Lithology
1	5	soil
5	20	sand
20	35	gravel
35	160	dolomite
160	170	sandstone
170	175	dolomite
175	180	dolomite & sandstone
180	275	sandstone
275	290	siltstone
290	325	dolomite
325	335	sandstone
335	365	dolomite
370	375	sandstone & siltstone
380	465	sandstone
465	470	sandstone & siltstone
470	480	dolomite,sandstone & siltstone
480	1419	sandstone
1419	1428	granite

*Lithology top and bottom are in feet below land surface

A more detailed description can be found at the WGNHS

UNIVERSITY OF WISCONSIN GEOLOGICAL & NATURAL HISTORY SURVEY
1815 University Avenue, Madison, Wisconsin 53706

Log No. Gr-87
Issued: April, 1967

County: Grant

Well name City of Lancaster, Wis., Well #2

Owner... Same as above

Address... Clerk, City Hall, Lancaster, Wis.

Driller... Varner Well and Pump Company

Engineer... Max F. Koletzke
Lakeland Engineers
Madison, Wisconsin

Completed... Feb., 1966

Field check.

Altitude... 1060' ETM

Use... Municipal Supply

Static w. l. 264 feet

Spec. cap... 8.24*

Quad. Lancaster

R. 3W.

T.

4

N.

Sec. 3

Drill Hole						Casing & Liner Pipe or Curbing							
Dia.	from	to	Dia.	from	to	Dia.	Wgt. & Kind	from	to	Dia.	Wgt. & Kind	from	to
26+	0	276'3"				26"	O.D. csg.	+12"*	80.5'				
16½"	276'3"	760'				18"	O.D. csg.	+33"*	276'3"				
13"	760'	1703'				14"	O.D. liner	625'	760'				
* Approx.													

Grout: Kind

from to

Cement grout between 18" and 16" csqs.

+12"* 276'3"

* Approx.

Samples from 0 to 1700' Date received: 2-9-66

Sample Nos. 263480 to 263820 Examined by: Joan McKee Date: 11-1-1966

Formations: Surface, Platteville-Galena, St. Peter, Prairie du Chien, Jordan, Franconia, Galesville, Eau Claire, Mt. Simon and Precambrian.

Remarks: Well tested for 3 hours at 760 gpm with 92 feet of drawdown.

*Pumping level as of 4-13-66 had returned to 288 feet.

LOG OF WELL:

S	0-5	5	St, dk yl or, M&C, G srtg; mch Vfn snd, ltl cl, tr org. material
U	5-10	5	St, rd or, fn, P srtg; mch cl, ltl Vfn/M snd, ltl cht, gvl & snd
B	10-15	5	St, rd or, fn, P srtg; mch cl, ltl Vfn/M snd, mch cht, gvl & snd
G	15-20	5	Dol, vl gry, M&fn; ltl cht, tr sh
A	20-30	10	Dol, lt vl gry, fn; mch cht, tr rd cl
L			
E			
N			
A	30-50	20	Dol, pl vl or, fn; mch cht, tr rd sh
	50-55	5	Ls, ol gry, M&fn; tr foss frags, pyr, & lt yl sh; tr fn-VC snd & ls
-	55-65	10	Dol, dk vl or, fn; ltl lim stn & cem; ltl M & mch C snd, ltl VC
P	65-70	5	Ls, dk vl or, fn; mch cht, ltl dol, ltl vl or calcic sh
L	70-72	2	Dol, dk vl or, fn; ltl calcic yl or sh, mch cht
A	72-85	13	Ls, lt gry, fn, ltl lim & qtz repl; foss frags; tr yl or calcic sh;
T			
I			
E			
V	85-110	25	Ls, pl vl or & lt gry, fn-Vfn, mny foss frags; ltl M-VC qtz & lt gry sh
I	110-120	10	Sh, Vlt gry gn, fn-Vfn, F ual-cem, mch lt vl bn & lt gry fossif Vfn
L	120-125	5	Ls, dk ol gry, Vfn, dns fossif, tr pyr & M-C qtz snd
E	125-135	10	Ls, pl vl gry, Vfn, V dns, fossif; tr pyr
	135-140	5	Ls, lt ol gry, Vfn micro xln, dns, few foss frags; tr gn sh, pyr & calc
	140-143	3	Ls, lt ol gry, mot pl bn, fn, slgt por, tr pyr & xln cal, tr foss frags
	143-150	5	Dol, lt ol gry, mot pl gry or, fn, slgt por, tr pyr, tr foss frags & calc
	150-155	5	Dol, pl vl gry, fn, por, tr pyr & gn sh
	155-160	5	Dol, vl gry, fn, slgt por, few foss frags; tr gn sh, few pyr xls
S	160-165	5	Ss, lt ol gry, C, P pyr cem, mch M, VC, ltl fn; ltl ol gry dol; mch gn pyr
I	165-170	5	Ss, pl vl gry, M&C, Vp pyr cem, mch fn; tr gn sh
P	170-175	5	Ss, pl vl gry, M&fn, ltl C, tr Vfn & st; tr gn sh; tr pyr
	175-185	10	Ss, pl vl gry, M&C, VP pyr cem, tr VC, ltl gn pyric sh
	185-190	5	Ss, pl vl or, M&fn, mch C, ltl Vfn, ltl st, tr gn & yl bn sh; tr pyr

UNIVERSITY OF WISCONSIN GEOLOGICAL & NATURAL HISTORY SURVEY
1815 University Avenue, Madison, Wisconsin 53706

Log No. GR-87

Well name City of Lancaster, Wis., Well #2

Sample Nos. 263480 to 263820

S T P E T E R	190-195	5	Ss, pl yl or, M & C, VP lim cem, tr gn sh & pyr
	195-200	5	Ss, Vlt vl gry, M & C, VP pvr-cem, mch fn, tr gn sh
	200-205	5	Sh, vl bn, dolie; mch M, C rnd qtz snd, tr in & Vfn; tr pyr
	205-210	5	Ss, Vlt gry, M, VP pvr-cem, mch C & fn; tr pyr-cem
	210-220	10	Ss, Vpl ol gry, M, mch C&fn; tr st; tr pyr, bn & gn sh
	220-225	5	Ss, Vpl ol gry, C, mch M, ltl fn, tr VC&Vfn; tr st, lim, pvr & dol
	225-245	20	Ss, Vpl ol gry, M, mch fn; ltl C; tr lim & pyr
105'	245-250	5	Ss, Vpl ol gry C, G pyr cem, mch VC & M, ltl fn
	250-255	5	Ss, ol gry & lt yl bn, M & C, G Si-cem, mch cht, some oolic, ltl por
	255-265	10	Ss, lt ol gry, C, G pyr cem tr Si cem, mch VC & M, ltl fn; tr oolic cht
P R A I R I E D U C H I E N	265-280	15	Dol, pl yl gry to lt ol gry, Vfn & fn, mch fn & ltl M snd in dol; tr oolic cht; ltl C&VC rnd snd, tr gn sh; ltl pvr&qtz
	280-290	10	Dol, pl or pl yl gry to wh, Vfn & fn, dns, some micro xln; cem ss ltl rnd snd; tr gn-sh, cht & glauc?
	290-295	5	Dol, pl yl gry, fn-Vfn, dns; tr cht & glauc?
	295-310	15	Dol, pl yl gry, fn-Vfn, dns; ltl Vfn/C, qtz snd; tr pyr, glauc?, lim, cht & oolic cht
	310-325	15	Dol, pl yl gry, fn, ltl M, dns; ltl cht; tr pyr-cem Ss
	325-335	10	Dol, Vpl yl gry, fn, dns, some M & C, xls; tr cl with some xls of dol; tr gn sh & M/C rnd snd
	335-340	5	Dol, Vpl vl gry mot rd, fn, Vdns, tr por; ltl cht; tr cl W/Vfn dol xls
	340-345	5	Dol, pl yl gry mot rd, fn, dns; ltl cht, tr oolic; tr dk bn qtz; tr glauc
	345-355	10	Dol, pl yl gry mot rd, fn, dns; tr pl yl gn cl with fn xls of dol; tr cht M/C dtz snd & pvr
	355-365	10	Dol, pl yl gry mot rd, fn&M, slgt por; dol xls in qtz veins; many wh cht veins, tr pyr xls
	365-375	10	Dol, pl yl or mot pnk, fn, dns; ltl cht; tr cl with dol
	375-385	10	Dol, lt yl bn mot pnk, fn&Vfn, slgt por; ltl cht; tr pyr
	385-395	10	Dol, Vpl or mot pnk, M & C, ltl fn, por, tr Fe stn
	395-405	10	Dol, Vpl or mot pnk, fn, slgt por; tr cht; tr Fe stn; tr pyr
	405-415	10	Dol, Vpl or mot pnk, M&C, dns; ltl lim, mch lim stn; tr pyr xls & cht
	415-420	5	Dol, Vpl or, M & fn, slgt por, tr C; ltl Fe stn; tr cht
	420-435	15	Dol, pl yl gry, fn, dns, ltl pnk mot; tr pyr
	435-440	5	Dol, lt yl bn, fn, dns, ltl wh, tr mot pnk; ltl cht, tr pyr
	440-445	5	Dol, lt vl bn, fn, dns, some mot pnk; tr pvr & tr calcic cl W/fn pvr xl
	445-455	10	Dol, lt vl bn, fn, por, ltl M; tr cht&oolic cht; ltl Fe stn; tr pvr&Fn/Catz slgt por, some mot pnk; mch cht&oolic cht; mch fn/C
	455-465	10	Dol, plylbn, M&fn, snd; mch fn/M sndy dol; tr glauc & pvr
205'	465-470	5	Dol, pl vl bn, M, ltl C&fn, slgt por, some mot pnk, mch cht&oolic cht; mch
J O R D A N	470-475	5	Ss, Vpl yl gry, M&C, F lim cem, mch fn, ltl VC&Vfn; tr st, cht&glauc
	475-480	5	Dol, grysh pnk, M&C, F lim cem, ltl fn xls, ltl mot pnk; mch M&fn snd, ltl C
L O D I	480-505	20	Ss, Vpl or, C, F dol cem, tr lim stn, gn sh & tr pyr, mch fn, tr Vfn & VC;
	505-510	5	Ss, gry or, M&C, G dol cem, mch fn, ltl C, Vfn&st; tr VC;
	510-540	30	Sts, pl yl or, M & C, slgt dolie, mch Vfn snd; ltl cl
B E	540-545	5	Dol, pl bn mot wh&pl vl fn, dns, ltl M; tr pvr
	545-550	5	Dol, pl bn mot wh&pl yl, fn, dns, ltl M; mch fn&qtz snd; tr pyr&glauc

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Log No. Gr-87































Well name City of Lancaster, Wis., Well #2
Sample Nos. 263480 to 263820

BLACK EARTH	550-565	15		Dol, pl bn mot wh & pl yl, fn, ltl M, dns, tr mot wh; tr pyr
	565-580	15		Dol, pl gry or pnk, fn&M, por, ltl dns; tr pyr & glauc
	580-595	15		Dol, Vpl or, fn & M, tr C, dns; tr pyr
	595-615	20		Dol, vl bn, fn, ltl M, dns; ltl lim; tr glauc & pyr
	615-620	5		Dol, Vpl or, fn&Vfn, dns, tr por; tr glauc & lim
	620-625	5	G	Dol, Vpl or, fn&Vfn, dns, tr por, ltl mot pnk∨ ltl glauc; tr pyr
	625-630	5		Dol, Vpl or, fn&Vfn, dns, ltl mot pnk∨ tr M-fn dol-cem Ss; tr glauc
	630-640	10	G	Dol, pl gry or, fn&Vfn, dns; ltl glauc, tr pyr & fn-M sndy dol
	640-645	5		Dol, pl gry or, fn&Vfn, dns; tr glauc, pyr & fn - M sndy dol
	645-650	5	G	Sh, pl gn, dol; ltl glauc & glaucic dol, mch Vfn, grnd dol & fn qtz snd;
115	650-655	5	G	Dol, pl vl gry mot pnk, fn&Vfn; ltl fn qtz snd; ltl glauc & glaucic sh
FRANCONIA	655-670	15		Ss, gry gn, Vfn, Sang, F, P dol-cem, tr fn&M, ltl st; mch gn sh & glauc;
	670-680	10	G	Ss, pl gn, fn&Vfn, srnd, P dol-cem, tr M, ltl st; mch gn sh & glauc;
	680-695	15		Sh, brt gn mot gry gn, slght dol; mch Vfn snd, ltl fn, ltl st; mch gla
	695-700	5		Sh, brt gn, Vslght dol; mch glauc & fn snd; ltl pl vl bn dol & M, Vfn snd
	700-720	20	G	Sh, brt gn mot gry gn, V slght dol; mch fn&Vfn snd & glauc
	720-730	10	G	Ss, pl gn, fn&Vfn, VP dol-cem; mch pl gn sh & glauc; ltl dol; tr pyr & st
	730-740	10	G	Sh, Vpl gry gn, fn&Vfn, slght dol; mch Vfn snd ltl fn; ltl gry sh & glauc dol
	740-745	5	G	Sh, Vpl gry gn, Vslght dol; mch Vfn snd; ltl glauc & fn snd, tr st & dol
	745-750	5		Ss, vl gry, C, mch M&C tr fn; tr glauc, dol & lim
	750-755	5		Ss, vl gry, C&VC, ltl M, tr fn; tr lim, glaucic dol & pyr
90	755-760	5		Ss, vl gry, C, mch M, ltl VC&fn; tr lim, glauc, gn sh & pyr
GALESVILLE	760-775	15		Ss, pl yl or, M, P lim-cem, ltl C&fn; tr Vfn, tr glauc, pl or dol & gn sh
	775-780	5		Ss, pl yl or, fn&Vfn, P lim-cem, ltl M & tr C; tr pyr
	780-790	10		Ss, pl yl or, M&fn, P lim-cem, mch Vfn, ltl C, lt st; tr glauc
	790-795	5		Ss, pl yl or, M, VP lim-cem, mch fn&C, ltl VC, ltl st & Vfn
	795-805	10		Ss, pl yl gry, M&fn, P lim-cem, ltl C, Cfn & st
	805-810	5		Ss, Vpl or, M&C, P lim-cem, ltl Vfn, fn & VC, tr st & cl
	810-815	5		Ss, Vpl gry or Vfn, P lim-cem, ltl fn, tr M, C & st; tr pyr
	815-820	5		Ss, Vpl or, fn&Vfn, VP lim-cem, ltl M, C & st
	820-825	5		Ss, wh Vfn, VP lim-cem, ltl fn & st, tr M; tr dol; wh sh
	825-830	5		Ss, Vpl or, M&C, P lim-cem, mch fn&Vfn, ltl st, tr VC; ltl Vfn dol; wh S
LE	830-835	5		Ss, Vpl or, M&fn, P lim-cem, mch C&Vfn, tr st; tr pyr & pnk dol
	835-845	10		Ss, Vpl or, fn&Vfn, P lim-cem, mch M, ltl C&st; ltl pl vl dol; sh; tr pyr
	845-850	5		Ss, pl ol gry, M&C, G dol-cem, ltl VC, fn; tr glauc & lim
	850-860	10		Ss, pl bn, M&C, P dol-cem, tr fn, Vfn & VC; tr lim
	860-865	5		Ss, Vpl yl or, M&C, VP lim-cem, tr fn & Vfn, & st
	865-880	15		Ss, Vpl yl, M&C, P lim-cem, ltl VC, tr fn; tr st
	880-890	10		Ss, Vpl yl or, M & C, P lim-cem, ltl VC, tr fn & st, tr Fe stn
	890-895	5		Ss, Vpl yl, C, rnd, F srtg, mch M&VC, ltl fn, tr Vfn; tr dol & yl bn sh
	895-900	5		Ss, Vpl or, M, rnd P lim-&dol-cem, mch C, ltl fn; tr dol
	900-915	15		Ss, pl gry or, M&C, VP lim-&dol-cem, ltl fn, tr Vfn & VC;
LE	915-930	15	G	Ss, pl gry or, M&C, VP lim-cem, tr fn, st & VC; tr dol; sh, tr pyr, dol & ch

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Log No. GR-87

Well name City of Lancaster, Wis., Well #2
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G V I L L E A U C L A I R		930-945	15		gry bn dol cem; Ss, lt ol gry, M&C, VP lim-&dol-cem, mch fn, Vfn, ltl st; ltl dol, mch gla
		945-955	10		Ss, Vpl yl bn, M&fn, ltl C; tr glauc; ltl pl bn & pl vl bn slight dolie sh w/sndy beams, tr gn sndy sh
	205	955-960	5		Ss, Vpl vl, M, VP lim-cem, mch C&fn; ltl pl vl bn glaucic dol; tr gn sh
		960-965	5		Ss, Vpl or, M&fn, P lim-cem, tr Vfn & st; tr glauc & dol
		965-970	5		Dol, ol gry, fn&Vfn; tr pyr, tr yl or sh; ltl glauc; mch M&fn snd; mch dolies
M T S I M O N		970-990	20		Sh, ol gry, fn&Vfn, slight dolie, tr mot pl yl bn; tr M-Vfn snd&st;
		990-1000	10		Sh, brt rd bn, dolie; ltl C/Vfn snd; tr glauc; ltl gn sh&well cemtd dolie
		1000-1010	10		Sh, pl gnsh gry, slight dolie; ltl dk gry sh; tr pyr & fn snd
	55'	1010-1020	10		Ss, mxd pl bn dk gry&ol or bn, VP, pyr-cem, mch glaucic dol
		1020-1035	15		Ss, gry or pnk, C, mch VC&M, ltl fn, tr Vfn; tr gn, dk gry vl bn sh;
		1035-1040	5		Ss, gry or pnk, C, VP dol-cem, mch VC&M, ltl fn&Vfn; tr dk gry gn sh, mch mch fn, ltl C&Vfn&st; mch pl vl bn, y ¹ dust
		1040-1050	10		Ss, gry or pnk, M, VP dol-cem, slight dolie sh, tr gnst
		1050-1060	10		Ss vl bn C, VP dol-cem mch M&VC, ltl fn, tr st; mch pl vl bn dolie sh
		1060-1070	10		Ss, Vpl or, M&C, mch fn, ltl VC, tr st; tr sndy dol; tr gry gn&yl bn sh;
		1070-1075	5		Ss, Vpl yl, C, tr gry sh & lim, ltl fn&VC, tr Vfn & st;
		1075-1080	5		Ss, Vpl yl, M&C, rnd, P srtg, tr gry cl & lim cem
		1080-1095	15		Ss, Vpl yl, M&C, VP lim-cem, ltl fn&VC, tr Vfn & st; tr dol & or bn sh;
		1095-1100	5		Ss, wh, M, rnd, P srtg, mch C&fn, tr VC&Vfn&st; tr lim&dol; tr pl yl&dk gry
		1100-1105	5		Ss, wh, M&C, ltl fn&VC, tr Vfn&st; tr dol&lim; tr dk gry&pl vl bn sh
		1105-1110	5		Ss, wh, C&VC, G dol-cem, mch M, ltl fn, tr Vfn&st; dol cem pl yl bn&wh, ltl
		1110-1115	5		Ss, Vpl yl, M&C, VP dol-cem, mch fn, tr Vfn, VC&st; tr Fe stn; tr dk gn sh
		1115-1120	5		Ss, Vpl yl gry, M&C, mch fn, Vfn&st; tr dol, pyr, lim, gry sh&rd or sts
		1120-1135	15		Ss, Vpl yl gry, M&C, VP dol-cem, mch fn, Vfn&st, tr VC; ltl gry sh; tr lim;
		1135-1140	5		Ss, pl vl gry, M&C, G dol-cem, mch fn, Vfn&st; ltl dol cem gry; fe stn
		1140-1145	5		Ss, pl vl gry, M&fn, G dol-cem, mch Vfn&st; dol cem Vpl yl; tr fe stn
		1145-1150	5		Ss, vl gry, fn, G dol-cem, ltl M&C, tr VC, mch Vfn&st; Vpl yl dol cem; tr pyr
		1150-1155	5		Ss, vl gry, M&fn, G dol-cem, ltl C, tr VC, mch Vfn&st; Vpl yl dol cem, tr lim
		1155-1160	5		Ss, vl or Vpl gry, C, mch VC&M, ltl fn, tr Vfn&st; tr gry dol&lim&Fe stn
		1160-1165	5		Ss, wh, M&C, mch fn, tr VC, Vfn&st; tr gry dol & Fe stn
		1165-1170	5		Ss, wh, C, mch fn&VC, ltl Vfn&M, tr st; tr gry dol
		1170-1190	20		Ss, Vpl ol gry, fn&Vfn, VP dol-cem, mch M&st, ltl C, tr VC, mch pl ol grys
		1190-1195	5		Ss, Vpl ol gry, VP dol-cem, mch C, fn&Vfn, ltl st, tr VC; mch pl ol gry
		1195-1200	5		Ss, Vpl ol gry, fn, VP dol-cem, mch M, ltl C, VC, Vfn&st; mch sh; tr lim
		1200-1205	5		Ss, Vpl ol gry, fn, VP dol-cem, mch M, ltl C, Vfn&st, tr VC; mch sh
		1205-1210	5		Ss, Vpl yl or, M&fn, ltl Vfn, tr st, & C; tr lim
		1210-1220	10		Ss, Vpl yl or, fn&Vfn, ang, F srtg, mch st; tr lim
		1220-1225	5		Ss, Vpl yl or, fn, ang, G srtg, tr M; tr lim
		1225-1230	5		Ss, Vpl yl or, fn&Vfn, ang, F srtg, mch st; ltl pl yl bn cl; tr lim
		1230-1235	5		Ss, Vpl yl or, fn, ang, F srtg, tr Vfn & st; tr lim
		1235-1240	5		Ss, Vpl yl gry, M&fn, srnd, P srtg, ltl C, tr VC, mch Vfn&st; tr lim
		1240-1245	5		Ss, Vpl yl gry, fn&Vfn, ang, VP srtg, ltl M & C, mch st
		1245-1250	5		Ss, Vpl or, M&fn, srnd, VP srtg, mch st, & C, ltl VC & Vfn; tr lim
		1250-1260	10		Ss, Vpl or, C&VC, rnd, VP srtg, mch M, ltl fn, Vfn & st; tr cl & lim
		1260-1285	25		Ss, Vpl yl or, M, srnd, mch C&fn, ltl Vfn, st & VC; mch sh; tr lim
		1285-1290	5		Ss, Vpl yl or, fn&Vfn, srnd, VP srtg, ltl M&C, tr st; mch sh; tr lim
		1290-1295	5		Ss, or pnk, M, VP Si-cem, mch or pnk sh, tr pl on dolie sh;

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Well name City of Lancaster, Wis., Well #2

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1295-1315	20		Ss. or pnk. fn. sang. VP srtg. mch M. Vfn & st. ltl C; mch or pnk sh; tr lim
1315-1320	5		Sh. rd bn. VP srtg; mch st; ltl fn & M snd; tr C. ltl st; ltl Vfn. fn. M. C
1320-1330	10		Sh. or bn. VP srtg; tr VC snd; tr V wea. ign snd. ltl st
1330-1340	10		Sh. or pnk. VP srtg. mch M. C & VC snd. ltl fn. Vfn & st; tr fn gvl
1340-1345	5		Ss. Vpl vl or. VC. VP pyr-cem. mch C. ltl M. tr fn & st; tr V wea ign snd; tr sh
1345-1350	5		Ss. pnk or. M & fn. mch C. Vfn & VC; tr st; mch pnk or sh
1350-1355	5		Ss. pnk or. M & C. mch fn. Vfn & VC; tr st & fn gvl; mch or pnk sh
1355-1370	15		Sh. pl rd bn. VP srtg. mch Vfn/VC snd; ltl feldspathic Si-&Fe-cem snd
1370-1375	5		Ss. pl rd bn. M & fn. mch Vfn. C & VC; mch pl rd bn sh; tr gn mica sh;
1375-1380	5		Ss cong. gry or pnk. C & VC snd; mch fn & Vfn gvl; ltl st; ltl pl rd bn sh;
1380-1385	5		Sh. pl rd bn. VP srtg. mch Vfn/VC snd
1385-1390	5		Sh. pl rd bn. VP srtg. mch Vfn/VC snd; tr fn gvl
1390-1395	5		Sh. pl rd bn. VP srtg. VP pyr-cem. mch Vfn/VC snd; tr fn gvl
1395-1400	5		Sh. pl gry or. mch fn/VC. ltl Vfn snd; tr V wea ign snd
1400-1405	5		Ss. pl gry or. C. mch M. VC & fn. tr Vfn; mch pl gry or sh
1405-1410	5		Sh. pl gry or. mch fn/VC snd. ltl Vfn
1410-1425	15		Ss. pl gry or; VC mch M & C. ltl fn & Vfn; tr pnk dol & Fe stn. fn gvl; ltl pl gry or sh;
1425-1430	5		Ss. or pnk. fn. ltl M & Vfn; mch or pnk sh
1430-1435	5		Ss. or pnk. M & fn. sang. P srtg. ltl Vfn & st; mch or pnk sh. mch fn gvl
1435-1450	15		ltl M. fn & Vfn; mch fn & M gvl; ltl wea ign snd & gvl; tr sh; ltl qtz cem Ss
1450-1470	20		Sh. rd bn. VP srtg; mch fn. M & C ang snd. ltl VC; tr gvl; ltl V wea ign & meta sh
1470-1480	10		Sh. rd bn. P srtg; mch M. fn & Vfn snd; ltl ign snd
1480-1485	5		Sh. rd bn. P srtg; mch st
1485-1490	5		Sh. rd bn. mch st; mch VC/Vfn snd; ltl Vfn gvl
1490-1500	10		Ss cong. rd bn. C & VC snd. grain size ranges from fn gvl down to cl
1500-1505	5		Ss. rd bn. M & C. mch fn & Vfn. tr VC; mch st & cl
1505-1530	25		Ss cong. Vpl or. C & M snd. mch VC & M; ltl Vfn gvl; all grns qtz; ltl st
1530-1535	5		Ss. pl rd bn. C & M snd. mch VC & fn. ltl Vfn; tr Vfn gvl; ltl st
1535-1555	20		Ss cong. pl rd bn. C & VC snd. mch M & ltl fn; mch Vfn gvl; all grns qtz
1555-1560	5		Ss cong. pl rd bn. tr fn; mch VC. C & M snd; mstly qtz
1560-1565	5		Ss. Vpl or. VC & C. mch M/Vfn; mch st; tr Vfn gvl
1565-1570	5		Ss cong. Vpl or. VC & C snd. mch M/Vfn; ltl Vfn gvl; ltl st
1570-1580	10		Ss. Vpl or. VC & C. mch M/Vfn; tr Vfn gvl; ltl st
1580-1595	15		Ss cong. gry or. VC & C snd. ltl M; mch Vfn gvl; few pnk grns feld
1595-1610	15		Ss. Vpl or. VC & C. ltl M; fn & Vfn; tr Vfn gvl
1610-1615	5		Ss cong. Vpl or. VC & C snd. ltl M; mch Vfn gvl. tr fn; mch st
1615-1625	10		Ss. Vpl or. VC & C. mch M. ltl fn; tr Vfn gvl; mch st
1625-1645	20		Ss cong. Vpl or. VC & C Ss. F cal-cem. ltl M; mch Vfn gvl. tr fn; ltl st

UNIVERSITY OF WISCONSIN GEOLOGICAL & NATURAL HISTORY SURVEY
1815 University Avenue, Madison, Wisconsin 53706

Log No GR-87

Well name City of Lancaster, Wis., Well #2

Sample Nos. 263480 to 263820

M	1645-1675	30	.....	Ss, Vpl or, VC&C, ltl M, ltl Vfn gvl; ltl st
I	1675-1680	5	.....	Ss, Vpl or, C & M, Sang, P srtg, mch VC & fn; ltl st
S	1680-1690	10	.....	Ss cong, VC&C Ss, srnd, P srtg, mch M; mch Vfn gvl, ltl fn
675	1690-1695	5	x x x	Red granite, or pnk blk wh, C, VC, ltl rd bn sh, tr pvr
PC	1695-1700	5	x x x	Granite, or pnk blk wh, C, biotite mic, qtz, orth feld, amphibole?

END OF WELL

Appendix 8: Well IW-32 and IW-3623 documents

Well IW-3623 replaced well IW-32

Historical Documents: IW-32

Appendix B cover sheet from Guenther and others (2017)

historical records for IW-32 can be found in WGNHS Open-File Report 2017-04, appendix B (Guenther and others, 2017)

Documentation of work done for this report: IW-32

WDNR fill and seal report, 2021, 2 pages

Documentation of work done for this report: IW-3623

Well owner document, 2019, 2 pages

WDNR monitoring well construction form, 2019, 1 page

4400-113A

WDNR monitoring well development form, 2019, 1 page

4400-113B

WDNR soil boring form, 2019, 5 pages

4400-112

WGNHS geophysical log, 2019, 1 page

gamma, self potential, single point resistivity, optical borehole image, fluid temperature, fluid conductivity, caliper

datum is top of casing: 2.28 ft above land surface in 2019

APPENDIX B OF REFERENCE DOCUMENTS IW-32

USGS Basic Data and Map 1980

USGS personnel went through in 1980 to combine observation well records

Alex Zaporozec Graphs of Water Levels 1957-1998

water levels graphed onto paper

USGS Well Schedule 1967

USGS Well Schedule contains some well construction information and hand-drawn location

IW-32 Geophysical log 2017

Gamma log, Caliper, Single Point Resistivity, Self Potential, Temperature, Fluid Conductivity

History of the North Survey School 1976

IW-32 was drilled for this school in 1906

IW-32 abandoned and replaced by IW-3623 (VQ879)

9/24/21, 4:40 PM

Well / Drillhole / Borehole Filling & Sealing

Filled out by driller

Wisconsin Department of Natural Resources

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295 and 299, Wis. Stats., and ch. NR 141 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.

Date of Filling & Sealing: 08/05/2021

Rec #: 169950

Verification. Check only if well filling & sealing was done previously and you are just verifying that work.: No

1. Well Location Information

County: Iowa	WI Unique Well #: not found	DNR Hicap Well #:			
Latitude: (DD.DDDDD°) 42.94538 °N	Longitude: (DD.DDDDD°) 90.15394 °W	GPS Method Code: GPS008			
Gov't Lot #:	Qtr/Qtr: SW	Quarter: SW	Section #: 32	Township #: 6 North	Range #: 3 East
Well Street Address: 4187 HWY B DODGEVILLE				Subdivision Name:	
Well City/Village/Town: Town of DODGEVILLE		Well Zip Code:	Lot #:	Does a new well replace this well? yes, IW-3623(VQ879)	
Reason for Filling & Sealing: NOT IN USE well was replaced				WI Unique Well # of Replacement Well:	

2. Facility / Owner Information

VQ-879

Facility Name:	FID #:	Well /Vame: 25000032 (aka IW-32)			
Original Well Owner:	Service Category:				
Present Well Owner: JIM LEE	Mailing Address of Present Owner: 4187 COUNTY ROAD B				
	City: DODGEVILLE	State: WI	Zip Code: 53533		

3. Well / Drillhole / Borehole Information

Well Type: Water Well	Original Construction Date: ~1906	Construction Type: Drilled
Formation Type:	Total Well Depth From Ground Surface (ft.): 91.00	(specify Other):
Casing Diameter (in.): 6.00	Lower Drillhole Diameter (in.):	Casing Depth (ft.): ~13 ft
Was well annular space grouted?	If yes, to what depth (ft.)?	Depth to Water (ft.):

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

Pump and piping removed?	Yes	Liner(s) removed? If no liner mark as N/A	N/A	If no, was liner perforated?	N/A
Screen removed?	N/A	Well casing (or loop if geothermal) left in place?	Yes	Was casing cut off below surface?	Yes
Did sealing material rise to surface?	Yes	Did material settle after 24 hours?	No	If yes, was hole retopped?	N/A

If bentonite chips/pellets were used, were they hydrated from a known water source?

Yes

Method of Placing Sealing Material: Conductor (Explain Other):

Pipe-Gravity

Well Sealing Materials: Bentonite Chips

Product Name and Manufacturer:

Other Drillholes:

5. Material Used to Fill Well / Drillhole

Material:	From (ft.):	To (ft.):	# and Units of Sealant:	Mix Ratio or Mud Weight:
BENTONITE CHIP	Surface	91.00	26	NO

9/24/21, 4:40 PM

Well / Drillhole / Borehole Filling & Sealing

6. Comments

WELL WAS ABANDONED USGS NO LONGER NEEDED.

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: MICHAEL A BERKHOLTZ	License #: 4792	Phone: 608-846-4697
6400 LAKE RD WINDSOR WI 53598-9717	Email Address: ANOTHERAWESOMEWELL@GMAIL.COM	

8. DNR Use Only

Signed On: 08/16/2021	Submitted By: anotherawesomewell	Received On: 08/16/2021	Approved On: 08/18/2021
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The Official Internet site for the Wisconsin Department of Natural Resources
101 S. Webster Street . PO Box 7921 . Madison, Wisconsin 53707-7921 . 608.266.2621



Wisconsin Geological and Natural History Survey

DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN-MADISON

August 12, 2019

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

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 IW-32 (USGS Site No: 425644090101901, USGS Site Name: IW-06/03E/32-0032, WGNHS Well ID: 25000032) 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 IW-32.
- 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

Analiese Genthe

Project Geologist
3817 Mineral Point Rd
Madison, WI 53705
analiese.genthe@wisc.edu
(608) 263-4004

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

State of Wisconsin
Department of Natural Resources

Route To:

Watershed/Wastewater ☐Waste Management ☐Remediation/Redevelopment ☐Other ☐

SES Project Number 507.80

MONITORING WELL CONSTRUCTION

Form 4400-113A

Rev. 7-98

Facility/Project Name:

WI GROUNDWATER-LEVEL
MONITORING NETWORK
IW-32 REPLACEMENT WELL

Local Grid Location of Well

ft. ☐ N. ☐ S. ☐ E. ☐ W.Grid Origin Location (estimated: ☐)

Lat. 42.946075 Long. -90.132108 or

St. Plane ft. N. ft. E. S/C/N

Section Location of Waste/Source

SW 1/4 of SW 1/4 of Sec. 32 T. 6 N. R. 3 ☐ E ☐ W

Location of Well Relative to Waste/Source

u ☐ Upgradient s ☐ Sidegradientd ☐ Downgradient n ☐ Not Known

Gov. Lot Number

Well Name

25003623 (AKA: IW-3623)

Wis. Unique Well No. DNR Well Number

V Q 8 7 9

Date Well Installed

0 8 / 1 6 / 2 0 1 9

Well Installed By: Name (first, last) and Firm

Steve Hunger

Soils & Engineering Services, Inc.

Type of Well

Well Code 11 / mw

Distance From Waste/
Source ft.Enf. Stds.
ApplyNO ☒

A. Protective pipe, top elevation

ft. MSL

B. Well casing, top elevation

1199.71 ft. MSL

C. Land surface elevation

1197.43 ft. MSL

D. Surface seal, bottom 1196.93 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:

GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐Bedrock ☒ OL/OH ☐ PT ☐

13. Sieve analysis attached?

☐ Yes☒ No

14. Drilling method used:

Rotary ☐ 5 0Hollow Stem Auger ☒ 4 1Down-the-hole hammer ☐ Other ☒15. Drilling fluid used: Water ☐ 0 2 Air ☒ 0 1Drilling Mud ☐ 0 3 None ☐ 9 9

16. Drilling additives used?

☐ Yes☒ No

Describe

17. Source of water (attach analysis):

E. Bentonite seal, top

F. Fine sand, top

G. Filter pack, top

H. Screen joint, top

I. Well bottom

J. Filter pack, bottom

K. Borehole, bottom

L. Borehole, diameter

M. O.D. well casing

N. I.D. well casing

Steel Casing installed to 40'-0" depth Below land Surf.
Bentonite-cement grout to 6'-0". Cement grout
to 1'-6". Bentonite chips to 0'-6". Topsoil to
ground surface.

Well is open hole in bedrock below steel casing.

OPEN BOREHOLE
NO PVC SCREEN1. Cap and lock? Cap & Lock on Well casing ☒ Yes ☐ No

2. Protective cover pipe:

a. Inside diameter:

No Protective

Cover Pipe

Installed

b. Length:

c. Material:

Steel ☐ 0 4Other ☐

d. Additional protection?

If yes, describe: 3 bumper posts with flags

Bentonite ☒ 3 0Concrete ☐ 0 1Other ☐

3. Surface seal:

4. Material between well casing and protective pipe:

Bentonite ☐ 3 0Other ☐

5. Annular space seal:

a. Granular/Chipped Bentonite ☐ 3 3b. Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5c. Lbs/gal mud weight Bentonite slurry ☐ 3 1d. % Bentonite Bentonite-cement grout ☐ 5 0e. Ft³ volume added for any of the above

f. How installed:

Tremie ☐ 0 1Tremie pumped ☒ 0 2Gravity ☐ 0 8

6. Bentonite seal:

a. Bentonite granules ☐ 3 3b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 3 2c. None ☒ Other ☐

7. Fine sand material: Manufacturer, product name and mesh size

a. None

b. Volume added ft³

8. Filter pack material: Manufacturer, product name and mesh size

a. None

b. Volume added ft³9. Well casing: Flush threaded PVC schedule 40 ☐ 2 3Flush threaded PVC schedule 80 ☐ 2 4Butt Welded Steel Schedule 40 ☒ Other ☐

10. Screen material:

a. Screen Type:

Factory cut ☐ 1 1Continuous slot ☐ 0 1Other ☐

b. Manufacturer

c. Slot size:

in.

d. Slotted length:

ft.

11. Backfill material (below filter pack):

None ☒ 1 4Other ☐

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

Signature

Craig M. Bower

Firm Soils & Engineering Services, Inc.

1102 Stewart Street, Madison, Wisconsin 53713

Tel: 608-274-7600

Fax: 608-274-7511

Please complete both Form 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.

State of Wisconsin
Department of Natural ResourcesMONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98Route to: Watershed/Wastewater ☐Waste Management ☐Remediation/Redevelopment ☐Other ☐

Facility/Project Name

WI GROUNDWATER-LEVEL
MONITORING NETWORK
IW-32 REPLACEMENT WELL

County Name

Iowa

Well Name

25003623 (AKA: IW-3623)

County Code

25

Wis. Unique Well Number

VQ879

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
 surge 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

60 min.

4. Depth of well Below land surface

90.5 ft.

5. Inside diameter of well

6.00 in.

6. Volume of water in filter pack and well casing

open hole 72.6 gal.

7. Volume of water removed from well

1800 gal.

8. Volume of water added (if any)

0.0 gal.

9. Source of water added

N/A

10. Analysis performed on water added?

(If you attach results)

☐ Yes ☒ No

17. Additional comments on development:

Use air compressor with PVC casing to push water out of the well. Did the operation 3 times and allowed the water to recharge for about 15 minutes each time.

11. Depth to Water Before Development After Development

a. 41.00 ft. 81.40 ft.
 (from top of well casing)

Date

08/16/2019 08/16/2019
m m d d y y y y m m d d y y y y

Time

c. 1:45 a.m. 2:45 p.m.
a.m. p.m.

12. Sediment in well bottom

0.0 inches 0.0 inches

13. Water clarity

Clear ☐ 10 Clear ☒ 20
 Turbidity ☒ 15 Turbidity ☐ 25
 (Describe) (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: Scott Last Name: Kumb

Firm: Soils & Engineering Services, Inc.

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:

Print Name: Duane Reichel

Firm:

Soils & Engineering Services, Inc.

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

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122

Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐SES Project Number **507.80**

Page 1 of 5

Facility/Project Name **WI GROUNDWATER-LEVEL MONITORING NETWORK**
IW-32 REPLACEMENT WELL Well name **25003623 (AKA: IW-3623)**Boring Drilled By: Name of crew chief (first, last) and Firm
Steve J. Hunger
Soils & Engineering Services, Inc. Date Drilling Started **August 14, 2019** Date Drilling Completed **August 16, 2019** Drilling Method **HSA, DTH, DTH**WI Unique Well No. **VQ879** DNR Well ID No. **IW-3623** Common Well Name **IW-3623** Final Static Water Level **1158.71 FT-MSL** Surface Elevation **1197.43 FT-MSL** Borehole Diameter **14.75 in, 10 in, 6 in**Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane **SW** 1/4 of **SW** 1/4 of Sec. **32**, T. **6** N, R. **3** (E) W Lat **42.946075** Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W Long **-90.172108**Facility ID **Iowa** County **Iowa** County Code **25** Civil Town/City/ or Village **Civil Township of Dodgeville**

Sample		Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID Readings	Soil Properties					P 200	RQD/ Comments
Number and Type	Length Att. & Recovered (in)							Blow Counts	Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index		
			Total Depth = 90'-5" Below Land Surface											
		1	moist, TOPSOIL-[5" thick]											
		2	SILTY SAND WITH GRAVEL (SM) — fine grained, non-plastic to low plasticity fines, pale brown, moist											
		3												
		4												
		5		SM										
		6												
		7												
		8												
		9	Firmer drilling at 8'-0"											
		10	Auger refusal on bedrock at 9'-2"											
		11	DOLOMITE — unweathered, pale brown											
		12												
		13												
		14												
		15												

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

Signature **Craig M. Bauer**Firm **Soils & Engineering Services, Inc.**
1102 Stewart Street Madison, Wisconsin 53713Tel: 608-274-7600
Fax: 608-274-7511

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.

State of Wisconsin
Department of Natural Resources

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

WELL IW-3623 / VQ879

SES Project Number **507.80**

Use only as an attachment to Form 4400-122.

Page 2 of 5

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID Readings	Soil Properties						RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200		
			16	DOLOMITE — <i>unweathered, pale brown</i> (continued)											
			17												
			18												
			19												
			20												
			21												
			22												
			23												
			24												
			25												
			26												
			27												
			28												
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			35												
			36												
			37												
			38												
			39												

State of Wisconsin
Department of Natural Resources

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

WELL IW-3623 / VQ879

SES Project Number **507.80**

Use only as an attachment to Form 4400-122.

Page **3** of **5**

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID Readings	Soil Properties						RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200		
			40	DOLOMITE — unweathered, pale brown (continued)											
			41												
			42												
			43												
			44												
			45												
			46												
			47												
			48												
			49												
			50												
			51												
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			59												
			60												
			61												
			62												
			63												

State of Wisconsin
Department of Natural Resources

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

Facility/Project Name

WELL IW-3623 / VQ879

SES Project Number **507.80**

Use only as an attachment to Form 4400-122.

Page **4** of **5**

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID Readings	Soil Properties						RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200		
			64	DOLOMITE — unweathered, pale brown (continued)											
			65												
			66												
			67												
			68												
			69												
			70												
			71												
			72												
			73												
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			81												
			82												
			83												
			84												
			85												
			86												
			87												

6" Open Hole

State of Wisconsin
Department of Natural Resources


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

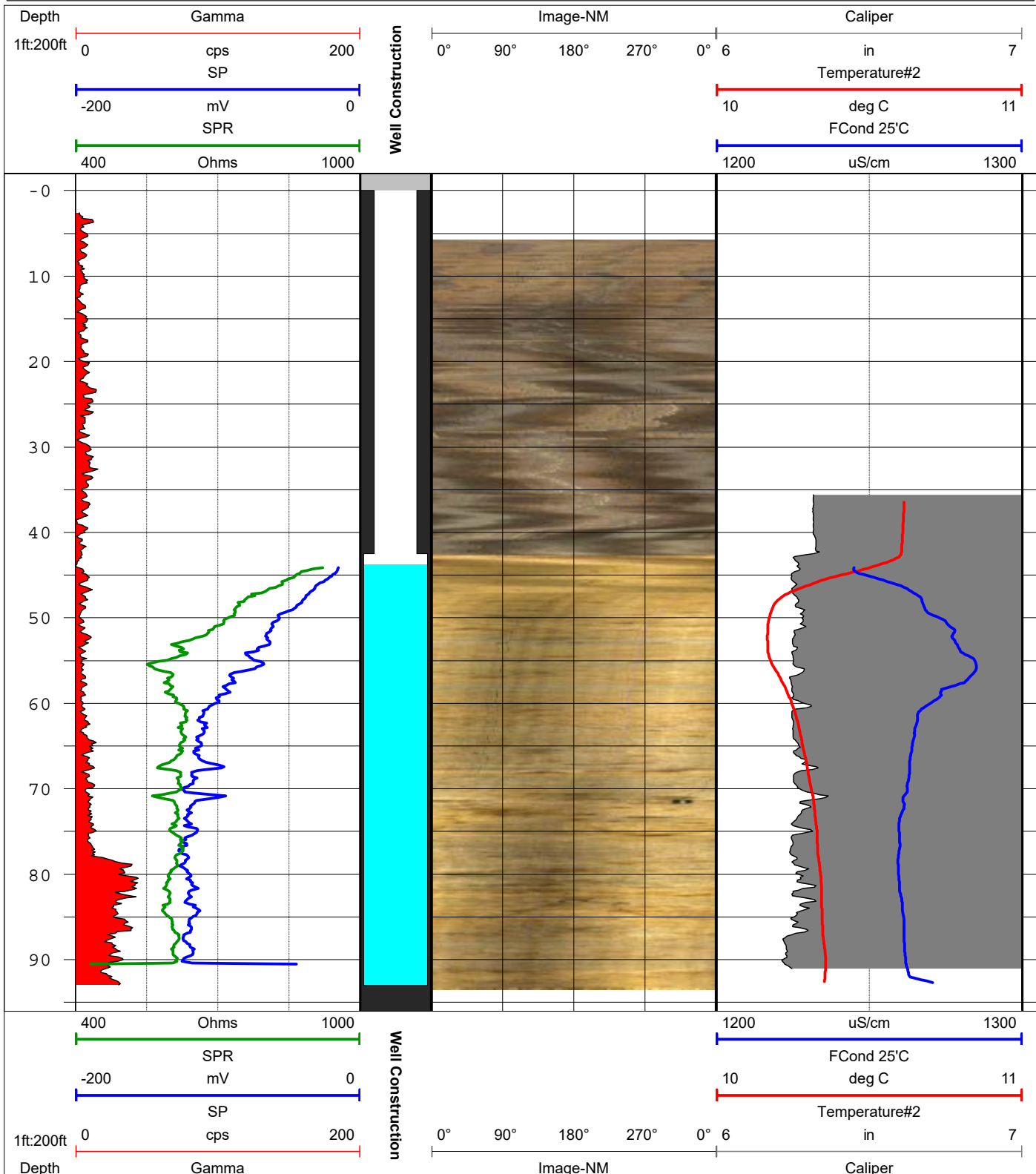
SES Project Number **507.80**

WELL IW-3623 / VQ877

Use only as an attachment to Form 4400-122.

Page 5 of 5

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID Readings	Soil Properties							RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200			
			88	DOLOMITE — unweathered, pale brown (continued)												
			89													
			90													
			91													
			92	NOTES Drilled with 10 ¹ / ₄ -inch I.D. hollow-stem augers (HSA) to 9'-2" on August 14, 2019. Drilled with 10-inch down-the-hole (DTH) hammer to 40'-0". Set 6-inch steel casing at 40'-0" and grouted with bentonite-cement to 6'-0" and cement grout to 1'-6" on August 15, 2019. Drilled with 6-inch DTH hammer to 90'-6" on August 16, 2019. <i>All depths in feet below Land Surface</i>												
			93													
			94													
			95													
			96													
			97													
			98													
			99													
			100													
			101													
			102													
			103													
			104													
			105													
			106													
			107													
			108													
			109													
			110													
			111													



Appendix 9: Well LA-1493 documents

Documentation of work done for this report

Well owner document, 2019, 2 pages

WDNR monitoring well construction form, 2019, 1 page
4400-113A

WDNR monitoring well development form, 2019, 1 page
4400-113B

WDNR soil boring form, 2019, 1 page
4400-112



Wisconsin Geological and Natural History Survey

DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN-MADISON

September 26, 2019

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 the Langlade County Airport property. Collaboration by organizations such as yours 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

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

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



State of Wisconsin
Department of Natural Resources

Route To:

Watershed/Wastewater ☐Waste Management ☐Remediation/Redevelopment ☐Other ☐

SES Project Number 507.84

MONITORING WELL CONSTRUCTION

Form 4400-113A

Rev. 7-98

Facility/Project Name

WI GROUNDWATER-LEVEL
MONITORING NETWORK

NEW WELL

Local Grid Location of Well

ft. ☐ N. ☐ E.
ft. ☐ S. ☐ W.Grid Origin Location (estimated) ☐

Well Location

Lat. 45.153792 Long. -89.104753 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

Location of Well Relative to Waste/Source

u ☐ Upgradient s ☐ Sidegradientd ☐ Downgradient n ☐ Not Known

Gov. Lot Number

Type of Well

Well Code 11 / mw

Distance From Waste/
Source ft.Enf. Stds.
Apply ☐

Well Name

34001493 (AKA: LA-1493)

Unique Well No. DNR Well Number

VQ876

Date Well Installed

10/10/2019

Well Installed By: Name (first, last) and Firm

Scott Klumb

Soils & Engineering Services, Inc.

A. Protective pipe, top elevation 1523.22 ft. MSL

B. Well casing, top elevation 1523.12 ft. MSL

C. Land surface elevation 1520.7 ft. MSL

D. Surface seal, bottom 1515.7 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:

GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐ OL/OH ☐ PT ☐13. Sieve analysis attached? ☐ Yes ☒ No14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☒ 41
Other ☐15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☒ 9916. Drilling additives used? ☐ Yes ☒ No

Describe

17. Source of water (attach analysis):

E. Bentonite seal, top 1489.7 ft. MSL or 31.0 ft.

F. Fine sand, top 1489.7 ft. MSL or 31.0 ft.

G. Filter pack, top 1487.7 ft. MSL or 33.0 ft.

H. Screen joint, top 1484.79 ft. MSL or 35.91 ft.

I. Well bottom 1469.39 ft. MSL or 51.31 ft.

J. Filter pack, bottom 1469.39 ft. MSL or 51.31 ft.

K. Borehole, bottom 1469.39 ft. MSL or 51.31 ft.

L. Borehole, diameter 8.3 in

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.

1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:

a. Inside diameter: 4.0 in.

b. Length: 7.0 ft.

c. Material: Steel ☒ 04Other ☐d. Additional protection? ☒ Yes ☐ No

If yes, describe: Two 2" x 7' steel bumper posts

3. Surface seal: Bentonite ☒ 30Concrete ☐ 01Other ☐

4. Material between well casing and protective pipe:

Bentonite ☒ 30Other ☐5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33b. Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35c. Lbs/gal mud weight Bentonite slurry ☐ 31d. % Bentonite Bentonite-cement grout ☐ 50e. 8.8 Ft³ volume added for any of the abovef. How installed: Tremie ☐ 01Tremie pumped ☐ 02Gravity ☒ 086. Bentonite seal: a. Bentonite granules ☐ 33b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 32c. None ☒ Other ☐

7. Fine sand material: Manufacturer, product name and mesh size

a. Red Flint Sand and Gravel, #15 well slot

b. Volume added 0.68 ft³

8. Filter pack material: Manufacturer, product name and mesh size

a. Red Flint Sand and Gravel, #40 well slot

b. Volume added 6.1 ft³9. Well casing: Flush threaded PVC schedule 40 ☒ 23Flush threaded PVC schedule 80 ☐ 24Other ☐

10. Screen material: Flush threaded PVC schedule

a. Screen Type: 40 Factory cut ☒ 11Continuous slot ☐ 01Other ☐

b. Manufacturer Baker Water Systems

c. Slot size: (Monoflex) 0.010 in.

d. Slotted length: 15.0 ft.

11. Backfill material (below filter pack): None ☒ 14Other ☐

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

Signature

Craig M. Bauer

Firm Soils & Engineering Services, Inc.

1102 Stewart Street, Madison, Wisconsin 53713

Tel: 608-274-7600

Fax: 608-274-7511

Please complete both Form 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.

Printed on 10/28/2019

State of Wisconsin
Department of Natural ResourcesMONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98Route to: Watershed/Wastewater ☐Waste Management ☐Remediation/Redevelopment ☐Other ☐

Facility/Project Name

WI GROUNDWATER-LEVEL
MONITORING NETWORK
NEW WELL

County Name

Langlade

Well Name

(AKA: LA-1493)

34001493

County Code

34

Wis. Unique Well Number

VQ876

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 80 min.4. Depth of well (Below land surf.) 51.31 ft.5. Inside diameter of well 2.05 in.6. Volume of water in filter pack and well casing 4.5 gal.7. Volume of water removed from well 160 gal.8. Volume of water added (if any) 0 gal.9. Source of water added NA10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

17. Additional comments on development:

11. Depth to Water Before Development After Development

a. 28.07 ft. 28.04 ft.

Date

b. 10 / 10 / 2019 10 / 10 / 2019
m m d d y y y y m m d d y y y y

Time

c. 02 : 00 ☐ a.m. 03 : 20 ☒ p.m.12. Sediment in well bottom 1 inches 0 inches13. Water clarity Clear ☐ 10 Turbid ☒ 15

(Describe)

Brown

Opaque

Clear ☐ 20 Turbid ☒ 25

(Describe)

Brown

Slight turbidity

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

14. Total suspended solids mg/l mg/l15. COD mg/l mg/l

16. Well developed by: Name (first, last) and Firm

First Name: Peter Last Name: Chase

Firm: Wis Geological and Natural History Survey

Name and Address of Facility Contact /Owner/Responsible Party

First Last
Name: 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: P M Chase

Print Name: Peter M. Chase

Firm: WGNHS

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				Well name 34001493 (AKA: LA-1493)	
Boring Drilled By: Name of crew chief (first, last) and Firm First Name: Craig Last Name: Bower				Date Drilling Started 10 / 10 / 2019	Date Drilling Completed 10 / 10 / 2019
Firm: Soils and Engineering Service				Drilling Method 4.25" Hollow stemmed augers	
WI Unique Well No. VQ876	DNR Well ID No. LA-1493	Well Name NEW WELL	Final Static Water Level 1495 Feet MSL	Surface Elevation 1520.7 Feet MSL	Borehole Diameter 8.25 inches
Local Grid Origin <input type="checkbox"/> (estimated: <input type="checkbox"/>) or Boring Location <input checked="" type="checkbox"/>			Grid Location		
State Plane N			Lat 45.153792		
1/4 of 1 of Section T N R			Long -89.104753		
Facility ID		County Laglade	County Code 34	Civil Town/City/ or Village Antigo	

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					RQD/ Comments
									Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	
1	16	4	3-5	SILTY SAND W/ GRAVEL, 70% sand 15% fines 15% gravel red/brown, moist, very loose										
2	10	4	8-10	POORLY SORTED SAND W/ GRAVEL 85% F-C sand 15% gravel trace silt, red/brown, moist, very loose, Outwash										
3	8	7	13-15	AS ABOVE but 75% sand 25% gravel, loose Driller reports gravelly 16-18'										
4	8	9	18-20	AS ABOVE										
5	6	11	23-25	AS ABOVE										
6	6	4	28-30	AS ABOVE but wet, very loose										
7	12	12	33-35	AS ABOVE but 80% sand 20% gravel, medium dense Driller starts to add water to reduce heaving										
8	8	8	38-40	AS ABOVE but loose										
9	14	7	43-45	AS ABOVE										
10	7	10	48-50	WELL SORTED SAND 95% F-M sand, 5% F gravel, red/brown, wet, loose										
				End of Boring @ 51.31' - build 2" ID well w/ 15' screen Below land surface										

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

Signature **J. McG...** 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 10: Well ML-118, ML-8032, and ML-8035 documents

Well ML-8032 was drilled to replace well ML-118, but was deemed an unsuccessful replacement; well ML-8035 successfully replaced ML-118

Historical Documents: ML-118

Basic well information, 1980; well evaluation, 1981; well location map; hydrographs, 1946-1955 and 1996-1998, 5 pages

well information historically compiled by WGNHS

Well construction report, 1941, 2 pages

includes lithology information

USGS well schedule, 1946, 1 page

includes hand drawn maps

USGS well schedule, 1969, 1 page

includes hand drawn maps

Geophysical, hydrological, and well construction information from Rauman and others (1999), 1 page

hydrograph (1946 - 1999), slug test, horizontal hydraulic conductivity, geophysical logs, and well measurements from unpublished report to DNR (DNR project number 135) by Rauman and others (1999)

datum is top of casing, approximately 0.6 ft above land surface in 1999, data courtesy of U.S. Geological Survey

Documentation of work done for this report: ML-8032

WDNR monitoring well construction form, 2020, 1 page

4400-113A

WDNR soil boring form, 2020, 2 pages

4400-112

WDNR fill and seal report, 2021, 1 page

Documentation of work done for this report: ML-8035

Site easement, 2022, 13 pages

includes original 2019 easement (initiated for well ML-8032) and 2022 amendment necessary to change the easement to well ML-8035

WDNR monitoring well construction form, 2021, 1 page

4400-113A

WDNR monitoring well development form, 2021, 1 page

4400-113B

WDNR soil boring form, 2021, 1 page

4400-112

Well construction report filled out by driller, 2021, 2 pages

WGNHS geophysical log, 2021, 1 page

gamma, self potential, single point resistivity, optical borehole image, fluid temperature, fluid conductivity, caliper

datum is top of casing (2.42 ft above land surface in 2021)

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number	ML 118		
Owner	A. Schaefer		
Location (Co., T/R.sec)	T8N, R21E, Sec. 35, NE 1/4 NE 1/4 NW 1/4; 5451 N. 51st St.		
Land surface altitude	679.25'		
Drainage basin	L. MICHIGAN - Milwaukee R. : Lincoln Creek		
distance to the nearest perennial stream:	1,400 ft of the L bank		
WELL DATA			
Depth	136'		
Casing depth	124'		
Screened interval	open end		
Diameter	6"		
Aquifers open to well	Niagara Dol.		
Geologic log available?	no		
Construction report available?	yes		
Use of well	domestic		
Access to measure well			
NEAREST SUPPLEMENTAL DATA POINTS			
Precipitation stations	Milwaukee Mt Mary College - 4 mi SW German town - 11 mi NW		
Streamgaging stations	West Allis - 7 mi SSW Milwaukee River at Milwaukee 3.25 mi SE		
Observation wells	MI 431 4'4" NW N MI 45 - 6'2" NW SE MI 120 4'6" NW SE MI 22 - 7'0" NW S		
Other			
EXISTING RECORD			
Measuring point	top of casing, .60 ft above 1st		
Measuring equipment	tape		
Frequency of measurement	monthly from 12/05/66, and 12/27/46 - 11/13/48 (04/12/46 - 12/27/46 weekly;		
Period of record -- 1946	to date bi-monthly 11/13/48 - 09/15/54 and 02/24 - 12/05/66; quarterly 09/15/54 - 02/24/66;		
Started	04/12/46		
Ended			
Volume of missing record	2.4% for monthly		
Recorded by	A. Janney on 3/2/81		

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

1. Areal spacing -- distance from any observation well 4.4 mi'
-- distance from observation well in same aquifer 4.6 mi'
2. Ownership: private -- public
3. Use of well unused domestic
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: 06/21/41
8. Diameter (4 in. minimum for recorder) 6"
9. Aquifer: single -- multiple
10. Good hydraulic connection with aquifer yes
11. Knowledge of pumping effect not apparent
12. Range and character of w.l. fluctuations 5 ft ; seasonal, long-term
13. Length of record 34 years
14. Missing record 2.4%
15. Adequacy of current measuring frequency good
16. Probability of permanence good
17. Recommendations/Improvements

Keep

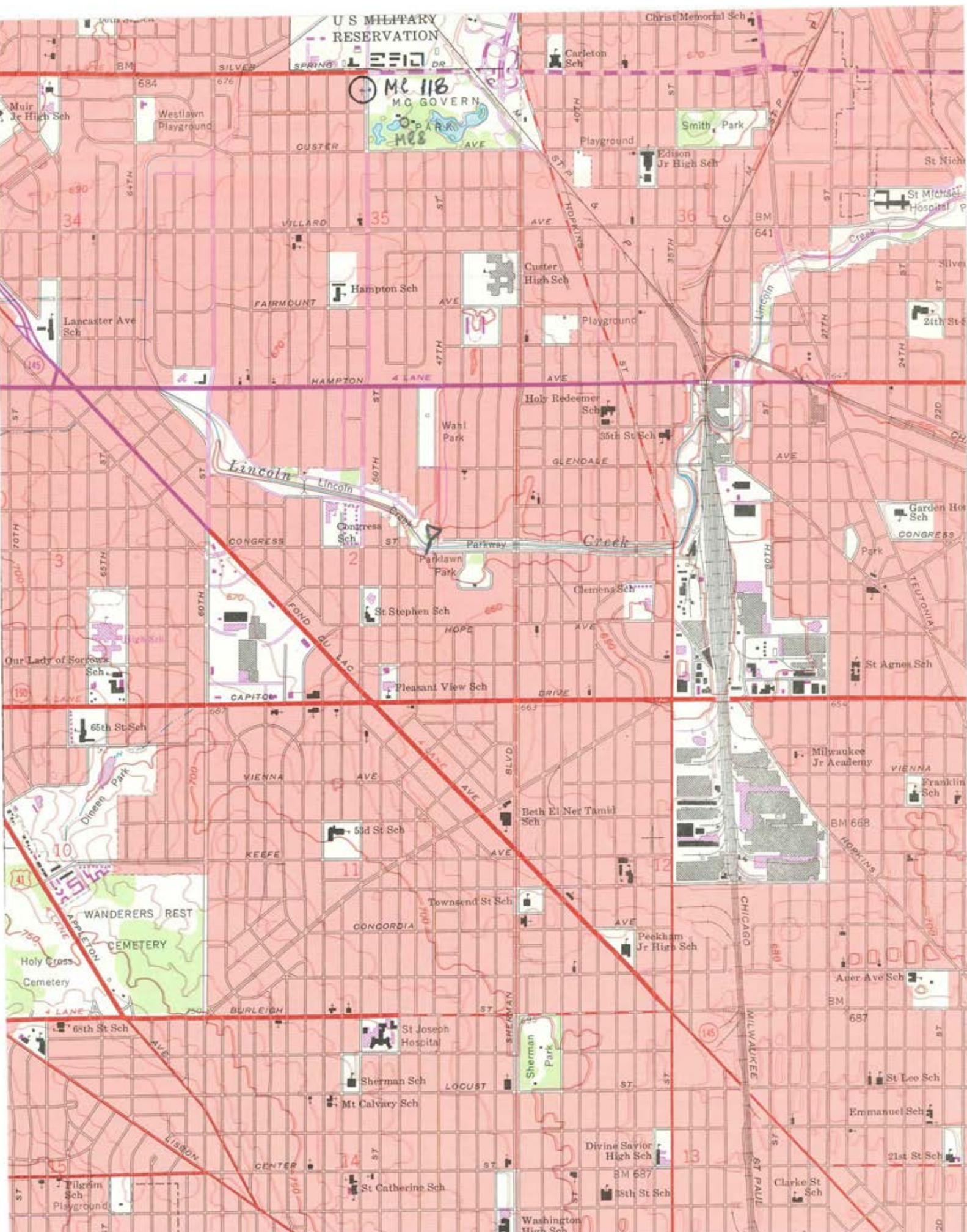
Evaluated by

A. J. Jorgensen

on

03/27/81

Appendix 10: Well ML-118, ML-8032, and ML-8035 documents, well location map for ML-118



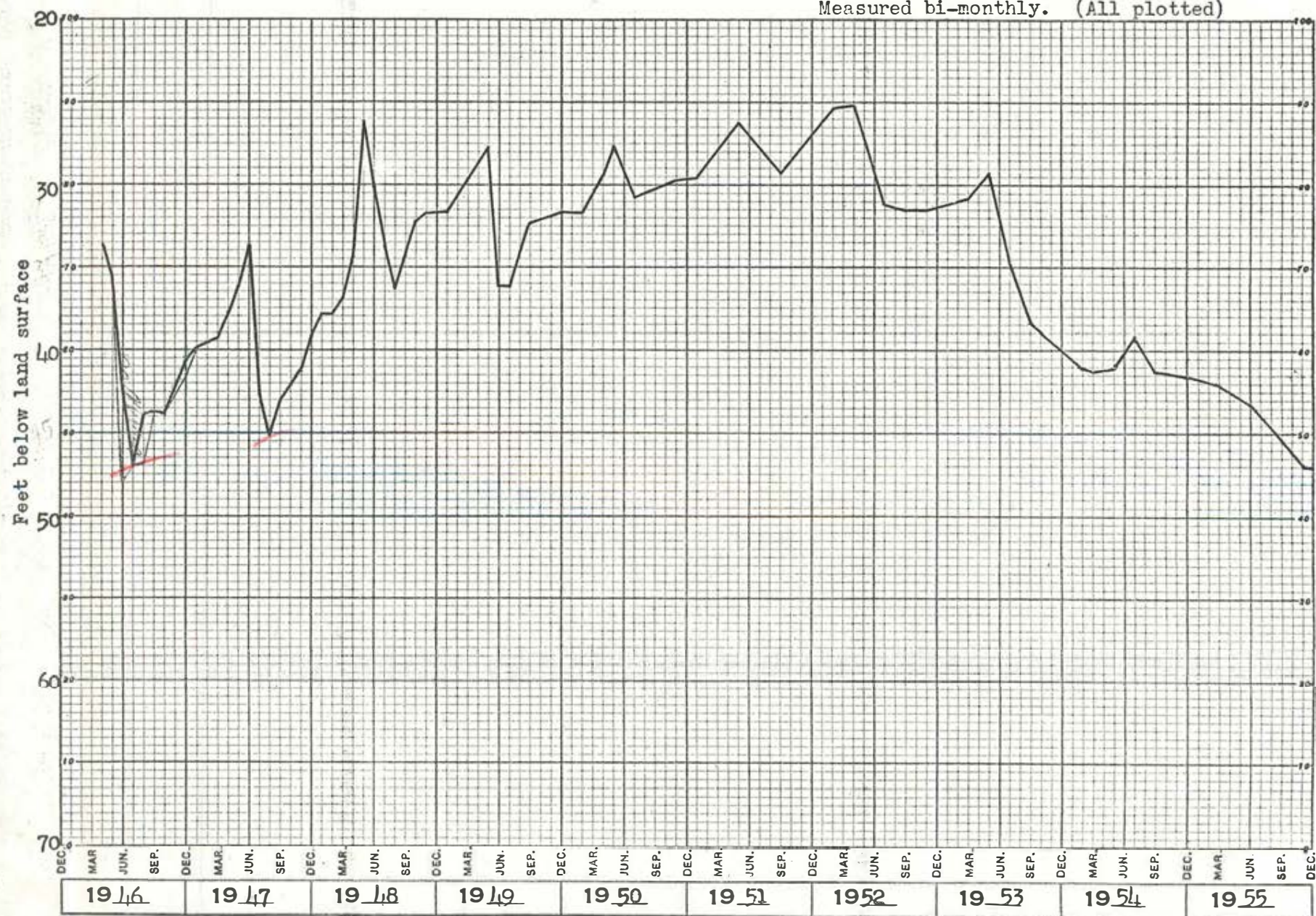


ML 118, Milwaukee, Wis. A. Schaefer, 5465 No. 51st.

Measuring point 6 feet above land surface. Altitude of land surface 679 feet.

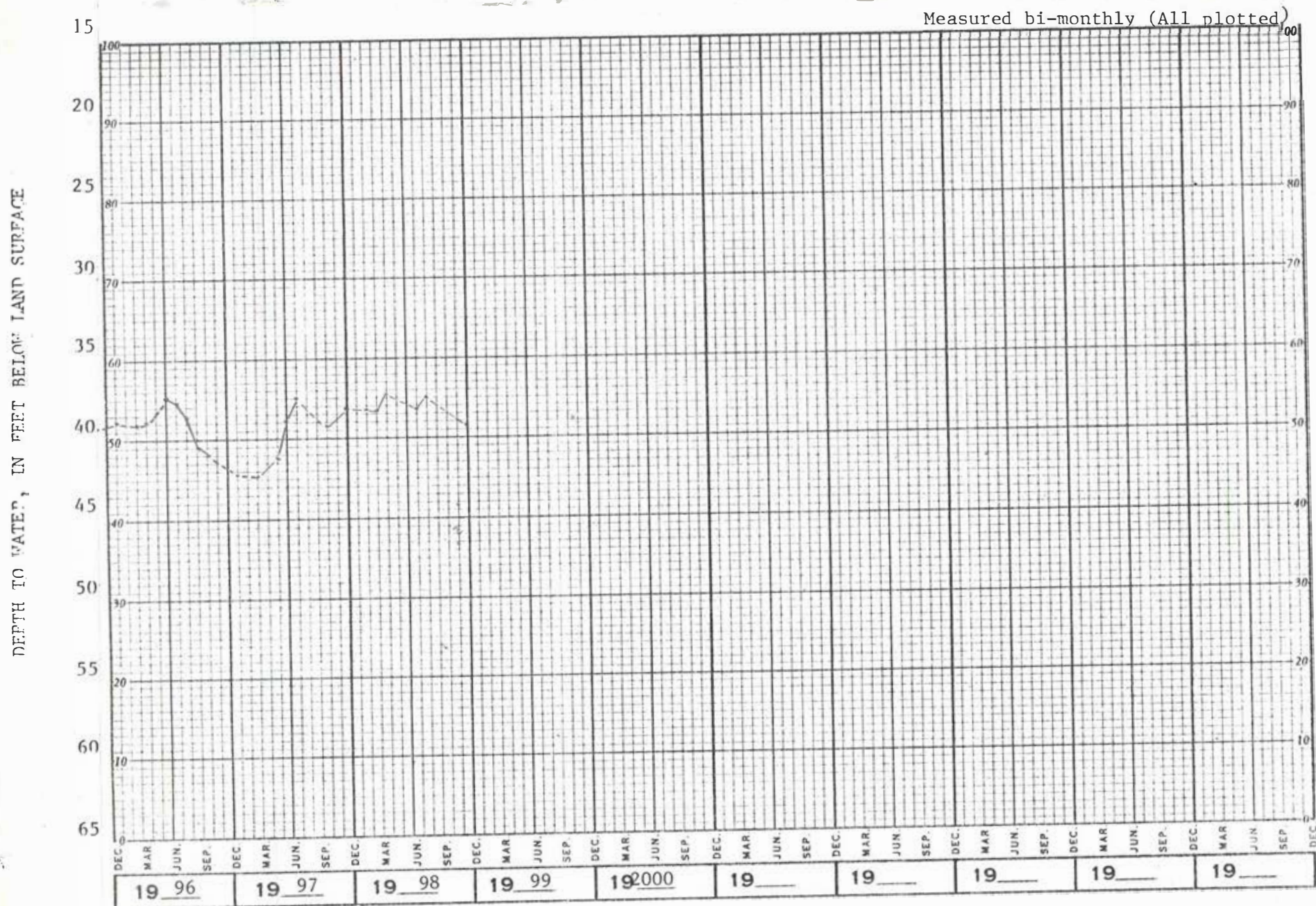
Niagara dolomite aquifer - artesian. Depth 134.5 feet, diameter 6 inches.

Measured bi-monthly. (All plotted)



Appendix 10: Well ML-118, ML-8032, and ML-8035 documents, hydrograph for ML-118

ML-08/21F/35-0118. A. Schaefer. 5451 N. 51st. St., Milwaukee. NE-NE 1/4. Drilled domestic artesian well in the Niagara aquifer. Diameter 6 in., depth 135 ft. Lsd 679 ft. above msl. MP top of casing, 0.60 ft. above lsd.



WELL CONSTRUCTION REPORT

WISCONSIN STATE BOARD OF HEALTH

WELL CONSTRUCTION DIVISION

ML-118-4

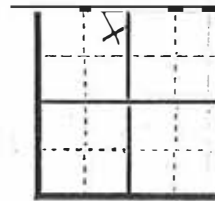
Note: Section 31 of the Wisconsin Well Construction Code, having the force and effect of law, provides that within thirty days after completion of every well the driller shall submit a report covering all essential details of construction to the State Board of Health on a form provided by the Board.

Owner ALBERT Schaefer Driller H. R. Ducey
 Street or ~~RFD~~ N 51st & Custer Post Office Milwaukee Wis
 Post Office Milwaukee Wis Date 7-15-41 Permit No. 330

LOCATION OF PREMISES

Milwaukee County Granville Town

The square below represents a section of land divided into 40 acre tracts. Mark the position of the premises in the section



NE NW 1/4

Sec. No. 35Twp. No. 8 NRange 21 { E
W

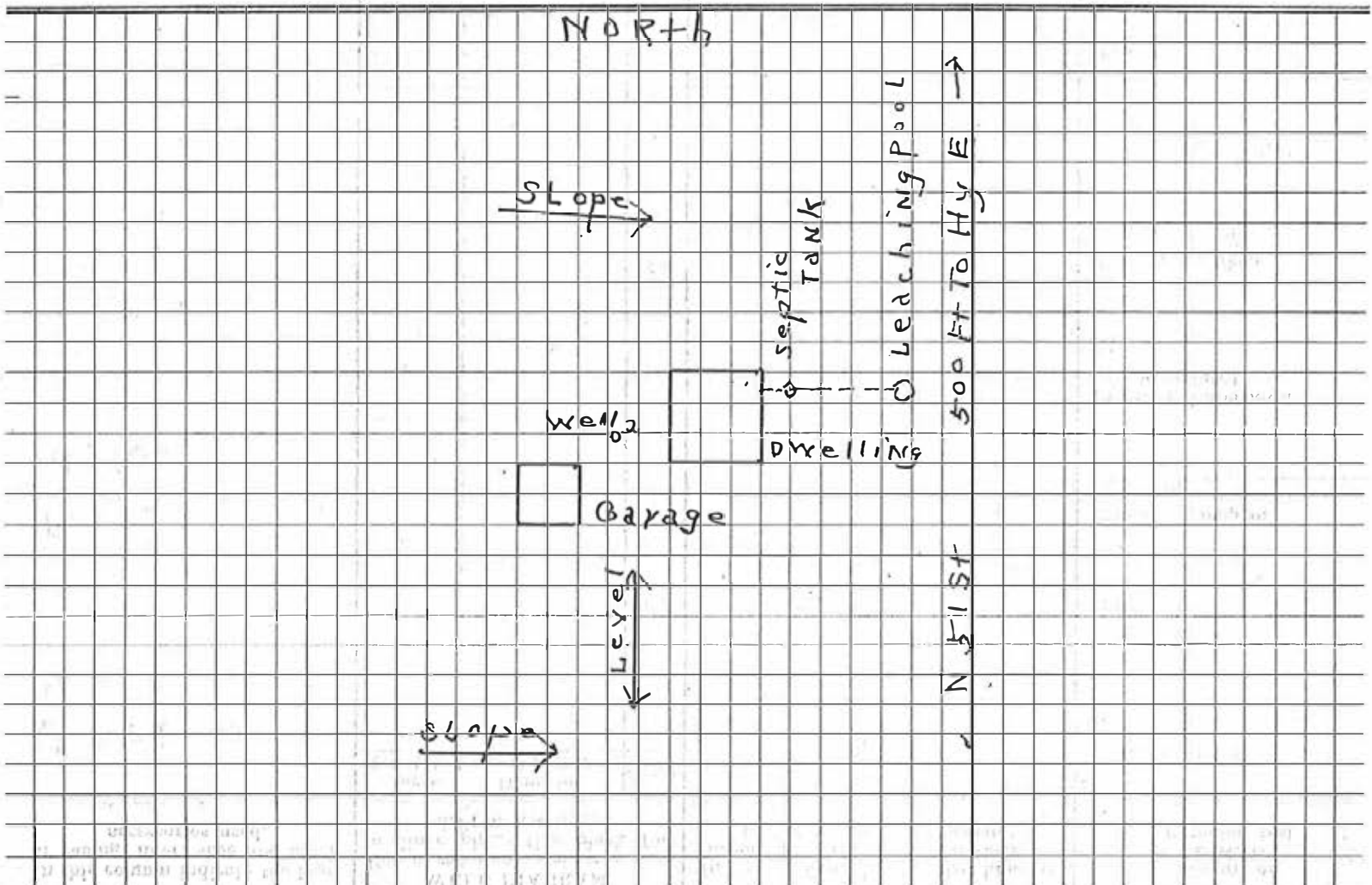
Hackbarth Sub
 Describe further by subdivision, plat, district, lake, lot,

COUNTY trunk Hy E is the
 block, nearest principal highway, etc., whichever apply.

Nearest principal Hy

DIAGRAM OF PREMISES

See Well Construction Report bulletin. In making the diagram in the space below consider 10 ft. as the distance between lines. Be sure to indicate NORTH.



WELL LOG and REPORT

For method of making report, refer to bulletin entitled "Well Construction Report," 7-5-1939.

In this column indicate the kind of casing, liner, shoe and other accessories used.

WELL DIAGRAM
Use a red line to show casing or liner pipe. Use black for drill or borehole.

In this column state the kind of formations penetrated, their thickness in feet and if water bearing.

Record of
FINAL
Pumping test

6" Std wt
wrat steel
Pipe

Forged steel
drive shoe.

Inches Diameter
2 3 4 5 6 8 10 12 14 16 18

Depth

Top soil and
yellow clay
10'

Blue clay
15'

sandy clay 5'

Hard pan 5'

Gravel 3'

Blue clay
60'

Gravel 2'

Blue clay 8'

Sand 16'

Limestone 12'

Duration of test

Hours 5

Pumping rate

G.P.M. 15

Depth of pump in

well. Ft. 50Standing water-level
(from surface)Ft. 30

Water-level when

pumping Ft. 40

Water. End of test.

Clear ✓

Cloudy

Turbid

Was the well sterilized?


Yes ✓ NoTo which laboratory was
sample sent?KennushaDate 6-20-41Was the well sealed on
completion?Yes ✓ NoHow high did you leave the
casing-pipe above grade?10'


Well was completed


Date 6-20-41

Well Driller

H. R. Ducey
SignatureDraw the diagram to show the
right half only

 = Mud Grout

 = casing pipe.

 = Drill hole

430706 N 0875836.1

9-185-July 1935
isedUNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCHM-8/21/35-118
M-118

WELL SCHEDULE

Date April 12, 1946 Field No. _____
Record by GEH Office No. 18
Source of data U.S. G.S.1. Location: State Wis. County Milw.Map _____
11E $\frac{1}{4}$ 111 $\frac{1}{4}$ sec. 35 T 8 N R 21 E2. Owner: A. Schaefer Address 5465 No. 51st.

Tenant _____ Address _____

Driller _____ Address _____

3. Topography _____

4. Elevation 679.85 ft. ^{above} ~~below~~5. Type: Dug (drilled) driven, bored, jetted Aug 19 416. Depth: Rept. _____ ft. Meas. 134.5 ft.7. Casing: Diam. 6 in., to _____ in., Type _____

Depth _____ ft., Finish _____

8. Chief Aquifer Drift From _____ ft. to _____ ft.

Others _____

er level 34.26 ft. ^{rept.} ~~meas.~~ April 12 1946 ^{above} ~~below~~ Top ofCollar of casing _____ which is 0.6 ft. ^{above} ~~below~~ surface10. Pump: Type Deep Well Injector Capacity 25 G. M.Power: Kind Electric Horsepower 1

11. Yield: Flow _____ G. M., Pump _____ G. M., Meas., Rept. Est. _____

Drawdown _____ ft. after _____ hours pumping _____ G. M.

12. Use: Dom. Stock, PS., RR., Ind., Irr., Obs. House supply

Adequacy, permanence _____

13. Quality _____ Temp _____ °F.

Taste, odor, color _____ Sample ^{Yes} ~~No~~

Unfit for _____

14. Remarks: (Log, Analyses, etc.) _____



Milwaukee County

ML-08/21E/35-0118

SILURIAN

Well Information

Est. MSL 679.25 feet

Total Depth 104.5 feet

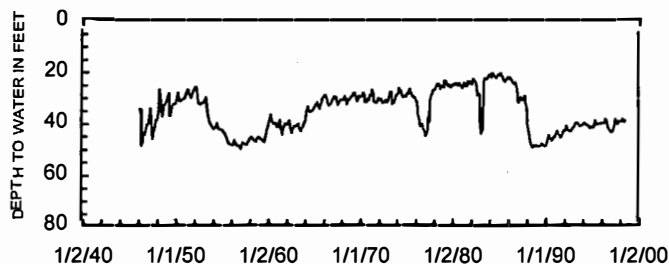
Cased Depth 124 feet*

Casing Diameter 6 inches

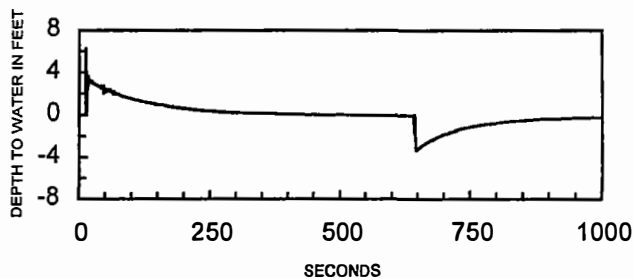
Use Of Well Non pumping

* Picked from drilling logs

Depth of Water Below Land Surface for Period of Record



Deviation From Static Water Level During Displacement/Recovery Test

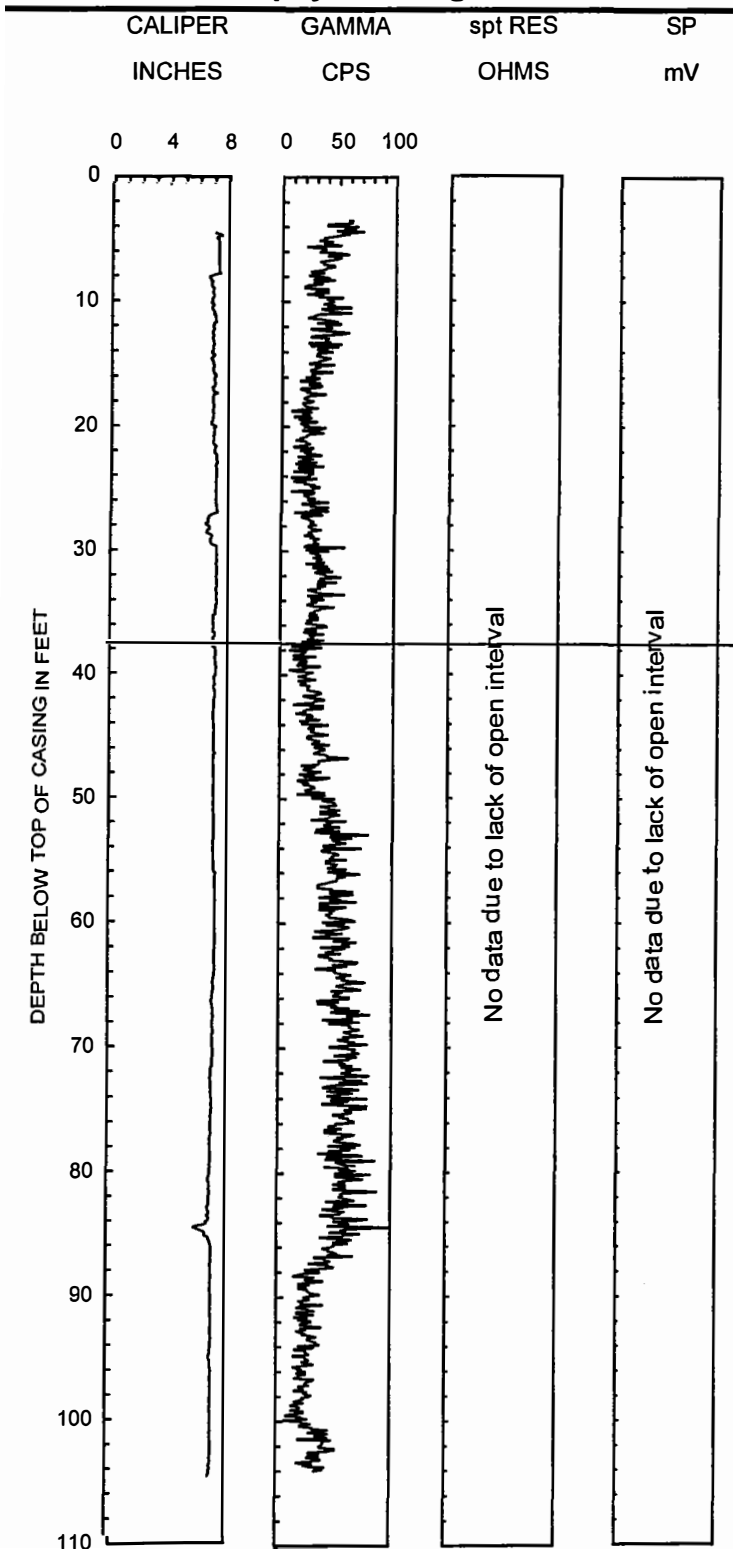


Hydraulic Conductivity

K = Hvorslev Method ~ 10 ft/day

Indeterminant screened interval due to collapse of the casing and screen

Geophysical Logs



41008032

ML-8032

replaced ML-118

later abandoned and replaced by ML-8035

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		Local Grid Location of Well ft. <input type="checkbox"/> N. <input type="checkbox"/> S. <input type="checkbox"/> E. <input type="checkbox"/> W.		Well name 41008032 ML-8032	
Facility License, Permit or Monitoring No.		Local Grid Origin <input type="checkbox"/> (estimated: <input type="checkbox"/>) or Well Location <input checked="" type="checkbox"/>		Wis. Unique Well No. DNR Well ID No.	
Facility ID		Lat. 43.128367 Long. -87.969706		Date Well Installed 03 / 10 / 2020	
Type of Well Well Code 12 / pz		Section Location of Waste/Source 1/4 of 1/4 of Sec. T. N.R. <input type="checkbox"/> E <input type="checkbox"/> W		Well Installed By: Name (first, last) and Firm John Denneau	
Distance from Waste/Source N/A ft.		Location of Well Relative to Waste/Source u <input type="checkbox"/> Upgradient s <input type="checkbox"/> Sidegradient d <input type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known		Gov. Lot Number	
Apply <input type="checkbox"/>				Subsurface Exploration Services, LLC	

A. Protective pipe, top elevation	ft. MSL	1. Cap and lock?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
B. Well casing, top elevation	ft. MSL	2. Protective cover pipe:	
C. Land surface elevation	701 ft. MSL or 0 ft	a. Inside diameter:	4.0 in.
D. Surface seal, bottom	ft. MSL or -6.5 ft.	b. Length:	7.0 ft.
12. USCS classification of soil near screen:		c. Material:	Steel <input checked="" type="checkbox"/> 04 Other <input type="checkbox"/>
GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input type="checkbox"/> SP <input type="checkbox"/>		d. Additional protection?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/>		If yes, describe:	
Bedrock <input checked="" type="checkbox"/>		3. Surface seal:	Bentonite <input checked="" type="checkbox"/> 30 Concrete <input type="checkbox"/> 01 Other <input type="checkbox"/>
13. Sieve analysis performed?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	4. Material between well casing and protective pipe:	Bentonite <input checked="" type="checkbox"/> 30 Other <input type="checkbox"/>
14. Drilling method used:	Rotary <input checked="" type="checkbox"/> 50 Hollow Stem Auger <input type="checkbox"/> 41 Other <input type="checkbox"/>	5. Annular space seal:	a. Granular/Chipped Bentonite <input type="checkbox"/> 33 b. Lbs/gal mud weight ... Bentonite-sand slurry <input type="checkbox"/> 35 c. 11+ Lbs/gal mud weight ... Bentonite slurry <input checked="" type="checkbox"/> 31 d. % Bentonite ... Bentonite-cement grout <input type="checkbox"/> 50 e. ~24 Ft ³ volume added for any of the above f. How installed: Tremie <input type="checkbox"/> 01 Tremie pumped <input checked="" type="checkbox"/> 02 Gravity <input type="checkbox"/> 08
15. Drilling fluid used: Water <input type="checkbox"/> 02 Air <input type="checkbox"/> 01 Drilling Mud <input checked="" type="checkbox"/> 03 None <input type="checkbox"/> 99		6. Bentonite seal:	a. Bentonite granules <input type="checkbox"/> 33 b. <input type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite chips <input type="checkbox"/> 32 c. 3/8" Coated Bentonite Pellets Hydrated O/N Other <input checked="" type="checkbox"/>
16. Drilling additives used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7. Fine sand material: Manufacturer, product name & mesh size	a. Red Flint #15 b. Volume added ~0.5 ft ³
Describe Bentonite		8. Filter pack material: Manufacturer, product name & mesh size	a. Red Flint #15 b. Volume added ~2.0 ft ³
17. Source of water (attach analysis, if required): SES Potable Well/Village of Glendale Public Water		9. Well casing:	Flush threaded PVC schedule 40 <input type="checkbox"/> 23 Flush threaded PVC schedule 80 <input checked="" type="checkbox"/> 24 Other <input type="checkbox"/>
E. Bentonite seal, top	ft. MSL or -122.0 ft.	10. Screen material:	PVC a. Screen type: Factory cut <input checked="" type="checkbox"/> 11 Continuous slot <input type="checkbox"/> 01 Other <input type="checkbox"/>
F. Fine sand, top	ft. MSL or -125.0 ft.	b. Manufacturer Johnson Screens	c. Slot size: 0.006 in. d. Slotted length: 10.0 ft.
G. Filter pack, top	ft. MSL or -125.0 ft.	11. Backfill material (below filter pack):	None <input checked="" type="checkbox"/> 14 Other <input type="checkbox"/>
H. Screen joint, top	ft. MSL or -127.0 ft.		
I. Well bottom	ft. MSL or -137.0 ft.		
J. Filter pack, bottom	ft. MSL or -137.0 ft.		
K. Borehole, bottom	ft. MSL or -137.0 ft.		
L. Borehole, diameter	6.0 in.		
M. O.D. well casing	2.375 in.	PVC screen interval is 10 ft	
N. I.D. well casing	1.91 in.		

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

Signature

John Denneau P.G.

Firm

Subsurface Exploration Services, LLC

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.

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	

ML-8032 (VQ850) abandoned and replaced by ML-8035 (AAK181)

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 Milw	WI Unique Well # of Removed Well VQ850	Hicap #
Latitude / Longitude (see instructions) 43.128367 -87.969706	Format Code <input type="checkbox"/> DD <input type="checkbox"/> DDM	Method Code <input type="checkbox"/> GPS008 <input type="checkbox"/> SCR002 <input type="checkbox"/> OTH001
1/4 / 1/4 or Gov't Lot #	Section	Township
		Range <input type="checkbox"/> E <input type="checkbox"/> W
Well Street Address 6141 N Hopkins		
Well City, Village or Town Milw WI		Well ZIP Code 53209
Subdivision Name Havenwoods State Forest		Lot #
Reason for Removal from Service Low Production		WI Unique Well # of Replacement Well AAK181

2. Facility / Owner Information

Facility Name Havenwoods State Forest		
Facility ID (FID or PWS)		
License/Permit/Monitoring # Well Name: 441008032 (aka ML-8032)		
Original Well Owner USGS		
Present Well Owner USGS		
Mailing Address of Present Owner 8551 Research Way		
City of Present Owner Middleton	State WI	ZIP Code 53562

3. Filled & Sealed Well / Drillhole / Borehole Information

<input checked="" type="checkbox"/> Monitoring Well	Original Construction Date (mm/dd/yyyy) 03/10/2020
<input type="checkbox"/> Water Well	
<input type="checkbox"/> Borehole / Drillhole	If a Well Construction Report is available, please attach.
Construction Type: <input checked="" type="checkbox"/> Drilled <input type="checkbox"/> Driven (Sandpoint) <input type="checkbox"/> Dug <input type="checkbox"/> Other (specify): _____	
Formation Type: <input type="checkbox"/> Unconsolidated Formation <input checked="" type="checkbox"/> Bedrock	
Total Well Depth From Ground Surface (ft.) 139.5	Casing Diameter (in.) 2.0
Lower Drillhole Diameter (in.) 6"	Casing Depth (ft.) 129.5
Was well annular space grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	
If yes, to what depth (feet)? 122	Depth to Water (feet) 34.1

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

Pump and piping removed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Liner(s) removed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Liner(s) perforated?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Screen removed?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Casing left in place?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Was casing cut off below surface?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Did sealing material rise to surface?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Did material settle after 24 hours?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
If yes, was hole retopped?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
If bentonite chips were used, were they hydrated with water from a known safe source?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Required Method of Placing Sealing Material <input type="checkbox"/> Conductor Pipe-Gravity <input type="checkbox"/> Conductor Pipe-Pumped <input checked="" type="checkbox"/> Screened & Poured (Bentonite Chips) <input type="checkbox"/> Other (Explain): _____	

Sealing Materials <input type="checkbox"/> Neat Cement Grout <input type="checkbox"/> Concrete <input type="checkbox"/> Sand-Cement (Concrete) Grout <input checked="" type="checkbox"/> Bentonite Chips	
For Monitoring Wells and Monitoring Well Boreholes Only: <input checked="" type="checkbox"/> Bentonite Chips <input type="checkbox"/> Bentonite - Cement Grout <input type="checkbox"/> Granular Bentonite <input type="checkbox"/> 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
Surface	139	4.5 bags	

6. Comments

Pumped well dry before filling w/ chips

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing Peter M Chase	License #	Date of Filling & Sealing or Verification (mm/dd/yyyy) 06/03/2021	DNR Use Only	
Street or Route 3817 Mineral Pt Rd	Telephone Number (608) 333 3785	Comments	Date Received	Noted By
City Madison	State WI	ZIP Code 53705	Signature of Person Doing Work P. M. Chase	Date Signed 6/4/21

Document Number	Document Title
-----------------	----------------

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

AMENDMENT TO GROUNDWATER MONITORING STATION EASEMENT

This Easement Amendment ("Amendment") is made as of the 4th day of February, 2022, by and between State of Wisconsin Department of Natural Resources, ("Grantor"), and the U.S. Department of Interior, U.S. Geological Survey and Wisconsin Geological and Natural History Survey – University of Wisconsin - Madison (collectively "Grantee").

RECITALS

- A. The Grantor, entered into a Groundwater Monitoring Station Easement with the Grantee on December 4th, 2019, ("Easement"), recorded with the Milwaukee County Register of Deeds Office as Document Number 10933506, which allowed the Grantee to install a monitoring station on property owned by the Grantor as shown on the attached Exhibit "A".
- B. Installation of the monitoring station in the planned location in Havenwoods State Forest did not produce adequate groundwater monitoring results.
- C. The Grantor and Grantee wish to relocate said groundwater monitoring station to a nearby location.
- D. Grantor and Grantee now desire to amend the Easement as more particularly set forth herein.

AGREEMENT

In consideration of the foregoing, the covenants and agreements hereinafter contained, and other good and valuable consideration, the Grantor and Grantee agree as follows:

1. The legal description on page 1 is hereby deleted in its entirety and replaced with the following and shown on the attached Exhibit "B":

"Part of the SE ¼ of the NE ¼ located in Section 26, Township 8 North, Range 21 East, City of Milwaukee, Milwaukee County, Wisconsin. Monitoring Station location in Havenwoods State Forest being a 50 foot-wide-radius around Latitude: 43.12833 Longitude: - 87.96917."
2. Except as expressly provided herein, all of the remaining terms, provisions and conditions of the Easement shall remain in full force and effect.

DOC # 11218299

RECORDED

02/15/2022 01:22 PM

ISRAEL RAMON

REGISTER OF DEEDS

Milwaukee County, WI

AMOUNT: 30.00

TRANSFER FEE:

FEE EXEMPT #:

***This document has been
electronically recorded and
returned to the submitter.***

Recording Area

Return: Department of Natural Resources
Bureau of Facilities & Lands – LF/6
P.O. Box 7921
Madison, WI 53707-7921
ATTN: Bill Peterson (CE-9834)

Parcel Identification Number (PIN):
1579998117

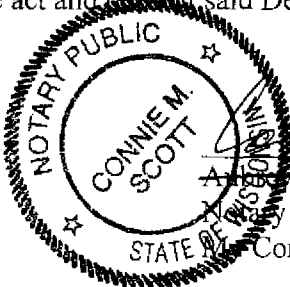
IN WITNESS WHEREOF, the Grantor has caused this instrument to be executed on its behalf this 29th day of November, 2021

State of Wisconsin
Department of Natural Resources
For the Secretary

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

State of Wisconsin)
) ss.
Dane County)

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.

 Connie M. Scott
Notary Public, State of Wisconsin
Commission (expires)(is) 5-3-23

IN WITNESS WHEREOF, U.S. Department of the Interior, U.S. Geological Survey, c/o Hydrologist, 8505 Research Way, Middleton, WI 53562 has agreed to and caused this Amendment to be executed on its behalf this

4 day of February, 2022

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

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

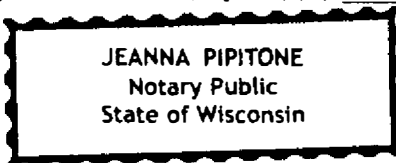
State of Wisconsin)
County of Dane) ss.

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.

Jeanna Pipitone

*
Notary Public, State of Wisconsin
My Commission (expires)(is)

My Commission Expires
September 10, 2024



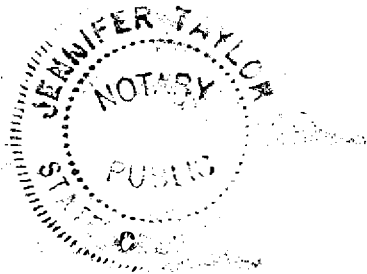
IN WITNESS WHEREOF, Wisconsin Geological and Natural History Survey – UW Madison, c/o hydrologist, 3817 Mineral Point Road, Madison, WI 53705 has agreed to and caused this Amendment to be executed on its behalf this 15 day of NOVEMBER, 2021.

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

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

State of Wisconsin)
County of Dane) ss.

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 Taylor
Notary Public, State of Wisconsin
My Commission ~~(expires)~~ (is) Permanent.

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

Exhibit "A"

- 1 -

DOC # 10933506

RECORDED
12/09/2019 11:09 AM

ISRAEL RAMON
REGISTER OF DEEDS
Milwaukee County, WI

AMOUNT: 30.00

TRANSFER FEE:

FEE EXEMPT #:

This document has been electronically recorded and returned to the submitter.

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 Interior, U.S. Geological Survey and Wisconsin Geological and Natural History Survey - University of Wisconsin - Madison (hereinafter referred collectively as "Grantee").

RECITALS

WHEREAS, the Grantor and Grantee are entering into an agreement to cooperatively collect long-term groundwater level in order to inventory and manage waters of the state, and implement the Great Lake Compact under s. 281.343(4)(a), Wis. Stats.;

WHEREAS, the Grantee has been collecting data since 1946 from an existing well currently located on private property in a nearby subdivision. In order to continue collecting local data, Grantee desires to relocate said well onto Grantor's property;

WHEREAS, the Grantee requests an Easement in order to collect groundwater data by constructing, installing, operating and maintaining, removing and replacing monitoring stations consisting of a monitoring well on Grantor's following described property ("Premises") as shown on the attached Exhibit "A" and more particularly described as:

Part of the SE ¼ of the NE ¼ located in Section 26, Township 8 North, Range 21 East, City of Milwaukee, Milwaukee County, Wisconsin. Monitoring Well location in Havenwoods State Forest being at Latitude: 43.128353 Longitude: -87.969704

WHEREAS, the Grantor is willing to allow the Grantee to access, construct, install, operate, maintain, repair, remove and replace monitoring station(s) and to collect samples from said station(s);

NOW, THEREFORE, the Grantor hereby agrees to convey to the Grantee, its successors and or 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 -

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 drilled wells which shall be constructed in compliance with Ch. NR 141, Wis. Adm. Code along with vehicle and walk in access to the Premises, as is reasonably deemed necessary for 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 successors and or 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 the 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 17 herein at least thirty (30) days prior to the initiation of any 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. Grantor grants to the Grantee the right to enter upon the Grantor's property outside of the Premises for the purpose of gaining access to the Premises in the event direct access to the Premises Area is not practical for the purpose of constructing, installing, operating, maintaining, repairing, removing, replacing and inspecting monitoring station(s).
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. All signage placed by the Grantee for purposes of project activities shall have prior written approval from the Grantor.

- 3 -

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 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 may abandon, remove, fill and/or plug according to federal, state and local regulations, at its own expense and shall properly abandon the monitoring well and restore the Premises to pre-existing conditions prior to installation of the monitoring station. Upon removal and proper abandonment, this Easement shall terminate.
15. The Easement shall automatically terminate upon Grantee's abandonment of the Easement Area and shall automatically revert to and re-vest in the Grantor without reentry upon the abandonment of the use of the same for the purposes for which the Easement was granted 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 Chapter NR 45, Wis. Adm. Code governing the conduct of visitors to state lands and to provide for the protection of the natural resources, and pertinent state laws, when needed to protect the Premises or the general public.
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
101 S. Webster St., Madison, WI 53707-7921
 - b. To the Grantee: U.S. Department of the Interior, U.S. Geological Survey, 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
any Party as above provided may be changed by written notice given by such Party as above
provided.

- 4 -

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.
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

- 5 -

IN WITNESS WHEREOF, the Grantor grants this Easement and has caused this instrument to be executed on its behalf this 4 day December, 2019.

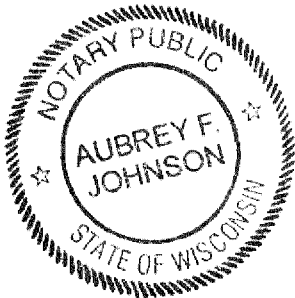
State of Wisconsin
Department of Natural Resources
For the Secretary

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 4 day of December, 2019, the above named Terry H. Bay, Bureau Director, Facilities and Lands, 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
Aubrey F. Johnson
Notary Public, State of Wisconsin
My Commission (expires)(is) 11/10/20



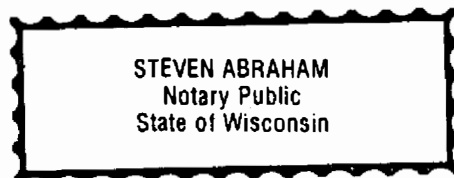
- 6 -

IN WITNESS WHEREOF, the Grantee hereby accepts and consents to the terms and conditions of this Easement this 22 day November, 2019.

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

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

State of Wisconsin)
County of DANE) ss.



Personally came before me this 22 day of Nov., 2019, the above named, Robert Waschbusch, Hydrologist, U.S. Department of Interior, U.S. Geological Survey, to me known to be the person who executed the foregoing instrument and acknowledged that they executed and delivered the same.

Steven Abraham
* STEVEN ABRAHAM
Notary Public, State of Wisconsin
My Commission (expires)(is) 04/01/2022.

- 7 -


IN WITNESS WHEREOF, the Grantee hereby accepts and consents to the terms and conditions of this Easement this 25 day NOVEMBER, 2019.

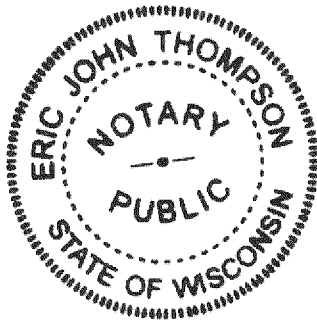
Wisconsin Geological and Natural History Survey,
University of Wisconsin - Madison

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

State of Wisconsin)
County of Dane) ss.

Personally came before me this 25 day of November, 2019, the above named, Dan Langer, Assistant Vice Chancellor/Controller, UW-Madison, to me known to be the person who executed the foregoing instrument and acknowledged that they executed and delivered the same.


Notary Public, State of Wisconsin
My Commission (expires)(is) 01/20/2020.

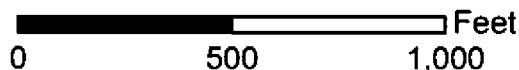
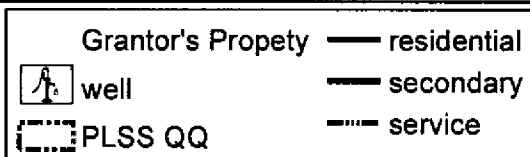
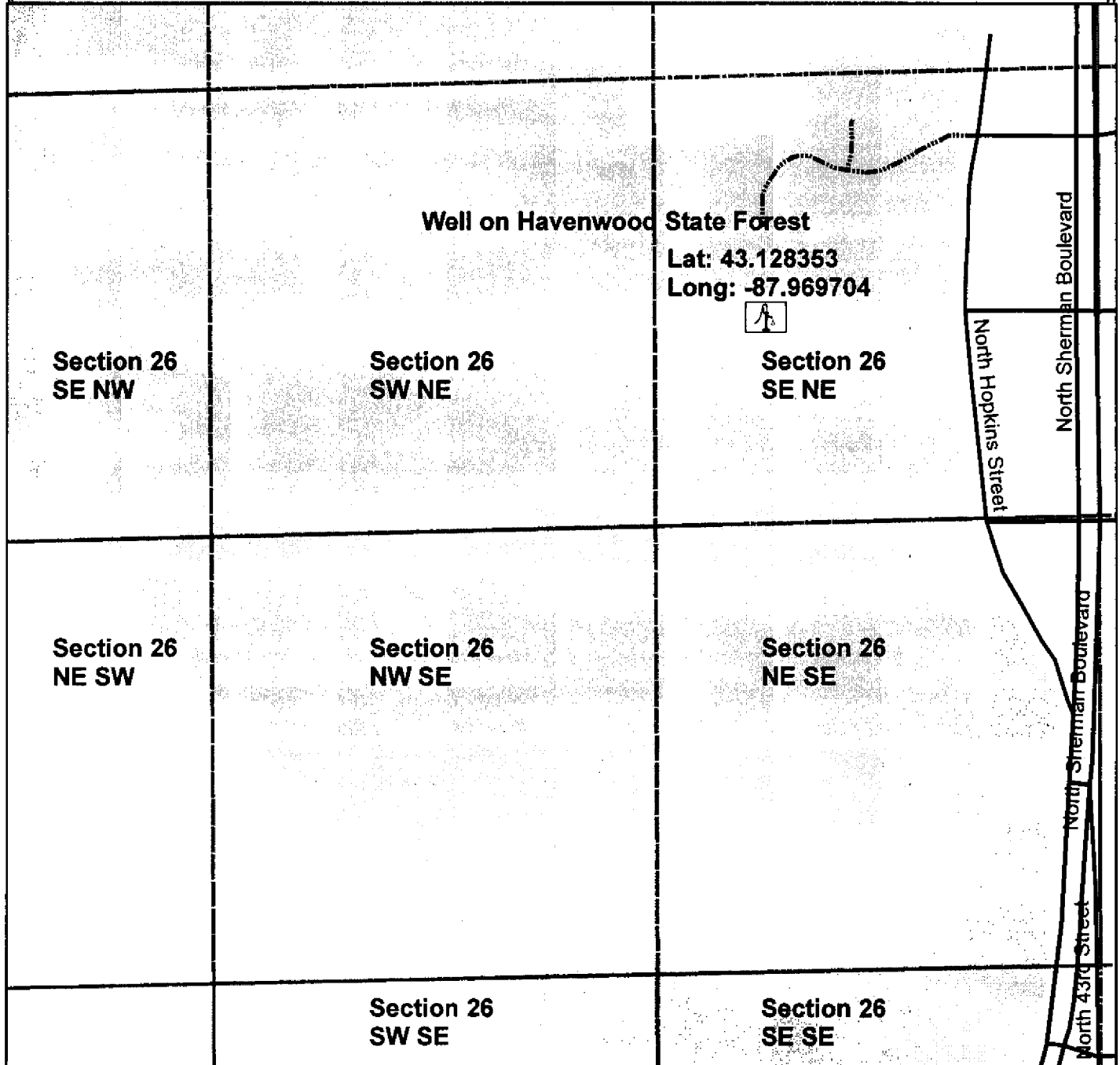


This instrument drafted by:
State of Wisconsin
Department of Natural Resources

Exhibit "A"

T08N, R21E, City of Milwaukee, Milwaukee County

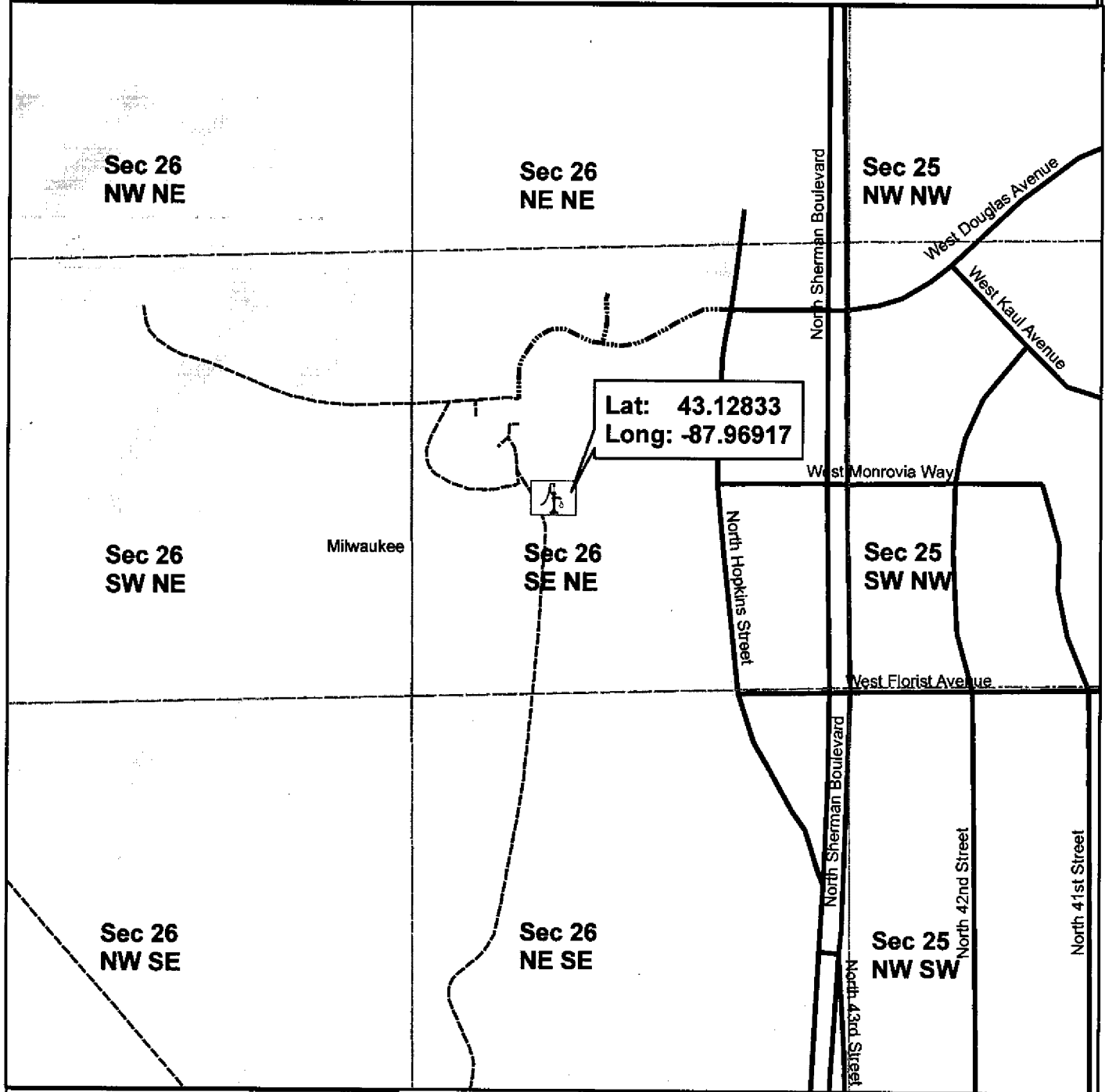
This exhibit is not to scale, and the data set forth hereon has been obtained from various sources and is of varying, age, reliability and resolution. This exhibit is for illustrative purposes only. No warranty, expressed, or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this exhibit. In the event of any conflicts between the Easement to which this exhibit is attached and this exhibit, the Easement shall control.



Real Estate Section
Bureau of Facilities and Lands
October 1, 2019 RLK

Exhibit "B"**T08N, R21E, City of Milwaukee, Milwaukee County**

This exhibit is not to scale, and the data set forth hereon has been obtained from various sources and is of varying, age, reliability and resolution. This exhibit is for illustrative purposes only. No warranty, expressed, or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this exhibit. In the event of any conflicts between the Easement to which this exhibit is attached and this exhibit, the Easement shall control.



- Managed Lands — residential
 Monitoring Well — secondary
 QQ PLSS — service
 — footway

0 500 1,000 Feet

Real Estate Section
 Bureau of Facilities and Lands
 October 20, 2021 RLK



replaces ML-8032, which replaced ML-118

State of Wisconsin
Department of Natural ResourcesRoute 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		Local Grid Location of Well ft. <input type="checkbox"/> N. <input type="checkbox"/> S. <input type="checkbox"/> E. <input type="checkbox"/> W.		Well Name 41008035 (aka ML-8035)	
Facility License, Permit or Monitoring No.		Local Grid Origin <input type="checkbox"/> (estimated: <input type="checkbox"/>) or Well Location <input checked="" type="checkbox"/> Lat. 43° 07' 42.33" Long. 87° 58' 09.52" or		Wis. Unique Well No. <input type="checkbox"/> DNR Well ID No. <input type="checkbox"/>	
Facility ID		St. Plane _____ ft. N, _____ ft. E. S/C/N		Date Well Installed 06 / 03 / 2021 m m d d y y y y	
Type of Well Well Code 11 / mw		Section Location of Waste/Source 1/4 of _____ 1/4 of Sec. _____, T. _____ N, R. _____ <input type="checkbox"/> E <input type="checkbox"/> W		Well Installed By: Name (first, last) and Firm Troy Sam's Well Drilling Inc	
Distance from Waste/Source _____ ft.		Location of Well Relative to Waste/Source u <input type="checkbox"/> Upgradient s <input type="checkbox"/> Sidegradient d <input type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known		Gov. Lot Number _____	
A. Protective pipe, top elevation _____ ft. MSL		B. Well casing, top elevation 706.92 ft. MSL		C. Land surface elevation 704.5 ft. MSL	
D. Surface seal, bottom _____ ft. MSL or _____ ft.				1. Cap and lock? cap and lock on well casing <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
12. USCS classification of soil near screen: GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input type="checkbox"/> SP <input type="checkbox"/> SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/> Bedrock <input checked="" type="checkbox"/>				2. Protective cover pipe: a. Inside diameter: n/a - steel casing & _____ in. b. Length: open borehole _____ ft. c. Material: Steel <input type="checkbox"/> 0 4 Other <input type="checkbox"/> d. Additional protection? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, describe: n/a	
13. Sieve analysis performed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				3. Surface seal: Bentonite <input checked="" type="checkbox"/> 3 0 Concrete <input type="checkbox"/> 0 1 Other <input type="checkbox"/>	
14. Drilling method used: Rotary <input checked="" type="checkbox"/> 5 0 Hollow Stem Auger <input type="checkbox"/> 4 1 dual rotary for upper enlarged drill hole Other <input checked="" type="checkbox"/> air rotary for lower open bedrock hole				4. Material between well casing and protective pipe: Bentonite <input type="checkbox"/> 3 0 Other <input type="checkbox"/>	
15. Drilling fluid used: Water <input type="checkbox"/> 0 2 Air <input checked="" type="checkbox"/> 0 1 Drilling Mud <input type="checkbox"/> 0 3 None <input type="checkbox"/> 9 9				5. Annular space seal: a. Granular/Chipped Bentonite <input type="checkbox"/> 3 3 b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry <input type="checkbox"/> 3 5 c. _____ Lbs/gal mud weight Bentonite slurry <input type="checkbox"/> 3 1 d. _____ % Bentonite Bentonite-cement grout <input checked="" type="checkbox"/> 5 0 e. _____ Ft ³ volume added for any of the above f. How installed: Tremie <input type="checkbox"/> 0 1 Tremie pumped <input type="checkbox"/> 0 2 Gravity <input type="checkbox"/> 0 8	
16. Drilling additives used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				6. Bentonite seal: n/a a. Bentonite granules <input type="checkbox"/> 3 3 b. <input type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite chips <input type="checkbox"/> 3 2 c. _____ Other <input type="checkbox"/>	
Describe _____				7. Fine sand material: Manufacturer, product name & mesh size a. _____ n/a b. Volume added _____ ft ³	
17. Source of water (attach analysis, if required): _____				8. Filter pack material: Manufacturer, product name & mesh size a. _____ n/a b. Volume added _____ ft ³	
E. Bentonite seal, top _____ ft. MSL or _____ ft.				9. Well casing: Flush threaded PVC schedule 40 <input type="checkbox"/> 2 3 Flush threaded PVC schedule 80 <input type="checkbox"/> 2 4 STD, black, pipe, 0.280 wall, P.E., A53B, nexteel Other <input checked="" type="checkbox"/>	
F. Fine sand, top _____ ft. MSL or _____ ft.				10. Screen material: n/a a. Screen type: Factory cut <input type="checkbox"/> 1 1 Continuous slot <input type="checkbox"/> 0 1 Other <input type="checkbox"/>	
G. Filter pack, top _____ ft. MSL or _____ ft.		b. Manufacturer _____			
H. Screen joint, top _____ ft. MSL or _____ ft.		c. Slot size: 0. _____ in.			
I. Well bottom 582.1 ft. MSL or 122.4 ft.		d. Slotted length: _____ ft.			
J. Filter pack, bottom _____ ft. MSL or _____ ft.		11. Backfill material (below filter pack): None <input type="checkbox"/> 1 4 Other <input type="checkbox"/>			
K. Borehole, bottom 582.1 ft. MSL or 122.4 ft.					
L. Borehole, diameter 6 in.					
M. O.D. well casing 6.63 in.					
N. I.D. well casing 6.07 in.					

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

Signature

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.

41008035
ML-8035State of Wisconsin
Department of Natural ResourcesMONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	WI Groundwater-Level Monitoring Network, ML-8032/ML-118 replacement	County Name	Milwaukee	Well Name	41008035 (aka ML-8035)
Facility License, Permit or Monitoring Number		County Code	41	Wis. Unique Well Number	AAK181
				DNR Well ID Number	

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

2. Well development method

- surged with bailer and bailed ☐ 4 1
 surged with bailer and pumped ☐ 6 1
 surged with block and bailed ☐ 4 2
 surged with block and pumped ☐ 6 2
 surged with block, bailed and pumped ☐ 7 0
 compressed air ☐ 2 0
 bailed only ☐ 1 0
 pumped only ☒ 5 1
 pumped slowly ☐ 5 0
 Other ☐

3. Time spent developing well 125 min.4. Depth of well (from top of well casing) 122.35 ft.
below land surface5. Inside diameter of well 6.07 in.6. Volume of water in filter pack and well casing 55 gal.7. Volume of water removed from well ~219.0 gal.8. Volume of water added (if any) 0.00 gal.9. Source of water added N/A10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

17. Additional comments on development:

Before Development After Development

11. Depth to Water (from top of well casing) a. 34.22 ft. 37.01 ft.Date b. 07 / 09 / 2021 07 / 09 / 2021
m m d d y y y y m m d d y y y yTime c. 9 : 30 ☒ a.m. 12 : 05 ☐ a.m.
☐ p.m. ☒ p.m.12. Sediment in well bottom inches inches13. Water clarity Clear ☐ 1 0 Clear ☒ 2 0
Turbid ☒ 1 5 Turbid ☐ 2 5
(Describe) (Describe)pale grey,
low turbidity

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

14. Total suspended mg/l mg/l
solids15. COD mg/l mg/l

16. Well developed by: Name (first, last) and Firm

First Name: Peter Last Name: Chase

Firm: WI Geologic and Natural History Survey

Name and Address of Facility Contact /Owner/Responsible Party

First Last
Name: 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: Print Name: Sarah BremmerFirm: WI Geologic and Natural History Survey

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

41008035
(ML-8035)State of Wisconsin
Department of Natural ResourcesSOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Revelopment ☐ Other ☐

Page ____ of ____

Facility/Project Name			License/Permit/Monitoring Number		Boring Number	
Boring Drilled By: Name of crew chief (first, last) and Firm First Name: Last Name:			Date Drilling Started m m / d d / y y y y		Date Drilling Completed m m / d d / y y y y	
Firm:						
WI Unique Well No. AAK181		DNR Well ID No.		Well Name		
Final Static Water Level 33 Feet MSL		Surface Elevation 704.5 Feet MSL		Borehole Diameter inches		
Local Grid Origin <input type="checkbox"/> (estimated: <input type="checkbox"/>) or Boring Location <input checked="" type="checkbox"/> State Plane N, E			Lat 43° 07 ' 42.33" Long -87° 58 ' 09.52"		Local Grid Location <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	
1/4 of 1/4 of Section , T N, R						
Facility ID		County		County Code		Civil Town/City/ or Village

Sample		Blow Counts	Depth in Feet (Below ground surface)	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	

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

Signature

Firm

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.

41008035

ML-8035

Filled out by driller

(replaces ML-8032/ML-118)

Well Construction Report WISCONSIN UNIQUE WELL NUMBER				AAK181		Drinking Water and Groundwater - DG/5 Department of Natural Resources, Box 7921 Madison WI 53707				Form 3300-077A	
Property Owner WI DEPARTMENT OF NATURAL RESOURCES				Phone # (608)266-0153		1. Well Location				Fire # (if avail.)	
Mailing Address PO BOX 7921						City of MILWAUKEE				6141	
City MADISON				State WI Zip Code 53707		Street Address or Road Name and Number				N HOPKINS STREET	
County Milwaukee		Co. Permit #		Notification # 8243669604		Completed 06-03-2021		Subdivision Name		Lot # Block #	
Well Constructor (Business Name) SAM'S WELL DRILLING INC				Lic. # 370		Latitude / Longitude in Decimal Degree (DD) 43.1285 °N -87.9692 °W				Method Code GPS008	
Address PO BOX 150 N9935 PLEASANT RD RANDOLPH WI 53956				Well Plan Approval #		SE NE Section Township Range				26 8 N 21 E	
Hicap Permanent Well #				Common Well #		Specific Capacity 0.2				2. Well Type New Well	
3. Well serves 1 # of MONITORING				Hicap Well ? No		of previous unique well #				constructed in	
Private, potable				Hicap Property ? No		Reason for replaced or reconstructed well ?					
Heat Exchange ___ # of drillholes				Hicap Potable ? No		Construction Type Drilled					
4. Potential Contamination Sources - ON REVERSE SIDE											
5. Drillhole Dimensions and Construction Method						Geology Codes		8. Geology Type, Caving/Noncaving, Color, Hardness, etc...		From (ft.) To (ft.)	
Dia. (in.)		From (ft.)		To (ft.)		Upper Enlarged Drillhole		Lower Open Bedrock			
6		Surface		120		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)					
6. Casing, Liner, Screen						9. Static Water Level		11. Well Is			
Dia. (in.)		Material, Weight, Specification		From (ft.) To (ft.)		35 ft. below ground surface		24 in. above grade			
		Manufacturer & Method of Assembly				10. Pump Test		Developed ?		Yes	
6		STD, BLK, PIPE, .280 WALL, P.E., A53B, NEXTEEL		Surface 103		Pumping level 100 ft. below surface		Disinfected ?		Yes	
Dia. (in.)		Screen type, material & slot size		From (ft.) To (ft.)		Pumping at 15 GP M for 1 Hrs.		Capped ?		Yes	
						Pumping Method ? Airlift					
7. Grout or Other Sealing Material						12. Notified Owner of need to fill & seal ? No					
Method MOUNDED											
Kind of Sealing Material		From (ft.) To (ft.)		# Sacks Cement		Filled & Sealed Well(s) as needed? No					
NEAT CEMENT GROUT		Surface									
13. Constructor / Supervisory Driller						Lic #		Date Signed			
JVG						6026		06-11-2021			
Drill Rig Operator						Lic or Reg #		Date Signed			
TS						8981		06-03-2021			

4a. Potential Contamination Sources

Is the well located in floodplain ? No

Comment:

Water Quality Text:

Water Quantity Text:


Difficulty Text:

Created On: 06-11-2021

Created by: swdlabs

Updated On: 06-11-2021

Updated by: swdlabs



Wisconsin Geological
and Natural History Survey

DIVISION OF EXTENSION

UNIVERSITY OF WISCONSIN-MADISON

BOREHOLE GEOPHYSICAL LOG

WGNHS ID

41008035

SITE NAME

USGS ML-08/21E/26-8035

WUWN

AAK181

COUNTY

Milwaukee

DATE

7/12/21

LOGGED BY

PMChase

LATITUDE

43.128425

LOCATION

750ft. SW of N. Hopkins @ W. Douglas Ave. Milwaukee, WI

LONGITUDE

-87.969311

LOC METHOD

GPS, survey grade

LOC CONF

0.3m/1ft

ELEVATION

704.5

WELL DEPTH

124.8

CASING DEPTH

102.7

ELEV. METHOD

USGS GPS NAVD88

DEPTH TO WATER

34.6

CASING STICK UP

2.42

Comments:

Unless noted, (1) all datum are in feet; (2) casing depth is interpreted from geophysical logs; (3) well depth incorporates 7/15/21 USGS tape-down; (4) water depth is reported from WGNHS on dayof logging; (5) datum is top of casing at 706.92 ft., NAV88; (6) Elevation is USGS land surface datum (lsd); (7) stick up is feet of casing above lsd

LOGS COLLECTED:

☒ Gamma

☒ Self Potential

☒ Fluid Conductivity

☒ Optical Borehole Imager

☒ Caliper

☐ Normal Resistivity

☐ Flow Meter- HeatPulse

☐ Acoustic Borehole Imager

☒ Single Point Resistivity

☒ Fluid Temperature

☐ Flow Meter- Spinner

☐ OTHER

(up is negative; down is positive)

For more information or to obtain collected data not shown, please contact:

data@wgnhs.wisc.edu

File Created on:

11/11/2021

By:

AMB

Header file: WGNHSGeoPhysHeader6_2021_NGWMN.wcf

Depth

1ft:200ft

0

200

Gamma

cps

SP

-250

0

mV

SPR

400

800

Ohms

Well Construction

Image-NM

0°

90°

180°

270°

0°

6

Caliper

in

6

7

Temperature#2

11

13

deg C

FCond 25°C

200

800

uS/cm

-0

10

20

30

40

50

60

70

80

90

100

110

120

Gamma

SP

SPR

Ohms

mV

SP

cps

Well Construction

Image-NM

0°

90°

180°

270°

0°

6

Caliper

in

6

7

Temperature#2

11

13

deg C

FCond 25°C

200

800

uS/cm

Appendix 11: Well ML-148 documents

Historical Documents

Appendix E cover sheet from Guenther and others (2017)

many historical records for ML-148 can be found in WGNHS Open-File Report 2017-04, appendix E (Guenther and others, 2017)*

WGNHS geophysical log, 2010, 1 page

self potential, single point resistivity

datum is assumed to be land surface in 2010

**archives search for this report turned up a 2010 geophysical log unpublished in Guenther and others (2017)*

WGNHS geophysical log, 2017, 1 page

gamma, self potential, single point resistivity, fluid temperature, fluid conductivity, caliper

datum is assumed to be land surface in 2017

**the geophysical log published in Guenther and others (2017), had incorrect header information. A corrected version is included with this report*

Documentation of work done for this report:

Right of Entry, 2019, 7 pages

includes a Scope of Work attachment

WGNHS geophysical log, 2020, 1 page

gamma, self potential, single point resistivity, fluid temperature, caliper

datum is land surface in 2020

APPENDIX E OF REFERENCE DOCUMENTS ML-148

Rehab in Photos March, 2017

This is a photo document showing our rehabilitation of the well access

Milwaukee County Parks Right of Entry Permit January, 2017

This the permit for working in the Boerner Botanical Gardens

Original USGS Well Schedule 1946

USGS Well Schedule contains some well construction information and hand-drawn location, includes black-and-white aerial photos

USGS Basic Data and Map 1981

USGS personnel went through in 1980 to combine observation well records

° — '8 ' ‡ 'O **1946-1998**

ML-94 Geological Log 1938

Included for reference due to proximity

ML-148 Geophysical log 2017

Gamma log, Caliper, Single Point Resistivity, Self Potential, Temperature, Fluid Conductivity

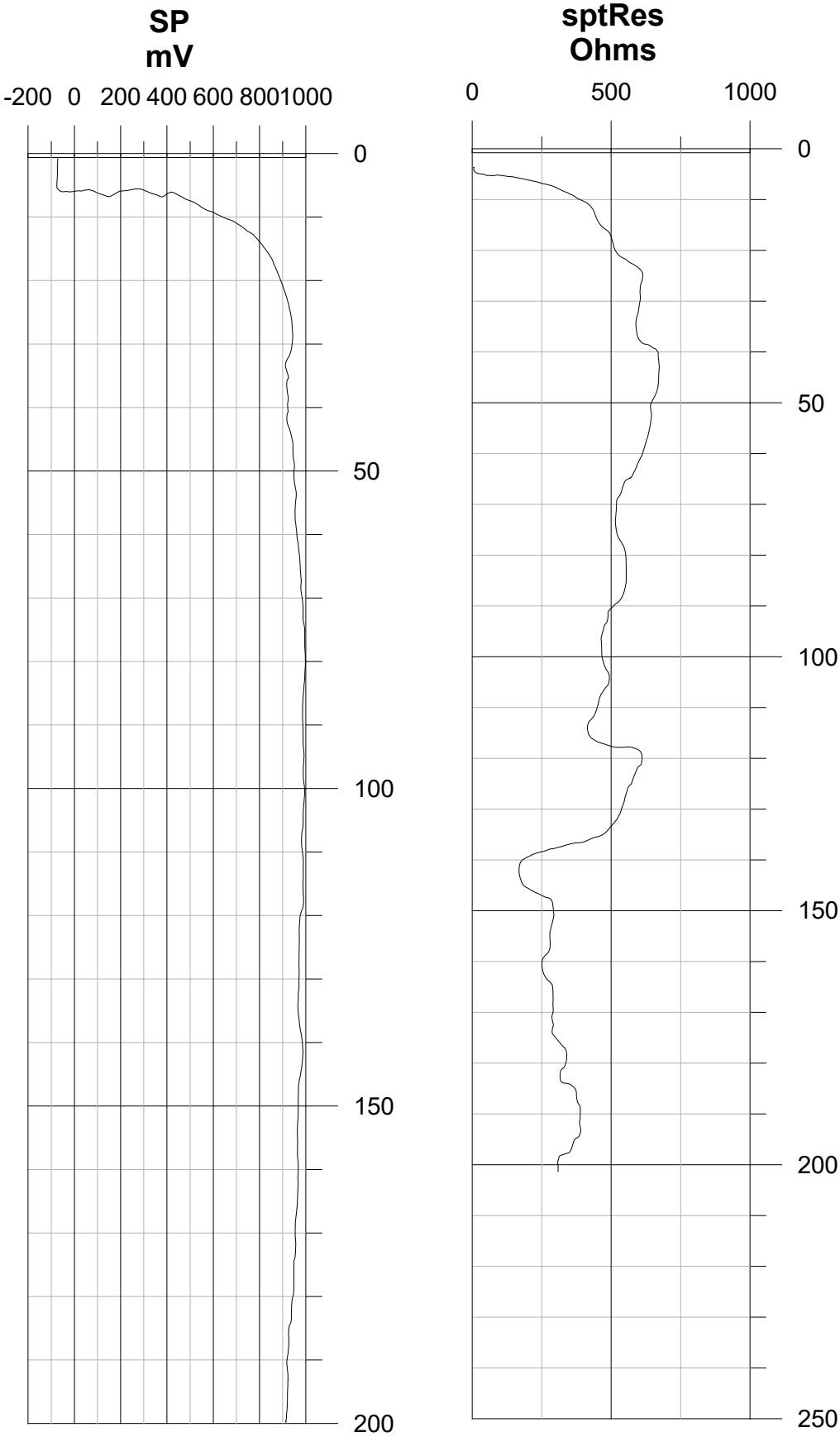
Wisconsin Geological and Natural History Survey
Geophysical Log

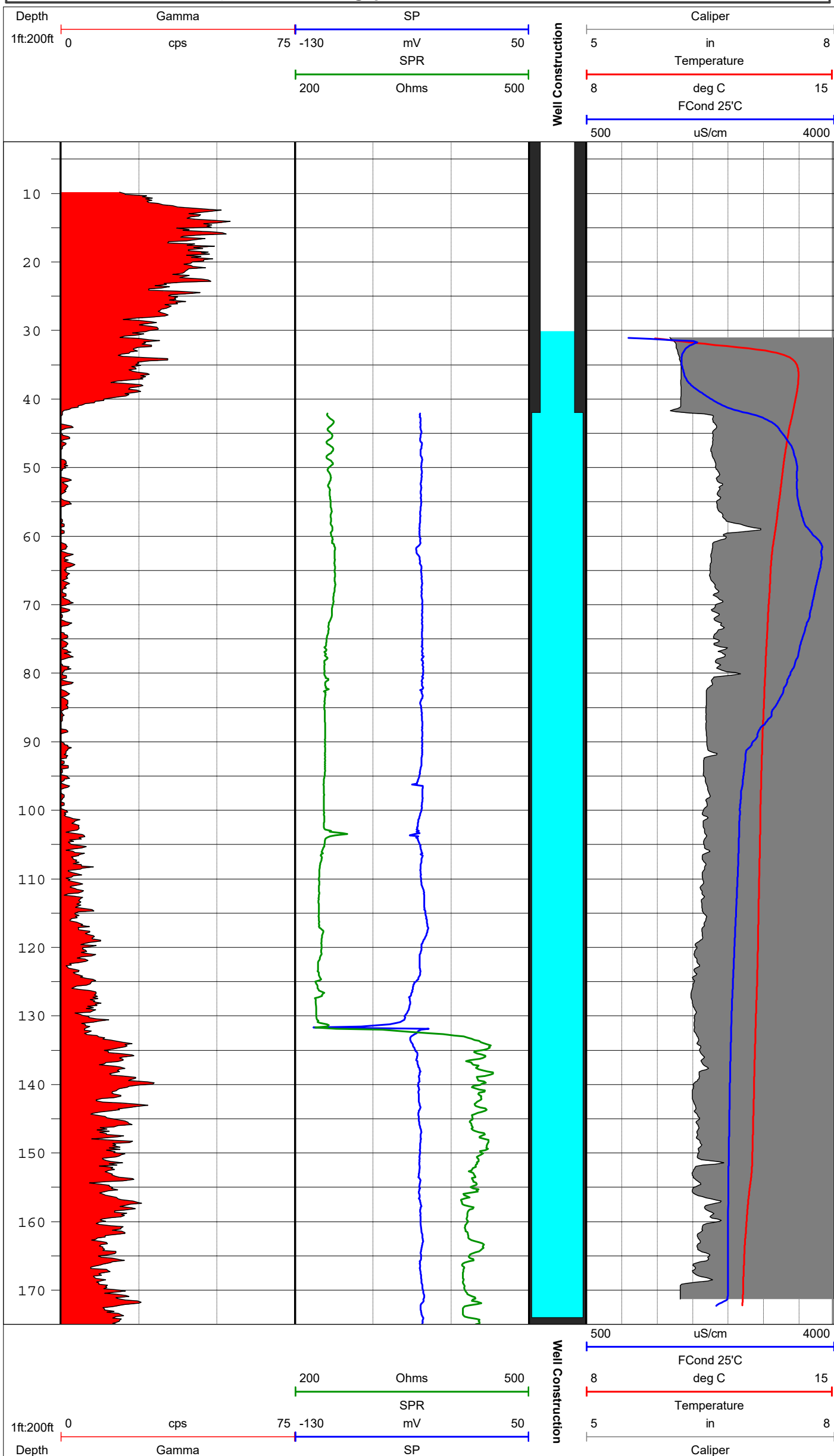
File: 410148a.grf

Total Depth: 179 ft
Casing: 44 ft
Depth to Water: 31 ft
Elevation: 775 ft

Well: ML-148
Whitnall Park Well

T6N, R21E, section 32, NE1/4, NE1/4, SE1/4







Milwaukee County Parks

9480 Watertown Plank Rd
Wauwatosa, WI 53226

Right of Entry Permit

Permit Number # 2681

Permit Fee waived

Restoration Bond Amount _____

Date: 04/22/19

Expiration Date of Permit: 12/31/19

Permittee: Wisconsin Geological and Natural History Survey

Contractor: _____

Contact: Michael Parsen

Contact: _____

Address: 3817 Mineral Point Rd. Madison, WI 53705

Address: _____

Phone: (608) 262-9419 (direct) (608) 228-3048 (cell)

Phone: _____

E-Mail: mike.parsen@wisc.edu

E-Mail: _____

To Enter: Whitnall Park

Location of Cross Streets: service yard located at 5870 South 92nd St

Purpose: To enter Whitnall Park service yard area to perform maintenance on existing monitoring well, WGNHS Well Number: 41000148 (aka: Milwaukee County – 148, ML-148), as described in the attached documents. WGNHS to provide contractor name and contact info once it is known.

Prior to performing work on well, contractor shall notify permit contact listed under item #14 of this permit to coordinate access and staging with Whitnall Park Unit Coordinator and staff. Coordination also needs to occur with site personnel to manage the evacuation of water and sediment that may be pushed to the surface during the redevelopment process. Upon completion of well maintenance and repair the site is to be restored to pre-project condition. WGNHS staff will ensure the subcontractor adequately completes the site restoration which shall include removal of all sediment/debris, patching of asphalt and turf restoration as required. Contractor shall follow all state regulations governing this work.

Conditions:

This Right-of-Entry Permit ("ROE") is issued by the Milwaukee County Department of Parks, Recreation and Culture (the "County") with the express condition that all work by Permittee be performed and completed according to submitted plans, specifications, information and all of the terms and conditions stated herein. Permittee, its agents and contractors agree to comply with all of the following conditions and requirements:

1. Permittee shall furnish to County any and all drawings, details and specifications as appropriate to identify the land to be entered, proposed access routes, proposed vegetation pruning or removal, the location and construction methods for any proposed work, and complete site restoration plan.
2. Permittee shall provide liability protection for its officers, employees and agents while acting within the scope of their employment. Permittee further agrees to indemnify and hold harmless the County for any and all liability, including claims, demands, losses, costs, or damages to persons or property arising out of, or in connection with, or occurring in connection with this permit, where such liability is founded upon or grow of out acts or omissions of any of Permittee's officers, employees or agents while acting within the scope of their employment, where protection is afforded by §§ 893.82 and 895.46(1), Wis. Stats.



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3. To the extent legally applicable, Permittee shall comply with all federal, state, and local environmental laws and regulations in performing work related to this ROE. Except as required in the ordinary course of its business, the Permittee shall not permit or conduct either the generation, treatment, storage, or disposal of any hazardous substance on County owned property included in the ROE and surrounding areas of the Project Area, to the extent permitted by law, will perform all remedial actions reasonably necessary as a result of its own acts which result in the presence of any hazardous substances on, at, or near, the County owned property included in the ROE and surrounding areas of the Project Area, as a result of an act or omission of the Permittee. The foregoing covenants shall survive termination of this permit. Permittee agrees to provide the other party with any notice of an environmental claim made by third parties or any governmental entity related to the Leased Premises or Facility immediately after of receipt of any such claim.

“Hazardous Materials” as the term is used herein shall mean any substance: (i) the presence of which requires investigation or remediation under any federal, state or local statute, regulation, ordinance, order, action, or policy; or (ii) which is or becomes defined as a “hazardous waste” or “hazardous substance” under any federal, state, or local statute, regulation, ordinance, or amendments thereto, including without limitation, the Comprehensive Environmental Response, Compensation and Liability Act (42 U.S.C. §9601 et seq.), or the Resource Conservation and Recovery Act (42 U.S.C. §6901, et seq.); or (iii) which is toxic, explosive, corrosive, flammable, infectious, radioactive, carcinogenic, mutagenic, or

otherwise hazardous and is or becomes regulated by any governmental authority, agency, department, commission, board, agency or instrumentality of the United States, the State of Wisconsin, or any political subdivision thereof; or (iv) the presence of which on lands within the Project Area causes or threatens to cause a nuisance upon the Project Area or surrounding area or poses or threatens to pose a hazard to the Project Area or surrounding areas or to the health or safety of persons on or about the Project Area; or (v) which contains gasoline, diesel fuel, or other petroleum hydrocarbons; or (vi) which contains polychlorinated biphenyls (PCBs), asbestos, or urea formaldehyde foam insulation.

“Environmental Regulations” means all applicable past, present, and future statutes, regulations, rules, ordinances, codes, licenses, permits, orders, approvals, plans, authorizations, concessions, franchises, and similar items of all governmental agencies, departments, commissions, boards, bureaus, or instrumentalities of the United States, the State of Wisconsin, and political subdivisions thereof and all applicable judicial and administrative and regulatory decrees, judgments, and orders related to the protection of human health or the environment, including, without limitation: (i) all requirements, including, but not limited to, those pertaining to reporting, licensing, permitting, investigation and remediation of emissions, discharges, releases or threatened releases of Hazardous Materials, chemicals, substances, pollutants, contaminants, or hazardous or toxic substances, materials, or wastes, whether solid, liquid, or gaseous in nature, and (ii) all requirements pertaining to the protection of the health and safety of employees or the public.

4. Permittee shall pay all costs associated with this ROE, including the costs related to obtaining any required permits or approvals required by any other government agencies or adjacent landowners, utilities or easement holders impacted by this work. Existing County owned utilities shall be located and identified by hot-lining prior to the start of proposed work, and properly protected, repaired or replaced if damaged during the work covered under this ROE.
5. Permittee or its agents shall comply with any and all laws, requirements, approvals, and obtain any licenses or permits, required by local municipalities or other regulatory agencies.
6. Permittee shall protect and avoid damage to any part of the Project Area and surrounding areas to ensure the safety of Permittee’s or its agent’s personnel, County staff and all park users. Permittee shall also provide and install all safety devices, barricades, signs, flag person(s) or other measures as needed to comply. Permittee shall conduct reasonable and appropriate restoration work to correct any rutting, re-seed disturbed areas, prevent the spread of invasive species, repair any damage to trails, and take the necessary steps to safely work in any environmentally sensitive areas. Permittee shall “decontaminate” their equipment before arriving and/or leaving a project area in order to prevent the spread of invasive species.”
7. Permittee shall protect existing trees, shrubs, sensitive wildlife habitat, delineated wetlands and wetland plants, and other vegetation located at or near the Project Area and surrounding areas of the construction site that this ROE grants access to.



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8. Roadways, parking lots, bicycle/recreation trails, sidewalks, and other County owned property located at or near the Project Area that this ROE grants Permittee access to must be kept clean and free of soil, rock, stone, and debris at all times. No materials or equipment may be placed, stockpiled, or stored on County owned property that is not included in this ROE. County owned and operated roadways, parking lots, bicycle/recreation trails, and sidewalks shall not be obstructed or closed without written permission from County.
9. Construction or work related vehicles and equipment shall not be operated upon County owned roadways, parking lots, bicycle/recreation trails, sidewalks, or surrounding areas of the Project Area not included in this ROE without prior written permission from County.
10. Upon completion of all work Permittee shall restore any and all damage to County owned property included in the ROE and surrounding areas of the Project Area caused by Permittee or its agents. Required repairs or restoration shall be made to a preconstruction condition, or better, at no expense to County and to the County's satisfaction.
11. In the event of an abandonment or non-use of any structures, improvements or facilities on County owned property allowed by this ROE, or if the County requires the relocation or removal of any structures, improvements or facilities, Permittee shall, within sixty (60) days after notification by County, remove or relocate them as directed at no cost to the County.
12. Permittee is required to contact **Diggers Hotline (1-800-242-8511)** regarding potential utilities located within the Project Area allowed by this ROE a minimum of five (5) business days before commencing work.
13. Permittee is required to contact **Blake Prusak, Parks Mechanical Services Manager, at phone number (414) 258-2322,** regarding potential County utilities located within the Project Area allowed by this ROE a minimum of five (5) business days before commencing work.
14. Permittee is required to contact, **Brad Drefcinski at 414-257-4772 OR Bradford.Drefcinski@milwaukeecountywi.gov** to schedule a site inspection before the start of any work to approve construction locations, access routes or any required tree or shrub pruning/removal within the area of construction allowed by this ROE a minimum of five (5) business days before commencing work, and upon completion to approve final restoration of the site.**Also please note if listed please contact the Natural Areas Coordinator below for a site review if the project area is located in one of the Park System's natural areas or agricultural fields. N/A
15. Permittee is required to contact the **Regional Manager** listed below a minimum of five (5) business days before commencing work to provide the anticipated start date and to receive any additional specific instructions. Permittee is also required to contact the **Regional Manager** upon completion to approve final restoration of the site.

South Mike Wrench: 414-257-8092 OR Michael.Wrench@milwaukeecountywi.gov

Authorized Parks Department Representative:

Guy Smith

Date: 4/23/2019

Permittee Approval and Acceptance of Conditions:

Margaret Erickson

Date: 4/26/2019

Approval upon satisfactory completion of all work:

Date: _____



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WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

3817 Mineral Point Road
Madison, WI 53705-5100
Tel • 608.262.1705
Fax • 608.262.8086
Wisconsin Relay • 711
WisconsinGeologicalSurvey.org

KENNETH R. BRADBURY
DIRECTOR AND STATE GEOLOGIST

March 18, 2019

Sarah Toomsen
Manager of Planning & Development
Milwaukee County Parks Dept.
(414) 257-7389
sarah.toomsen@milwaukeecountywi.gov

Re: Whitnall Park, Milwaukee, WI well repair

The Wisconsin Geological & Natural History Survey (WGNHS) is requesting access to Whitnall Park for the purposes of properly performing maintenance to existing monitoring well 41000148.

Names for this well include:

- WGNHS Well Number: 41000148 (aka: Milwaukee County – 148, ML-148)
- USGS Site Number: 425613088014301
- USGS Site Name: ML-06/21E/32-0148

This well was drilled in 1933 to a total depth of 180 ft-bls with a 6-inch diameter casing that extends to 43 ft-bls. The well has been monitored since 1946. Previous maintenance by the WGNHS occurred in 2016-2017 as part of a grant issued by the U.S. Geological Survey's (USGS) National Ground Water Monitoring Network (NGWMN) program. This work was documented in WGNHS Open-File Report 2017-05 (<https://wgnhs.uwex.edu/pubs/wofr201704/>) and included reconstruction of the well head and well evaluation including a video log and slug testing. This evaluation also documented upwards of 6.5 feet of accumulated sediment at the base of the well. Based on this prior evaluation, the recommended maintenance needs for this well include redevelopment of the bottom section of the well followed by a full well characterization including borehole video and geophysical logs and a slug test to ensure proper well-aquifer connectivity.

Due to the condition of the well, the WGNHS was granted funding by the USGS National Groundwater Monitoring Network in 2018 to perform repairs to this well during 2019. This letter provides more background about the monitoring well and outlines the main work components involved.

Background

This well was drilled in 1933 to a total depth of 180 feet into the Silurian-Devonian aquifer system and has been recording water-level data since 1946. Prior to the 2016-2017 investigation by the WGNHS,

the well was recorded to have a 5-inch diameter casing and casing depth of 46 ft-bls. The most recent investigation to rehabilitate the well showed that the well is in fact a 6-inch diameter casing that extends to 43 ft-bls. A representative geologic log for neighboring well ML-94, as well as a geophysical log for ML-148, and other well information is included in the WGNHS WOFR 2017-04 referenced above.

The Wisconsin Groundwater-Level Monitoring Network has been jointly operated since 1946 by the WGNHS and the U.S. Geological Survey (USGS), in close coordination with the Wisconsin Department of Natural Resources (WDNR). The WGNHS provides a general overview of the monitoring network (<http://wgnhs.uwex.edu/water-environment/groundwater-monitoring-network/>), while the USGS maintains an interactive portal for viewing and downloading water-level data in Wisconsin (<http://groundwaterwatch.usgs.gov/statemap.asp?sc=55&sa=WI>). Access to the full USGS national groundwater-level network is available here: <http://groundwaterwatch.usgs.gov/>

The monitoring provides a consistent, long-term record of fluctuations in groundwater levels across the state. 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.

In southeastern Wisconsin, water-level data from this monitoring network was used to study and calibrate the regional groundwater flow model developed for the Southeast Wisconsin Regional Planning Commission (SEWRPC). A copy of that report on the SEWRPC website is here: http://www.sewrpc.org/SEWRPCFiles/Publications/TechRep/tr-041_aquifer_simulation_model.pdf

Work plan

The WGNHS will submit the access plan approved by the Milwaukee Parks Staff to the contractor to initiate work. This is the Whitnall Park service yard located at 5870 South 92nd Street Hales Corners WI.

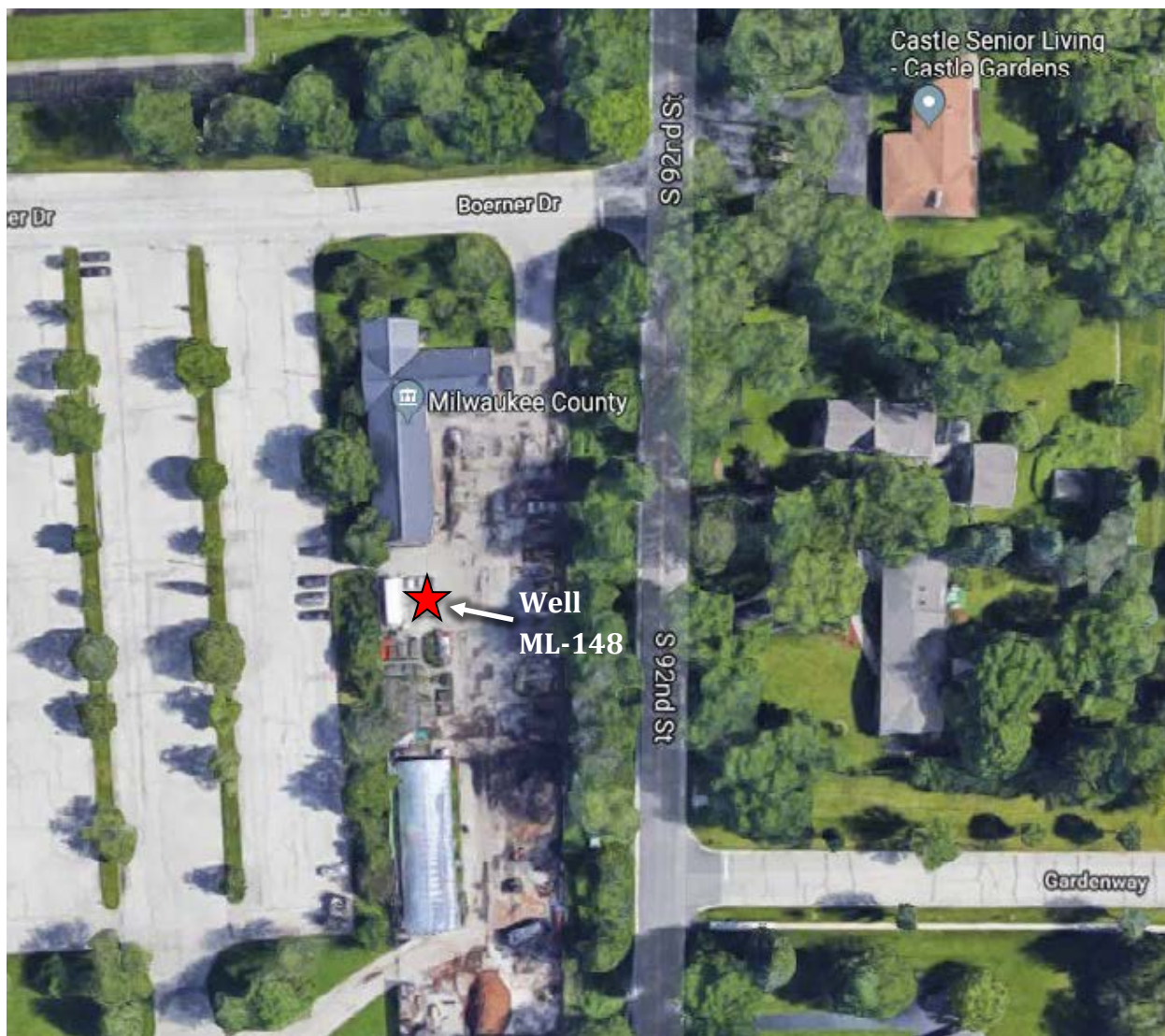
Once the contractor checks and approves the proposed access location, the well will be redeveloped.

Well maintenance procedures will ultimately depend on the subcontractor selected from the bidding process, but all state regulations will be adhered to. A common way to remove accumulated sediment is via an air pump that has a tube with a 180 degree turn on the end that is put at the bottom of the well, forcing sediment upward.

Following redevelopment of the well, a slug/pump testing would be performed to ensure the well is in hydraulic connection to the surrounding aquifer.

Location and Access

The well is located in the parking lot next to the park service garage off of S 92nd Street (42.936835, -88.028989).



Site Map showing location of the well ML-148 in the Whitnall Park service lot.

Schedule

If approved, the WGNHS would like to conduct field work between May 1 and December 31, 2019.

Data and Data Sharing

The water-level in the monitoring well is anticipated to be measured monthly. The well will be periodically tested to ensure good hydraulic communication with the surrounding aquifer and that sediment is not accumulating in the bottom of the well. All data collected will be made publicly available on the USGS' interactive portal for viewing and downloading water-level data in Wisconsin (<http://groundwaterwatch.usgs.gov/statemap.asp?sc=55&sa=WI>).

Equipment

Redevelopment entails putting a flexible tubing with a 180 degree turn at the end, to the bottom of the well. Air is then pumped into the tube, using an air compressor hooked up to a truck, which creates pressure forcing water and sediment to overflow the casing at the surface. This is typically performed

March 18, 2019

by a drilling company which would mobilize a rig to the site to inject air and run tubing into the well. Coordination needs to occur with site personnel to manage the evacuation of water during the redevelopment process as the air pushes water and any sediment deposited at the bottom of the well to the land surface.

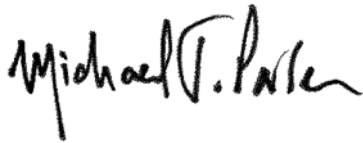
Personnel

A competitive bidding process will be used to select a subcontractor to perform the scope of work outlined above (redevelopment). Information on the winning bidder will be provided to Milwaukee County Parks once finalized. At least one staff member from WGNHS will be present at all times on site to oversee work done by the subcontractor. Staff from Milwaukee County are welcome to be present on site during the work and encouraged to visit at any time to check on progress.

Site Restoration

The site will be restored to previous site conditions which will be clearly indicated in the bid request and WGNHS staff will ensure the subcontractor adequately completes the site restoration. This will include removal of all sediment/debris and the replanting of any damaged grass. Milwaukee County is encouraged to inform the WGNHS of any additional restrictions or considerations to include in the bid request.

Sincerely,

A handwritten signature in black ink that reads "Michael T. Parsen". The signature is written in a cursive, flowing style.

Michael Parsen
Wisconsin Geological and Natural History Survey
3817 Mineral Point Rd.
Madison, WI 53705
(608) 262-1705
mike.parsen@wisc.edu

Appendix 12: Well MN-28 documents

Historical Documents

Appendix D cover sheet from Guenther and others (2017)

historical records for MN-28 can be found in WGNHS Open-File Report 2017-04, appendix D (Guenther and others, 2017)

Documentation of work done for this report

WGNHS geophysical log, 2018, 1 page

gamma, optical borehole image, fluid temperature, fluid conductivity, caliper

datum is top of casing (1.24 ft above land surface in 2018)

APPENDIX D OF REFERENCE DOCUMENTS MN-28

USGS Basic Data and Map 1980

USGS personnel went through in 1980 to combine observation well records

Well Construction Report (WCR) to State Board of Health 1959

WCR to Wisconsin State Board of Health

USGS Well Schedules 1972

USGS Well Schedule contains some well construction information and hand-drawn location

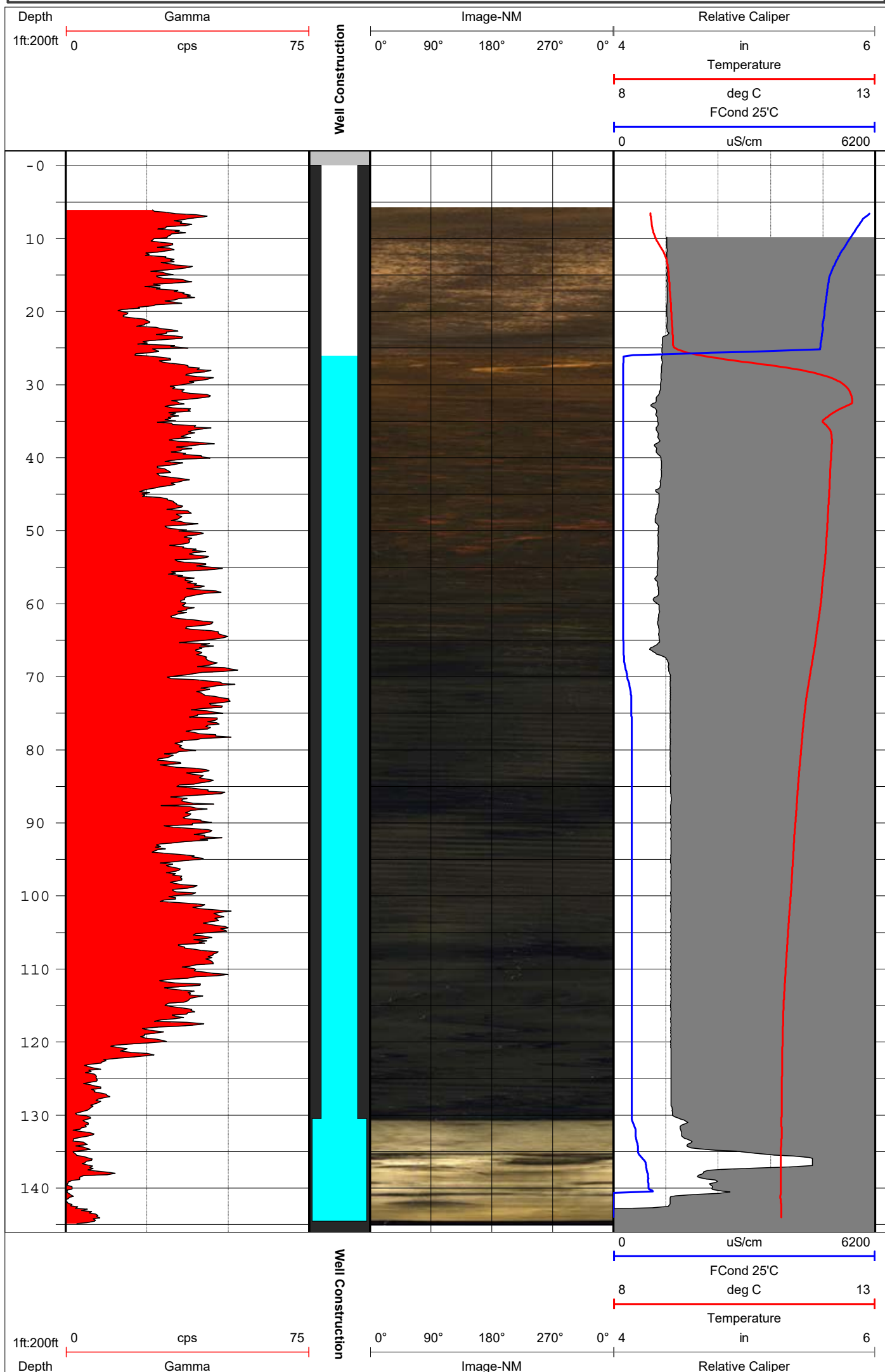
USGS Site Schedule 1976

USGS meta-data similar to Well Schedule

Alex Zaporozec Graphs of Water Levels 1991-1999

MN-28 Geologic Log 1959

MN-28 record of geology



Appendix 13: Well MO-02 documents

Historical Documents

Basic well information, 1980; well evaluation, 1980; well location map; USGS water-level data, 1986; hydrograph, 1934-1998, 12 pages
well information historically compiled by WGNHS

USGS well schedules, 1934 and 1946, 1 page
only the first page for each of these 2-page well schedules are legible and have been included in this appendix

USGS well schedule, 1967, 1 page

Geophysical, hydrological, and well construction information from Dunning and others (1996), 1 page

hydrograph (1955 - 1995), slug test, horizontal hydraulic conductivity, geophysical logs, and well measurements from unpublished report to DNR (DNR project number 118) by Dunning and others, (1996)

datum is top of casing, approximately 0.50 ft above land surface in 1996, data courtesy of U.S. Geological Survey

Appendix 13: Well MO-02 documents, basic well information, 1980

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number Mo 2
 Owner ~~Joseph Harrison~~ → new owner:
 Location (Co., T/R.sec) Monroe Co., T15N, R4W, Sec. 34 - NE/SE/SE 1/4
2 mi. W. of Cashton
 Land surface altitude 1125'
 Drainage basin Mississippi R.; Coon Cr. - East Branch; Bullard Coulee: unnamed tributary
 distance to the nearest perennial stream: (100 ft)

WELL DATA

Depth 44.1 ft.
 Casing depth unknown
 Screened interval unknown
 Diameter 5 in
 Aquifers open to well Cambrian (? Jordan s.s.)
 Geologic log available? no
 Construction report available? no (yes)
 Use of well unused
 Access to measure well poor - exp. difficult in winter

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Cashton - 2 mi E
Weston - 3 mi S
Oxtarid - 13 mi E
 Streamgaging stations 05408000 Kickapoo River at Le Forge 14 mi SE (not in basin)
 Observation wells Mo 10 - 7 mi NE
Ve 71 - 9 mi SSW
Ve 41 - 11 mi SSW
 Other

EXISTING RECORD

Measuring point Top of casing, .50 ft. above Lsd.
 Measuring equipment Tape
 Frequency of measurement monthly from 03/11/40 (weekly 07/07/34 - 10/12/39; no record 10/13/39 - 03/10/40)
 Period of record -- 1934 - present
 Started July 7, 1934
 Ended
 Volume of missing record 14.7% overall (1940-71: 5%; 1972-80: 50% !; esp. poor 1978-80: 65% !!!)
No record: 12/02/39 - 03/10/40; 08/03/41 - 01/06/42; 09/28/67 - 01/11/68; 12/18/68 - 04/16/69; 04/26/73 - 10/06/73;
05/20/74 - 09/06/74; 11/21/77 - 04/08/78; 10/15/78 - 04/27/79; 10/29/79 - 05/28/80.

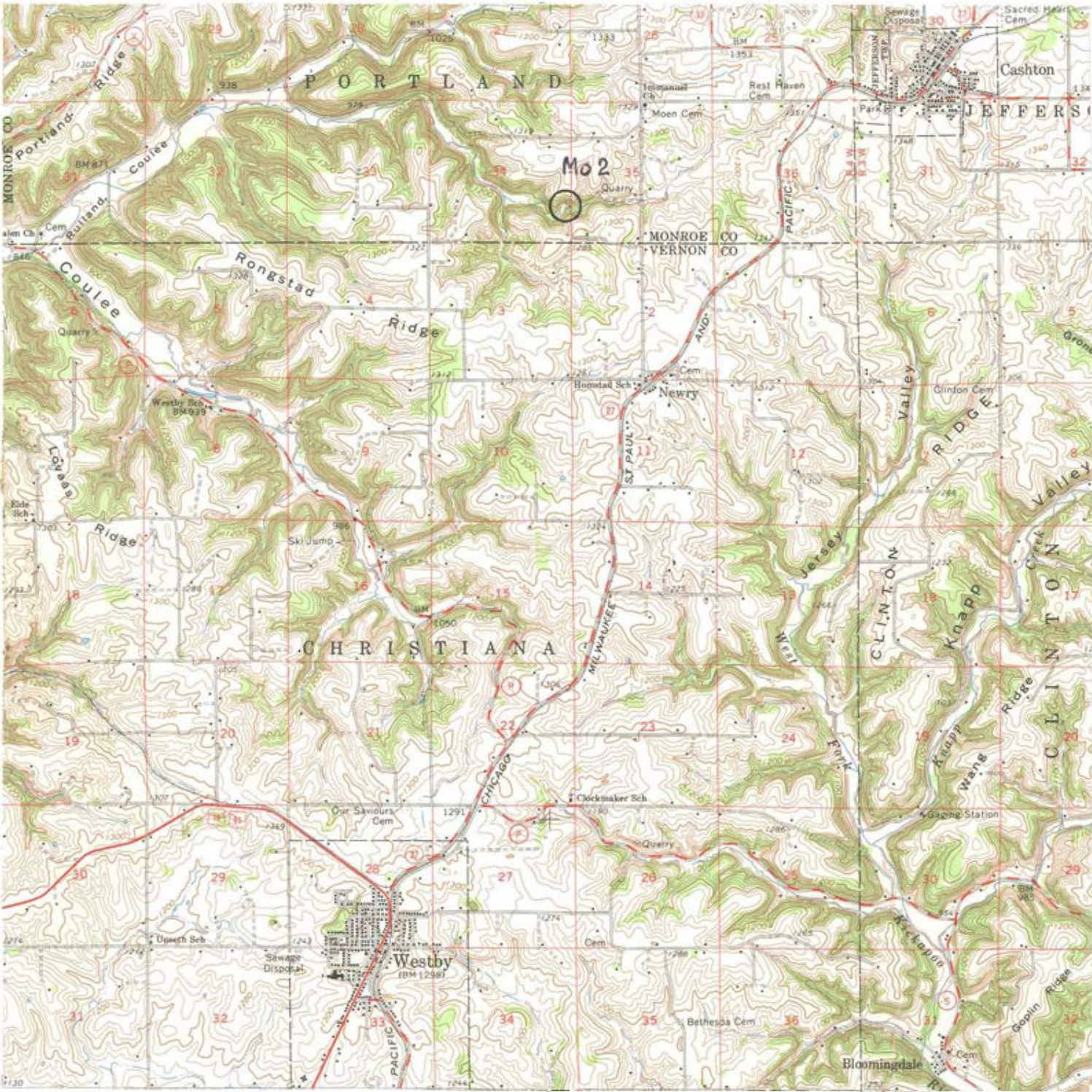
Recorded by G. J. Lawrence on 11/7/80

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

1. Areal spacing -- distance from any observation well
-- distance from observation well in same aquifer 7 mi
9 mi
2. Ownership: private -- public
3. Use of well unused - observation
4. Access -- physical poor
-- owner's permission
5. Condition of well -- casing
-- housing
6. Geologic log: yes -- no
7. Construction report: yes -- no
Well completion date: ~ 1895
8. Diameter (4 in. minimum for recorder) 5"
9. Aquifer: single -- multiple unknown
10. Good hydraulic connection with aquifer yes
11. Knowledge of pumping effect no
12. Range and character of w.l. fluctuations 15 ft (4-19), large seasonal & long-term
13. Length of record 46 years
14. Missing record Very poor since 1978! - only 4 measurements a year
15. Adequacy of current measuring frequency monthly O.K.
16. Probability of permanence Good
17. Recommendations/Improvements
 - needs improvement of record !!
 - retain as one of the oldest wells (potential key well)
 - install a recorder

Evaluated by Dr. J. J. J. J. on 11/21/80

Appendix 13: Well MO-02 documents, well location map



WRD/Mad-29

MO-0002 (1986)

Site Ident. No. 434342090495601

U.S. DEPT. OF INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISIONHIGHEST WATER LEVEL 4.66 Mar. 19, 86
4.70 Apr. 10, 1976

LOWEST WATER LEVEL 18.23 Mar. 27, 1959

RECORDS AVAILABLE 1934--86

R = 234 * T = A *

WATER LEVELS IN OBSERVATION WELLS

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.75	6.84	6.80	6.18	↑		6.60	6.57	6.89	6.65	6.86	6.94
2	6.75	6.81	6.77	6.19		↓	6.64	6.65	6.89	6.67	6.87	6.93
3	6.75	6.81	6.79	6.19		6.56	6.65	6.71	6.89	6.67	6.85	6.90
4	6.75	6.76	6.79	6.19		6.57	6.65	6.72	6.89	6.65	6.87	6.97
5	6.74	6.64	6.79	6.19		6.57	6.66	6.73	6.89	6.28	6.87	6.98
6	6.77	6.64	6.80	6.18		6.57	6.69	6.75	6.90	6.45	6.87	6.98
7	6.79	6.65	6.85	6.18		6.56	6.70	6.75	6.90	6.50	6.88	6.98
8	6.79	6.67	6.85	6.20		6.56	6.74	6.78	6.90	6.63	6.87	6.96
9	6.70	6.69	6.77	6.32		6.59	6.75	6.79	6.90	6.68	6.93	6.95
10	6.72	6.70	6.78	6.32		6.59	6.75	6.81	6.90	6.68	6.94	
11	6.72	6.72	6.83	↑		6.59	6.74	6.84	6.84	6.68	6.94	
12	6.72	6.77	6.83			6.55	6.74	6.84	6.60	6.67	6.96	
13	6.76	6.79	6.79			6.57	6.78	6.84	6.71	6.66	6.97	
14	6.74	6.84	6.76			6.61	6.79	6.83	6.74	6.66	6.95	
15	6.74	6.86	6.76	6.35	6.50	6.61	6.79	6.83	6.79	6.69	6.90	
16	6.73	6.86	6.76			6.60	6.75	6.86	6.82	6.70	6.88	
17	6.70	6.86	6.71		No Record	6.62	6.77	6.87	6.82	6.74	6.87	
18	6.72	6.84	6.60			6.64	6.79	6.87	6.80	6.75	6.90	
19	6.73	6.82	5.94			6.64	6.80	6.87	6.81	6.76	6.90	
20	6.73	6.81	5.58			6.63	6.77	6.88	6.84	6.75	6.88	
21	6.73	6.82	5.91			6.66	6.79	6.88	6.84	6.75	6.88	
22	6.80	6.81	6.01			6.66	6.81	6.88	6.79	6.76	6.88	
23	6.80	6.76	6.01			6.65	6.81	6.88	6.69	6.79	6.89	
24	6.78	6.78	5.74			6.64	6.81	6.89	6.65	6.80	6.90	
25	6.72	6.78	5.79			6.67	6.80	6.89	6.65	6.80	6.90	
26	6.78	6.75	5.83			6.67	6.49	6.89	6.70	6.79	6.90	
27	6.78	6.80	5.95			6.65	6.56	6.88	6.71	6.79	6.91	
28	6.74	6.80	6.00			6.65	6.65	6.89	6.73	6.81	6.91	
29	6.85		6.05			6.55	6.69	6.89	6.73	6.85	6.93	
30	6.85		6.13			6.59	6.70	6.89	6.65	6.85	6.94	
31	6.85		6.14				6.59	6.89		6.85		

MO-15/04W/34-0002.
@ 1st.High → 4.66 MAR. 19, 1986
Low → 6.90 SEPT. 10, 1986

Report Page No. _____

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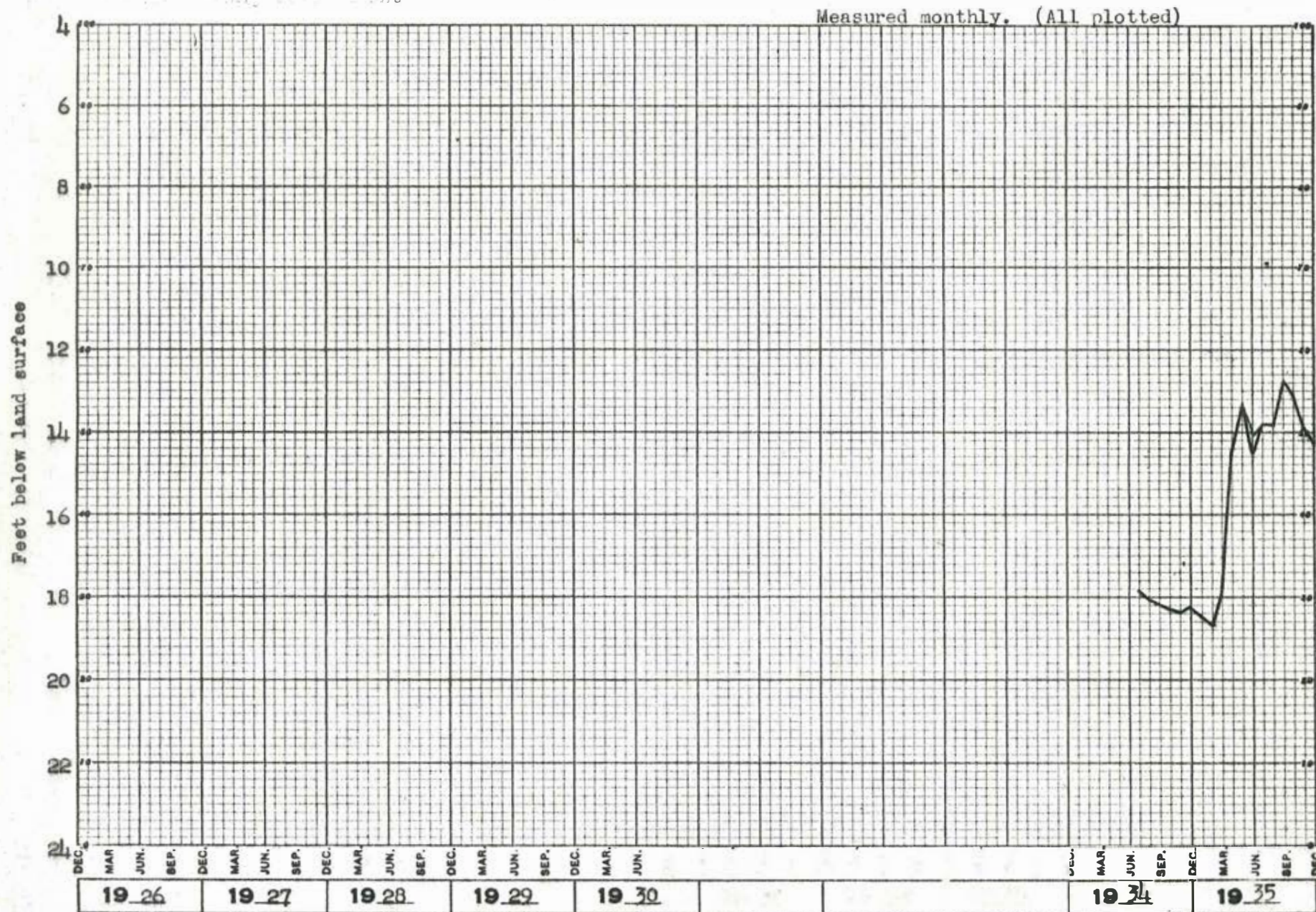
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Monroe Co., Wis.

Well No. 2./ Joseph Anderson. SE 1/4 sec. 34, T. 15 N., R. 4 W. Drilled unused water-table well in sandstone, diameter 5 inches, depth 44 feet. Land-surface datum is 1,100 feet above msl. Measuring point is top of casing, 0.5 feet above lsd.

TECHNICHART



CLEARPRINT PAPER CO.

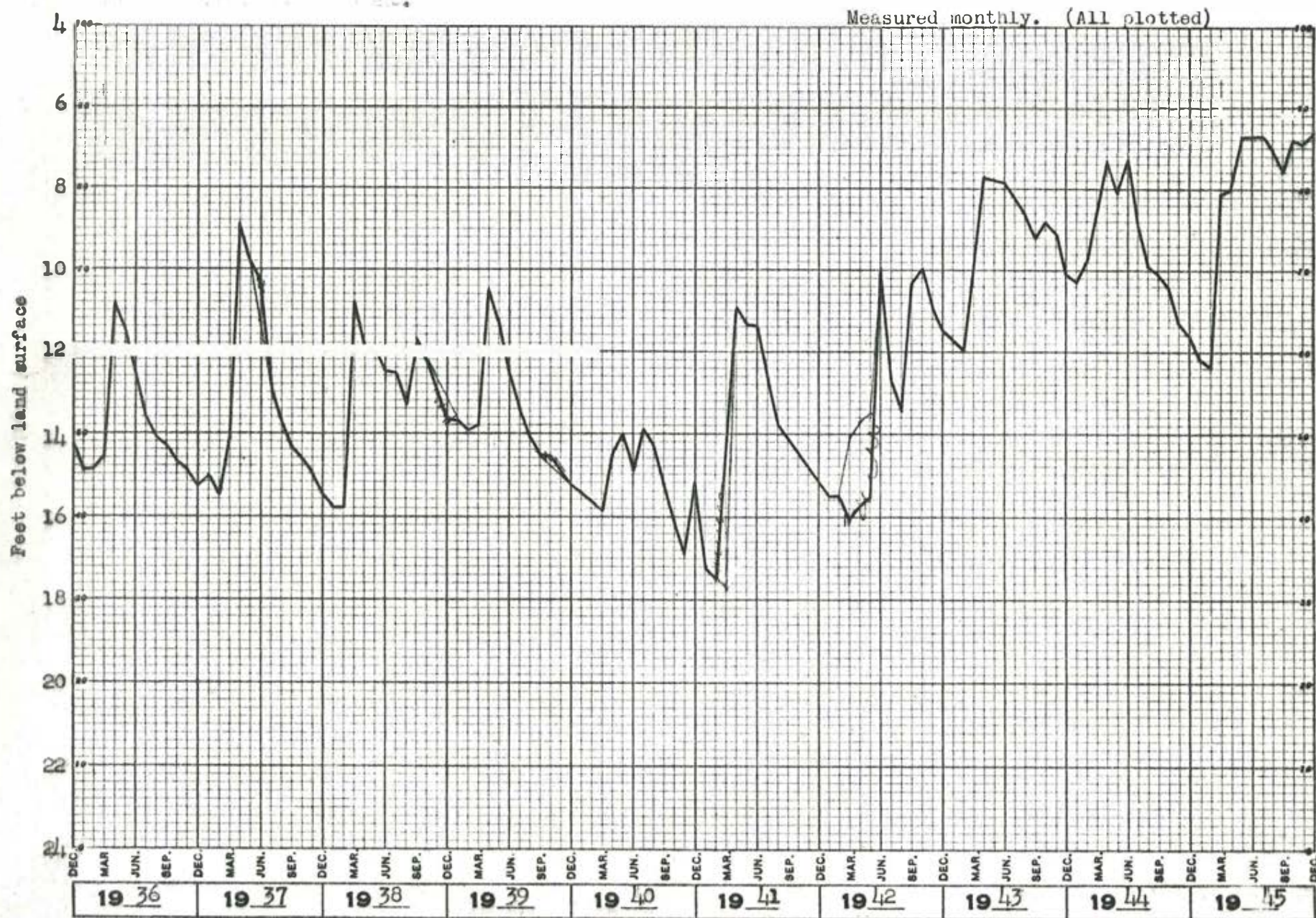
NO. T356. TEN YEARS BY MONTHS X 100 DIVISIONS.

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1000H



Monroe Co., Wis.

No 2./ Joseph Anderson. SE $\frac{1}{4}$ sec. 34, T. 15 N., R. 4 W. Drilled unused water-table well in sandstone, diameter 5 inches, depth 44 feet. Land-surface datum is 1,100 feet above msl. Measuring point is top of casing, 0.5 feet above lsd.



CLEARPRINT PAPER CO.

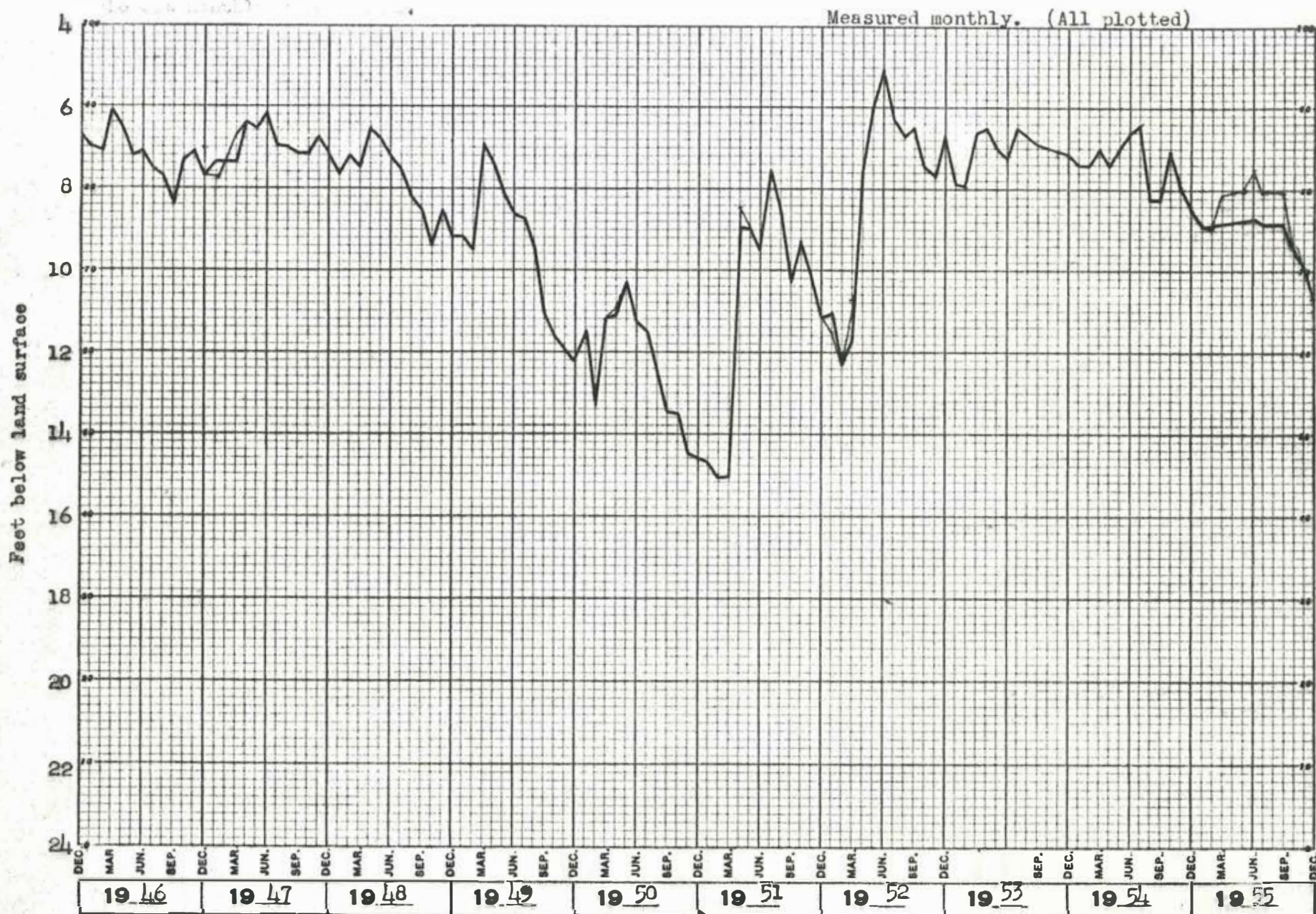
NO. T356 TEN YEARS BY MONTHS X 100 DIVISIONS.

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1000H



Monroe Co., Wis.

No. 2. / Joseph Anderson. ~~SE 1/4~~ sec. 34, T. 15 N., R. 4 W. Drilled unused water-table well in sandstone, diameter 5 inches, depth 44 feet. Land-surface datum is 1,100 feet above msl. Measuring point is top of casing, 0.5 feet above lsd.

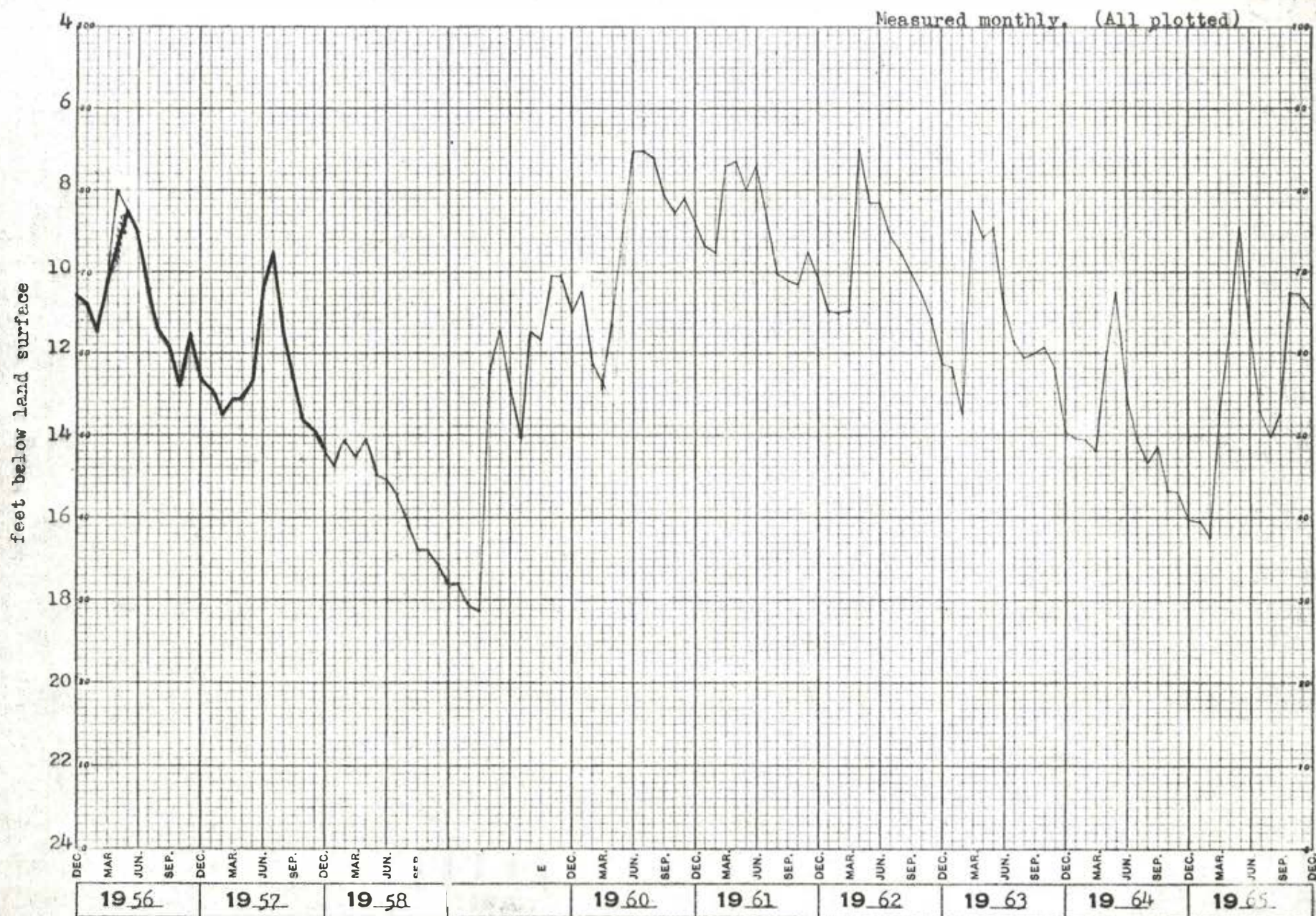


CLEARPRINT PAPER CO. NO. T356. TEN YEARS BY MONTHS X 100 DIVISIONS.

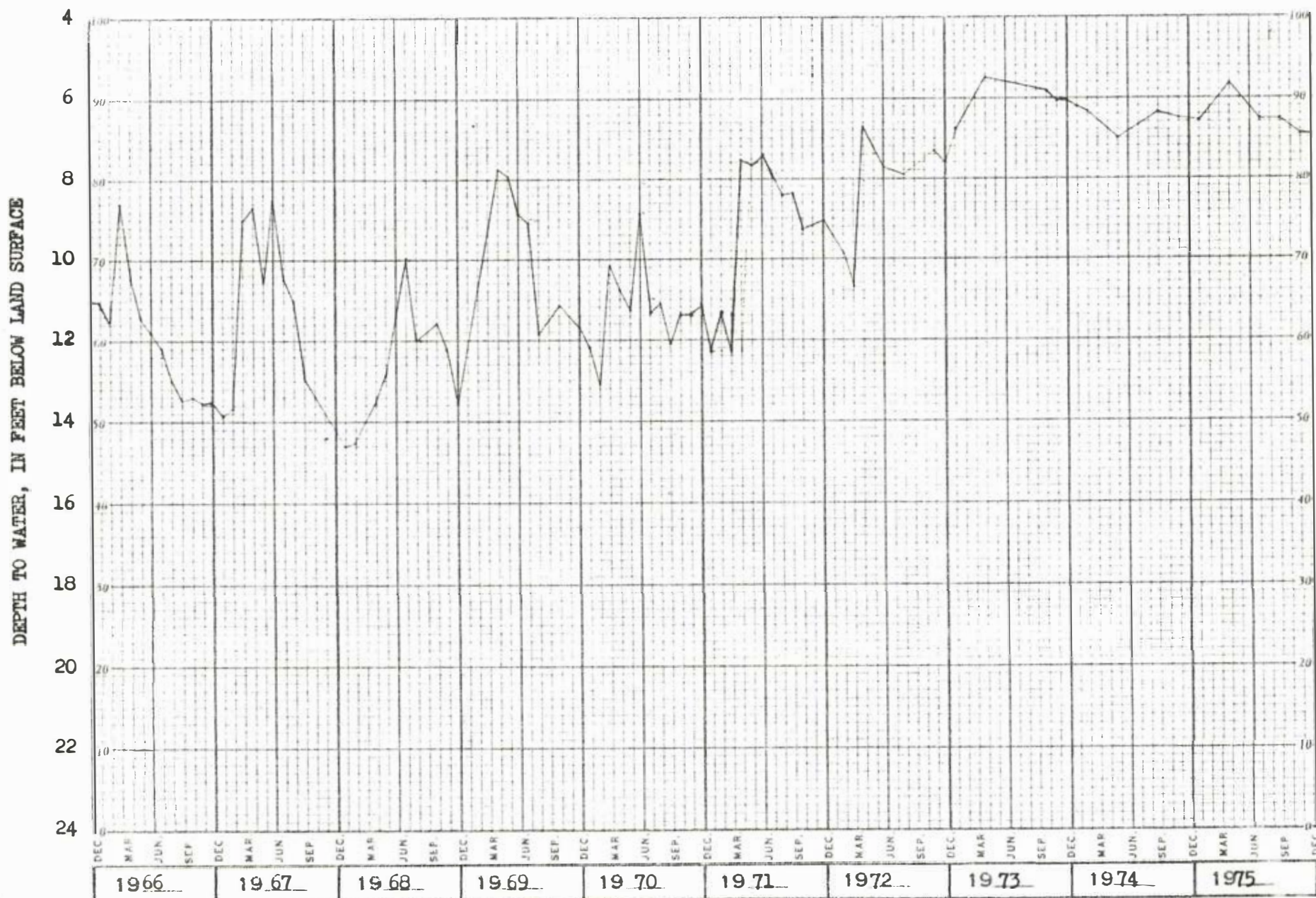
PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1000H



No. 2. Monroe Co., Wis. Joseph Anderson. ~~SE-SE~~ sec. 34, T. 15 N., R. 4 W. Drilled unused well in sandstone, diameter 5 inches, depth 44 feet. Land surface datum is 1,100 feet above msl. Measuring point is top of casing, 0.5 feet above lsd.



MO-15/4W/34-2 Joseph Anderson. ~~SE1~~ ^{SE1}. Drilled unused water-table well in sandstone of Cambrian age, diam 5 in, depth 44 ft. Lad 1,100 ft above msl. MP top of casing, 0.50 ft above lsd.



Appendix 13: Well MO-02 documents, hydrograph, continued

CLEARPRINT PAPER CO. NO. C356. TEN YEARS BY MONTHS X 100 DIVISIONS.

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015

CLEARPRINT CHARTS

Mo-15/4W/34-2. Joseph Anderson. $SE\frac{1}{4}SE\frac{1}{4}$. Drilled unused water-table well in sandstone of Cambrian age, diam 5 in, depth 44 ft. Lsd 1,100 ft above msl. MP top of casing, 0.50 ft above lsd.

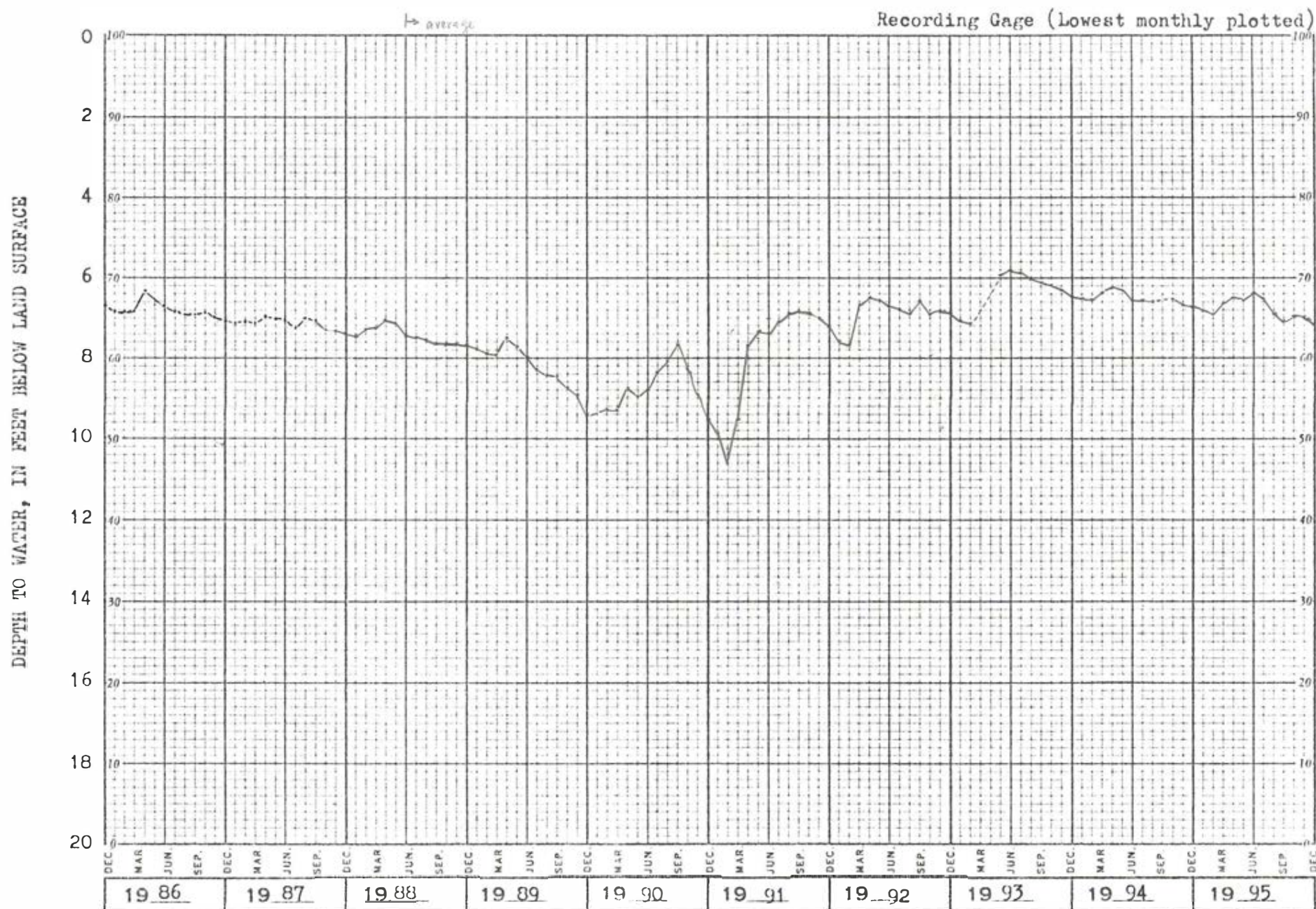


CLEARPRINT PAPER CO. NO. C356. TEN YEARS BY MONTHS X 100 DIVISIONS.

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015

CLEARPRINT CHARTS

MO-15/04W/34-0002. Joseph Anderson. SE $\frac{1}{4}$ SE $\frac{1}{4}$. Drilled unused water-table well in the sandstone aquifer. Diameter 5 in., depth 44 ft. Lsd 1,100 ft. above msl. MP top of casing, 0.50 ft. above lsd.

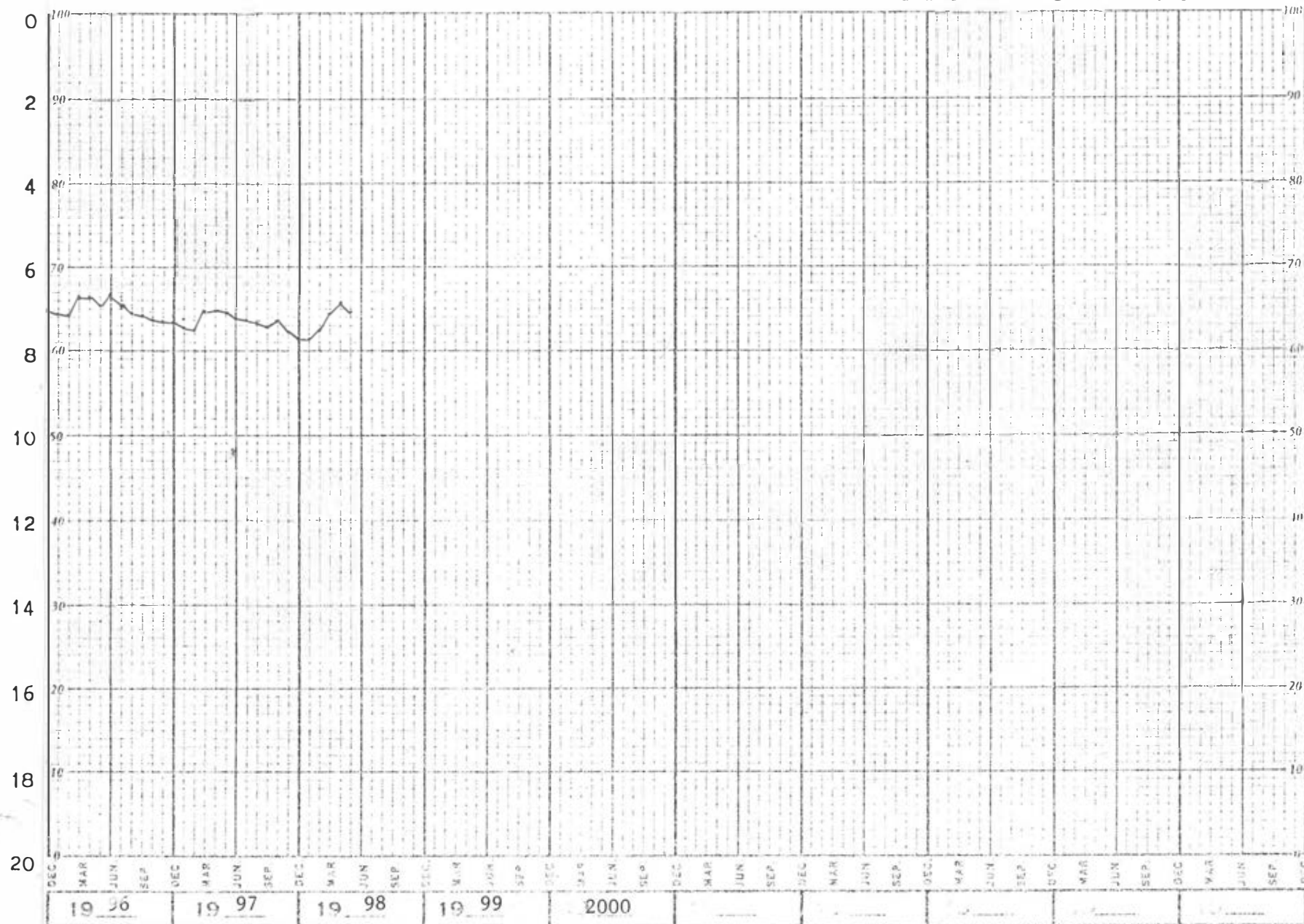




MO-15/04W/34-0002. Joseph Anderson. SE $\frac{1}{4}$ SE $\frac{1}{4}$. Drilled unused water-table well in the sandstone aquifer. Diameter 5 in., depth 44 ft. Lsd 1,100 ft. above msl. NP top of casing, 0.50 ft. above lsd.

Recording gage (Average monthly plotted)

DEPTH TO WATER, IN FEET BELOW LAND SURFACE



In 2K Data Base verified

DEPARTMENT OF THE INTERIOR
SOIL EROSION SERVICE
WELL RECORD

Mo-2

Well No. Mo-2
Date November 1, 1934 Project No. 1
Record by C. C. Gucker

1. Location: State Wisconsin County Monroe
 Quadrangle Viroqua
SE 1/4 SE 1/4 sec 34 T 15 N R 4 E W
2. Owner J. Anderson Address Cashton, Wis.
 Driller _____ Address _____
3. Topography valley
4. Altitude 1100 ft. above sea level
 below
5. Type: Dug, drilled, driven, bored
6. Depth 20+ ft. Date _____, 19____
7. Diameter: Top 6" Bottom 6"
8. Chief Aquifer sandstone
- From _____ ft. to _____ ft. Others _____
9. Casing: Type galv. pipe Depth 20+ ft. Diam 6" to _____
 Finish _____
- Water level 1083 (approx) ft. above sea level
 below
10. Pump: Type hand pump Capacity _____ G. M.
 Power: Kind _____ Horsepower _____
12. Yield: Flow _____ G. M., Pump _____ G. M., Meas., Rept _____
 Drawdown _____ ft.; pumping _____ G. M.; time _____
13. Use: Dom. Stock, PS., RR., Ind., DW., Irr. Quantity _____
 Adequacy, permanence _____
14. Quality: Good, fair, bad _____ Sample Yes _____ No _____
 Taste, odor, color _____ Temp _____ °F
 Unfit for _____
 Sanitation _____
15. Cost: Well, \$ _____; Plant (well, pump, power, etc.), \$ _____
 Operating, \$ _____ per _____ inc. _____ exc. _____
 Log, analysis, authority _____ on back page _____



In 2K Data Base verified

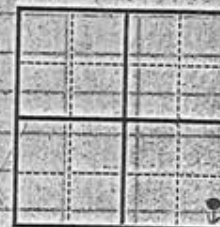
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

US 29

WELL SCHEDULE

Date June 27, 1946 Field No. Mo-2
 Record by F.C.F. Office No. _____
 Source of data _____

1. Location: State Wisconsin County Monroe
 Map SE 1/4 SE 1/4 sec 34 T 15 N R 4 E W
2. Owner: Jos. Anderson Address R 3 Cashton
 Tenant _____ Address _____
 Driller _____ Address _____
3. Topography bottom narrow valley
from S. outer edge
4. Elevation 1100 ft. above sea level
 below
5. Type: Dug (drilled) driven, bored, jetted 1895
6. Depth: Rept. _____ ft. Meas. 44.1 ft.
7. Casing: Diam. 5 in., to _____ in., Type Gal
 Depth _____ ft., Finish _____
8. Chief Aquifer Gambria ss From _____ ft. to _____ ft.
 others _____
- Water level 7.59 ft. above Top of
 below casing at notch at N. side which is 105 ft. above surface
 below
10. Pump: Type cyl. hand Capacity _____ G. M.
 Power: Kind _____ Horsepower _____
11. Yield: Flow _____ G. M., Pump _____ G. M., Meas., Rept. Est. _____
 Drawdown _____ ft. after _____ hours pumping _____ G. M.
12. Use: Dom., Stock, PS., RR., Ind., Irr. Obs
 Adequacy, permanence _____
13. Quality: _____ Temp. _____ °F
 Taste, odor, color _____ Sample Yes _____ No _____
 Unfit for _____



ADP SCHEDULE MADE

14. Remarks: (Log, Analyses, etc.) Jos. Anderson observer
Original tape worn out - expendable
Issued New 50 FT tape No. M-6

In 2K Data Base verified

WRD Exp. April 19

Well No. MO-15/4W/34-2

WELL SCHEDULE Verified FCH

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

CC YENKER INNOV 34 SOIL EROSION SERVICE
FCF 27 JUN 46 USGS

MASTER CARD

Record by E. J. DASHIT Source of data FIELD Date 19 DEC 67 Map VIROQUA 1:62,500

State WISCONSIN County MONROE City or town M. 4

Latitude: 43 43 42 N Longitude: 09 04 95 W Sequential number: 1

Local well number: 15 N 09 W 34 D D A Other number: Dead

Local use: M 1000 03 Owner or name: JOSEPH ANDERSON

Owner of name: JOSEPH ANDERSON Address: R. 3, Cashton

Ownership: County, Fed Gov't, City, Corp or Co, Private, State Agency, Water Dist P

Use of water: (A) Air cond, Bottling, Comm, Devater, Power, Fire, Dom, Irr, Med, Ind, P S, Rec, Stock, Inactive, Unused, Repressure, Recharge, Desal-P S, Desal-other, Other U

Use of well: (A) Anode, Drain, Seismic, Heat Ex, Obs, Oil-gas, Recharge, Test, Unused, Withdraw, Waste, Destroyed P

DATA AVAILABLE: Well data 9 Freq. W/L meas.: Monthly Field aquifer char. M

Hyd. lab. data: 1934

Qual. water data: type: yes Pumpage inventory: no period: yes

Aperture cards: yes

Log data: yes

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 44.1 ft Casing type: Galv. Diam. 5 in

Depth cased: (first perf.) 44 ft Casing accuracy: TAPE

Finish: porous gravel v. concrete, (Perf.), (screen), gallery, end, other 51

Method: (A) air bored, cable, dug, hyd jetted, air reverse trenching, driven, drive rot., percussion, rotary, wash, other 52

Date drilled: 1895 Pump intake setting: 87.5 ft

Driller: name LP address Trans. of meter no.

Life: (A) air, bucket, cent, jet, (C) multiple, (N) none, (P) piston, (R) submerg, turb, other P Deep S Shallow 53

Power: nat LP gas, wind, H.P. 1

Descript. MP TOP OF CASING 1/2 ft above LSD, Alt. MP 1100.5

Alt. LSD: 1125 Accuracy: TOPO-20' CE

Water level: 13.4 ft above MP: 13 Accuracy: TAPE

Date meas: 27 SEPT 67 Yield: 9.67 gpm Method determined: 54

Drawdown: ft Accuracy: 55 Pumping period: hrs

QUALITY OF WATER DATA: Iron ppm Sulfate ppm Chloride ppm Hard. ppm

Sp. Conduct. K x 10⁶ Temp. °F Date sampled 56

Taste, color, etc. Punched ERC

CHECKED AGAINST DATA SOURCE 3/10/68 CHECKED 3/10/68

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD Physiographic Province: PENT LOW Section: WAS

Drainage basin: UP MISS Subbasin: Black-Tremp

Topo of well site: (D) depression, stream channel, dunes, flat, hilltop, sink, swamp, (E) (F) (G) (H) (I) (J) (K) (L) (M) (N) (O) (P) (Q) (R) (S) (T) (U) (V) (W) (X) (Y) (Z) 27 ✓

MAJOR AQUIFER: CAMBR. UP C3 Jordan SS 9.8

Lithology: Sandstone V Origin: Mar 6 Aquifer Thickness: ft

Length of well open to: ft Depth to top of: ft

MINOR AQUIFER: system series aquifer, formation, group 57 59

Lithology: ft Origin: ft Aquifer Thickness: ft

Length of well open to: ft Depth to top of: ft

Intervals Screened: 51 53

Depth to consolidated rock: ft Source of data: 54

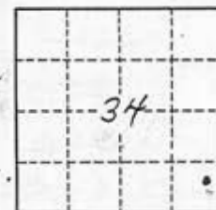
Depth to basement: ft Source of data: 55

Surficial material: 70 71 Infiltration characteristics: 72

Coefficient Trans: gpd/ft Coefficient Storage: 76 78

Coefficient Perm: gpd/ft² Spec cap: gpm/ft Number of geologic cards: 79

S of Cashton on 27. First turn right
S of Junction of 27 & 33 1.3 mi. W of
27 turn S at brick church - S 1 mi
Right & uphill. Joe Anderson 12th House
0.4 white house with large spruces
at road. Well about .15 mi. W. of
house by car then walk N ab. 4 mi.



Limestone Bluff ← Prairie du Chien

HHHHH

stream usually is dry - S. fields

TBM A: ASSUMED WELL old house basement

Elev = 100.00'

TBM B, Elev = 90.6'

TBM A

Mo-2 = 97.20'

To Road

JOSEPH ANDERSON OBS. Dead

Tenant new observer

Mo-2-U

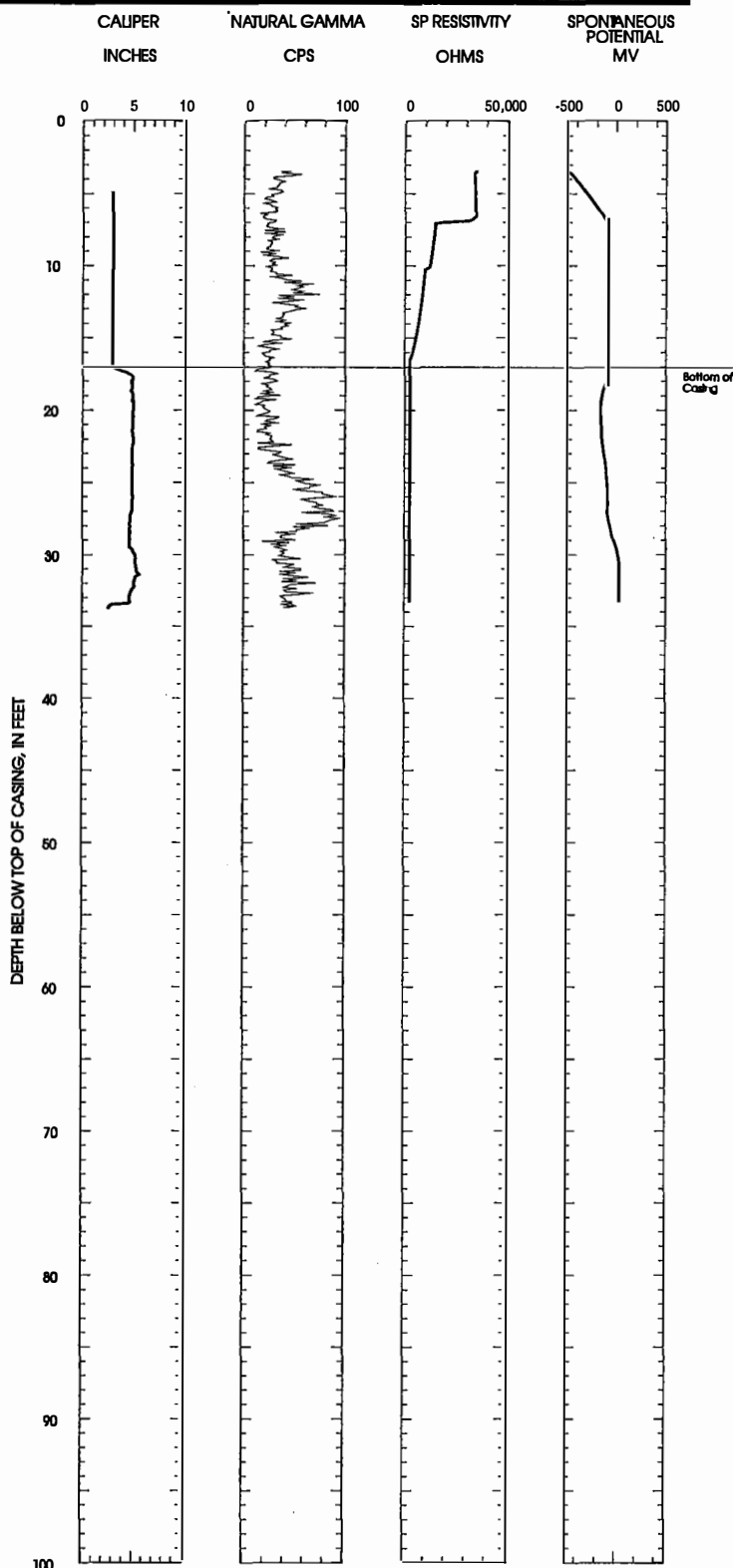


Monroe County

MO-15/04W/34-0002

SANDSTONE AQUIFER

Geophysical Logs

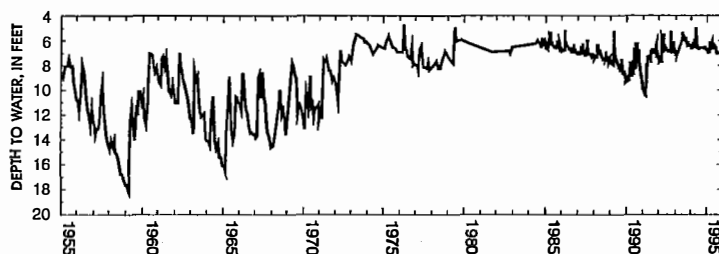


Well Information

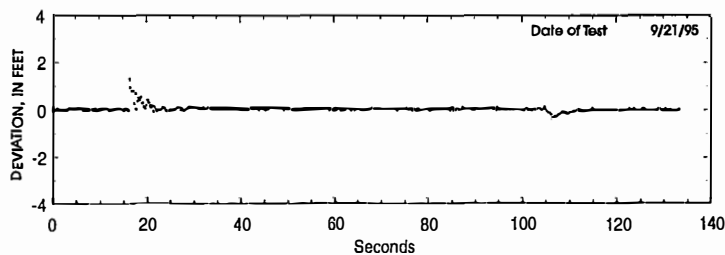
Total Depth 44 feet
 Cased Depth 17 feet *
 Casing Diameter 3 inches
 Use of Well Non-pumping

*Picked from geophysical logs

Depth to Water Below Land Surface For Period of Record



Deviation From Static Water Level During Displacement/Recovery Test



Horizontal Hydraulic Conductivity

Hvorslev K
 33.6 ft/day

Appendix 14: Well MO-17 documents

Historical Documents

Basic well information, 1980; well evaluation, 1980; well location map; hydrographs, 1934-1959 and 1990-1999, 5 pages

well information historically compiled by WGNHS

WGNHS cuttings description, 1940, 1 page

WGNHS geologic log, 1940, 1 page

USGS well schedule, 1949, 3 pages

USGS well schedule, 1967, 1 page

WGNHS geophysical log, 2010, 1 page

self potential, single point resistivity

datum is assumed to be top of casing, 1.0 ft above land surface in 2010, data courtesy of U.S. Geological Survey

WGNHS geophysical log, 2012, 1 page

self potential, single point resistivity

datum is assumed to be top of casing, 0.50 ft above land surface in 2012, data courtesy of U.S. Geological Survey

Geophysical, hydrological, and well construction information from Dunning and others (1996), 1 page

hydrograph (1955 - 1995), slug test, horizontal hydraulic conductivity, geophysical logs, and well measurements from unpublished report to DNR (DNR project number 118) by Dunning and others (1996)

datum is top of casing, approximately 1.0 ft above land surface in 1996, data courtesy of U.S. Geological Survey

Documentation of work done for this report

WGNHS geophysical log, 2020, 1 page

gamma, self potential, single point resistivity, fluid temperature, fluid conductivity, caliper

datum is top of well shelter base (0.5 ft above land surface in 2020)

Appendix 14: Well MO-17 documents, basic well information, 1980

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number Mo 17
 Owner U. S. Army
 Location (Co., T/R.sec) Monroe Co.; T18N, R2W, Sec. 19 - NW/4NW/4SW/4;
at Camp McCoy
 Land surface altitude 905'
 Drainage basin Mississippi R. : La Crosse River : Torr Creek; Sparta Creek
 distance to the nearest perennial stream: 1,500 ft of the L bank

WELL DATA

Depth 192 ft.
 Casing depth 109 ft.
 Screened interval open hole
 Diameter 9 in
 Aquifers open to well Cambrian (Dresbach)
 Geologic log available? yes
 Construction report available? no
 Use of well unused
 Access to measure well

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Tonah Ranger Sta. 7 mi - E.
Sparta 9 mi. - SW
 Streamgaging stations Black River Falls - 22 mi NNW
no station available in Basin
 Observation wells Ja 5 - 13 mi NNW
Mo 10 - 14 mi SSW
Ju 98 - 20 mi SE
 Other

EXISTING RECORD

Measuring point Top of casing, 1.00 ft above lsd
 Measuring equipment recorder
 Frequency of measurement continuous recording from 06/02/50
 Period of record -- 1950 - present
 Started June 2, 1950
 Ended
 Volume of missing record 10.65%
No record : 09/16/74 - 12/16/74; 02/27/69 - 06/16/69; 01/10/68 - 04/01/68; 04/13/65 - 05/11/65

Recorded by

G. Jernigan

on

11/14/80

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

1. Areal spacing -- distance from any observation well 13 mi²
-- distance from observation well in same aquifer 13 mi²
2. Ownership: private -- public
3. Use of well unused - observation
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: 1940
8. Diameter (4 in. minimum for recorder) 9"
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 7 ft (1-8); large short-term & large seasonal
13. Length of record 31 years
14. Missing record 10.65%
15. Adequacy of current measuring frequency O.K.
16. Probability of permanence good
17. Recommendations/Improvements

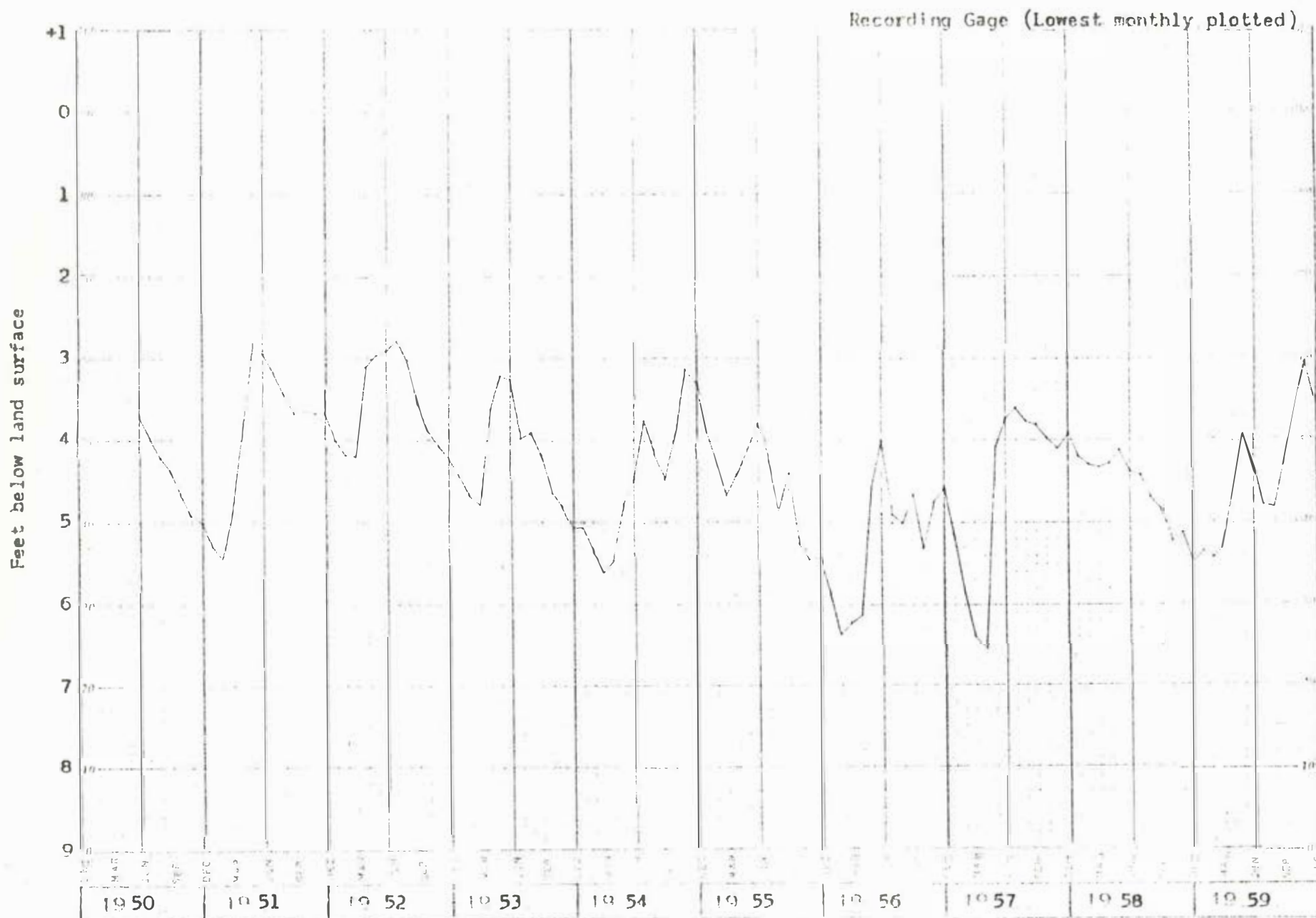
- retain as key well
- reduce volume of mowing days

Evaluated by A. J. Jansz on 11/21/80

A detailed topographic map of Camp McCoy Military Reservation. The map features the La Fayette River flowing through the center, with Alderwood Lake located in the upper right. The terrain is characterized by numerous contour lines indicating elevation. Key locations labeled include Camp McCoy, La Fayette, and various creeks and streams. The map also shows a network of roads and rail lines. A handwritten note 'Mo 17' is visible in the bottom right corner.

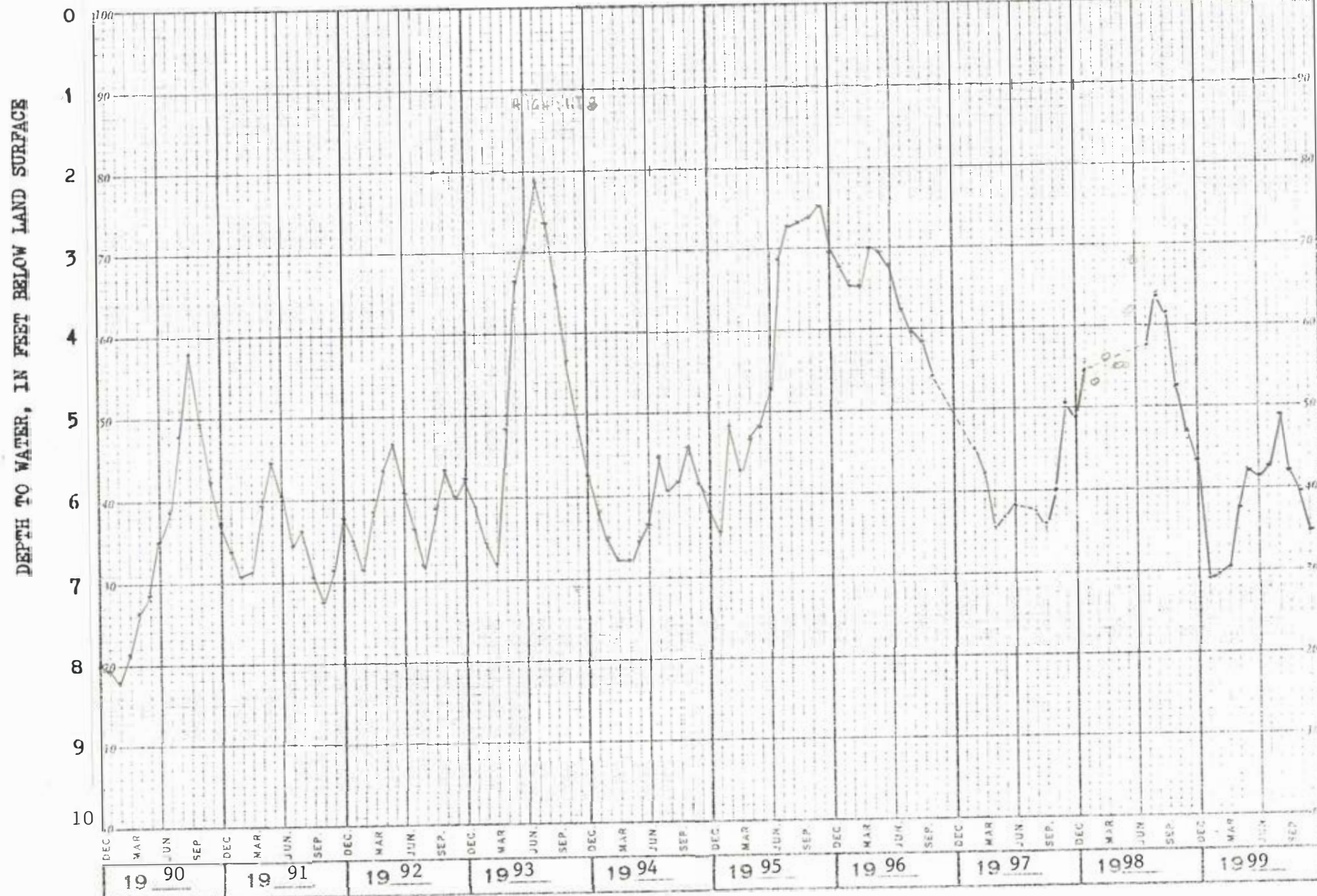
Appendix 14: Well MO-17 documents, hydrograph

Mo-18/2W/29-17. U. S. Army, Camp McCoy. Drilled unused artesian well in sandstone of Cambrian age, diam 9 in, depth 192 ft, cased to 109. MP top of casing, 1.00 ft above lsd.



MO-18/02W/29-0017. U. S. Army, Camp McCoy. Drilled unused artesian well in sandstone of Cambrian age, diam 9 in, depth 192 ft, cased to 109. Lsd 909 ft above msl. MP top of casing, 1.00 ft above lsd.

Recording page (Average Monthly plotted)



Mo-17
108310-108348

U.S. WAR DEPARTMENT WELL NO.5
Old Airport, Camp McCoy, Wisconsin
Near Spring Bank Resort
SW $\frac{1}{4}$ Sec.29, T.18N, R.2W
M.F. Baley, Driller
1940

108310	0-1	Soil, black, sandy.
11	1-5	Sand, medium to fine, light yellow-gray.
12	5-10	Sand, medium to fine, light gray.
13	10-15	Same
14	15-20	Sand, medium to coarse, light gray.
15	20-25	Same
16	25-30	Same
17	30-35	Same (Chunks of siltstone, pebbles?)
18	35-40	Same (Chunks of white sandstone, pebbles?)
19	40-45	Same
20	45-50	Same
21	50-55	Sand, coarse to fine, light yellow-gray.
22	55-60	Same
23	60-65	Same
24	65-70	Sand, medium to fine, light gray, pebbles of siltstone, yellow and gray, glauconitic.
25	70-75	Sand, medium to coarse, light gray.
26	75-80	Same
27	80-85	Sand, very fine, dark gray (soil?).
28	85-90	Sand, fine to medium, light gray, fragments of chert and silty soil.
29	90-95	Silt, black (old soil) (Block at 97?)
30	95-100	Dresbach sand, fine to coarse, gray, pebbles of chert and sandstone.
31	100-105	Same Total surface 105 feet.
32	105-110	Dresbach sandstone, fine to coarse-grained, light gray.
33	110-115	Same
34	115-120	Sandstone, fine-grained, gray.
35	120-125	Sandstone, fine to coarse-grained, light gray.
36	125-130	Same.
37	130-135	Siltstone, sandy, light gray.
38	135-140	Sandstone, fine to medium-grained, light gray.
39	140-145	Same
40	145-150	Sandstone, fine to coarse-grained, light gray.
41	150-155	Same
42	155-160	Same
43	160-165	Same
44	165-170	Same
45	170-175	Same
46	175-180	Same (Some siltstone)
47	180-185	Same as above
48	185-190	Sandstone like above; shale, gray, silty. Dresbach entered 85 feet (includes Eau Claire).

F. T. Thwaites, September 16, 1940

U. S. WAR DEPARTMENT WELL, OLD AIRPORT, CAMP MC COY, WIS.

On Co. Trunk B near Spring Bank Resort

NW 1/4, NW 1/4, SW 1/4 sec. 29, T. 18 N., R. 2 W.

M. F. Baley, Driller, 1940 (No. 5)

Samples examined by F. T. Thwaites, Nos. 108310-108348

Alt 909'

S U R F A C E	0-1	1	Soil, black, sandy	7 wa or 10" black steel pipe 41 #
	1-5	4	Sand, medium to fine, light yellow-gray	
	5-15	10	Sand, medium to fine, light gray	
	15-30	15	Sand, medium to coarse, light gray	
	30-40	10	Gravel, pebs. sandstone, siltstone in sand	
	40-50	10	Sand, medium to coarse, light gray	
	50-65	15	Sand, coarse to fine, light yellow-gray	
	65-70	5	Sand, medium to fine, lt. gy; pebs. siltstone	
	70-80	10	Sand, medium to coarse, light gray	
	80-85	5	Sand, very fine, dark gray (soil)	
D R E S B A C H	85-90	5	Sand, fine to medium, light gray; chert peb.	forged steel shoe 109
	90-95	5	Silt, black (soil)	
	105	95-105	10 Gravel, pebs. chert, ss in sand, fine to coar.	10" hole
	105-115	10	Sandstone, fine to coarse, light gray	
	115-120	5	Sandstone, fine, gray	
	120-130	10	Sandstone, fine to coarse, light gray	
	130-135	5	Siltstone, sandy, light gray	
85	135-145	10	Sandstone, fine to medium, light gray	
	145-175	30	Sandstone, fine to coarse, light gray	
	175-190	15	Sandstone, fine to coarse; layers of shale, gray, silty	

Formations: Surface (stream deposits); Dresbach including Eau Claire Log says rock at 97
 Tested with suction pump at 108 g.p.m. specific capacity = 6.35 g.p.m.

Appendix 14: Well MO-17 documents, USGS well schedule, 1949

Well Name _____

Log No. Mo-17

Sample Nos. _____

County _____

Township _____

Location NW, NW, SW, Sec. 29, 18N, 2W

R.I. 3 Elevation 909±5'

Quad. _____

Map No. 6

Flatbook Check (date & page) _____

Owner _____

Address _____

Remarks _____

Driller _____

Completed _____ C.R. Yes/No Yes

Depths _____

Date Rec'd _____

Examined by _____

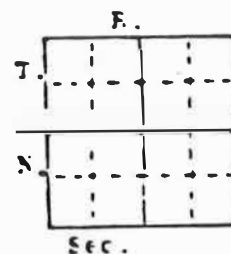
Date _____

G.I. Records checked Yes / No

Field checked by _____

date _____

map Yes / No



REMARKS

Plotted by TEW using field map
(no DOPs).

9-19- July 1935

sed

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

Mo-18/2/49-17

WELL SCHEDULE

Date Nov. 16, 1949 Field No. Mo-17
Record by A H H Office No. _____
Source of data Water Super. Camp M^c Coy

1. Location: State Wis County Monroe
Map Milkston Quad. 1:62,500 (T)-1549

NH 1/4 SW 1/4 sec. 27 T 18 N 2 R 2 W

2. Owner: U.S. Army Address Camp M^c Coy

Tenant _____ Address _____

Driller _____ Address _____

3. Topography Flat

4. Elevation ~ 909 ft. above _____
below _____

5. Type: Dug, drilled driven, bored, jetted 19.40

6. Depth: Rept. _____ ft. Meas. 192 ft.

7. Casing: Diam. 9 in., to _____ in., Type _____

Depth to ft., Finish open

8. Chief Aquifer Dresbach From 109 ft. to 170 ft.

_____ level 5.45 ft. meas Nov 16 1949 rim

of casing which is 1 ft. above surface

10. Pump: Type _____ Capacity _____ G. M.

Power: Kind _____ Horsepower _____

11. Yield: Flow _____ G. M., Pump _____ G. M., Meas., Rept. Est. _____

Drawdown _____ ft. after _____ hours pumping _____ G. M.

12. Use: Dom., Stock, PS, RR., Ind., Irr., Obs

Adequacy, permanence _____

13. Quality _____ Temp _____ °F.

Taste, odor, color _____ Sample Yes _____ No _____

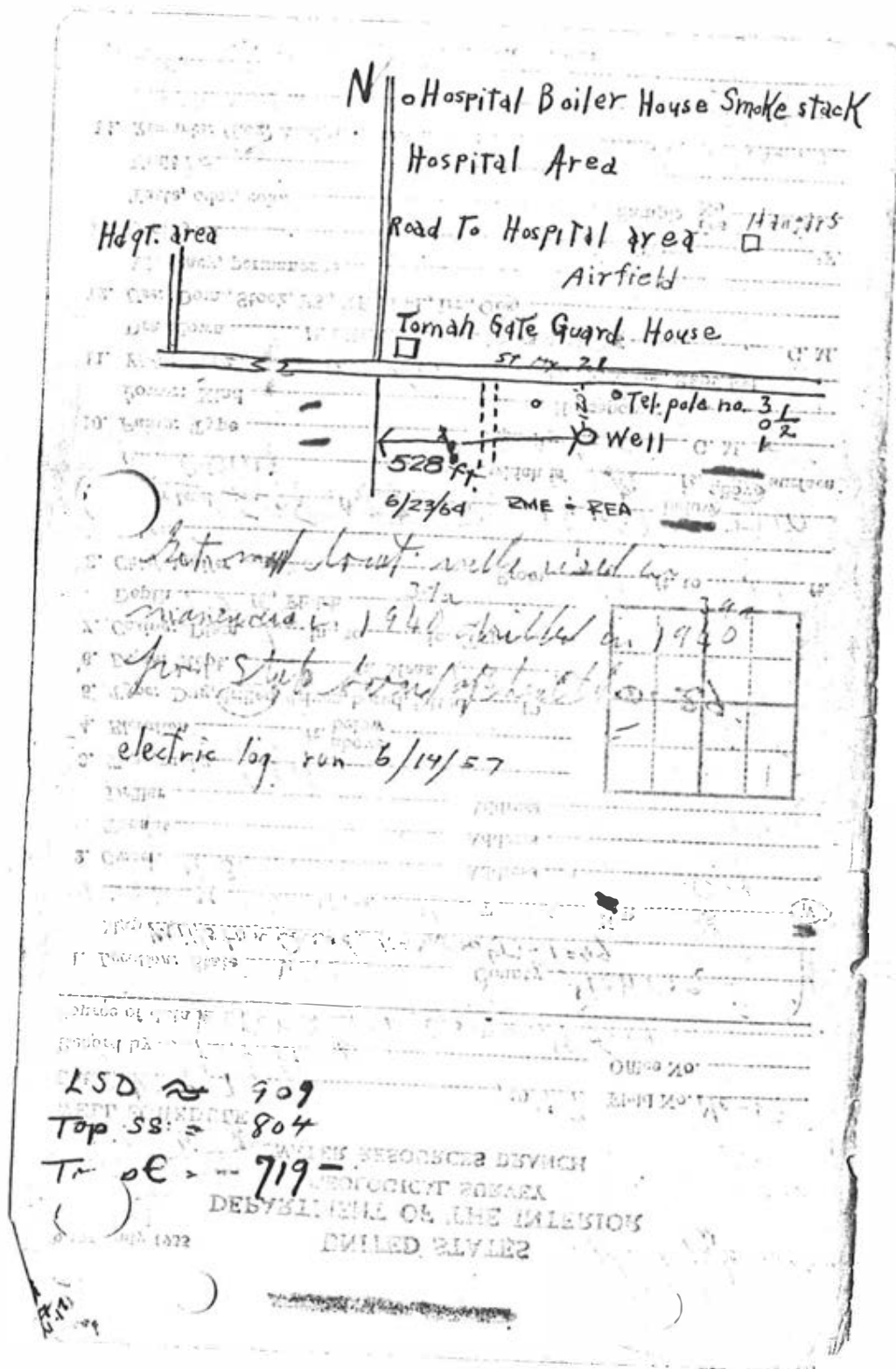
Unfit for _____

14. Remarks: (Log, Analyses, etc.) Good recorder. Write read

to get sent box for recorder. They will send

recorder. A-35 recorder installed 6/1/50

MO-17



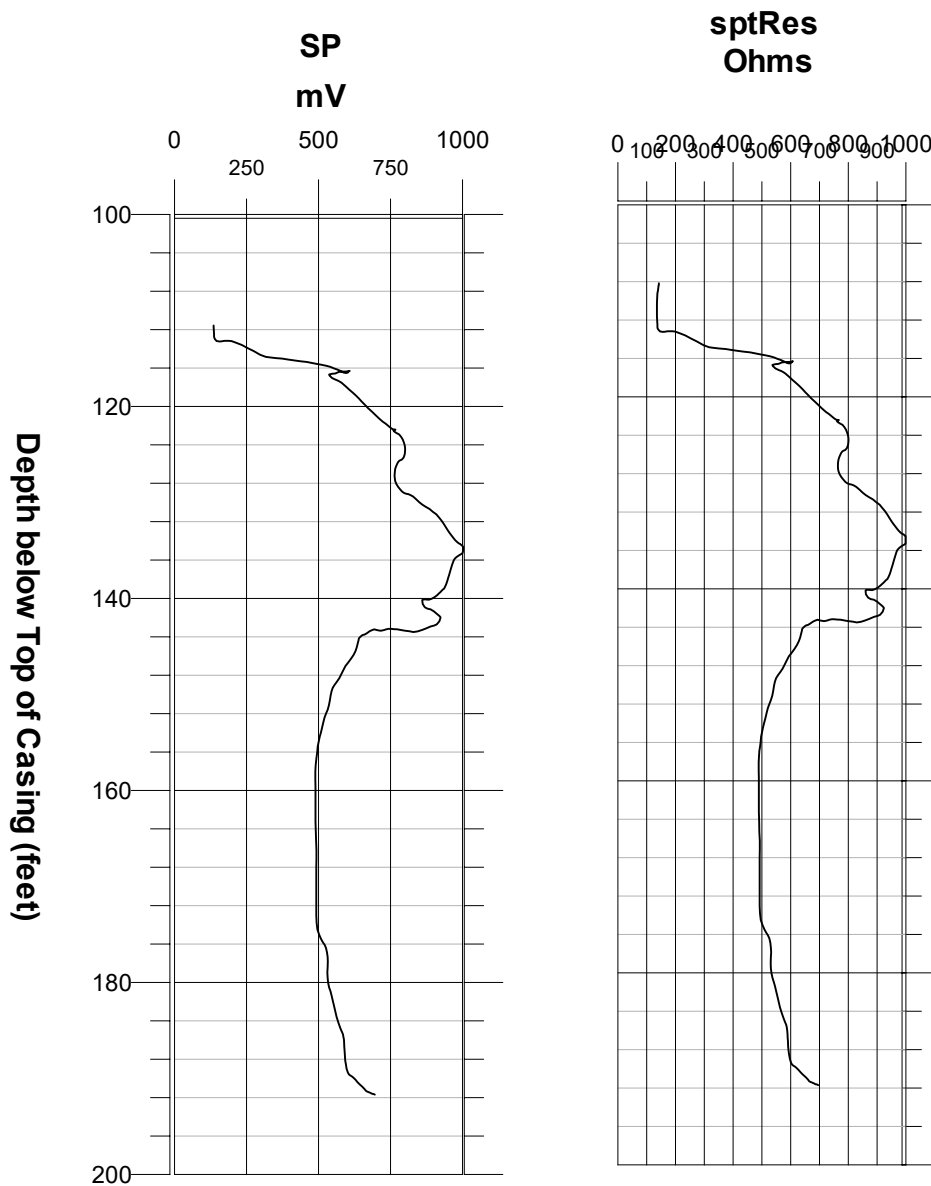
Wisconsin Geological and Natural History Survey
Geophysical Log


File: 420017.grf

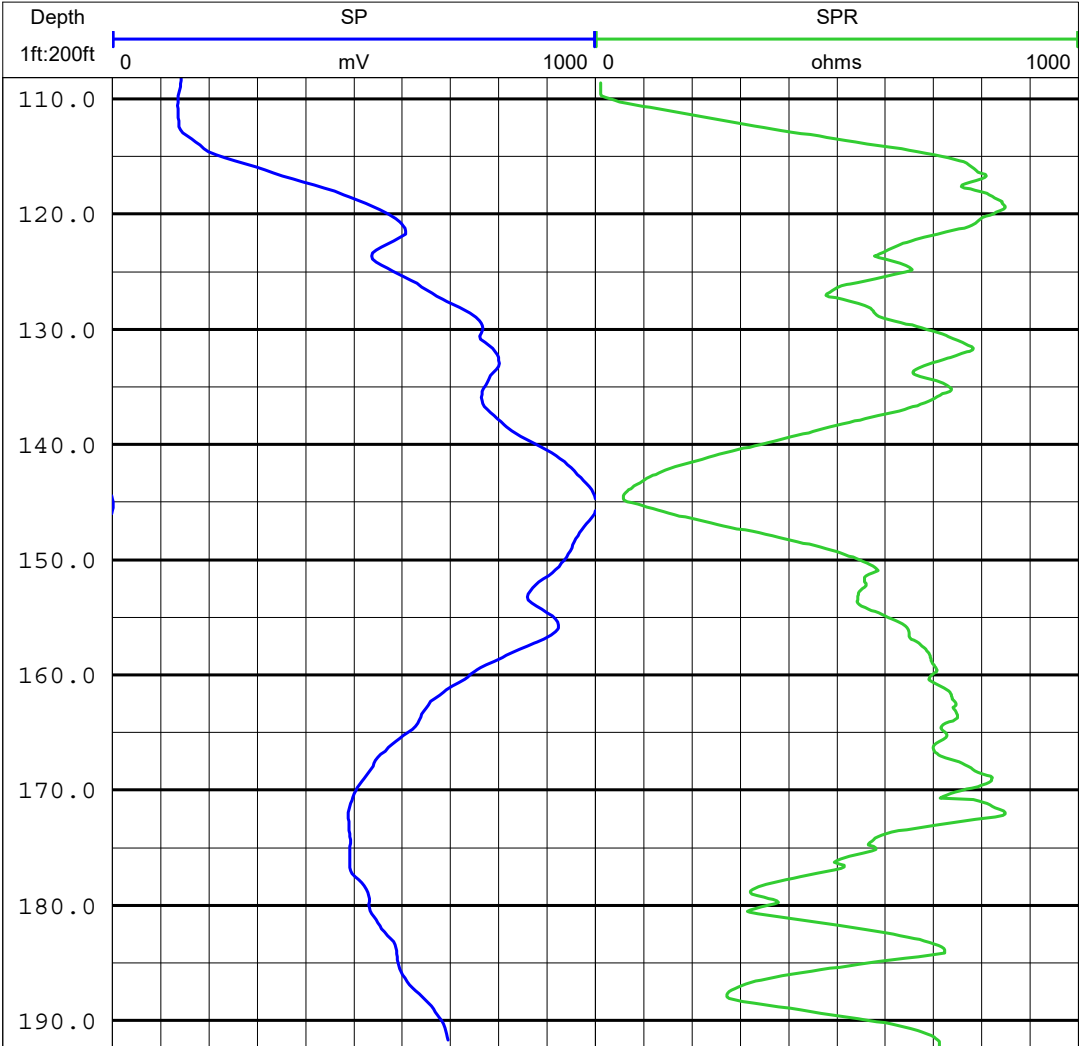
Total depth: 192 ft
Casing: 110 ft
Water level: 7 ft

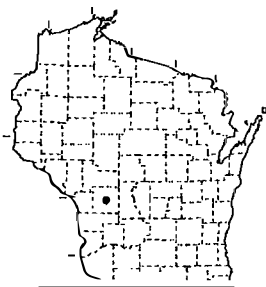
Well: MO-17 U.S. War Department Well

T2N, R22E, section 12, NE1/4, NE1/4, NW1/4



		Wisconsin Geological and Natural History Survey Well Owner: U.S. War Department Well / Hole Name: U.S. War Department Well Well Address: Old Airport, on Co. Trunk B near Spring Bank Resort City, State, Zip Code: Camp McCoy, WI WGNHS Well ID: MO-17 WI Unique Well #:	
Property Owner: Address: line 2: City State:		WGNHS Well ID : MO-17 WI Unique Well #	
GPS Latitude: GPS Longitude: WTM83_N: WTM83_E: Elevation & Method: Location: NW 1/4, SW 1/4 SEC. 29 T. 18N R. 2W			
PERMANENT DATUM: GROUND SURFACE		ELEVATION: SU:	
LOG MEAS. FROM		ABOVE PERM. DATUM	
DRILLING MEAS. FROM		DTW: 7'	
Date:		Log 8 Performed on Borehole:	
Logged by:		Log 9 Performed on Borehole:	
Witness:		Log 10 Performed on Borehole:	
Log 1 Performed on Borehole:	SP/SPR	DEPTH-DRILLER: 190'	
Log 2 Performed on Borehole:		DEPTH-LOGGER: 192'	
Log 3 Performed on Borehole:		TYPE FLUID IN HOLE	
Log 4 Performed on Borehole:		CASING 110'	
Log 5 Performed on Borehole:		DENSITY	
Log 6 Performed on Borehole:		WATER LEVEL 7'	
Log 7 Performed on Borehole:		MAX. REC. TEMP.	
Comment:			



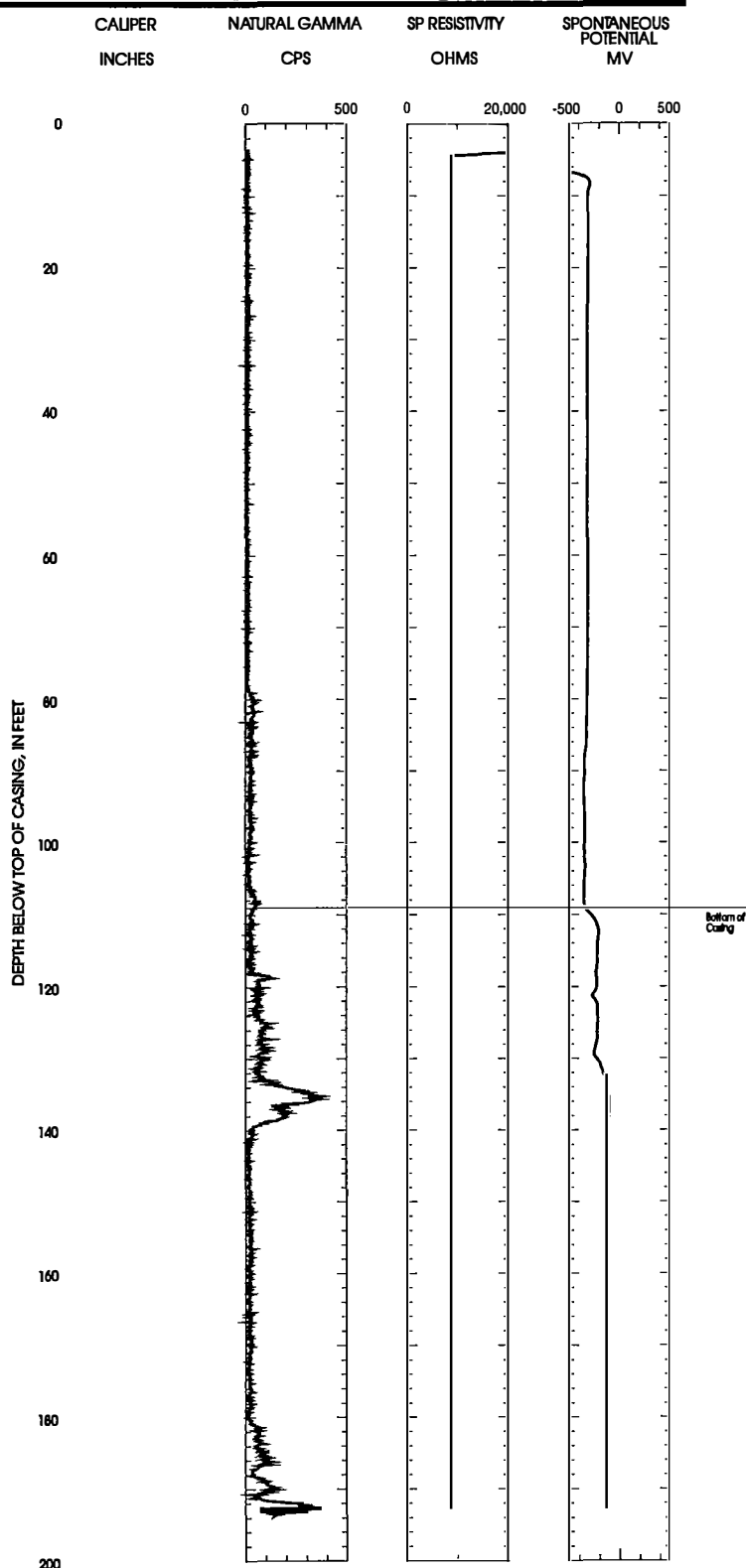


Monroe County

MO-18/02W/29-0017

SANDSTONE AQUIFER

Geophysical Logs



Well Information

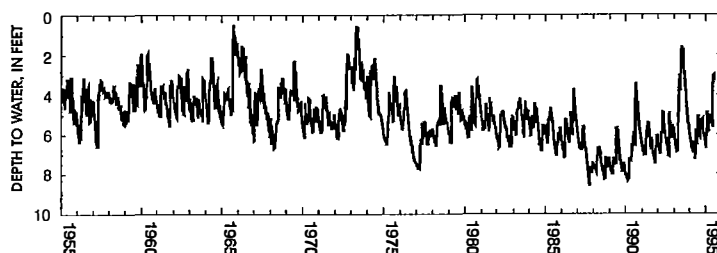
Total Depth 192 feet

Cased Depth 109 feet

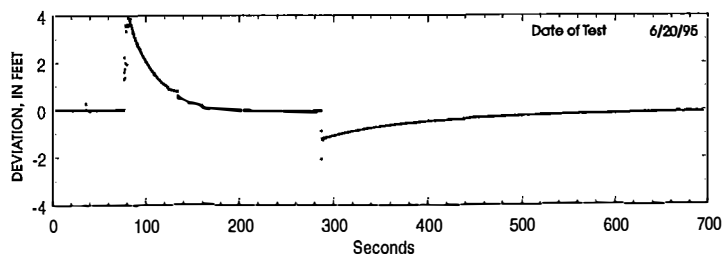
Casing Diameter 9 inches

Use of Well Non-pumping

Depth to Water Below Land Surface For Period of Record

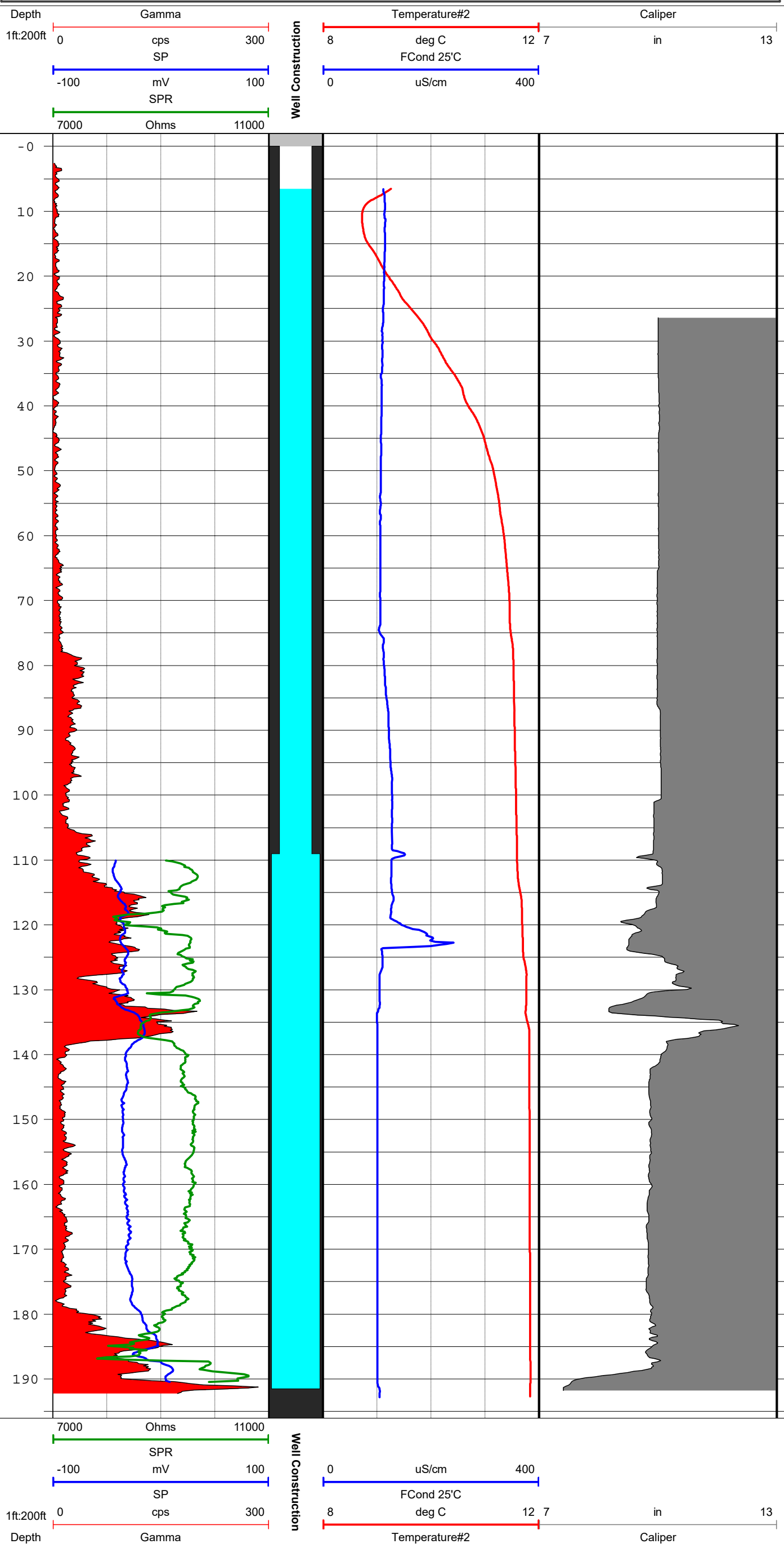


Deviation From Static Water Level During Displacement/Recovery Test



Horizontal Hydraulic Conductivity

Hvorslev K
4.3 ft/day



Appendix 15: Well MQ-09 documents

Historical Documents

Basic well information, 1980; well evaluation, 1980; well location map; hydrographs, 1949-1955, 1986-1999, 6 pages

well information historically compiled by WGNHS

USGS well schedule, 1949, 1 page

USGS well schedules, 1967, 1 page

Geophysical, hydrological, and well construction information from Dunning and others (1996), 1 page

hydrograph (1955 - 1995), slug test, horizontal hydraulic conductivity, geophysical logs, and well measurements from unpublished report to DNR (DNR project number 118) by Dunning and others (1996)

datum is top of casing, approximately 0 ft above land surface in 1996, data courtesy of U.S. Geological Survey

Documentation of work done for this report

WGNHS geophysical log, 2019, 1 page

gamma, self potential, single point resistivity, optical borehole image, fluid temperature, fluid conductivity, caliper

datum is top of well shelter base (2.45 ft above land surface in 2019)

7/11/80

12/1/80
MQ-9

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number MQ-16/08E/12-0009

Owner VILLAGE OF WESTFIELD

Location (Co., T/R.sec) MARQUETTE Co.

T. 16N., R. 8E., SEC. 12 SW1/4SE1/4

Land surface altitude 880 FT.

Drainage basin Fox Wolf River Basin

Distance to Nearest Perennial Stream: 1/4 mi. to tributary of Caves Creek

WELL DATA

Depth 274 FT.

Casing depth ?

Screened interval —

Diameter 6 in.

Aquifers open to well SS

Geologic log available? No

Construction report available? No

Use of well IRRIGATED

Access to measure well GOOD

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations

Montello - 10 mi SE

Friendship Ranger Sta - 18 NW

Hancock Exp. Farm - 18 mi N

Streamgaging stations

04073500 Fox River at Berlin

Observation wells

AD 76 - 18 mi NW

WS 105

18 mi NE

WS 8 - 18 mi N

MQ 26

15 mi SE

Other

EXISTING RECORD

Measuring point TOP OF CASING

Measuring equipment TAPE

Frequency of measurement MONTHLY

Period of record --

Started 1949

Ended CONTINUING

Volume of missing record

July 1980
R. D. Cotter

MQ-9

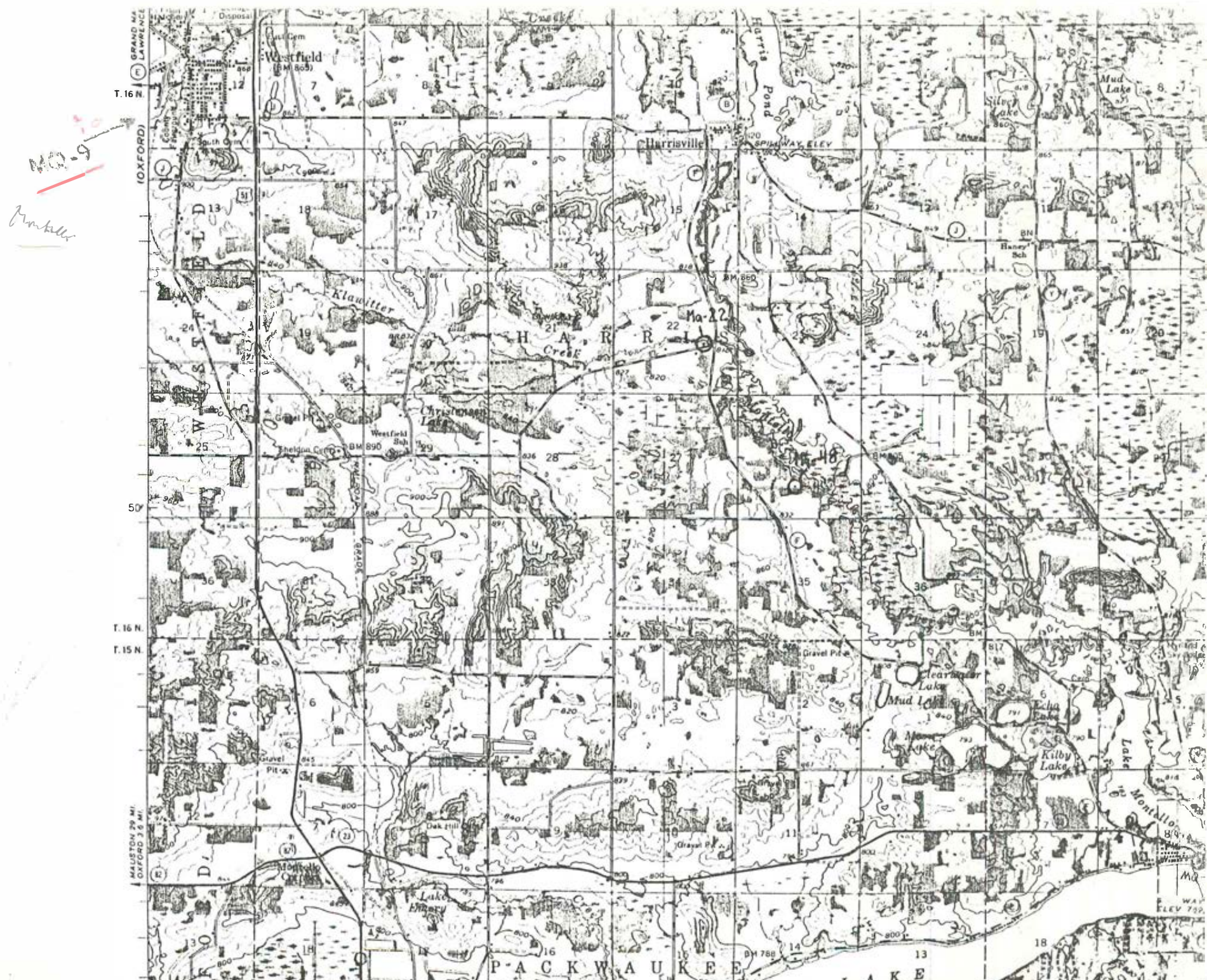
CRITERIA FOR EVALUATION OF WATER-LEVEL OBSERVATION WELLS IN WISCONSIN

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 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 GOOD
11. Knowledge of pumping effects —
12. Range and character of water level fluctuations 5 ft.
13. Length of record 31 yrs.
14. Missing record
15. Adequacy of current measuring frequency OK
16. Probability of permanence GOOD

NOTES

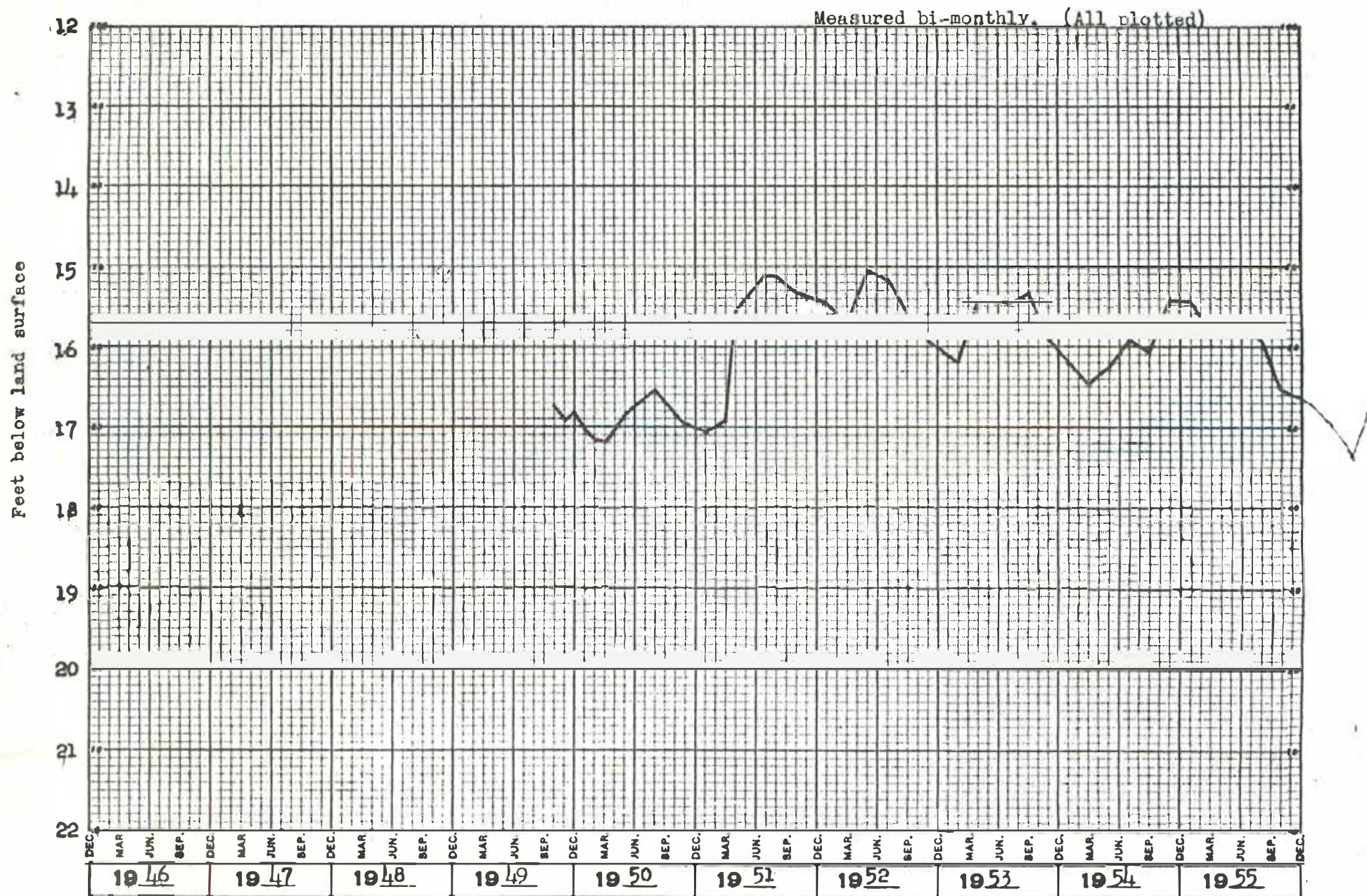
Recommendations

Appendix 15: Well MQ-09 documents, well location map



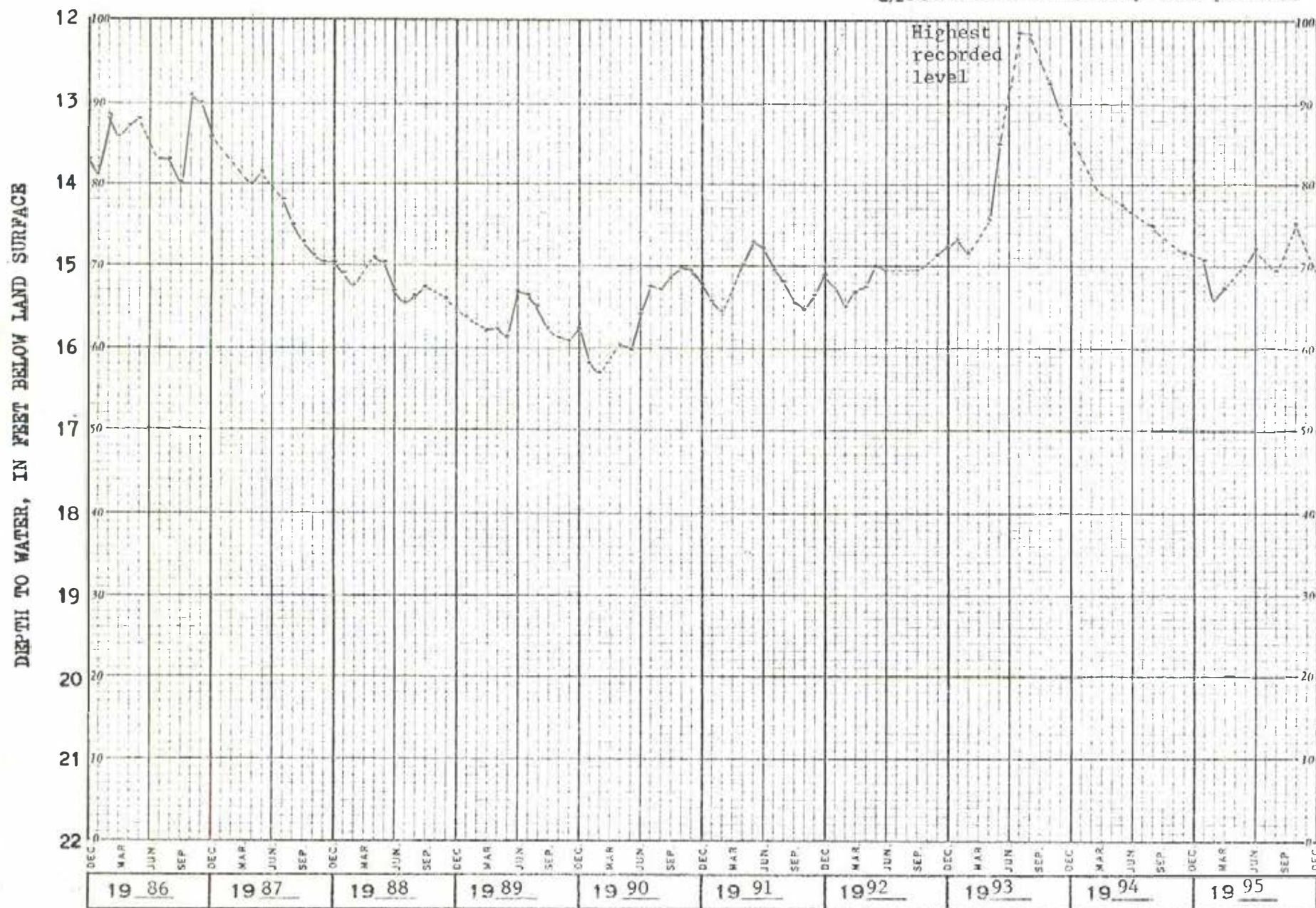


Mq 9, Marquette Co., Wis. Village of Westfield, SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, T.16N., R.8E. Drilled unused well.
 Measuring point is 1.0 feet above land surface. Cambrian sandstone aquifer.
 Depth 27 $\frac{1}{4}$ feet, diameter 6 inches.



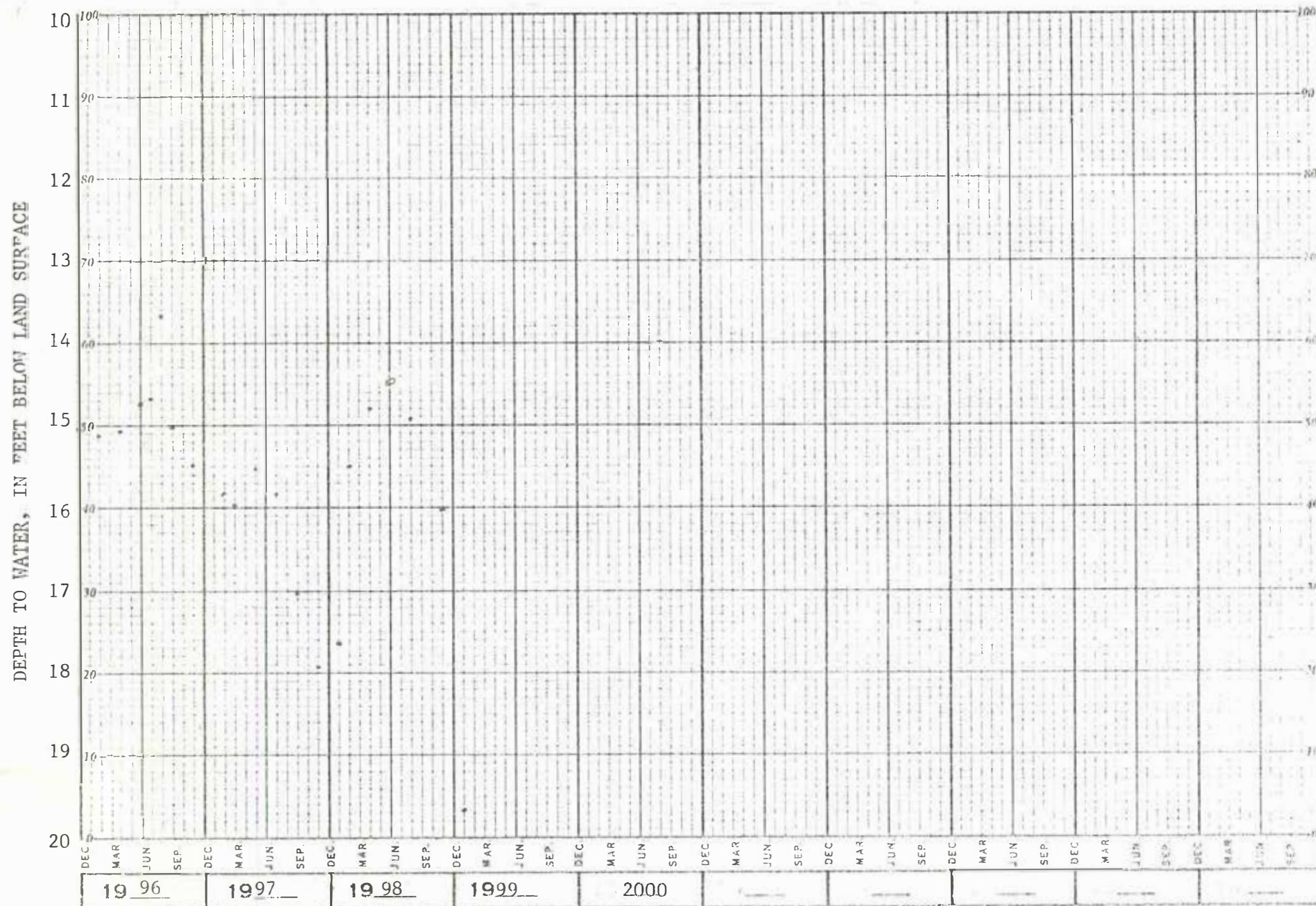
Mq-16/8/12-9. Village of Westfield. SW $\frac{1}{4}$ Sec 4. Drilled unused artesian well in sandstone of Cambrian age, diam 6 in, depth 274 ft. Lsd 880 ft above msl. MP top of casing, 1.00 ft above lsd.

Measured bi-monthly (All plotted)



Mq-16/8/12-9. Village of Westfield. SW $\frac{1}{4}$ $\frac{1}{4}$ Sec. 12, T. 9N, R. 12E. Drilled unused artesian well in sandstone of Cambrian age, diam 6 in, depth 274 ft. Lsd 880 ft above msl. MP top of casing, ~~1.00 ft above lsd.~~

⁹/₁₂ Measured bi-monthly (All plotted)



9-15 July 1935
vised

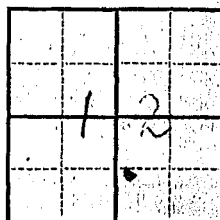
**UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH**

WELL SCHEDULE

Date Oct 17, 1949 Field No. Mq 9
Record by WJD & AMH Office No. _____
Source of data AIF Janke, Fire Chief

1. Location: State Wis County Marquette
Map SW 1/4 SE 1/4 sec. 12 T 7 N R 8
2. Owner: Village of Westfield Address Westfield
Tenant _____ Address _____
Driller _____ Address _____

3. Topography _____
4. Elevation _____ ft. above _____ below _____
5. Type: Dug, drilled, driven, bored, jetted _____ 19____
6. Depth: Rept. _____ ft. Meas. 274 ft.
7. Casing: Diam. 6 in., to _____ in., Type _____
Depth _____ ft., Finish _____



8. Chief Aquifer E S S From _____ ft. to _____ ft.
Others _____

Water level 17.76 ft. 10-17 1949 above _____ below _____
of casing _____ which is 1.0 ft. above _____ below _____ surface

10. Pump: Type _____ Capacity _____ G. M.
Power: Kind _____ Horsepower _____

11. Yield: Flow _____ G. M., Pump _____ G. M., Meas., Rept. Est. _____
Drawdown _____ ft. after _____ hours pumping _____ G. M.

12. Use: Dom., Stock, PS., RR., Ind., Irr., Obs. Fire well Also
Adequacy, permanence _____

13. Quality _____ Temp. _____ °F.
Taste, odor, color _____ Sample Yes _____ No _____
Unfit for _____

14. Remarks: (Log, Analyses, etc.) _____ In 2K Data Base verified _____
check for recorder locate fire chief
says OK except pull in emergency

14. Remarks: (Log, Analyses, etc.) _____
Source of data _____
Record by _____
Date _____
Field No. _____

15. Name: Part of Town of Westfield
16. Name: Sinclair Gas Station
17. Name: Owell
18. Name: Yellow Casing

19. Name: _____
20. Name: _____
21. Name: _____
22. Name: _____
23. Name: _____
24. Name: _____
25. Name: _____
26. Name: _____
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67. Name: _____
68. Name: _____
69. Name: _____
70. Name: _____

WATER RESOURCES BRANCH
GEOLOGICAL SURVEY
DEPARTMENT OF THE INTERIOR
UNITED STATES

WRD Exp.
April 1968Well No. MQ-16/8/12-7Well No. MQ-16/8/12

WELL SCHEDULE
U. S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

MASTER CARD

Record by E. J. DASPIT Source of data A. JANKE Date 18 DEC 67 Map MONTIELLO 1:2500State WISCONSIN 518 County MARQUETTE MILatitude: 43 52 44 N Longitude: 087 29 34 W Sequential number: 1Lat-long accuracy: 2 Sec 12 NW 5 SW 4 SE 4Local well number: 16 N 08 E 12 D C B 1 L Other number: 4Local use: WILDFIRE Owner or name: WILDFIREOwner or name: WILDFIRE Address: Westfield

Ownership: County, Fed Gov, City, Corp or Co, Private, State Agency, Water Dist

Use of water: (A) Air cond, Bottling, Comm, Dewater, Power, Fir, Dom, Irr, Med, Ind, P, S, Rec.

Use of well: (A) Anode, Drain, Seismic, Heat Res, Obs, Oil-gas, Recharge, Test, Unused, Withdraw, Waste, Destroyed

DATA AVAILABLE: Well data 4 Freq. W/L meas.: MONTHLY Field aquifer char. 1Hyd. lab. data: 1949Qual. water data: type: 1Freq. sampling: 1 Pumpage inventory: yes no period: 1Aperture cards: 1Log data: 1

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 274 ft 274 ftDepth cased: (first perf.) 6 ft 6 ft

Finish: (C) porous concrete, (F) gravel w. concrete, (H) gravel w. screen, (I) horiz. open, (J) open, (K) perf., (L) screen, (M) ad. pt., (N) shore, (O) open hole, (P) other

Method: (A) air, (B) bored, (C) cable, (D) dug, (E) hyd, (F) jetted, (G) air, (H) reverse, (I) trenching, (J) driven, (K) drive, (L) percussion, (M) rotary, (N) wash, (O) other

Date Drilled: 1 Pump intake setting: 1 ft 1 ftDriller: name 1 address 1

Lift: (A) air, (B) bucket, (C) cent, (D) jet, (E) multiple, (F) (ent.), (G) (ent.), (H) (ent.), (I) (ent.), (J) (ent.), (K) (ent.), (L) (ent.), (M) (ent.), (N) (ent.), (O) (ent.), (P) (ent.), (Q) (ent.), (R) (ent.), (S) (ent.), (T) (ent.), (U) (ent.), (V) (ent.), (W) (ent.), (X) (ent.), (Y) (ent.), (Z) (ent.)

Power: (type) diesel, elec, gas, gasoline, hand, gas, wind, H.P.

Descrip. MP TOP OF CASING 1 ft above LSD, Alt. MP 851Alt. LSD: 850 Accuracy: 80' CE topoWater Level: 10.52 ft above MP; Ft below LSD 1 Accuracy: 7.75Date meas: 406767 Yield: 1 gpmDrawdown: 1 ft Accuracy: 1 ftQUALITY OF WATER DATA: Iron ppm 1 Sulfate ppm 1 Chloride ppm 1 Hard. ppm 1Sp. Conduct: 1 x 10³ Temp. 1 Date sampled 1Taste, color, etc. Punched ERG

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD Physiographic Province: CEAST (C) Section: EL5Drainage Basin: GT LKS Subbasin: WOLF-FOX

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (G) hilltop, (H) sink, (I) swamp, (J) offshore, (K) pediment, (L) hillside, (M) terrace, (N) undulating, (O) valley flat

MAJOR AQUIFER: CAMP system UP series C13 aquifer, formation, group CAMB aquifer, formation, group 9.8Lithology: SANDSTONE Origin: MAR Thickness: 1 ftLength of well open to: 1 ft Depth to top of: 1 ftMINOR AQUIFER: 1 system 1 series 1 aquifer, formation, group 1 aquifer, formation, group 1Lithology: 1 Origin: 1 Thickness: 1 ftLength of well open to: 1 ft Depth to top of: 1 ftIntervals Screened: 1Depth to consolidated rock: 1 ft Source of data: 1Depth to basement: 1 ft Source of data: 1Surficial material: 1 Infiltration characteristics: 1Coefficient Trans: 1 gpd/ft² Coe ffl dnt Storage: 1Coefficient Perm: 1 gpd/ft²; Spec cap: 1 gpm/ft; Number of geologic cards: 1

AIP Janke - Pine Chief

S. PART OF CITY OF WILDFIELD

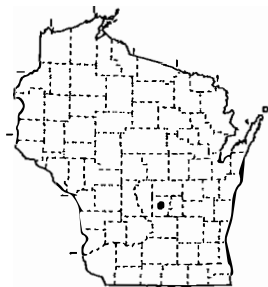
FORMER GAS STATION

CTY. 3

O WELL

YELLOW CASING

MEASURE UNDER CAP ON CASING WHERE CASING IS BENT IN. In 23 Data Base verified

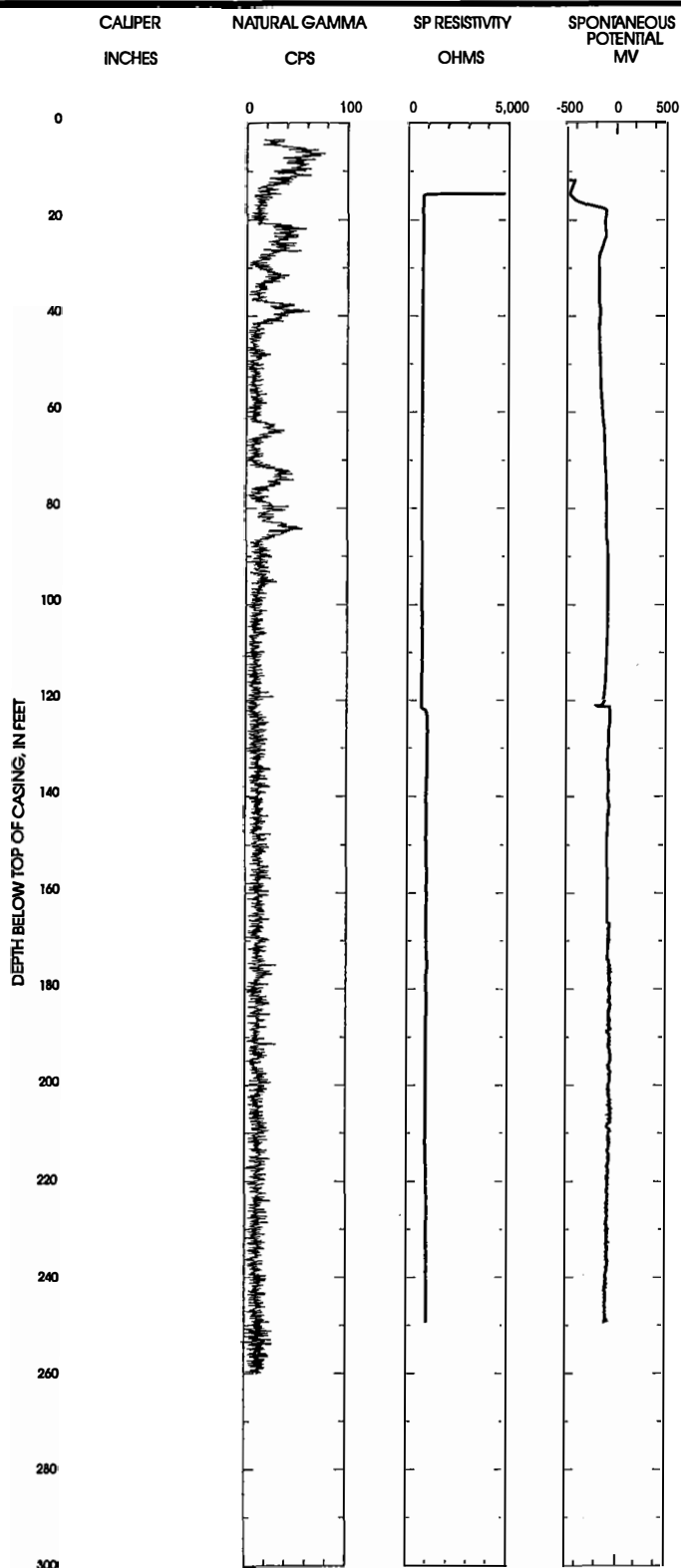


Marquette County

MQ-16/08E/12-0009

SANDSTONE AQUIFER

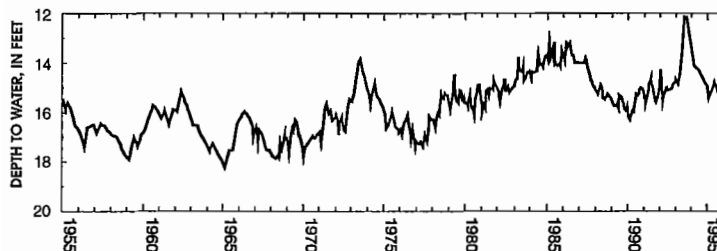
Geophysical Logs



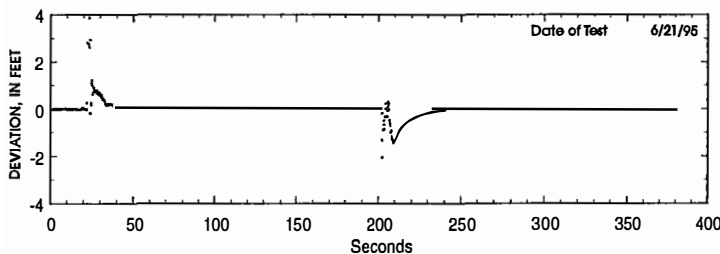
Well Information

Total Depth 274 feet
 Cased Depth Unknown feet
 Casing Diameter 6 inches
 Use of Well Non-pumping

Depth to Water Below Land Surface For Period of Record

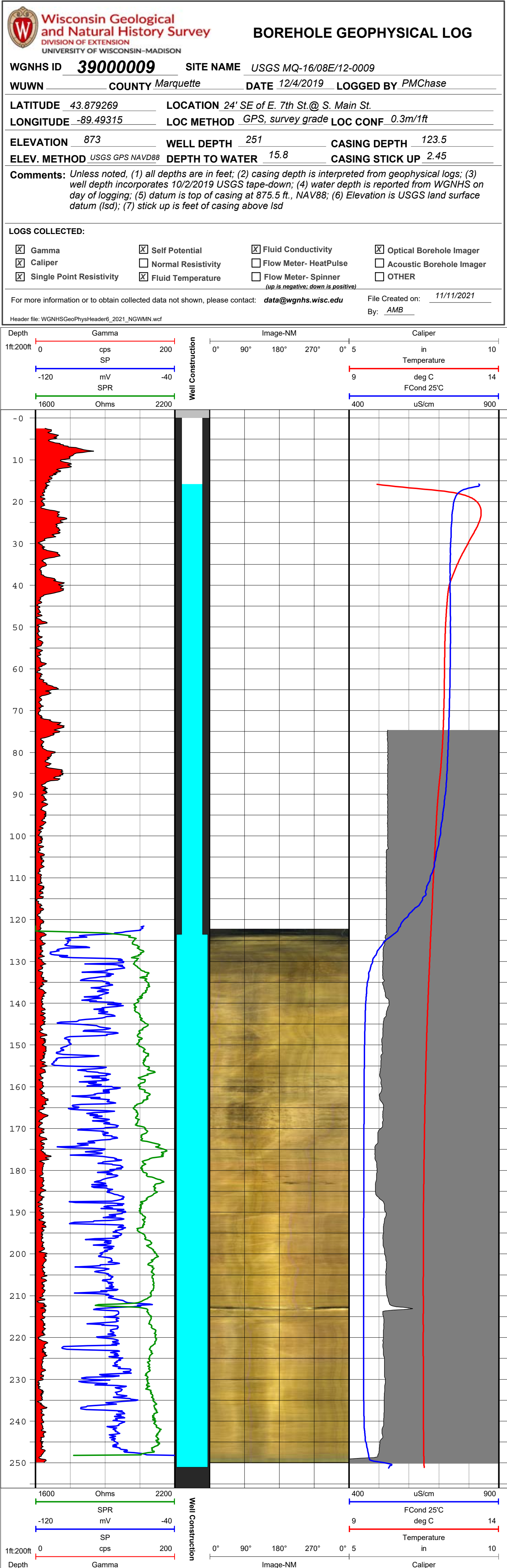


Deviation From Static Water Level During Displacement \ Recovery Test



Horizontal Hydraulic Conductivity

Hvorslev K
 > 8.1 feet/day



Appendix 16: Well SH-27 documents

Historical Documents

Basic well information, date unknown; well evaluation, date unknown; well location maps; hydrographs, 1974-1980, 1991-1997, 6 pages
well information historically compiled by WGNHS

WDNR well construction report, 1970, 1 page

USGS well schedule, 1974, 1 page

USGS site schedule, 1977, 5 pages

WGNHS preliminary geologic log, date unknown, 2 pages

SH-27

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number SH-27/16E/34-0027 (444627088321401)
 Owner Wis. Dept. of Transportation
 Location (Co., T/R.sec) *Wayne STH 29 32 mi. NW of Green Bay*
SHAWANO T. 27N., R. 16E., SEC. 34 NW 1/4 SE 1/4
 Land surface altitude *840 ft.* *WAYSIDE*
 Drainage basin *04030202* *Wolf River Basin*

WELL DATA

Depth *95 ft.*
 Casing depth *51 ft.*
 Screened interval *none*
 Diameter *6 in.*
 Aquifers open to well *Sandstone*
 Geologic log available? *yes* *no*
 Construction report available? *yes*
 Use of well *Wayside*
 Access to measure well *good*

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations *Shawano - 2 mi. W*
Clintonville - 13 mi. SW
 Streamgaging stations *Seymour - 21 mi. SE*
04077400 Wolf River Near Shawano - 5 mi. NW
 Observation wells *Sh 27 - 10 mi. SE* *Oc 20 - 24 mi. ENE*
On 380 - 18 mi. S *Wp 771 - 16 mi. SW*
 Other

EXISTING RECORD

Measuring point *1/4 in. hole in pump base*
 Measuring equipment *Tape*
 Frequency of measurement *Monthly*
 Period of record --
 Started *1974*
 Ended *Continuing*
 Volume of missing record

1st measured: Sept. 1974 8'45 ft

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

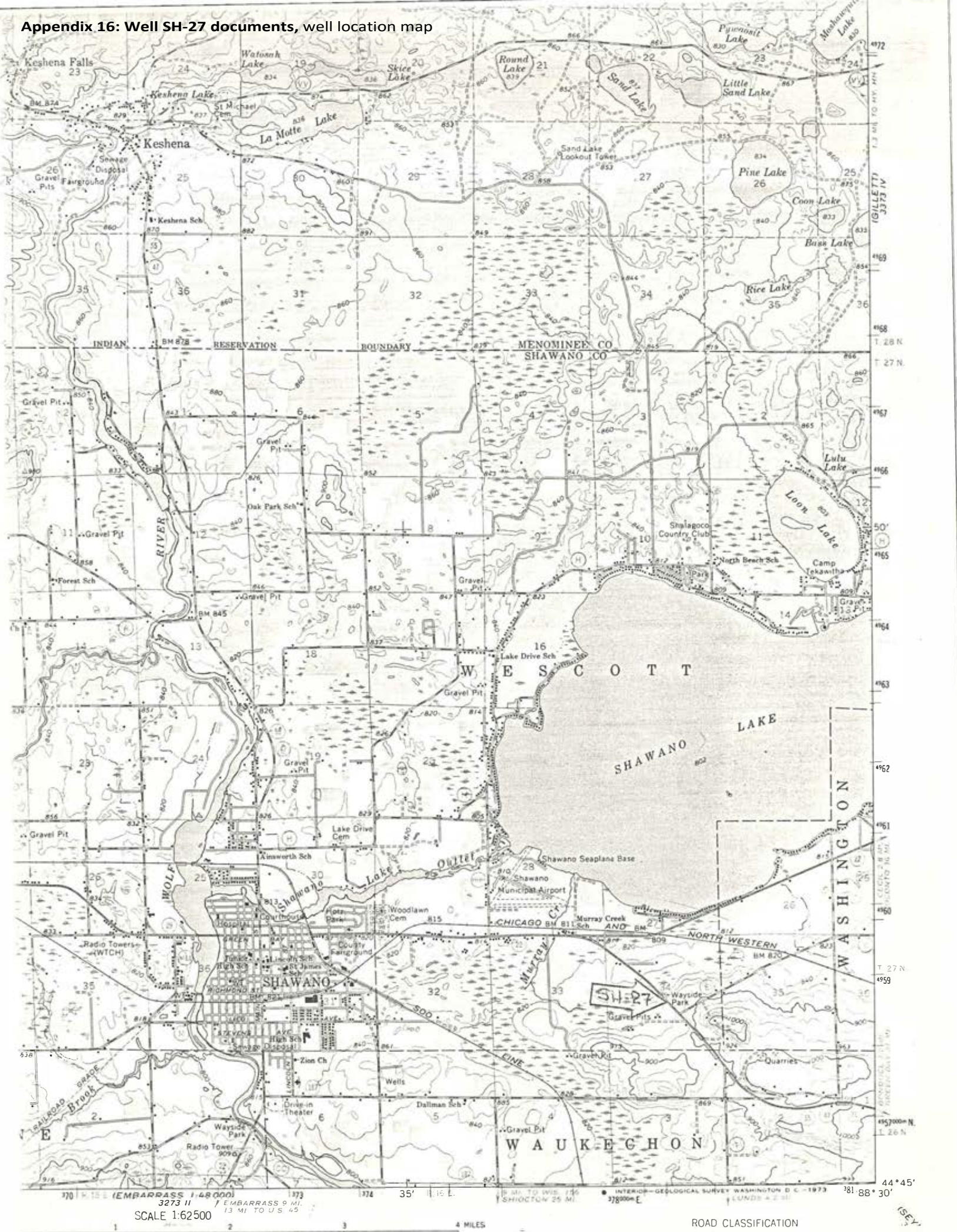
1. Areal spacing -- distance from any observation well 10 mi.
-- distance from observation well in same aquifer 25 mi.
2. Ownership: private -- ~~public~~
3. Use of well wayside
4. Access -- physical good
-- owner's permission OK
5. Condition of well -- casing good
-- housing none
6. Geologic log: ~~yes~~ -- no
7. Construction report: ~~yes~~ -- no
Well completion date: 3/70
8. Diameter (4 in. minimum for recorder) 6 in.
9. Aquifer: ~~single~~ -- multiple
10. Good hydraulic connection with aquifer good
11. Knowledge of pumping effect None
12. Range and character of w.l. fluctuations 7 ft.
13. Length of record 6 yrs.
14. Missing record
15. Adequacy of current measuring frequency good
16. Probability of permanence good
17. Recommendations/Improvements

Evaluated by _____ on _____

Appendix 16: Well SH-27 documents, well location map



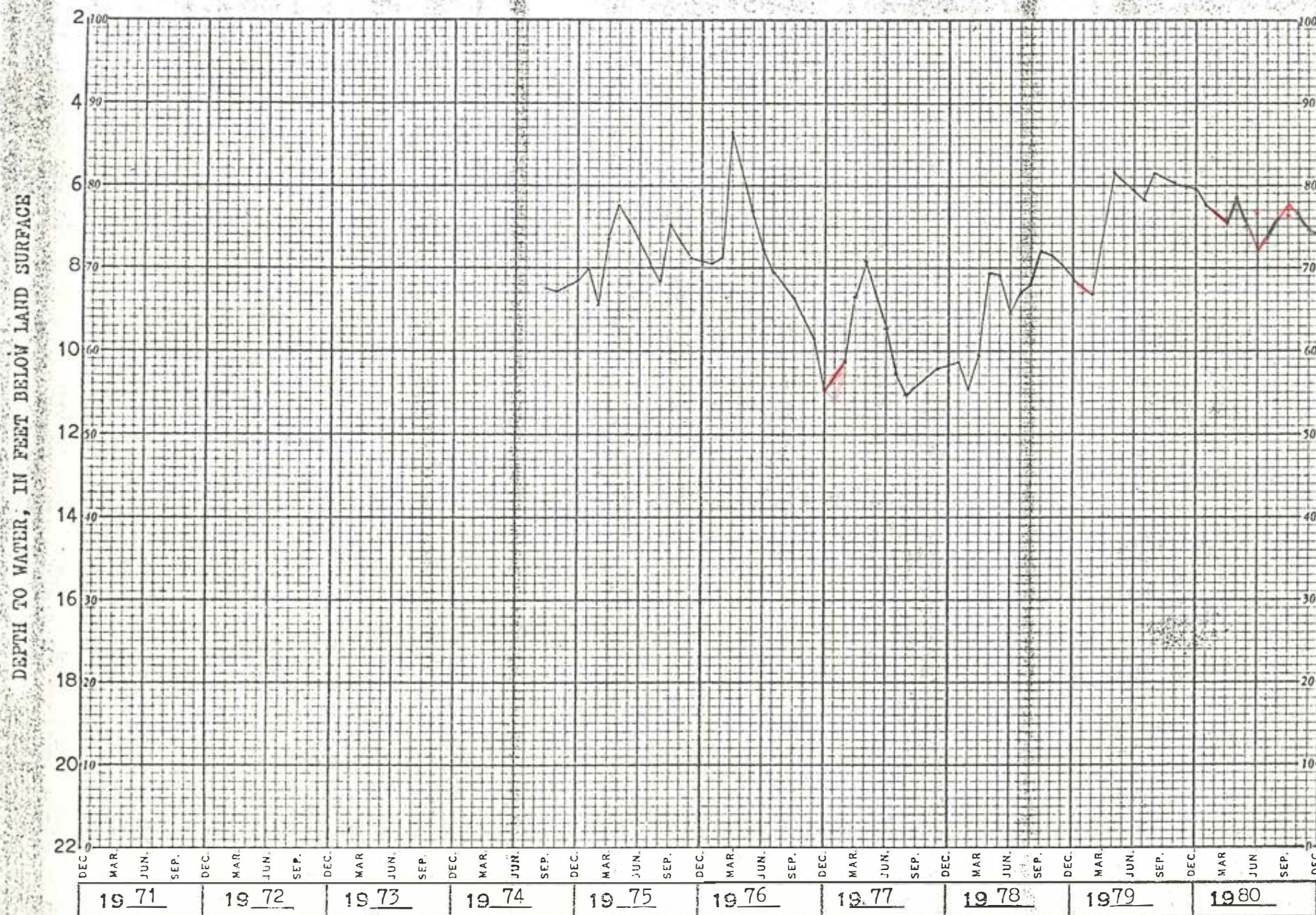
Appendix 16: Well SH-27 documents, well location map



CLEARPRINT PAPER CO. NO. C356, TEN YEARS BY MONTHS X 100 DIVISIONS.

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 10

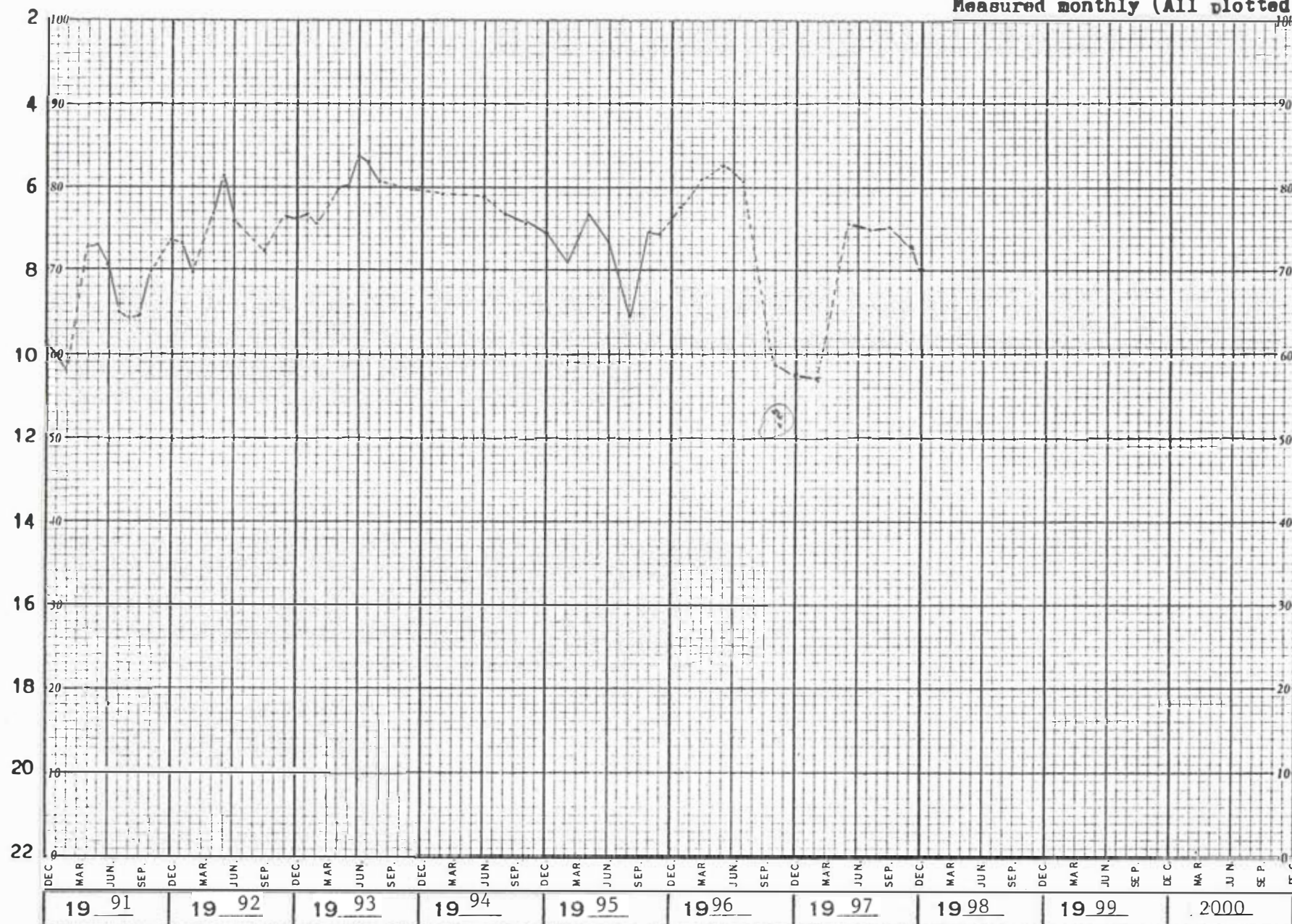
Sh-27/16/34-27. Wis. Dept. of Transportation. NW $\frac{1}{4}$ SE $\frac{1}{4}$. Drilled domestic water-table well in sandstone of Cambrian age, diam 6 in, depth 95 ft, cased to 51. Lsd 840 ft above nsl. MP $\frac{1}{4}$ -in hole in pump base, 2.00 ft above lsd.



SH-27/16E/34-0027. Wis. Dept. of Transportation. NW $\frac{1}{4}$ SE $\frac{1}{4}$. Drilled domestic water-table well in sandstone of Cambrian age, diam 6 in, depth 95 ft, cased to 51. Lsd 840 ft above msl. MP $\frac{1}{4}$ -in hole in pump base, 2.00 ft above lsd.

Measured monthly (All plotted)

DEPTH TO WATER, IN FEET BELOW LAND SURFACE



WELL CONSTRUCTOR'S REPORT

MAR 27 1970

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
Box 450
Madison, Wisconsin 53701

Well-6

WHITE COPY - DIVISION'S COPY
GREEN COPY - DRILLER'S COPY
YELLOW COPY - OWNER'S COPY

1. COUNTY Shawano CHECK ONE ☒ Town ☐ Village ☐ City Wescott NAME

2. LOCATION (Number and Street or 1/4 section, section, township and range. Also give subdivision name, lot and block numbers when available.)
NE 1/4 SW, Sec 34, T27N-R16E NW, SE, Sec. 34 per USGS

3. OWNER AT TIME OF DRILLING: State of Wis.

4. OWNER'S COMPLETE MAIL ADDRESS: Green Bay

5. Distance in feet from well to nearest:

BUILDING	SANITARY SEWER	FLOOR DRAIN	FOUNDATION DRAIN	WASTE WATER DRAIN	
C.I.	TILE	C.I.	TILE	C.I.	TILE
<u>none</u>	<u>none</u>	<u>none</u>	<u>none</u>	<u>none</u>	

(Record answer in appropriate block)

CLEAR WATER DRAIN	SEPTIC TANK	PRIVY	SEEPAGE PIT	ABSORPTION FIELD	BARN	SILLO	ABANDONED WELL	SINK HOLE
C.I.	TILE							
<u>none</u>	<u>none</u>	<u>100+</u>	<u>none</u>	<u>none</u>	<u>none</u>	<u>none</u>	<u>none</u>	<u>none</u>

OTHER POLLUTION SOURCES (Give description such as dump, quarry, drainage well, stream, pond, lake, etc.)
none

6. Well is intended to supply water for:

Hi-Way 29 Wayside

7. DRILLHOLE

Dis. (in.)	From (ft.)	To (ft.)	Dis. (in.)	From (ft.)	To (ft.)
<u>10</u>	<u>Surface</u>	<u>51</u>			
<u>6</u>	<u>51</u>	<u>95</u>			

10. FORMATIONS

Kind	From (ft.)	To (ft.)
<u>top soil & clay</u>	<u>Surface</u>	<u>6</u>
<u>sand</u>	<u>6</u>	<u>16</u>
<u>soft sandstone</u>	<u>16</u>	<u>45</u>
<u>sand stone</u>	<u>45</u>	<u>95</u>

8. CASING, LINER, CURBING, AND SCREEN

Dis. (in.)	Kind and Weight	From (ft.)	To (ft.)
<u>6-ID</u>	<u>18.8, new, black, PE</u>	<u>Surface</u>	<u>51</u>

9. GROUT OR OTHER SEALING MATERIAL

Kind	From (ft.)	To (ft.)
<u>Cement</u>	<u>Surface</u>	<u>51</u>

11. MISCELLANEOUS DATA

Yield test: 4 Hrs. at 15 GPM

Depth from surface to normal water level 15 ft.

Depth to water level when pumping 30 ft.

Water sample sent to Madison

Well construction completed on 3-25-1970Well is terminated 10 inches ☒ above ☐ below final gradeWell disinfected upon completion ☒ Yes ☐ NoWell sealed watertight upon completion ☒ Yes ☐ Nolaboratory on: 3-24-1970

Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, type of casing joints, method of finishing the well, amount of cement used in grouting, blasting, sub-surface pumprooms, access pits, etc., should be given on reverse side.

SIGNATURE

Bryan Jones

Registered Well Driller

COMPLETE MAIL ADDRESS

Ellett, Wis.

Please do not write in space below

COLIFORM TEST RESULT
REV. 11-68

GAS - 24 HRS.

GAS - 48 HRS.

CONFIRMED

REMARKS

SH2285

WRD Exp. (GW)
April 1966Well No. Sh-27/16E/34-27

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR

GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

MASTER CARD

Record by RME Source of data _____ Date 9/25/74 Me. _____

State WIS County (or town) SHAWANO

Latitude: 44° 46' 27" N Longitude: 088° 32' 14" W Sequential number: _____

Lat-long accuracy: 1:27 R 16 N, Sec 37, T. NW, S. SF

Local well number: _____ Other number: _____

Local use: _____

Owner or name: _____ Address: _____

Ownership: County, Fed Gov't, City, Corp or Co, Private, State Agency, Water Dist _____

Use of Air cond, Bottling, Comm, Dewater, Power, Fire, Dom, Irr, Med, Ind, P, S, Rec, _____

Water: (S) (T) (U) (V) (W) (X) (Y) (Z) (AA) (AB) (AC) (AD) (AE) (AF) (AG) (AH) (AI) (AJ) (AK) (AL) (AM) (AN) (AO) (AP) (AQ) (AR) (AS) (AT) (AU) (AV) (AW) (AX) (AY) (AZ) (BA) (BB) (BC) (BD) (BE) (BF) (BG) (BH) (BI) (BJ) (BK) (BL) (BM) (BN) (BO) (BP) (BQ) (BR) (BS) (BT) (BU) (BV) (BW) (BX) (BY) (BZ) (CA) (CB) (CC) (CD) (CE) (CF) (CG) (CH) (CI) (CJ) (CK) (CL) (CM) (CN) (CO) (CP) (CQ) (CR) (CS) (CT) (CU) (CV) (CW) (CX) (CY) (CZ) (DA) (DB) (DC) (DD) (DE) (DF) (DG) (DH) (DI) (DJ) (DK) (DL) (DM) (DN) (DO) (DP) (DQ) (DR) (DS) (DT) (DU) (DV) (DW) (DX) (DY) (DZ) (EA) (EB) (EC) (ED) (EE) (EF) (EG) (EH) (EI) (EJ) (EK) (EL) (EM) (EN) (EO) (EP) (EQ) (ER) (ES) (ET) (EU) (EV) (EW) (EX) (EY) (EZ) (FA) (FB) (FC) (FD) (FE) (FF) (FG) (FH) (FI) (FJ) (FK) (FL) (FM) (FN) (FO) (FP) (FQ) (FR) (FS) (FT) (FU) (FV) (FW) (FX) (FY) (FZ) (GA) (GB) (GC) (GD) (GE) (GF) (GG) (GH) (GI) (GJ) (GK) (GL) (GM) (GN) (GO) (GP) (GQ) (GR) (GS) (GT) (GU) (GV) (GW) (GX) (GY) (GZ) (HA) (HB) (HC) (HD) (HE) (HF) (HG) (HH) (HI) (HJ) (HK) (HL) (HM) (HN) (HO) (HP) (HQ) (HR) (HS) (HT) (HU) (HV) (HW) (HX) (HY) (HZ) (IA) (IB) (IC) (ID) (IE) (IF) (IG) (IH) (II) (IJ) (IK) (IL) (IM) (IN) (IO) (IP) (IQ) (IR) (IS) (IT) (IU) (IV) (IW) (IX) (IY) (IZ) (JA) (JB) (JC) (JD) (JE) (JF) (JG) (JH) (JI) (JJ) (JK) (JL) (JM) (JN) (JO) (JP) (JQ) (JR) (JS) (JT) (JU) (JV) (JW) (JX) (JY) (JZ) (KA) (KB) (KC) (KD) (KE) (KF) (KG) (KH) (KI) (KJ) (KK) (KL) (KM) (KN) (KO) (KP) (KQ) (KR) (KS) (KT) (KU) (KV) (KW) (KX) (KY) (KZ) (LA) (LB) (LC) (LD) (LE) (LF) (LG) (LH) (LI) (LJ) (LK) (LL) (LM) (LN) (LO) (LP) (LQ) (LR) (LS) (LT) (LU) (LV) (LW) (LX) (LY) (LZ) (MA) (MB) (MC) (MD) (ME) (MF) (MG) (MH) (MI) (MJ) (MK) (ML) (MN) (MO) (MP) (MQ) (MR) (MS) (MT) (MU) (MV) (MW) (MX) (MY) (MZ) (NA) (NB) (NC) (ND) (NE) (NF) (NG) (NH) (NI) (NJ) (NK) (NL) (NM) (NO) (NP) (NQ) (NR) (NS) (NT) (NU) (NV) (NW) (NX) (NY) (NZ) (OA) (OB) (OC) (OD) (OE) (OF) (OG) (OH) (OI) (OJ) (OK) (OL) (OM) (ON) (OO) (OP) (OQ) (OR) (OS) (OT) (OU) (OV) (OW) (OX) (OY) (OZ) (PA) (PB) (PC) (PD) (PE) (PF) (PG) (PH) (PI) (PJ) (PK) (PL) (PM) (PN) (PO) (PP) (PQ) (PR) (PS) (PT) (PU) (PV) (PW) (PX) (PY) (PZ) (QA) (QB) (QC) (QD) (QE) (QF) (QG) (QH) (QI) (QJ) (QK) (QL) (QM) (QN) (QO) (QP) (QQ) (QR) (QS) (QT) (QU) (QV) (QW) (QX) (QY) (QZ) (RA) (RB) (RC) (RD) (RE) (RF) (RG) (RH) (RI) (RJ) (RK) (RL) (RM) (RN) (RO) (RP) (RQ) (RR) (RS) (RT) (RU) (RV) (RW) (RX) (RY) (RZ) (SA) (SB) (SC) (SD) (SE) (SF) (SG) (SH) (SI) (SJ) (SK) (SL) (SM) (SN) (SO) (SP) (SQ) (SR) (SS) (ST) (SU) (SV) (SW) (SX) (SY) (SZ) (TA) (TB) (TC) (TD) (TE) (TF) (TG) (TH) (TI) (TJ) (TK) (TL) (TM) (TN) (TO) (TP) (TQ) (TR) (TS) (TT) (TU) (TV) (TW) (TX) (TY) (TZ) (UA) (UB) (UC) (UD) (UE) (UF) (UG) (UH) (UI) (UJ) (UK) (UL) (UM) (UN) (UO) (UP) (UQ) (UR) (US) (UT) (UU) (UV) (UW) (UX) (UY) (UZ) (VA) (VB) (VC) (VD) (VE) (VF) (VG) (VH) (VI) (VJ) (VK) (VL) (VM) (VN) (VO) (VP) (VQ) (VR) (VS) (VT) (VU) (VV) (VW) (VX) (VY) (VZ) (WA) (WB) (WC) (WD) (WE) (WF) (WG) (WH) (WI) (WJ) (WK) (WL) (WM) (WN) (WO) (WP) (WQ) (WR) (WS) (WT) (WU) (WV) (WW) (WX) (WY) (WZ) (XA) (XB) (XC) (XD) (XE) (XF) (XG) (XH) (XI) (XJ) (XK) (XL) (XM) (XN) (XO) (XP) (XQ) (XR) (XS) (XT) (XU) (XV) (XW) (XX) (XY) (XZ) (YA) (YB) (YC) (YD) (YE) (YF) (YG) (YH) (YI) (YJ) (YK) (YL) (YM) (YN) (YO) (YP) (YQ) (YR) (YS) (YT) (YU) (YV) (YW) (YX) (YY) (YZ) (ZA) (ZB) (ZC) (ZD) (ZE) (ZF) (ZG) (ZH) (ZI) (ZJ) (ZK) (ZL) (ZM) (ZN) (ZO) (ZP) (ZQ) (ZR) (ZS) (ZT) (ZU) (ZV) (ZW) (ZX) (ZY) (ZZ)

DATA AVAILABLE: Well data _____ Freq. W/L meas.: _____ Field aquifer char. _____

Hyd. lab. data: _____

Qual. water data: Type: _____

Freq. sampling: _____ Pumpage inventory: _____

Aperture cards: _____

Log data: _____

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: _____ Meas. _____

Depth cased: _____ Casing type: _____; Diam. _____

Finish: (C) (F) (G) (H) (I) (J) (K) (L) (M) (N) (O) (P) (Q) (R) (S) (T) (U) (V) (W) (X) (Y) (Z) (AA) (AB) (AC) (AD) (AE) (AF) (AG) (AH) (AI) (AJ) (AK) (AL) (AM) (AN) (AO) (AP) (AQ) (AR) (AS) (AT) (AU) (AV) (AW) (AX) (AY) (AZ) (BA) (BB) (BC) (BD) (BE) (BF) (BG) (BH) (BI) (BJ) (BK) (BL) (BM) (BN) (BO) (BP) (BQ) (BR) (BS) (BT) (BU) (BV) (BW) (BX) (BY) (BZ) (CA) (CB) (CC) (CD) (CE) (CF) (CG) (CH) (CI) (CJ) (CK) (CL) (CM) (CN) (CO) (CP) (CQ) (CR) (CS) (CT) (CU) (CV) (CW) (CX) (CY) (CZ) (DA) (DB) (DC) (DD) (DE) (DF) (DG) (DH) (DI) (DJ) (DK) (DL) (DM) (DN) (DO) (DP) (DQ) (DR) (DS) (DT) (DU) (DV) (DW) (DX) (DY) (DZ) (EA) (EB) (EC) (ED) (EE) (EF) (EG) (EH) (EI) (EJ) (EK) (EL) (EM) (EN) (EO) (EP) (EQ) (ER) (ES) (ET) (EU) (EV) (EW) (EX) (EY) (EZ) (FA) (FB) (FC) (FD) (FE) (FF) (FG) (FH) (FI) (FJ) (FK) (FL) (FM) (FN) (FO) (FP) (FQ) (FR) (FS) (FT) (FU) (FV) (FW) (FX) (FY) (FZ) (GA) (GB) (GC) (GD) (GE) (GF) (GG) (GH) (GI) (GJ) (GK) (GL) (GM) (GN) (GO) (GP) (GQ) (GR) (GS) (GT) (GU) (GV) (GW) (GX) (GY) (GZ) (HA) (HB) (HC) (HD) (HE) (HF) (HG) (HH) (HI) (HJ) (HK) (HL) (HM) (HN) (HO) (HP) (HQ) (HR) (HS) (HT) (HU) (HV) (HW) (HX) (HY) (HZ) (IA) (IB) (IC) (ID) (IE) (IF) (IG) (IH) (II) (IJ) (IK) (IL) (IM) (IN) (IO) (IP) (IQ) (IR) (IS) (IT) (IU) (IV) (IW) (IX) (IY) (IZ) (JA) (JB) (JC) (JD) (JE) (JF) (JG) (JH) (JI) (JJ) (JK) (JL) (JM) (JN) (JO) (JP) (JQ) (JR) (JS) (JT) (JU) (JV) (JW) (JX) (JY) (JZ) (KA) (KB) (KC) (KD) (KE) (KF) (KG) (KH) (KI) (KJ) (KK) (KL) (KM) (KN) (KO) (KP) (KQ) (KR) (KS) (KT) (KU) (KV) (KW) (KX) (KY) (KZ) (LA) (LB) (LC) (LD) (LE) (LF) (LG) (LH) (LI) (LJ) (LK) (LM) (LN) (LO) (LP) (LQ) (LR) (LS) (LT) (LU) (LV) (LW) (LX) (LY) (LZ) (MA) (MB) (MC) (MD) (ME) (MF) (MG) (MH) (MI) (MJ) (MK) (ML) (MN) (MO) (MP) (MQ) (MR) (MS) (MT) (MU) (MV) (MW) (MX) (MY) (MZ) (NA) (NB) (NC) (ND) (NE) (NF) (NG) (NH) (NI) (NJ) (NK) (NL) (NM) (NO) (NP) (NQ) (NR) (NS) (NT) (NU) (NV) (NW) (NX) (NY) (NZ) (OA) (OB) (OC) (OD) (OE) (OF) (OG) (OH) (OI) (OJ) (OK) (OL) (OM) (ON) (OO) (OP) (OQ) (OR) (OS) (OT) (OU) (OV) (OW) (OX) (OY) (OZ) (PA) (PB) (PC) (PD) (PE) (PF) (PG) (PH) (PI) (PJ) (PK) (PL) (PM) (PN) (PO) (PP) (PQ) (PR) (PS) (PT) (PU) (PV) (PW) (PX) (PY) (PZ) (QA) (QB) (QC) (QD) (QE) (QF) (QG) (QH) (QI) (QJ) (QK) (QL) (QM) (QN) (QO) (QP) (QQ) (QR) (QS) (QT) (QU) (QV) (QW) (QX) (QY) (QZ) (RA) (RB) (RC) (RD) (RE) (RF) (RG) (RH) (RI) (RJ) (RK) (RL) (RM) (RN) (RO) (RP) (RQ) (RR) (RS) (RT) (RU) (RV) (RW) (RX) (RY) (RZ) (SA) (SB) (SC) (SD) (SE) (SF) (SG) (SH) (SI) (SJ) (SK) (SL) (SM) (SN) (SO) (SP) (SQ) (SR) (SS) (ST) (SU) (SV) (SW) (SX) (SY) (SZ) (TA) (TB) (TC) (TD) (TE) (TF) (TG) (TH) (TI) (TJ) (TK) (TL) (TM) (TN) (TO) (TP) (TQ) (TR) (TS) (TT) (TU) (TV) (TW) (TX) (TY) (TZ) (UA) (UB) (UC) (UD) (UE) (UF) (UG) (UH) (UI) (UJ) (UK) (UL) (UM) (UN) (UO) (UP) (UQ) (UR) (US) (UT) (UU) (UV) (UW) (UX) (UY) (UZ) (VA) (VB) (VC) (VD) (VE) (VF) (VG) (VH) (VI) (VJ) (VK) (VL) (VM) (VN) (VO) (VP) (VQ) (VR) (VS) (VT) (VU) (VV) (VW) (VX) (VY) (VZ) (WA) (WB) (WC) (WD) (WE) (WF) (WG) (WH) (WI) (WJ) (WK) (WL) (WM) (WN) (WO) (WP) (WQ) (WR) (WS) (WT) (WU) (WV) (WW) (WX) (WY) (WZ) (XA) (XB) (XC) (XD) (XE) (XF) (XG) (XH) (XI) (XJ) (XK) (XL) (XM) (XN) (XO) (XP) (XQ) (XR) (XS) (XT) (XU) (XV) (XW) (XX) (XY) (XZ) (YA) (YB) (YC) (YD) (YE) (YF) (YG) (YH) (YI) (YJ) (YK) (YL) (YM) (YN) (YO) (YP) (YQ) (YR) (YS) (YT) (YU) (YV) (YW) (YX) (YY) (YZ) (ZA) (ZB) (ZC) (ZD) (ZE) (ZF) (ZG) (ZH) (ZI) (ZJ) (ZK) (ZL) (ZM) (ZN) (ZO) (ZP) (ZQ) (ZR) (ZS) (ZT) (ZU) (ZV) (ZW) (ZX) (ZY) (ZZ)

Date Drilled: 03/25/1970 Pump intake setting: _____

Driller: _____

Lift (A) (B) (C) (D) (E) (F) (G) (H) (I) (J) (K) (L) (M) (N) (O) (P) (Q) (R) (S) (T) (U) (V) (W) (X) (Y) (Z) (AA) (AB) (AC) (AD) (AE) (AF) (AG) (AH) (AI) (AJ) (AK) (AL) (AM) (AN) (AO) (AP) (AQ) (AR) (AS) (AT) (AU) (AV) (AW) (AX) (AY) (AZ) (BA) (BB) (BC) (BD) (BE) (BF) (BG) (BH) (BI) (BJ) (BK) (BL) (BM) (BN) (BO) (BP) (BQ) (BR) (BS) (BT) (BU) (BV) (BW) (BX) (BY) (BZ) (CA) (CB) (CC) (CD) (CE) (CF) (CG) (CH) (CI) (CJ) (CK) (CL) (CM) (CN) (CO) (CP) (CQ) (CR) (CS) (CT) (CU) (CV) (CW) (CX) (CY) (CZ) (DA) (DB) (DC) (DD) (DE) (DF) (DG) (DH) (DI) (DJ) (DK) (DL) (DM) (DN) (DO) (DP) (DQ) (DR) (DS) (DT) (DU) (DV) (DW) (DX) (DY) (DZ) (EA) (EB) (EC) (ED) (EE) (EF) (EG) (EH) (EI) (EJ) (EK) (EL) (EM) (EN) (EO) (EP) (EQ) (ER) (ES) (ET) (EU) (EV) (EW) (EX) (EY) (EZ) (FA) (FB) (FC) (FD) (FE) (FF) (FG) (FH) (FI) (FJ) (FK) (FL) (FM) (FN) (FO) (FP) (FQ) (FR) (FS) (FT) (FU) (FV) (FW) (FX) (FY) (FZ) (GA) (GB) (GC) (GD) (GE) (GF) (GG) (GH) (GI) (GJ) (GK) (GL) (GM) (GN) (GO) (GP) (GQ) (GR) (GS) (GT) (GU) (GV) (GW) (GX) (GY) (GZ) (HA) (HB) (HC) (HD) (HE) (HF) (HG) (HH) (HI) (HJ) (HK) (HL) (HM) (HN) (HO) (HP) (HQ) (HR) (HS) (HT) (HU) (HV) (HW) (HX) (HY) (HZ) (IA) (IB) (IC) (ID) (IE) (IF) (IG) (IH) (II) (IJ) (IK) (IL) (IM) (IN) (IO) (IP) (IQ) (IR) (IS) (IT) (IU) (IV) (IW) (IX) (IY) (IZ) (JA) (JB) (JC) (JD) (JE) (JF) (JG) (JH) (JI) (JJ) (JK) (JL) (JM) (JN) (JO) (JP) (JQ) (JR) (JS) (JT) (JU) (JV) (JW) (JX) (JY) (JZ) (KA) (KB) (KC) (KD) (KE) (KF) (KG) (KH) (KI) (KJ) (KK) (KL) (KM) (KN) (KO) (KP) (KQ) (KR) (KS) (KT) (KU) (KV) (KW) (KX) (KY) (KZ) (LA) (LB) (LC) (LD) (LE) (LF) (LG) (LH) (LI) (LJ) (LK) (LM) (LN) (LO) (LP) (LQ) (LR) (LS) (LT) (LU) (LV) (LW) (LX) (LY) (LZ) (MA) (MB) (MC) (MD) (ME) (MF) (MG) (MH) (MI) (MJ) (MK) (ML) (MN) (MO) (MP) (MQ) (MR) (MS) (MT) (MU) (MV) (MW) (MX) (MY) (MZ) (NA) (NB) (NC) (ND) (NE) (NF) (NG) (NH) (NI) (NJ) (NK) (NL) (NM) (NO) (NP) (NQ) (NR) (NS) (NT) (NU) (NV) (NW) (NX) (NY) (NZ) (OA) (OB) (OC) (OD) (OE) (OF) (OG) (OH) (OI) (OJ) (OK) (OL) (OM) (ON) (OO) (OP) (OQ) (OR) (OS) (OT) (OU) (OV) (OW) (OX) (OY) (OZ) (PA) (PB) (PC) (PD) (PE) (PF) (PG) (PH) (PI) (PJ) (PK) (PL) (PM) (PN) (PO) (PP) (PQ) (PR) (PS) (PT) (PU) (PV) (PW) (PX) (PY) (PZ) (QA) (QB) (QC) (QD) (QE) (QF) (QG) (QH) (QI) (QJ) (QK) (QL) (QM) (QN) (QO) (QP) (QQ) (QR) (QS) (QT) (QU) (QV) (QW) (QX) (QY) (QZ) (RA) (RB) (RC) (RD) (RE) (RF) (RG) (RH) (RI) (RJ) (RK) (RL) (RM) (RN) (RO) (RP) (RQ) (RR) (RS) (RT) (RU) (RV) (RW) (RX) (RY) (RZ) (SA) (SB) (SC) (SD) (SE) (SF) (SG) (SH) (SI) (SJ) (SK) (SL) (SM) (SN) (SO) (SP) (SQ) (SR) (SS) (ST) (SU) (SV) (SW) (SX) (SY) (SZ) (TA) (TB) (TC) (TD) (TE) (TF) (TG) (TH) (TI) (TJ) (TK) (TL) (TM) (TN) (TO) (TP) (TQ) (TR) (TS) (TT) (TU) (TV) (TW) (TX) (TY) (TZ) (UA) (UB) (UC) (UD) (UE) (UF) (UG) (UH) (UI) (UJ) (UK) (UL) (UM) (UN) (UO) (UP) (UQ) (UR) (US) (UT) (UU) (UV) (UW) (UX) (UY) (UZ) (VA) (VB) (VC) (VD) (VE) (VF) (VG) (VH) (VI) (VJ) (VK) (VL) (VM) (VN) (VO) (VP) (VQ) (VR) (VS) (VT) (VU) (VV) (VW) (VX) (VY) (VZ) (WA) (WB) (WC) (WD) (WE) (WF) (WG) (WH) (WI) (WJ) (WK) (WL) (WM) (WN) (WO) (WP) (WQ) (WR) (WS) (WT) (WU) (WV) (WW) (WX) (WY) (WZ) (XA) (XB) (XC) (XD) (XE) (XF) (XG) (XH) (XI) (XJ) (XK) (XL) (XM) (XN) (XO) (XP) (XQ) (XR) (XS) (XT) (XU) (XV) (XW) (XX) (XY) (XZ) (YA) (YB) (YC) (YD) (YE) (YF) (YG) (YH) (YI) (YJ) (YK) (YL) (YM) (YN) (YO) (YP) (YQ) (YR) (YS) (YT) (YU) (YV) (YW) (YX) (YY) (YZ) (ZA) (ZB) (ZC) (ZD) (ZE) (ZF) (ZG) (ZH) (ZI) (ZJ) (ZK) (ZL) (ZM) (ZN) (ZO) (ZP) (ZQ) (ZR) (ZS) (ZT) (ZU) (ZV) (ZW) (ZX) (ZY) (ZZ)

Power (type): diesel, elec, gas, gasoline, hand, gas, wind, H.P. _____

Descript. MP 1/4" hole in pump _____

Alt. LSD: 840 _____

Water Level 10.49 _____

Date Sept. 25/74 _____

Drawdown: _____

QUALITY OF WATER DATA: Iron _____ Sulfate _____ Chloride _____ Hard. _____

Sp. Conduct _____ K x 10⁶ _____ Temp. _____

Taste, color, etc. _____

Also on larger site schedule

Well No. Sh-27/16E/34-27

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD Physiographic Province: _____ Section: _____

Drainage Basin: _____ Subbasin: _____

(D) (C) (Z) (P) (H) (K) (L) depression, stream channel, dunes, flat, hilltop, sink, swamp.

Topo of well site: (Q) (P) (S) (T) (U) (V) offshore, pediment, hillside, terrace, undulating, valley flat _____

MAJOR AQUIFER: system _____ series _____ aquifer, formation, group _____

Lithology: _____ Origin: _____

Length of well open to: _____ ft _____ Depth to top of: _____ ft _____

MINOR AQUIFER: system _____ series _____ aquifer, formation, group _____

Lithology: _____ Origin: _____

Length of well open to: _____ ft _____ Depth to top of: _____ ft _____

Intervals Screened: _____

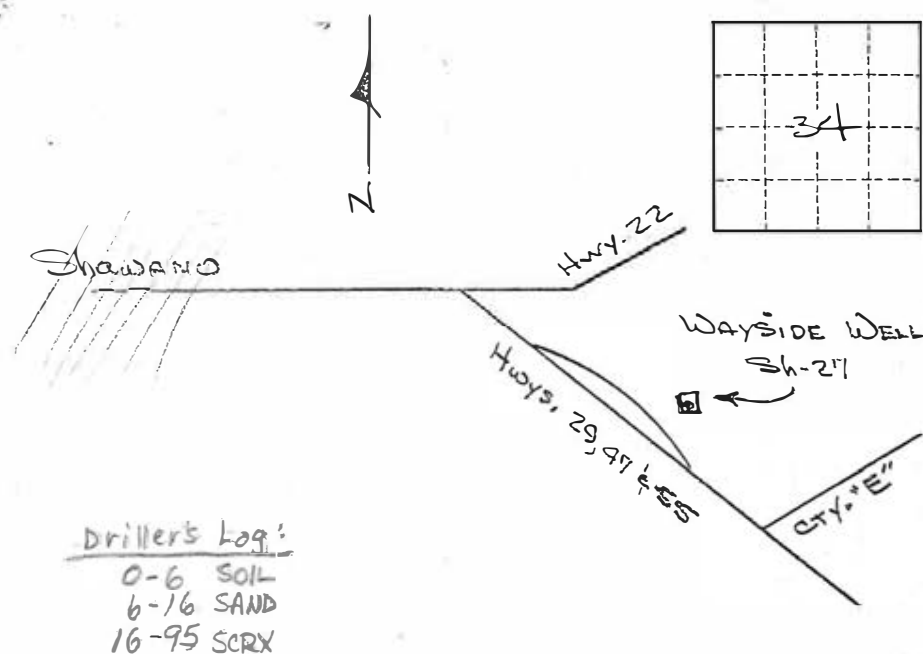
Depth to consolidated rock: _____ ft _____ Source of data: _____

Depth to basement: _____ ft _____ Source of data: _____

Surficial material: _____ Infiltration characteristics: _____

Coefficient Trans: _____ gpd/ft _____ Coefficient Storage: _____

Coefficient Perm: _____ gpd/ft² _____ Spec cap: _____ gpm/ft; Number of geologic cards: _____



FORM NO 9-1904-A

SITE NO SH-27/16E/34-0027Recorded by R.M. EricksonU.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
GROUND WATER SITE INVENTORY
SITE SCHEDULEDate 12/13/1977Check One ☒ English ☐ Metric Units

GENERAL SITE DATA (0)

Site Ident No 444627088321401 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 * Data 3= C U L M * Reliability 3= C U L M * Reporting Agency 4=USGS *
collector, drain, sinkhole, connector, multiple, pond, tunnel or, well shaft field checked, unchecked, location not, minimal accurate data

Project No. 5= * District 6=55 * State 7=55 * County (or town) SHAWANO 8=115 *

Latitude 9= 44 46 27 * Longitude 10= 088 32 14 * Lat-Long Accuracy 11= S F T M *
deg min sec deg min sec, 5 sec, 10 sec, Min

Local Number 12=SH-27/16E/34-0027 * Land Net Loc. 13= S 34 T 27 N R 16 E 4 *
1/4 1/4 1/4 section, township, range, mer

Location Map 14=SHAWANO * Scale 15=6250 0 *

Altitude 16= 840 1 * Method of Measurement 17=A L M * Accuracy 18=20 *
altimeter, level, map

Topo Setting 19= D C E F H K L O P S T U V W * Hydrologic Unit (OWDC) 20= *
depression, stream, dunes, flat, hilltop, sink, swamp, offshore, pediment, hillside, terrace, undulating, valley, upland channel flat draw

Date of First Construction/Completion 21=03/25/1970 * Use of Site 23=A D E G H O M P R S T U W X Z *
month day year anode, drain, geo- seismic, heat, observ- mine, oil or, recharge, repress, test, unused, with- waste, destroyed drawal, thermal reserv ation, gas

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, recreation, stock, institution, unused, desal, other supply

Secondary Water Use 25= 0 * Tertiary Use of Water 26= * Depth of Hole 27= 95 * Depth of Well 28= 95 * Source of Depth Data 29=D *
Source of

Water Level 30= 15 * Date Measured 31=03/25/1970 * Source 33=0 *
month day year

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, electric, calibrated, other gage pressure gage logs tape tape electric tape

Site Status 37=D F G H O P R S T V X Z *
dry, flowing, nearby, nearby, obstruction, pumping, recently, nearby, nearby, foreign surface water other recently, recently substance effects flowing flowing pumped pumping pumped pumped

Source of Geohydrologic Data 36=5 * Pump Used 35= * Measuring Point 266= 2 00 * Measuring Point Date 267=09/25/1974 *
month day year

OWNER IDENTIFICATION (1)

R=158 * T=A D M * Date of Ownership 159#03/25/1970 *
add, delete, modify month day year

Name: Last 161=TRANSPORTATION * First 162=WTS. DEP. OF * Middle Initial 163= *

OTHER SITE IDENTIFICATION NUMBERS (1)

R=189 * T=A D M * Ident 190#SH-0027 * Assigner 191=USGS *
add, delete, modify

New Card Same R & T Ident 190# * Assigner 191= *

SITE VISIT DATA (1)

R=186 * T=A D M * Date of Visit 187#09/25/1974 * Name of Person 188=ERICKSON R *
add, delete, modify month day year

FIELD WATER QUALITY MEASUREMENTS (1)

R=192 * T=A D M * Date 193# / / * Geohydro-logic Unit 195# *
add, delete, modify month day year

New Card Same R thru 195

Temperature 196# 0 0 0 1 0 * Degrees C 197= *
196# 0 0 0 9 5 * 197= *

Conductance 196# * Value 197= *

Other (STORET) Parameter 196# * Value 197= *

Other (STORET) Parameter 196# * Value 197= *

FOOT NOTES:

① Source of Data Codes:

S D O A R L G Z *
reporting, driller, owner, other gov't, other logs, geologist, other agency reported,

In 2K Data Base verified

SH-27/16E/34-0027

Appendix 16: Well SH-27 documents, USGS well schedule, 1977, continued

WELL CONSTRUCTION DATA (1)

R = 58 * T = (A) D M * Entry No 59 # 1 * Date of Construction Completion 60 = 03/25/1970 * Source of ① 64 = D *
 add, delete, modify
 Name of Contractor/Driller 63 = GILLET, CØ * GILLET WELL DRILLING CØ. GILLET, IL. 54124
 Method of Construction 65 = A B (C) D H J P R T V W Z *
 air-, rotary bored, cable-, dug, hydraulic, jetted, air-per-, reverse, trenching, driven, drive, other
 or augered tool end rotary rotary cussion rotary rotary
 Finish 66 = C F G H Ø P S T W (X) Z * Type of Seal 67 = B C (G) Z *
 porous, gravel w, gravel, horizontal, open, perforated, screen, sand point, walled, open, other
 concrete perf screen gallery, end or slotted hole hole grout
 Bottom of Seal 68 = 51 * Method of Development 69 = A B C J N P S Z *
 air-lift, bailed, compressed, jetted, none, other, surged, other
 pump air pump
 Special Treatment During Development 71 = C D E F H M Z *
 chemicals, dry ice, explosives, deflocculent, hydrofracturing, mechanical, other

DIMENSIONS OF THE HOLE CONSTRUCTED (2)

R = 72 * T = (A) D M * Construction Entry No 59 # 1 *
 add, delete, modify
 Top of Hole Segment Below LSD
 73 # 0 *
 73 # 51 *
 73 # *
 73 # *
 73 # *
 Bottom of Hole Segment below LSD
 74 = 51 *
 74 = 95 *
 74 = *
 74 = *
 74 = *
 Diameter of Hole Segment
 75 = 10 *
 75 = 6 *
 75 = *
 75 = *
 75 = *
 75 = *

New Card for Each Hole Segment
 Same R, T & Field 59

CASING SCHEDULE (2)

R = 76 * T = (A) D M * Construction Entry No 59 # 1 *
 add, delete, modify
 Top of Casing Segment Below LSD
 77 # 0 *
 77 # *
 77 # *
 77 # *
 77 # *
 Bottom of Casing Segment Below LSD
 78 = 51 *
 78 = *
 78 = *
 78 = *
 78 = *
 Diameter of Casing Segment
 79 = 6 *
 79 = *
 79 = *
 79 = *
 79 = *
 Casing Material ⑤
 80 = S *
 80 = *
 80 = *
 80 = *
 80 = *
 Thickness of Casing
 81 = *
 81 = *
 81 = *
 81 = *
 81 = *

OPENINGS SCHEDULE (2)

R = 82 * T = (A) D M * Construction Entry No 59 # 1 *
 add, delete, modify
 Top of Section Below LSD 83 # 16 *
 Bottom of Section Below LSD 84 = 2 *
 Type of Openings ⑥ 85 = *
 Type of Material ⑦ 86 = *
 Diameter of Open Section 87 = 6 *
 Width of Opening 88 = *
 Length of Opening 89 = *
 (Openings Data)
 83 # *
 84 = *
 85 = *
 86 = *
 87 = *
 88 = *
 89 = *
 (Openings Data)
 83 # *
 84 = *
 85 = *
 86 = *
 87 = *
 88 = *
 89 = *

FOOT NOTES:

① Source of Data Codes:

S D Ø A R L G Z
 reporting, driller, owner, other gov't, other logs, geologist, other
 agency reported,

⑥ Type of Openings Codes

F L M P R S T W X Z
 fracture, louvered, mesh, perforated, wire, screen, sand, walled, open, other
 shuttered or slotted wound (unknown) point hole

⑤ Casing Material Codes

B C G I M P R S T U W Z
 brick, concrete, galv, wrought, other, PVC or, rock or, steel, tile, coated, wood, other
 iron iron metal plastic stone steel

⑦ Type of Material Codes for Open Sections

B C G I M P R S T Z
 brass or, concrete, galv, wrought, other, PVC or, stainless, steel, tile, other
 bronze iron iron metal plastic steel

SITE NO. SH-27/6E/34-0027Check one English ☒ Metric ☐

GEOLOGIC LOG SCHEDULE

Site Ident No Recorded by RM ERICKSONDate 12/13/1977

GEOLOGIC UNIT DESCRIPTIONS

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 1</u> *	Depth to Top <u>91 = 0.0</u> *	Depth to Bottom <u>92 = 6.0</u> *
--------	-------------------	---------------------------	--------------------------------	-----------------------------------

Unit Identifier 93 = WISOL *Lithology 96 = SAIL *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 2</u> *	Depth to Top <u>91 = 6.0</u> *	Depth to Bottom <u>92 = 16.0</u> *
--------	-------------------	---------------------------	--------------------------------	------------------------------------

Unit Identifier 93 = WISAND *Lithology 96 = SAND *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 309</u> *	Depth to Top <u>91 = 16.0</u> *	Depth to Bottom <u>92 = 95.0</u> *
--------	-------------------	-----------------------------	---------------------------------	------------------------------------

Unit Identifier 93 = BITSCRX *Lithology 96 = SCRX *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 4</u> *	Depth to Top <u>91 =</u> *	Depth to Bottom <u>92 =</u> *
--------	-------------------	---------------------------	----------------------------	-------------------------------

Unit Identifier 93 = *Lithology 96 = *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 5</u> *	Depth to Top <u>91 =</u> *	Depth to Bottom <u>92 =</u> *
--------	-------------------	---------------------------	----------------------------	-------------------------------

Unit Identifier 93 = *Lithology 96 = *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 6</u> *	Depth to Top <u>91 =</u> *	Depth to Bottom <u>92 =</u> *
--------	-------------------	---------------------------	----------------------------	-------------------------------

Unit Identifier 93 = *Lithology 96 = *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 7</u> *	Depth to Top <u>91 =</u> *	Depth to Bottom <u>92 =</u> *
--------	-------------------	---------------------------	----------------------------	-------------------------------

Unit Identifier 93 = *Lithology 96 = *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 8</u> *	Depth to Top <u>91 =</u> *	Depth to Bottom <u>92 =</u> *
--------	-------------------	---------------------------	----------------------------	-------------------------------

Unit Identifier 93 = *Lithology 96 = *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 9</u> *	Depth to Top <u>91 =</u> *	Depth to Bottom <u>92 =</u> *
--------	-------------------	---------------------------	----------------------------	-------------------------------

Unit Identifier 93 = *Lithology 96 = *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 10</u> *	Depth to Top <u>91 =</u> *	Depth to Bottom <u>92 =</u> *
--------	-------------------	----------------------------	----------------------------	-------------------------------

Unit Identifier 93 = *Lithology 96 = *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 11</u> *	Depth to Top <u>91 =</u> *	Depth to Bottom <u>92 =</u> *
--------	-------------------	----------------------------	----------------------------	-------------------------------

Unit Identifier 93 = *Lithology 96 = *Lithologic Modifier 97 = *

R=90 *	T= <u>A</u> D M *	Entry No <u>256 # 12</u> *	Depth to Top <u>91 =</u> *	Depth to Bottom <u>92 =</u> *
--------	-------------------	----------------------------	----------------------------	-------------------------------

Unit Identifier 93 = *Lithology 96 = *Lithologic Modifier 97 = *SITE NO. SH-27/6E/34-0027

SH-27

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
physical,	common,	trace,	pesticides,	nutrients,	sanitary,	codes,	codes,	codes,	codes,	codes,	codes,	all or,	most	other											
	chemical	elements				R&D	R&E	R&F	R&G	R&H	R&I	R&J	R&K	R&L	R&M	R&N	R&O	R&P	R&Q	R&R	R&S	R&T	R&U	R&V	R&W

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * T = A D M * Entry No 256 # 100 * Depth to Top 91 = 16 * Depth to Bottom 92 = *

Unit Identifier 93 = 300S NDS * Lithology 96 = S NDS * Lithologic Modifier 97 = *

AQUIFER DATA (2)

R = 94 * T = A D M * Geohydrologic Unit Entry No 256 # 100 *
Date 95 # 09/25/1970 * Water Level 126 = 5 * % Water Contributed 132 = 100 *

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * T = A D M * 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 * Geohydrologic Unit Entry No 256 # *
Date 95 # / / * Water Level 126 = * % Water Contributed 132 = *

PERTINENT REMARKS

R = 183 * T = A * 185 = 'C186/MONTHLY VISITS BY USGS'
New Card Same R&T 185 = 'C266/.25 HOLE IN PUMP BASE'
185 = '

NOTES:

LOG

0-6 SOIL

6-16 SAND

16-45 SOFT SANDSTONE

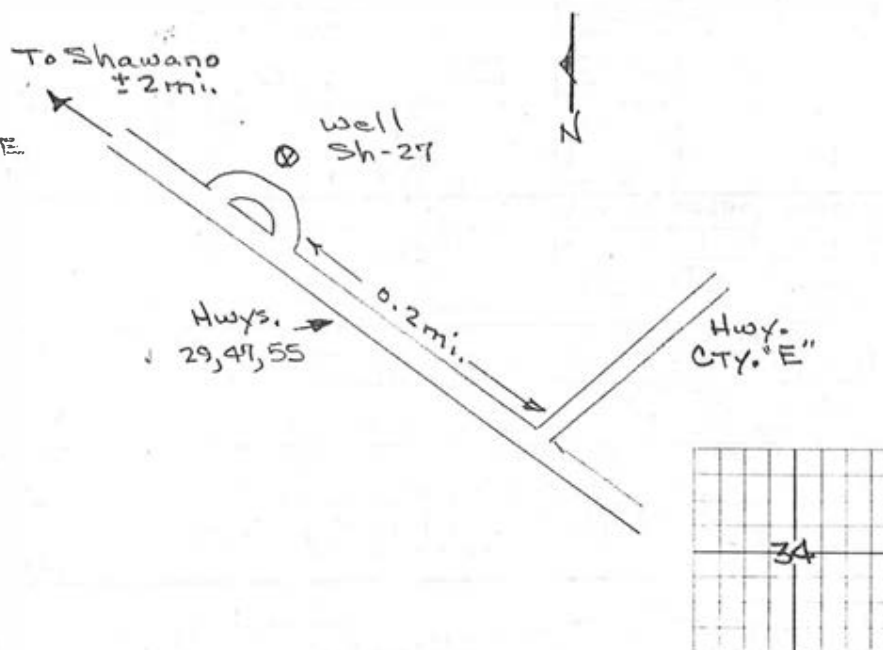
45-95 SANDSTONE

SEPT. 25, 1974

D/W → 10.49 MEAS.

- 2.00

8.49 TO WSD



Appendix 16: Well SH-27 documents, WGNHS preliminary geologic log, date unknown

Wisconsin Geological & Natural History Survey
3817 Mineral Point Rd. Madison, WI 53705

Preliminary Geologic Log
WG&NHS Log No. SH 27

Site Name: DOT Highway 29 Wayside

County: SHAWANO

Owner: Wis. Department of Transportation

Completed: 3 / 25 / 1970

Address:

Field Check:

Elevation: 840

Well Use: monitoring - discontinued

Driller: Gillett Well Drilling

Topo Name:

Engineer:

Sample Nos.

Location:

Perm no.:

SEC: 34 T 27 N R 16 E

WI-Unique ID#: JC778

Formations		
Formation	From	To
surface	0	6
Quaternary	6	16
St. Croixan Series undif	16	95

Records available for this site

* Indicates an indexing term

Diameter

*subsurface boring (non-core) site

USGS Groundwater Observation N

USGS record available

Lithology						
Top	Btm	Rock Type	Color	Mode	Range	Description
0	2	NO SAMPLE				
2	10	gravel	pale brown	Gr/MP		Subrounded. Poor sorting. Mixed. Slightly dolomitic. Much mixed Vfn/VC sand. Much silt.
10	16	gravel	pale brown	Gr/VLP		Subangular. Poor sorting. Mixed. Slightly dolomitic. Much mixed Vfn/VC sand. Little silt.
16	24	gravel	pale brown	Gr/MP		Subangular. Poor sorting. Mixed. Slightly dolomitic. Much mixed Vfn/VC sand. Trace silt.
24	35	gravel	pale brown	Gr/LP		Subangular. Poor sorting. Mixed. Slightly dolomitic. Much mixed Vfn/VC sand. Trace silt.
35	45	sand	yellow brow	Fn/VC		Subrounded. Poor sorting. Mixed. Slightly dolomitic. Much mixed Gr/MP gravel. Trace silt.
45	53	gravel	pale brown	Gr/VLP		Subangular. Poor sorting. Mixed. Slightly dolomitic. Much mixed Vfn/VC sand. Trace silt.
53	58	clay & silt	dark red bro	--		Very calcitic. Vfn/C sand. Trace Gr gravel.
58	69	sand	pale brown	Vfn/C		Subrounded. Poor sorting. Moderately calcitic. Little silt. Trace VC sand. Trace clay.

Appendix 16: Well SH-27 documents, WGNHS preliminary geologic log, date unknown, continued

Per IDL on 7/26/2018, geologic log file is missing. Data entry is incomplete for cuttings.

Per 3/14/2019 email from Mike Parsen:

I spoke with Darlene Sense, site contact for SH-27, on Tuesday and we agreed that the well was not the right fit for her

This is a preliminary geologic log. If more detailed information is needed please contact WGNHS Subsurface Lab at: (608) 263-4004 or geodata@wgnhs.uwex.edu.

Appendix 17: Well TA-01 documents

Historical Documents

Basic well information, 1980; well evaluation, 1980; well location map; USGS water-level data, 1988; hydrograph, 1957-1998, 9 pages
well information historically compiled by WGNHS

Geologic log and well construction information, 1950, 1 page

USGS well schedule, 1957, 1 page

USGS well schedule, 1967, 1 page

Geophysical, hydrological, and well construction information from Dunning and others (1996), 1 page

hydrograph (1957 - 1995), geophysical logs, and well measurements from unpublished report to DNR (DNR project number 118) by Dunning and others (1996)

datum is top of casing, approximately 2.3 ft above land surface in 1996, data courtesy of U.S. Geological Survey

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number Ta 1 (replaced well Ta 2 in 1949; wells are 30' apart)
 Owner Village of Gilman (well # 2)
 Location (Co., T/R.sec) Taylor Co., T 31 N, R 4 W, Sec 13 - SE/SW/SE 1/4;
 at Gilman
 Land surface altitude 1205 ft above sea
 Drainage basin CHIPPEWA R.: Yellow R. (200 ft off the right bank)

WELL DATA

Depth 24 ft
 Casing depth 16 ft
 Screened interval 16-24 ft
 Diameter 18"
 Aquifers open to well Pleistocene sand & gravel
 Geologic log available? yes
 Construction report available? no
 Use of well city supply
 Access to measure well

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Stanley - 15 mi SW
 Holcombe - 16 mi W
 Jump River - 13 mi N
 Streamgaging stations 05362000 Jump R. at Sheldon - 12 mi NW
 05365500 Chippewa R. at Chippewa Falls - 34 mi WSW
 Observation wells Ta 6 - 21 mi E Ch 284 - 17 mi W
 Ru 89 - 25 mi NNE Ru 202 - 20 mi NW
 Other Ta 9 - 28 mi ENE

EXISTING RECORD

Measuring point top of casing; 2.00 ft above land surface
 Measuring equipment recording gage installed Nov. 24, 1970
 Frequency of measurement continuous from Dec. 7, 1970 (quart. 04/17/57-12/20/63; monthly 1/18/64-12/7/70)
 Period of record -- 23 yrs
 Started April 17, 1957
 Ended
 Volume of missing record 9.5% for recorder
 43% for monthly

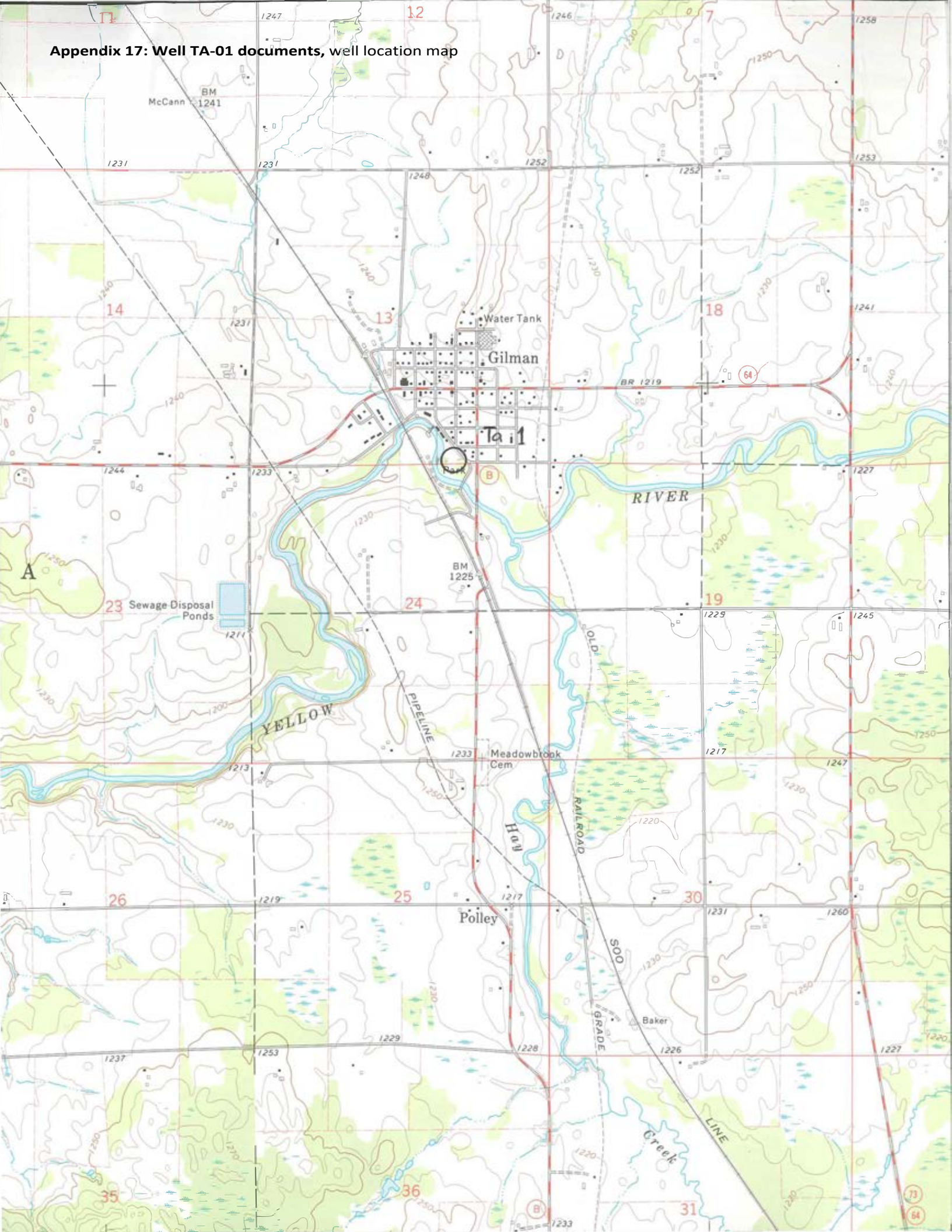
G3 08/11/80

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

1. Areal spacing -- distance from any observation well 21 mi.
-- distance from observation well in same aquifer 21 mi.
2. Ownership: private -- public
3. Use of well village 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: 1949
8. Diameter (4 in. minimum for recorder) 18"
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 6'4 ft (6'7"-13''); sharp fluct.;
no long-term trends
13. Length of record 23 yrs
14. Missing record 23% total (9.5% recorder; 13% monthly)
15. Adequacy of current measuring frequency OK
16. Probability of permanence keep as a key well
17. Recommendations/Improvements
- improve completeness of record; 9.5% too high for a recorder
- replace recorder

Evaluated by CZ on 8/15/80

Appendix 17: Well TA-01 documents, well location map



WHD/Mad-29

TA-0001 (1988)

Ident. No. 4,5,0,9,4,7,0,9,0,4,8,3,9,0,1
5 19U.S. DEPT. OF INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISIONHIGHEST WATER LEVEL 3.23 Apr. 18, 19 82LOWEST WATER LEVEL 13.11 Oct. 15, 19 59

WATER LEVELS IN OBSERVATION WELLS

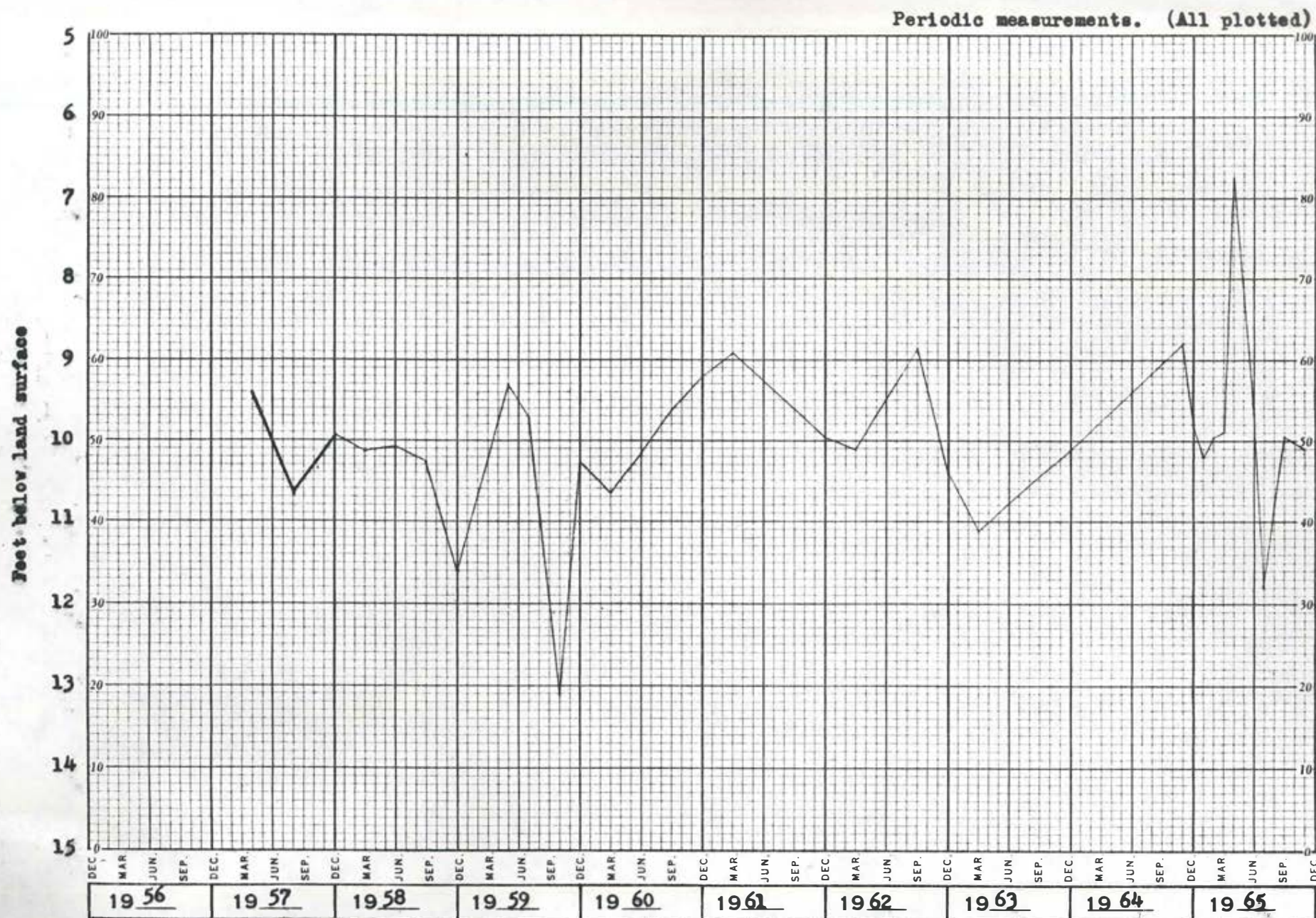
RECORDS AVAILABLE 1957-88

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	9.25	9.45	9.62✓	7.51	8.90	9.70	10.30	10.45	10.50	10.20	10.03	9.44
2	9.20	9.41	9.23	7.54	8.96	9.70	10.37	10.45	10.49	10.20	10.02	9.42
3	9.18	9.43	9.07	7.53	9.02	9.58	10.41	10.43	10.49	10.21	10.07	9.46
4	9.18	9.42	9.02	7.56	9.05	9.58	10.43	10.43	10.49	10.21✓	10.07	9.47
5	9.17	9.42	9.04	7.60	9.10	9.55	10.46	10.40	10.50	10.24✓	10.06	9.48
6	9.17	9.42	9.08	7.52	9.15	9.58	10.50	10.45	10.50	10.23	10.04	9.51
7	9.17	9.42	9.14	7.58	9.19	9.63	10.52	10.49	10.50	10.22	10.05	9.54
8	9.18	9.42	8.80	7.62	9.24	9.65	10.53	10.49	10.51	10.21	10.05	9.54
9	9.18	9.42	8.40	7.82	8.98	9.74	10.53✓	10.35	10.52	10.21	10.06	9.56
10	9.18	9.43	8.13	7.94	8.69	9.79	10.51	10.43	10.53	10.21	10.07	9.55
11	9.18	9.44	8.02	8.07	8.56	9.84	10.52	10.43	10.53✓	10.22	10.08	9.54
12	9.19	9.45	8.46	8.21	8.63	9.89	10.51	10.42	10.50	10.23	10.09✓	9.55
13	9.19	9.53	8.71	8.34	8.69	9.93	10.50	10.43	10.51	10.21	10.01	9.59
14	9.19	9.53	8.83	8.45	8.75	9.99	10.47	10.41	10.52	10.21	10.00	9.62
15	9.21	9.58	8.91	8.55	8.84	10.01	10.45	10.45	10.52	10.20	9.98	9.69
16	9.23	9.59	8.95	8.64	8.92	10.05	10.42	10.46	10.51	10.19	9.92	9.67
17	9.40	9.60	8.98	8.75	9.01	10.09	10.39	10.46	10.38	10.18	9.82	9.67
18	9.42	9.61	9.00	8.82	9.06	10.14	10.38	10.49	10.38	10.15	9.74	9.69
19	9.42	9.61	9.05	8.87	9.14	10.16	10.39	10.49	10.35	10.15	9.63	9.74
20	9.42✓	9.62	9.09	9.11	9.19	10.17	10.39	10.50	10.20	10.14	9.56	9.74
21	9.40	9.64	9.13	9.15	9.25	10.19	10.38	10.51	10.20	10.11	9.56	9.52
22	9.42	9.59	9.15	9.17✓	9.29	10.20	10.35	10.51✓	10.22	10.08	9.54✓	9.52
23	9.44	9.63	9.11	9.15	9.32	10.23	10.27	10.42	10.26	10.08	9.53	9.52
24	9.45	9.63	8.98	9.11	9.41	10.25	10.28	10.43	10.27	10.04	9.53	9.56
25	9.45	9.64✓	7.78	9.10	9.43	10.28	10.29	10.47	10.30	10.04	9.55	9.70
26	9.45	9.60	7.39	9.12	9.50	10.29✓	10.40	10.43	10.31	10.04	9.56	9.64
27	9.35	9.60	7.54	9.08✓	9.59	10.18	10.40	10.46	10.32	10.04	9.48	9.62
28	9.35	9.63	7.34	8.89	9.61	10.08	10.43	10.46	10.32	10.03	9.43	9.63
29	9.36	9.63	7.31	8.84	9.58	10.16	10.45	10.48	10.30	10.03	9.43	9.64
30	9.33		7.39	8.86	9.61	10.20	10.45	10.49	10.27	10.03	9.44	9.65
31	9.38		7.43		9.65✓		10.45	10.50		10.03		9.65

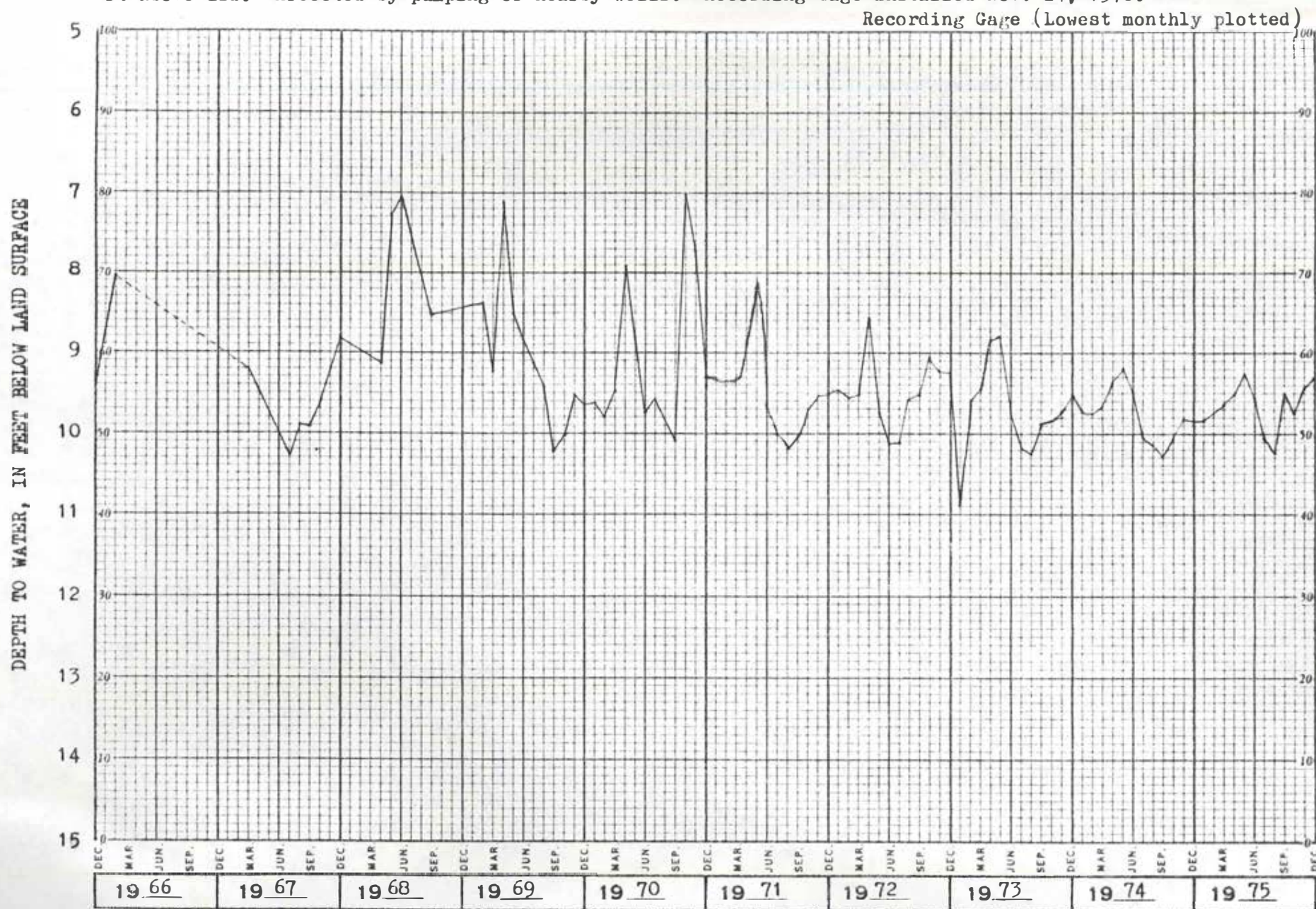
TA-31/04W/13-0001.
-2.00 ft. to lsd.HIGH - 7.16 MAR 26, 1983
LOW - 10.53 SEP 11, 1983

Report Page No. _____

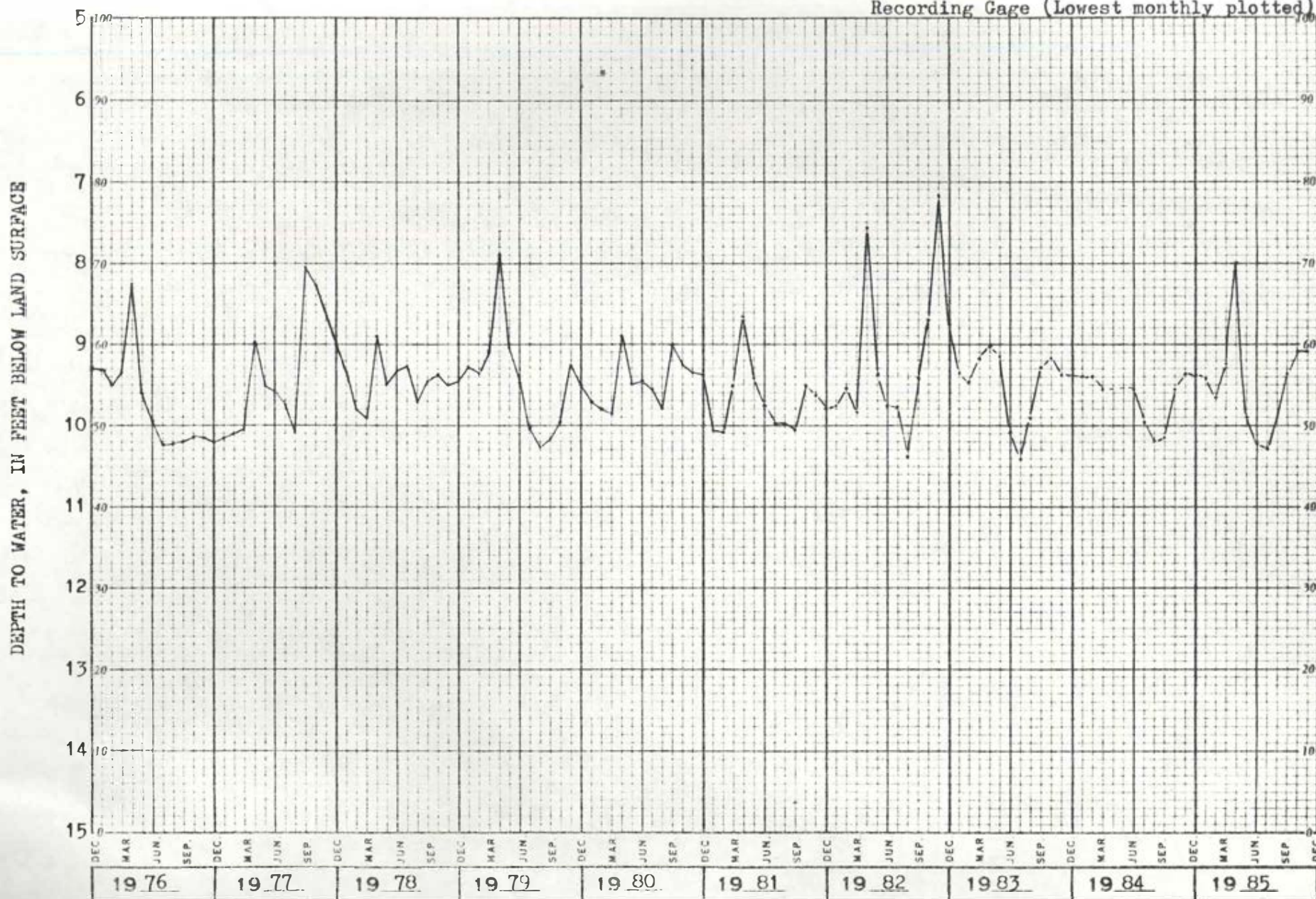
Ta 1. Taylor Co., Wis. Village of Gilman. NE $\frac{1}{4}$ sec. 24, T. 31 N., R. 2 W. Drilled public-supply water-table well in drift of Pleistocene age, diameter 18 to 16 inches, reported depth 24 feet, cased to 16, screen 16-24. Measuring point is top of casing, 2.0 feet above lsd.



Ta-31/4W/13-1. Village of Gilman. SW $\frac{1}{4}$ SE $\frac{1}{4}$. Drilled unused water-table well in drift of Pleistocene age, diam 18-16 in, depth 26 ft, cased to 16, screened 16-26. Lsd 1,200 ft above msl. MP top of casing, 2.00 ft above lsd. Affected by pumping of nearby wells. Recording Gage installed Nov. 24, 1970.

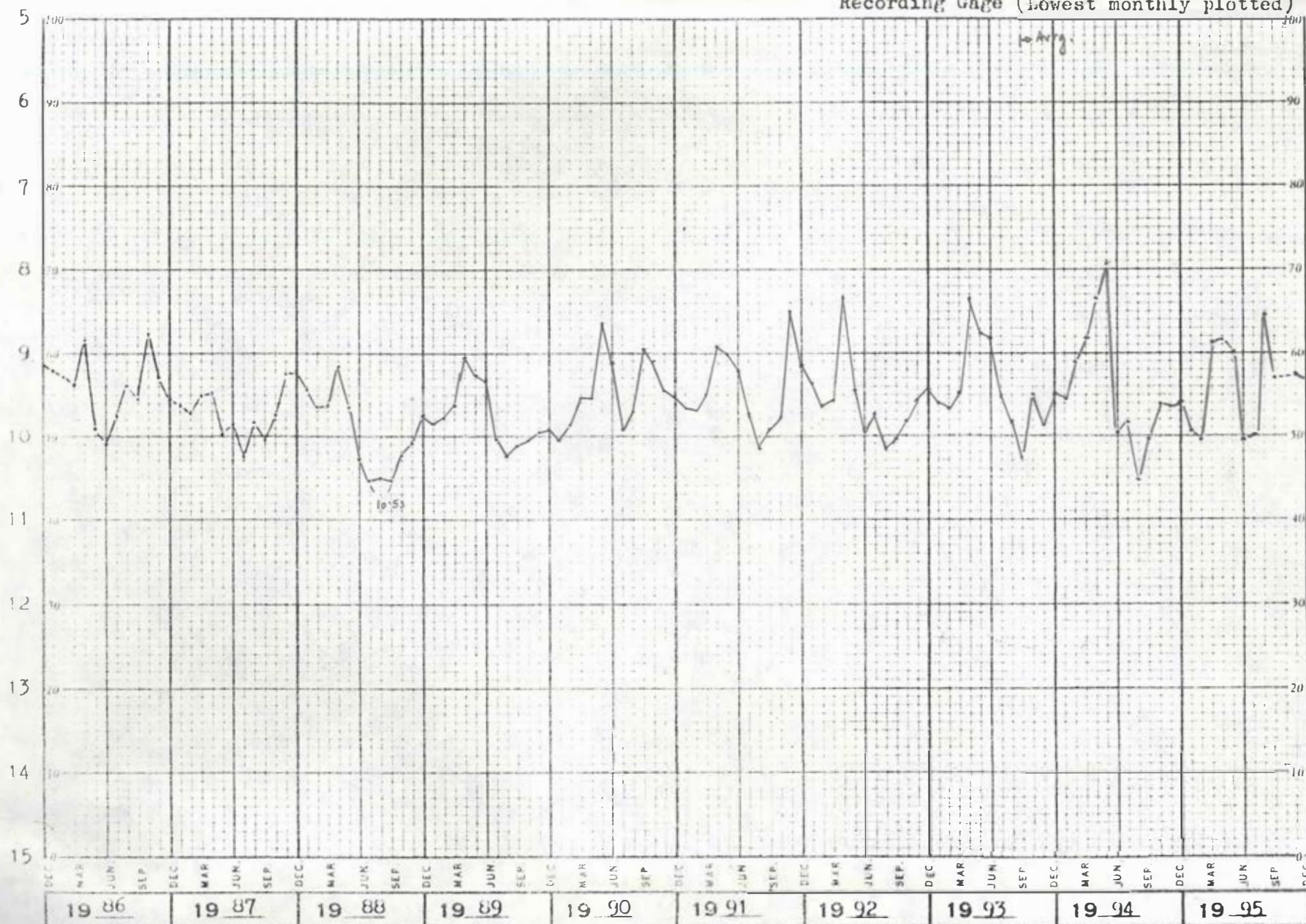


Recording Gage (Lowest monthly plotted)



TA-31/04W/13-0001. Village of Gilman. SW $\frac{1}{4}$ SE $\frac{1}{4}$. Drilled unused water-table well in the sand and gravel aquifer. Diameter 18 to 16 in., depth 26 ft., cased to 16 ft., screened 16 to 26 ft. Lsd 1,200 ft. above msl. NP top of casing, 2.00 ft. above lsd. Affected by pumping of nearby wells.

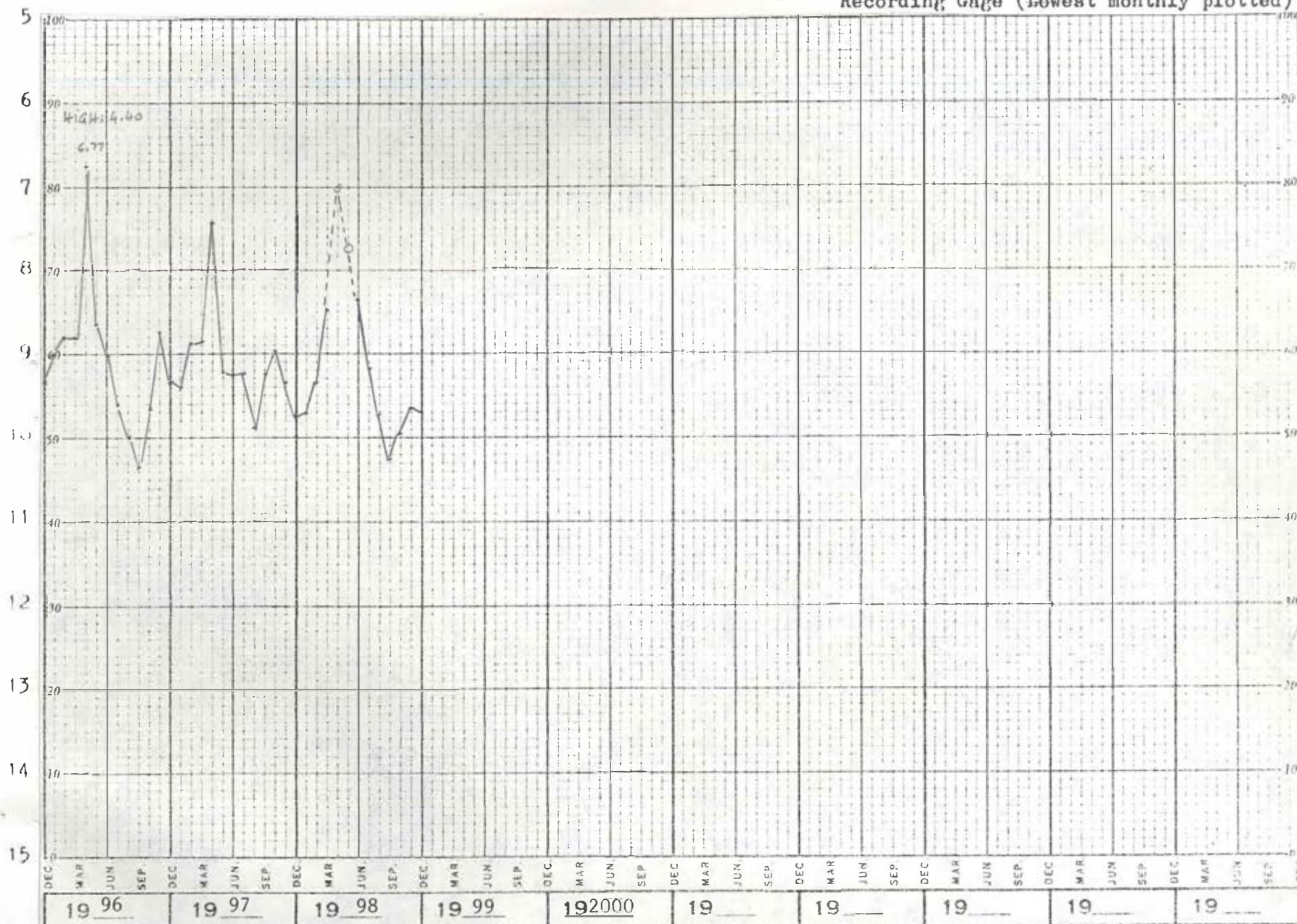
Recording Gage (lowest monthly plotted)



CLEARPRINT (L) 1015

TA-31/04W/13-0001. Village of Gilman. SW $\frac{1}{4}$ SE $\frac{1}{4}$. Drilled unused water-table well in the sand and gravel aquifer. Diameter 18 to 16 in., depth 26 ft., cased to 16 ft., screened 16 to 26 ft. Lsd 1,200 ft. above msl. MP top of casing, 2.00 ft. above lsd. Affected by pumping of nearby wells.

Recording Gage (lowest monthly plotted)



Ta-1

VIDIAGE WELL NO. 2, GILMAN, WIS.

SW $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, SW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec. 13, T. 31 N., R. 4 W. Near R.R. S. of bridge

Midwest Engineering Co., Marshfield, Engineers 1950

Samples examined by F. T. Thwaites, Nos. 147323-147328

Elevation - 1208' ETM

D	0-9	9	.....	Sand, very coarse to fine, gray	54" hole
R	9-12	3	.....	Till, gray	18" pipe
I	12-20	8	.....	Gravel, fine, very sandy	3" cemented
E	20-22	2	.....	Sand, west, no sample	16"
T	22-23	1	.....	Clay, sandy, no sample	conc. screen
P	23-27	4	.....	Clay, no sample	
	27-28	1	.....	Rock, no sample	

Total depth 24

Tested at 60 g.p.m. specific capacity = 10 g.p.m./ft. Static level = 8.0 ft.

Ground filled about 5ft. Base of pump 6 ft. above original surface.

9-185
(October 1950)UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

WELL SCHEDULE

Date April 17, 1957 Field No. 5-19-53 Ta-21
Record by LeRoux Office No. _____
Source of data UW log, Insp., John Zabinski (Surf.)1. Location: State Wisconsin County Taylor
Map County SE 13 RME 1/21/64
NE 1/4 NE 1/4 sec. 24 T 31 N R 4 W2. Owner: Village, Well #2 Address Gilman
Tenant _____ Address _____
Driller _____ Address _____3. Topography Flat4. Elevation 1202 ft. above _____
below _____5. Type: Dug, drilled, driven, bored, jetted 19496. Depth: Rept. 24 ft. Meas. 24.0 ft.7. Casing: Diam. 18 in., to _____ in., Type ONE
Depth 2-16 ft., Finish 1/8" concrete screen 16-248. Chief Aquifer glacial drift From 0 ft. to 27 1/2 ft.
Others _____9. Water level 11.42 ft. rept. Apr. 17 1957 above top
below _____
of casing which is 2.0 ft. above below surface

10. Pump: Type _____ Capacity _____ G. M.

Power: Kind Elec Horsepower _____

11. Yield: Flow _____ G. M., Pump _____ G. M., Meas., Rept. Est.

Drawdown _____ ft. after _____ hours pumping 60 G. M.12. Use: Dom., Stock, PS, RR., Ind., Irr, Obs UNUSED

Adequacy, permanence _____

13. Quality _____ Temp _____ °F.

Taste, odor, color _____ Sample Yes _____
No _____

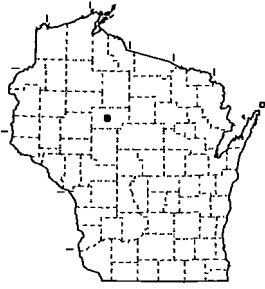
Unfit for _____

14. Remarks: (Log, Analyses, etc.) UW log specific capacity =
10 g.p.m./ft. static level = 18'. Ground filled about
5 ft. Base of pump 6' above original surface.

00 1191.0

U. S. GOVERNMENT PRINTING OFFICE 16-62891-1 In 2K Data Base verified

APP SCHEDULE C ADE

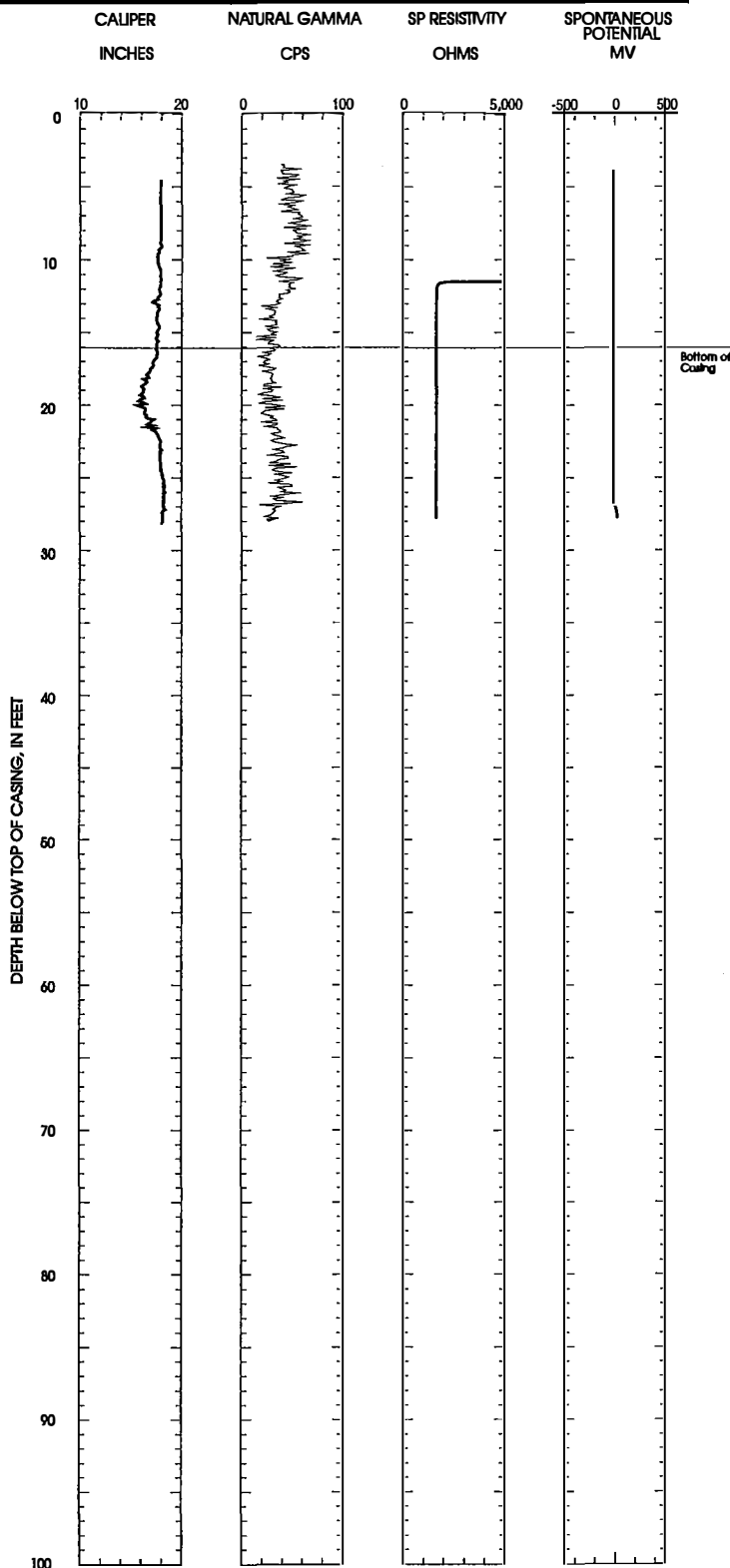


Taylor County

TA-31/04W/13-0001

SAND AND GRAVEL AQUIFER

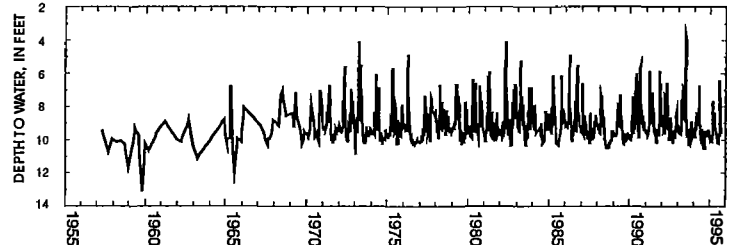
Geophysical Logs



Well Information

Total Depth 28 feet
 Cased Depth 16 feet
 Casing Diameter 18 inches
 Use of Well Non-pumping

Depth to Water Below Land Surface For Period of Record



Deviation From Static Water Level During Displacement/Recovery Test

Horizontal Hydraulic Conductivity

Hvorslev K
 Data not usable

Appendix 18: Well TR-71 documents

Historical Documents

Basic well information, 1980; well evaluation, 1980; well location map; hydrographs, 1979-1980, 1991-2000, 5 pages

well information historically compiled by WGNHS

Well construction reports, 1967, 2 pages

two versions from 1967 that are slightly different

USGS site schedule, 1979, 4 pages

WDNR approval to convert site to a monitoring well, 2008, 1 page

email conversation from WDNR to WDOT

Documentation of work done for this report

Right of work application and permit, 2019, 4 pages

WGNHS Geophysical Log, 2019, 1 page

gamma, self potential, single point resistivity, optical borehole image, fluid temperature, fluid conductivity, caliper

datum is top of casing (1.65 ft above land surface in 2019)

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number **Tr 71**Owner **Wis. DOT**Location (Co., T/R.sec) **Trumpleau Co.; T21N, R7W, Sec. 17-SE/NE/SW 1/4;
wayside #5 on USH 53 1 mi N of Blair**Land surface altitude **885'**Drainage basin **Mississippi R.; Trumpleau River**
distance to the nearest perennial stream: **1,000 ft of the L bank**

WELL DATA

Depth **83 ft.**Casing depth **42 ft**Screened interval **open hole**Diameter **0 ft - 42 ft; 4 in. : 42 ft - 83 ft; 6 in.**Aquifers open to well **Cambrian ? (unidentified)**Geologic log available? **no**Construction report available? **no**Use of well **wayside well**

Access to measure well

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations **Blair 1 mi E****Stream 20.50 mi NNW**

Streamgaging stations

Dodge 18.5 mi SW**0538200 Trumpleau River at Dodge 18.5 mi SW**

Observation wells

Tr 1 - 16 mi S**Bf 118. 27 mi WSW****Tr 9 - 19 mi SW****Tr 5 - 25 mi**

Other

EXISTING RECORD

Measuring point **4 in hole in pump base 2.00 ft above 1st**Measuring equipment **tape**Frequency of measurement **monthly**

Period of record --

Started **Nov. 16, 1979**

Ended

Volume of missing record **11/16/79 - 03/03/80**

Recorded by

A. Zernow

on

11/7/80

Tr 71LIST OF CRITERIA FOR THE EVALUATION OF
EXISTING 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 wayside 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: unknown (? before 1967)
well record on 09/11/67
8. Diameter (4 in. minimum for recorder) 4"
9. Aquifer: single -- multiple
10. Good hydraulic connection with aquifer
11. Knowledge of pumping effect
12. Range and character of w.l. fluctuations
13. Length of record 1 year
14. Missing record N/A
15. Adequacy of current measuring frequency inadequate
16. Probability of permanence good
17. Recommendations/Improvements

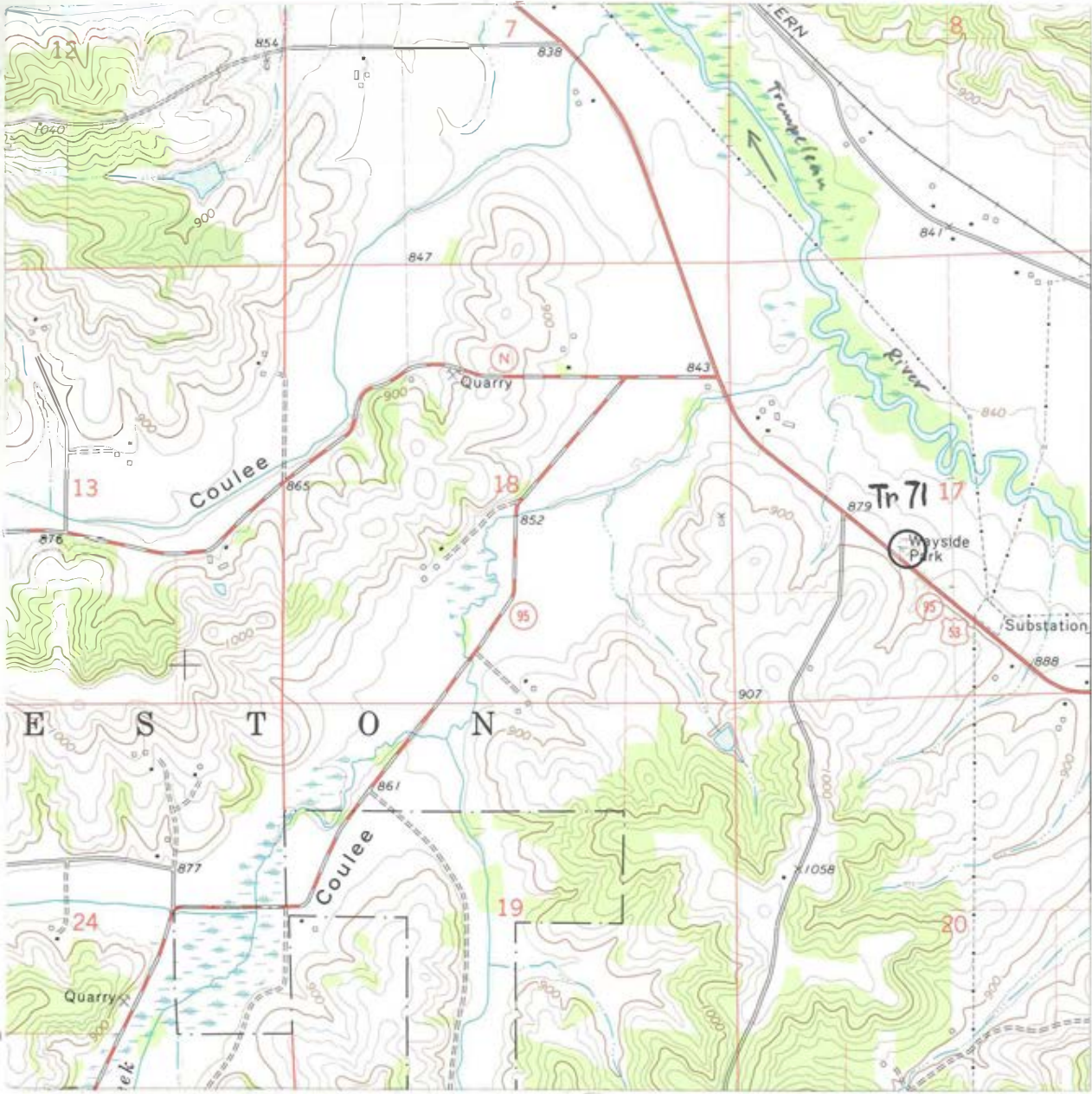
16 mi
16 mi

check DNR

} N/A

- maintain monthly frequency

Evaluated by A. Zimmerman on 11/21/80

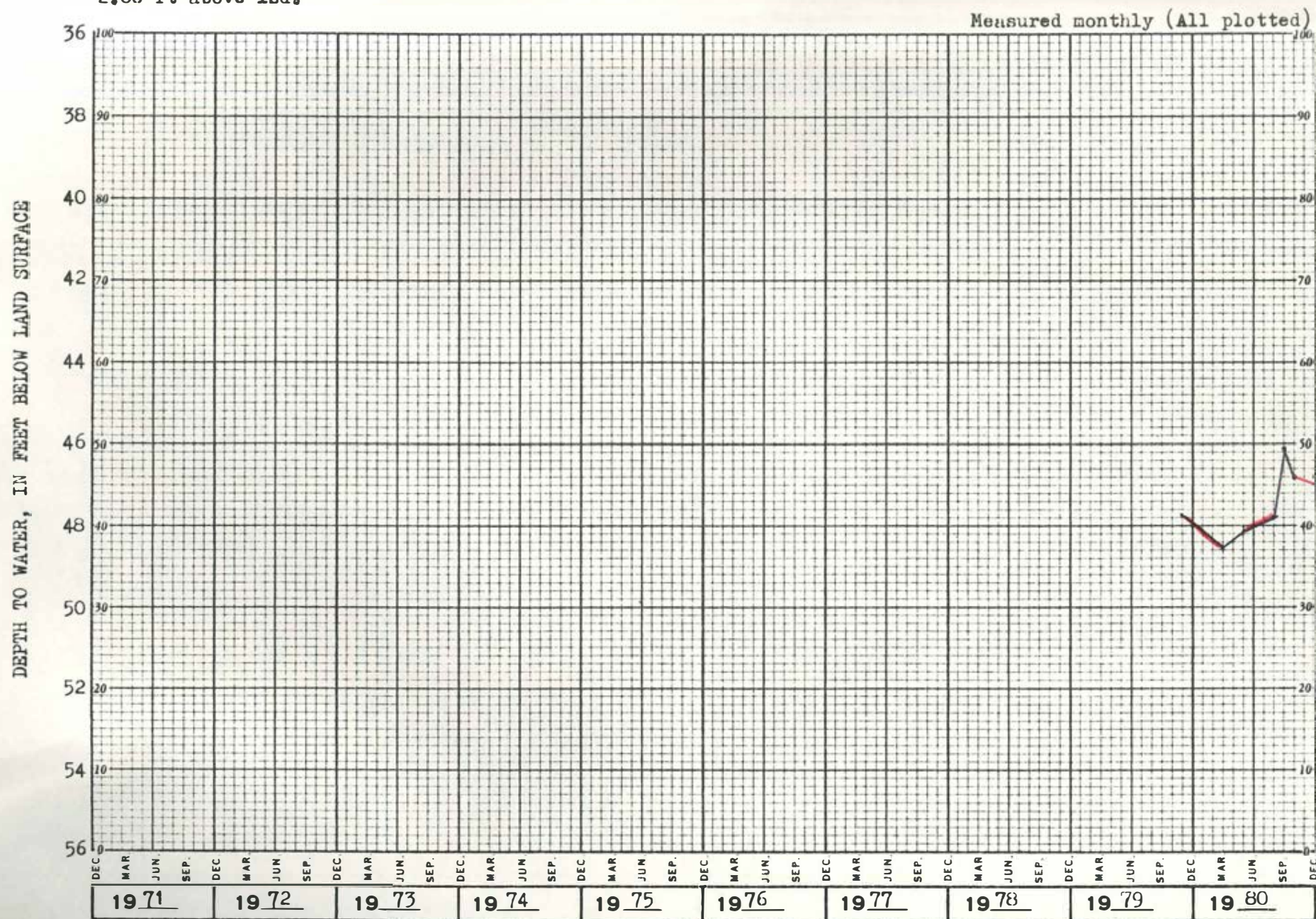


Appendix 18: Well TR-71 documents, hydrograph

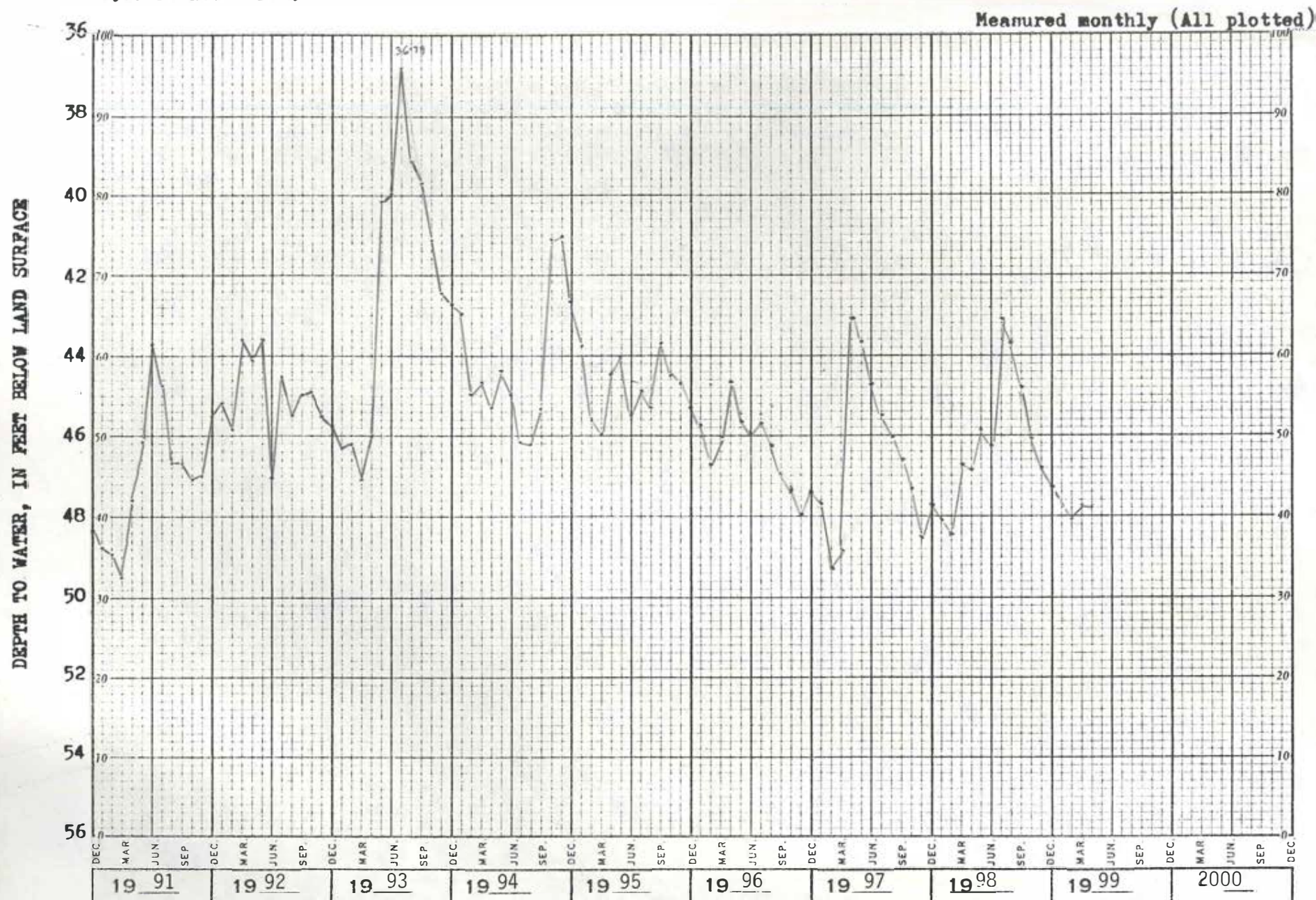
CLEARPRINT PAPER CO. NO. C356. TEN YEARS BY MONTHS X 100 DIVISIONS.

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015

TR-21/07W/17-0071. Wis. Dept. of Transportation. Drilled domestic water-table well in sandstone of Cambrian age, diam 4 in, depth 83 ft, cased to 42. Lsd 885 ft above msl. MP $\frac{1}{4}$ -in hole in pump base, 2.00 ft above lsd.



TR-21/07W/17-0071. Wis. Dept. of Transportation. NB $\frac{1}{4}$ SW $\frac{1}{4}$. Drilled domestic water-table well in sandstone of Cambrian age, diam 4 in, depth 83 ft, cased to 42. Lsd 885 ft above msl. MP $\frac{1}{4}$ -in hole in pump base, 2.00 ft above lsd.



WELL CONSTRUCTOR'S REPORT

WISCONSIN STATE BOARD OF HEALTH

Well

1. COUNTY Trempealeau CHECK ONE ☐ Town ☐ Village ☐ City NAME

2. LOCATION (Number and Street or W section, section, township and range. Also give subdivision name, lot and block numbers when available.)
Coleraine-Whitchall Road (Wayside No. 5)

3. OWNER AT TIME OF DRILLING
Wisconsin Highway Commission - Madison, Wisconsin

4. OWNER'S COMPLETE MAIL ADDRESS
State Office Building 1 West Wilson Street Madison, Wisconsin 53702

5. Distance in feet from well to nearest: BUILDING SANITARY SEWER FLOOR DRAIN FOUNDATION DRAIN WASTE WATER DRAIN
(Record answer in appropriate block) C.I. TILE C.I. TILE SEWER CONNECTED INDEPENDENT C.I. TILE

CLEAR WATER DRAIN SEPTIC TANK PRIVY SEEPAGE PIT ABSORPTION FIELD BARN SILO ABANDONED WELL SINK HOLE
C.I. TILE

300'

OTHER POLLUTION SOURCES (Give description such as dump, quarry, drainage well, stream, pond, lake, etc.)
None

6. Well is intended to supply water for:

Wayside

7. DRILLHOLE

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)	10. FORMATIONS Kind	From (ft.)	To (ft.)
8"	Surface	42	6	42	83	Unknown	Surface	

8. CASING, LINER, CURBING, AND SCREEN

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)	
4	Standard Pipe	Surface	42	This is an old well which we recased The method used: We filled well with sand up to the bottom of casing which was 42 feet. The 4 inch pipe was installed and centered on the sand Between the 8 inch tile and 4 inch pipe

9. GROUT OR OTHER SEALING MATERIAL

Kind	From (ft.)	To (ft.)	
Cement	Surface	42	Cement grout was installed. After cement has hardened the sand was bucketed out.

11. MISCELLANEOUS DATA

Yield test: 8 Hrs. at 6 GPM Well is terminated 24 inches ☒ above ☐ below final grade

Depth from surface to normal water level 53 ft. Well disinfected upon completion ☒ Yes ☐ No

Depth to water level when pumping 53 ft. Well sealed watertight upon completion ☒ Yes ☐ No

Water sample sent to Madison laboratory on: Sept. 11, 1967

Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, type of casing joints, method of finishing the well, amount of cement used in grouting, blasting, surface pumprooms, access pits, etc., should be given on reverse side.

SIGNATURE

COMPLETE MAIL ADDRESS

Registered Well Driller

500 West Main St.
Durand, Wisconsin

Finner Well Drilling Co.

Please do not write in space below

COLIFORM TEST RESULT	GAS - 24 HRS.	GAS - 48 HRS.	CONFIRMED	REMARKS
----------------------	---------------	---------------	-----------	---------

WELL CONSTRUCTOR'S REPORT		STATE OF WISCONSIN DEPARTMENT OF RESOURCE DEVELOPMENT				Tr 71 Well	
1. COUNTY <u>Trempealeau</u>		CHECK ONE <input checked="" type="checkbox"/> Town <input type="checkbox"/> Village <input type="checkbox"/> City		NAME <u>Preston</u> <u>Galesville-Whitehall</u>			
2. LOCATION (Number and Street or 1/4 section, section, township and range. Also give subdivision name, lot and block numbers when available.) <u>Galesville-Whitehall Road (Wayside # 5)</u> <u>T. 21N. R. 8W. NE 1/4 of SW 1/4</u> Sec. 16							
3. OWNER AT TIME OF DRILLING <u>Wisconsin Highway Commission</u>							
4. OWNER'S COMPLETE MAIL ADDRESS <u>Madison, Wisconsin 53702</u>							
5. Distance in feet from well to nearest: (Record answer in appropriate block)		BUILDING	SANITARY SEWER C. I.	FLOOR DRAIN C. I.	FOUNDATION DRAIN SEWER CONNECTED	WASTE WATER DRAIN C. I.	
		--	--	--	----	----	--
CLEAR WATER DRAIN C. I.	SEPTIC TANK TILE	PRIVY	SEEPAGE PIT	ABSORPTION FIELD	BARN	SILO	ABANDONED WELL
---	---	---	300'	----	--	--	---
OTHER POLLUTION SOURCES (Give description such as dump, quarry, drainage well, stream, pond, lake, etc.) <u>None</u>							
6. Well is intended to supply water for: <u>Wayside Purposes (Repair Job)</u>							
7. DRILLHOLE						10. FORMATIONS	
Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)	Kind	From (ft.) To (ft.)
8	Surface	42				Unknown	Surface
6	42	83				This is an old well which we recased.	
8. CASING, LINER, CURBING, AND SCREEN							
Dia. (in.)	Kind and Weight		From (ft.)	To (ft.)	The method used: We filled well with sand		
4	New steel TC 11 lbs.		Surface	42	up to the bottom of casing which was 42 feet.		
					The 4 inch pipe was installed and centered on the		
					sand. Between the 8 inch tile and 4 inch pipe		
					cement grout was installed. After cement had		
					hardened the sand was bucketed out.		
9. GROUT OR OTHER SEALING MATERIAL							
Kind			From (ft.)	To (ft.)			
Neat Cement			Surface	42			
11. MISCELLANEOUS DATA						Well construction completed on <u>September 11 1967</u>	
Yield test: <u>8</u> Hrs. at <u>6</u> GPM						Well is terminated <u>24</u> inches <input checked="" type="checkbox"/> above <input type="checkbox"/> below final grade	
Depth from surface to normal water level <u>53</u> ft.						Well disinfected upon completion <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Depth to water level when pumping <u>53</u> ft.						Well sealed watertight upon completion <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Water sample sent to <u>Madison, Wis.</u> <u>APP</u> (Safe) laboratory on: <u>Sept. 20 1967</u>							
Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, type of casing joints, method of finishing the well, amount of cement used in grouting, blasting, sub surface pumprooms, access pits, etc., should be given on reverse side.							
SIGNATURE <u>E. C. Fisher</u> By: <u>E. C. Fisher, President</u> Registered Well Driller				COMPLETE MAIL ADDRESS <u>500 W. Main St.</u> <u>Durand, Wisconsin 5473</u>			
Please do not write in space below							
COLIFORM TEST RESULT		GAS — 24 HRS.		GAS — 48 HRS.		CONFIRMED	
REMARKS							

FORM NO 9-1904-A

SITE NO. TR-21/07W/17-0071

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

Date 11/19/79

SITE SCHEDULE

Check One ☒ English ☐ Metric Units

GENERAL SITE DATA (0)

Site Ident No	441743091153101										RG Number	R = 0 *		Transaction	T = A D <u>M</u> V *																																							
															add, delete, modify, verified																																							
Site-Type	2 = C D H I M P T <u>W</u> *										Data Reliability	3 = <u>C</u> U L M *		Reporting Agency	4 = USGS *																																							
	collector, drain, sinkhole, connector, multiple, pond, tunnel or, well shaft											field checked, unchecked, location not, minimal accurate data																																										
Project No.	5 = [] [] [] [] [] [] [] [] [] [] *										District	6 = 55 *		State	7 = 55 *		County	TREMPEALEAU		8 = 121 *																																		
Latitude	9 = 44 17 43 *										Longitude	10 = 09 11 53 1 *										Lat-Long Accuracy	11 = S <u>E</u> T M *																															
	deg min sec											deg min sec											sec, 5 sec, 10 sec, Min																															
Local Number	12 = TR-21/07W/17-0071 *										Land Net Loc.	13 = SENESEWS 017 T 21 N R 07W 4 *																																										
												1/4 1/4 1/4 section, township, range, merid																																										
Location Map	14 = WHITEHALL *										Scale	15 = 24000 *																																										
Altitude	16 = 885 *										Method of Measurement	17 = A L <u>M</u> *		Accuracy	18 = 10 *																																							
												altimeter, level, map																																										
Topo Setting	19 = D C E F H K L Ø P S T U V W *										Hydrologic Unit (OWDC)	20 = [] [] [] [] [] [] [] [] [] [] *																																										
	depression, stream, dunes, flat, hilltop, sink, swamp, offshore, pediment, hillside, terrace, undulating, valley, upland channel																																																					
Date of First Construction/Completion	21 = 09 / 11 / 1967 *										Use of Site	23 = A D E G H Ø M P R S T U <u>W</u> X Z *																																										
	month day year											anode, drain, geo- seismic, heat, observ- mine, oil or, recharge, repress, test, unused, with- waste, destroyed thermal reservation, gas drawal,																																										
Use of Water	24 = A B C D E F <u>H</u> I M N P R S T U Y Z *																																																					
	air cond., bottling, commercial, dewater, power, fire, domestic, irrigation, medicinal, industrial, public, recreation, stock, institution, unused, desal, other supply																																																					
Secondary Water Use	25 = [] *										Tertiary Use of Water	26 = [] *										Depth of Hole	27 = 83 *										Depth of Well	28 = 83 *										Source of Depth Data	29 = D *									
Water Level	30 = 49.76 *										Date Measured	31 = 11 / 16 / 1979 *										Source	33 = S *																															
												month day year																																										
Method of Measurement	34 = A C E G H L M R <u>S</u> T V Z *																																																					
	airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel, electric, calibrated, other airline gage pressure gage logs tape tape electric tape																																																					
Site Status	37 = D F G H Ø P R S T V X Z *																																																					
	dry, flowing, nearby, flowing											obstruction, pumping, recently, nearby, pumped pumping											nearby, foreign recently substance pumped surface water effects other																															
Source of Geohydrologic Data	36 = S *										Pump Used	35 = [] *										Measuring Point	266 = 2.00 *										Measuring Point Date	267 = 11 / 16 / 1979 *																				
																																		month day year																				

OWNER IDENTIFICATION (1)

R = 158 * T = (A) D M * Date of Ownership 159 # 09 / 11 / 1967 *
 add, delete, modify month day year
 Name: Last 161 = TRANSPORTATION * First 162 = WIS. DEPT. * Middle Initial 163 = *

OTHER SITE IDENTIFICATION NUMBERS (1)

R = 189 * T = A D M * Ident 190 # TR-0071 * Assigner 191 = USGS *
aid, delete, modify
 New Card Same R & T Ident 190 # _____ * Assigner 191 = _____ *

SITE VISIT DATA (1)

R=186 * T= (A) D M *
add, delete, modify

Date of Visit 187# 11/16/1979 *
month day year

Name of Person 188= ERICKSON, R. M., *

FIELD WATER QUALITY MEASUREMENTS (1)

R = 192 * T = A D M * Date 193 # / / * Geohydro-logic Unit 195 # / / *
 add, delete, modify month day year

*N evCard 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, driller, owner, other gov't, other agency				logs, geologist, other reported,			

TR-2107W/17-0071

Appendix 18: Well TR-71 documents, USGS site schedule, 1979, continued

WELL CONSTRUCTION DATA (1)

R = 58 * T = A D M * Entry No 59 # 1 * Date of Construction Completion 60 = 09/11/1967 * Source of ^① Const. Data 64 = D *
 Name of Contractor/Driller 63 = FISHER DR CO * FISHER WELL DRILLING CO.
500 W. MAIN ST. DURAND, WI.
 Method of Construction 65 = A B C D H J P R T V W Z *
 air- rotary, bored, cable- dug, hydraulic, jetted, air perc- reverse, trenching, driven, drive, other
 or augered tool or slotted screen, sand point, walled, open, hole wash
 Finish 66 = C F G H O P S T W X Z * Type of Seal 67 = B C G Z *
 porous, gravel w. gravel, horizontal, open, perforated, screen, sand point, walled, open, other
 concrete, perl screen, gallery, and or slotted screen, hole hole grout
 Bottom of Seal 68 = 42 * Method of Development 69 = A B C J N P S Z * Number of Hours in Development 70 = *
 air-lift, bailed, compressed, jetted, none, other, surged, other
 pump air pump
 Special Treatment During Development 71 = C D E F H M Z *
 chemicals, dry ice, explosives, deflocculent, hydrofracturing, mechanical, other

DIMENSIONS OF THE HOLE CONSTRUCTED (2)

R = 72 * T = A D M * Construction Entry No 59 # 1 *
 add, delete, modify
 Top of Hole Segment Below LSD
 73 # 0 * 42 *
 73 # 42 *
 73 # *
 73 # *
 73 # *
 Bottom of Hole Segment below LSD
 74 = 42 *
 74 = 83 *
 74 = *
 74 = *
 74 = *
 74 = *
 Diameter of Hole Segment
 75 = 8 *
 75 = 6 *
 75 = *
 75 = *
 75 = *
 75 = *

New Card for Each Hole Segment
Same R, T & Field 59

CASING SCHEDULE (2)

R = 76 * T = A D M * Construction Entry No 59 # 1 *
 add, delete, modify
 Top of Casing Segment Below LSD
 77 # 0 *
 77 # *
 77 # *
 77 # *
 77 # *
 Bottom of Casing Segment Below LSD
 78 = 42 *
 78 = *
 78 = *
 78 = *
 78 = *
 Diameter of Casing Segment
 79 # 4 *
 79 # *
 79 # *
 79 # *
 79 # *
 79 # *
 Casing Material ^⑤
 80 = S *
 80 = *
 80 = *
 80 = *
 80 = *
 80 = *
 Thickness of Casing
 81 = *
 81 = *
 81 = *
 81 = *
 81 = *
 81 = *

New Card for Each Casing With Same R, T & Field 59

OPENINGS SCHEDULE (2)

R = 82 * T = A D M * Construction Entry No 59 # 1 *
 add, delete, modify
 Top of Section Below LSD 83 # 42 *
 Bottom of Section Below LSD 84 = 83 *
 Type of Openings ^⑥ 85 = X *
 Type of Material ^⑦ 86 = *
 Diameter of Open Section 87 = 6 *
 Width of Opening 88 = *
 Length of Opening 89 = *
 (Openings Data)
 83 # *
 84 = *
 85 = *
 86 = *
 87 = *
 88 = *
 89 = *
 (Openings Data)
 83 # *
 84 = *
 85 = *
 86 = *
 87 = *
 88 = *
 89 = *

New Card for Each Open Section With Same R, T and Field 59

FOOT NOTES:

① Source of Data Codes:

S	D	O	A	R	L	G	Z
reporting, driller, owner, other agency	gov't, other reported,	logs, geologist, other					

⑤ Casing Material Codes

B	C	G	I	M	P	R	S	T	U	W	Z
brick, concrete, galv, wrought, iron	iron	iron	iron	metal	PVC or metal plastic	rock or stone	steel, tile, coated, wood, other steel				

⑥ Type of Openings Codes

F	L	M	P	R	S	T	W	X	Z
fracture, shuttered	louvered, or slotted	mesh, wound (unknown)	perforated, point	wire, screen,	sand, walled, open, other				

⑦ Type of Material Codes for Open Sections

B	C	G	I	M	P	R	S	T	Z
brass or bronze	concrete, galv, wrought, iron	iron	iron	metal	PVC or plastic	stainless, steel, tile, other steel			

Appendix 18: Well TR-71 documents, USGS site schedule, 1979, continued

PRODUCTION DATA (1)

R = 134 146 * T = A D M * Entry No 147 # 1 * Date 148 = 09 / 11 / 1967 *
flowing, pumped add, delete, modify month day year

Discharge: 150 = 8 * Source of Data 151 = D *
bailler, current, estimated, flume, totaling, orifice, pitot-tube, reported, trajectory, venturi, volumetric, weir, ther

Method of Measurement 152 = B C E F M O P R T U V W Z *
airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel, electric, calibrated, other

Production Level 153 = 53 * Static Level 154 = 53 * Source of Data 155 = D * Specific Capacity 272 = *
airline page pressure gauge logs tape tape electric tape

Method of Measurement 156 = A C E G H L M R S T V Z * Pumping Period 157 = 6 *
airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel, electric, calibrated, other

LIFT DATA (1)

R = 42 * T = A D M * Type of Lift 43 # A B C J P R S T U Z * Entry No 254 # *
add, delete, modify ar, bucket, centrifugal, jet, piston, rotary, submersible, turbine, unknown, other

Pump Intake Setting 44 = * Type of Power 45 = D E G H L N W Z *
diesel, electric, gasoline, hand, LP gas, natural, windmill, other gas

Date 38 = 11 / 16 / 1979 * Horsepower 46 = *
month day year

MAJOR PUMP DATA (2)

R = 47 * T = A D M * Type of Lift 43 # * Lift Entry No 254 # * Manufacturer of Pump 48 = *
add, delete, modify

Serial No of Pump 49 = * Name of Power Company 50 = *
 Power Company Account No 51 = * Power Meter No 52 = * Pump Rating 53 = *
 Person or Company Who Maintains the Pump 54 = * Additional Lift 255 = * Rated Pump Capacity 268 = *

STANDBY POWER DATA (2) (See LIFT DATA for codes of fields 43 and 56 below)

R = 55 * T = A D M * Type of Lift 43 # * Type of Power 56 = * Horsepower 57 = * Lift Entry No 254 # *
add, delete, modify

AVAILABLE LOG DATA (1)

R = 198 * T = A D M *
add, delete, modify

New Card for Each Log Type Same R & T

Type of Log 2	Begin Depth	End Depth	Source of Data 1
199 # *	200 = *	201 = *	202 = *
199 # *	200 = *	201 = *	202 = *
199 # *	200 = *	201 = *	202 = *
199 # *	200 = *	201 = *	202 = *

WATER QUALITY DATA COLLECTION (1)

R = 114 * T = A D M * Begin Year 115 # * End Year 116 = * Source Agency 117 = *
add, delete, modify

Frequency of Collection 118 = * Network Site 257 = * Type of Analyses 120 = *

WATER LEVEL DATA COLLECTION (1)

R = 121 * T = A D M * Begin Year 122 # 1979 * End Year 123 = * Source Agency 124 = USGS *
add, delete, modify

Frequency of Collection 125 = M * Network Site 258 = Y *

WATER PUMPAGE/WITHDRAWAL DATA COLLECTION (1)

R = 127 * T = A D M * Begin Year 128 # * End Year 129 = * Source Agency 130 = *
add, delete, modify

Frequency of Collection 131 = * Network Site 259 = * Method of Collection 133 = C E M U Z *
calculated, estimated, metered, unknown, other

OTHER DATA AVAILABLE (1)

R = 180 * T = A D M * Type of Data 181 # * Loc 182 = C D Z * Format 261 = F M P Z *
add, delete, modify cooperator, district, other files, machine, published, other readable

New Card Same R & T Type of Data 181 # * Loc 182 = C D Z * Format 261 = F M P Z *

FOOT NOTES:

① Source of Data Codes: S D Ø A R L G Z
reporting, driller, owner, other gov't, agency other logs, geologist, other reported

② Type of Log Codes: A B C D E F G H I J K L M N Ø P Q
time, collar, caliper, driller's, electric, fluid, geologist, magnetic, induction, gamma, dipmeter, laterlog, microlog, neutron, µ later, photo, radio, active

③ Frequency of Collection Codes: A B C D F I M Ø Q S W Z
annual, bi-monthly, continuous, daily, semi, intermittent, monthly, one time, quarter, semi, weekly, other only annual annual

④ Type of Quality Analyses Codes: A B C D E F G H J K L M Z
physical, common, trace, pesticides, nutrients, sanitary, codes, codes, codes, codes, codes, all or, other chemical elements B&D B&E B&F D&E C,D&E most

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * T = A D M * Entry No 256 # * Depth to Top 91 = * Depth to Bottom 92 = *

add, delete, modify

Unit Identifier 93 = * Lithology 96 = * Lithologic Modifier 97 = *

AQUIFER DATA (2)

R = 94 * T = A D M * Geo hydrologic Unit Entry No 256 # *

add, delete, modify

Date 95 # / / * Water Level 126 = * % Water Contributed 132 = *

month day year

Water Level

% Water

Contributed

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * T = A D M * Entry No 256 # * Depth to Top 91 = * Depth to Bottom 92 = *

add, delete, modify

Unit Identifier 93 = * Lithology 96 = * Lithologic Modifier 97 = *

AQUIFER DATA (2)

R = 94 * T = A D M * Geo hydrologic Unit Entry No 256 # *

add, delete, modify

Date 95 # / / * Water Level 126 = * % Water Contributed 132 = *

month day year

Water Level

% Water

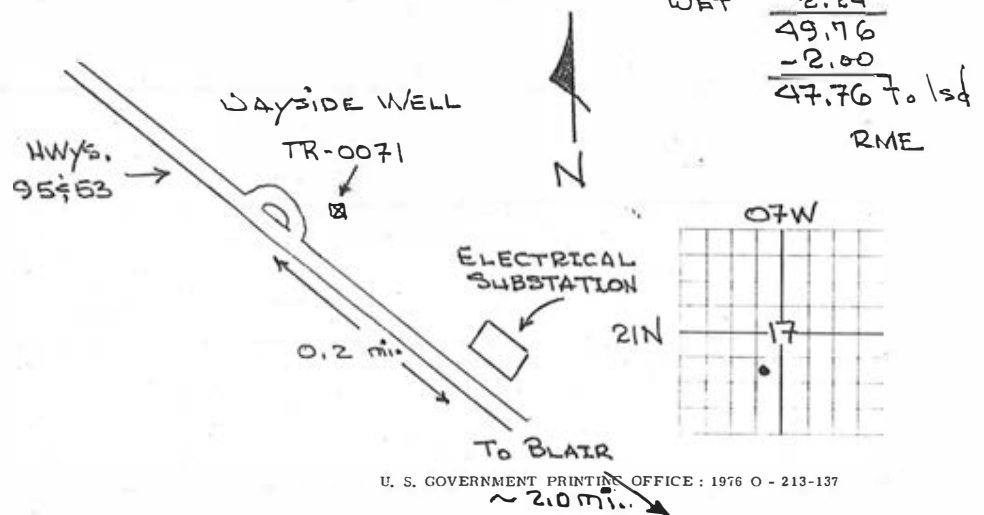
Contributed

PERTINENT REMARKS

R = 183 * T = A * 185 = C94/AQUIFER - 300SND5 *
 185 = C121/MONTHLY VISITS BY LOCAL OBSERVER *
 185 = C266/.25 HOLE IN PUMP BASE *
 185 = C76/ORIGINAL CASING WAS 8 INCH TILE *

New Card Same R&T

NOTES: LØG





"Bates, William J - DNR"
<William.Bates@Wisconsin.gov>
07/03/2008 01:45 PM

To "McNallan, Brenda - DOT"
<brenda.mcnallan@dot.state.wi.us>
cc "Hoyt, Lacey C - DNR" <Lacey.Hoyt@wisconsin.gov>,
<jasons@usgs.gov>
bcc

Subject RE: wayside well abandonment

Brenda -

Per our phone conversation earlier today, the pump and well at the Blair Wayside may remain "as is" for as long as needed for groundwater monitoring by the USGS subject to the following conditions:

- Attachment, ASAP, of a tamper resistant, plague-type notification indicating to the public that the former handpump well is being used as a groundwater data collection site .
- The pump handle remains off.
- The pump hardware sanitation integrity be maintained to prevent potential groundwater contamination. If the pump is damaged, or needs well seal maintenance, etc., that the repair be made promptly.
- If a change in use occurs, or is anticipated, that the West Central Regional DNR office be contacted.

By receipt of this e-mail, DNR will convert the Blair Wayside well to private status, or otherwise inactivate it. I understand DOT plans to retain ownership of this wayside for potential future reactivation as a public well.

You or USGS may e-mail, or phone me at (715) 839-3796.

Jack Bates

From: Hoyt, Lacey C - DNR
Sent: Thursday, July 03, 2008 10:06 AM
To: Bates, William J - DNR
Cc: McNallan, Brenda - DOT
Subject: RE: wayside well abandonment

Jack - please see Brenda's email below regarding WI DOT Wayside in Blair. Could you please give her your formal blessing (in writing) on the issue with the hand pump to not fill and seal, if possible, for the USGS study purposes, but to just inactivate it.

If you need more info on this please call Brenda. Her # is provided below in her email.
Thanks Jack! Please cc me on the email so I know when to inactivate the HP.

Lacey Hoyt
SDWA Compliance Specialist
Wisconsin Department of Natural Resources
1300 W. Clairemont Ave.
Eau Claire, WI 54701
Phone: 715-839-3744

**APPLICATION/PERMIT TO WORK ON HIGHWAY RIGHT-OF-WAY**

Wisconsin Department of Transportation (WisDOT)

DT1812 1/2016 s. 86.07(2), 86.16 and other applicable Wis. Stats.

1. Applicant's Name, Address, City, State and ZIP Code Wisconsin Geological and Natural History Survey 3817 Mineral Point Road Madison, WI 53705-5100		2. Work Start Date 11/26/2018	4. Location Description (¼ section, section, town, range; provide plat and location maps) SW1/4, NE1/4, Section 18 T20N, R9E 44.209165, -89.47064 Approximately 20 ft. north of white line
		3. Work Finish Date* 12/31/2019	
5. Is the work area near a survey monument? (If yes, call 866-568-2852 or email geodetic@dot.wi.gov .) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		6. Work Location (List all that apply) Town: _____ Village: _____ City: <u>Blair</u> County: <u>Trempealeau</u>	
8. Trans 401 project designation? (Provide a formal erosion control plan for all Major projects. See provision #13.) <input type="checkbox"/> Major <input type="checkbox"/> Minor		7. Highway (List all that apply) WIS _____ US 53 _____ Interstate _____	
9. Are any environmental approvals, certifications or permits required from other regulatory agencies? (If yes, provide a copy of each item. If no, provide proof of other agency coordination as needed. For additional information, go to environmental coordination .) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
10. Work Type (Check all that apply) <input type="checkbox"/> Access management <input type="checkbox"/> Crash investigation/cleanup <input type="checkbox"/> Drainage: Culverts/tiles <input type="checkbox"/> Drainage: Grading/riprap <input type="checkbox"/> Drainage: Storm Sewer <input type="checkbox"/> Environmental assessment <input type="checkbox"/> Harvesting nature products <input type="checkbox"/> Hazmat: Cleanup/remediation <input type="checkbox"/> Hazmat: Monitoring wells <input type="checkbox"/> Invasive species assessment <input type="checkbox"/> Landscaping <input type="checkbox"/> Soil borings <input type="checkbox"/> Surveying <input checked="" type="checkbox"/> Well Repair		12. Work Zone Description (Check all that apply) <input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> Full road closure: detour** <input type="checkbox"/> Full road closure: temporary <input type="checkbox"/> Lane closure: without flagging <input type="checkbox"/> Lane closure: with flagging <input type="checkbox"/> Lane encroachment (2 feet or less) <input type="checkbox"/> Intersection/roundabout <input type="checkbox"/> Shoulder/parking lane closure Freeway/expressway location <input type="checkbox"/> Off shoulder: < 30' off white line <input type="checkbox"/> Off shoulder: ≥ 30' off white line <input type="checkbox"/> Near right-of-way line or fence Non-Freeway/expressway location <input type="checkbox"/> Off shoulder: < 15' off white line <input type="checkbox"/> Off shoulder: ≥ 15' off white line <input type="checkbox"/> Back of curb: < 2' behind <input type="checkbox"/> Back of curb: ≥ 2' behind	
11. Vegetation Management (Check all that apply) <input type="checkbox"/> Mow <input type="checkbox"/> Remove <input type="checkbox"/> Prune <input type="checkbox"/> Cut and/or trim <input type="checkbox"/> Plant <input type="checkbox"/> Chemically treat ¹³		13. Provide detailed description of how work will be accomplished. Use page 2 or additional pages if needed. Provide work plans, drawings and specifications as needed. For chemical treatment, answer questions on page 2. The well at this wayside has been made inoperable (handle removed) and is strictly used to monitor groundwater levels as part of the Wisconsin Groundwater-Level Monitoring Network (WGLMN) and the National Ground Water Monitoring Network (NGWMN). Repairs to this well include removal of the hand-pump and pipes from the well, removal of accumulated sediment from the bottom of the well, and construction of a protective well head. This work will be completed by a certified well driller. The well-head protector will be equipped with ports so that monitoring can continue at this site and the well can be regularly evaluated and maintained. The WGNHS will also use borehole geophysical instruments to evaluate the well's integrity and well construction. The driller and WGNHS will access the well by driving vehicles over the grass area of the wayside to the existing well.	

It is understood and agreed that approval is subject to the applicant's full compliance with the pertinent Statutes, as well as any codes, rules, regulations, and other jurisdictional agencies' permit requirements. Applicant shall comply with all permit provisions, superimposed notes, and detail drawings that WisDOT may add. Any alteration of this form by the applicant is prohibited and may be cause to revoke this permit. When approved, the permit does not transfer any land; nor give, grant or convey any land right, right in land, nor easement in WisDOT right-of-way. It is not assignable or transferrable. All costs associated with this permit are the permittee's responsibility unless otherwise noted.

X(Applicant or Authorized Representative Signature)
(If Computer-filled, Brush Script Font)

(Date)

(Main Contractor Company Name, If applicable)

(Contractor Representative/Title)

(Area Code/Phone No. – Office)

(Printed Name)

(Title)

(Area Code/Phone No. – Cell)

(Email Address)

(Area Code/Phone No.)

(Email Address)

* Includes permanent restoration. If the permitted work has not started by the "Work Finish Date", this permit is null and void. If the permitted work has started, but has not been completed by the "Work Finish Date", the work shall not be completed unless authorized through an approved written time extension or a subsequent permit. **ANY PERMIT ISSUED IS REVOCABLE.**

For Official Wisconsin DOT Use Only – Do Not Write Below

☐ **PERMITTEE SHALL NOTIFY THE WISDOT REPRESENTATIVE LISTED BELOW 3 DAYS BEFORE STARTING ANY WORK:**

Region contact, title, office address, area code/phone no., and email address

Wisconsin DOT

☐ **See Supplemental Permit Provisions (Page 4)**
☐ **Special Permit Provisions Also Included**

☐ Lane Closure System notification required
☐ Insurance or performance bond required
☐ Other regulatory agency permits not required
☐ **State highway traffic [detour permit](#) required
☐ Permit issued in conjunction with: _____
☐ Permit voids and supersedes permit(s):
#_____, Issued _____

☐

Date Application Received

Date Application Complete

Permit Issuance Date

Permit Expiration Date

Permit Extension Date

Permit Number

(WisDOT Authorized Representative Signature – If Computer-filled, Brush Script Font)

Appendix 18: Well TR-71 documents, Right of work application and permit, 2019, continued

<p>Use this section to provide information on chemical treatment (question #11):</p> <p>(a) Chemical(s) to be used and EPA Registration Number(s)? (Example: Garlon 4 Ultra, EPA REG. NO. 62719-527)</p> <p>(b) Type of application(s)? (Example: Stump treatment, broadcast, etc.)</p> <p>(c) Applicator name(s) and Wisconsin certification number(s)? (Example: Bill Smith, 146886-CA. Personnel must be licensed as commercial applicators in category 6.0, Right-of-Way, to legally apply herbicides on roadsides.)</p> <p>(d) How will property owners bordering the affected highway ROW be notified prior to spraying? (Examples: In-person, doorknob cards, letters, phone calls, etc.)</p> <p>(e) Will spraying occur near wetlands? (If yes, see question #9)</p> <p>(f) Provide name(s) and cell number(s) for the supervisor or lead worker of each crew:</p>	<p>Use this section to provide information that does not fit on front page or #11(a)-(f) on left:</p>
--	---

INDEMNIFICATION

~~The Applicant shall save and hold the State, its officers, employees, agents, and all private and governmental contractors and subcontractors with the State under Chapter 84 Wisconsin Statutes, harmless from actions of any nature whatsoever (including any by Applicant itself) which arise out of, or are connected with, or are claimed to arise out of or be connected with any of the work done by the Applicant, or the construction or maintenance of facilities by the Applicant, pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right of way, (1) while the Applicant is performing its work, or (2) while any of the Applicant's property, equipment, or personnel, are in or about such place or the vicinity thereof, or (3) while any property constructed, placed or operated by or on behalf of Applicant remains on the State's property or right of way pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right of way, including without limiting their liability, damages, loss, expense, claim account of personal injury, death or of officers, employees, agents, contractors to the Applicant, its employees, agents, frequenters; or to any other persons, who be based upon, statutory (including, with foregoing, worker's compensation), con caused or claimed to have been caused or other breach of duty by the State, i contractors, subcontractors or frequent agents, contractors, subcontractors or fr~~

~~Without limiting the generality of the foregoing, the liability, damage, loss, expense, claims, demands and actions indemnified against shall include all liability, damage, loss, expense, claims, demands and actions for damage to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right of way in the past or present, or that are located on any highway or State property or right of way with or without a permit issued by the State, for any loss of data, information, or material; for trademark, copyright or patent infringement; for unfair competition or infringement of personal or property rights of any kind whatever. The Applicant shall at its own expense investigate all such claims and demands, attend to their settlement or other disposition, defend all actions based thereon and pay all charges of attorneys and all other costs and expenses of any kind arising from any such liability, damage, loss, claims, demands and actions.~~

The Wisconsin Geological and Natural History Survey, as part of the University of Wisconsin Extension, is a state agency.

To the extent provided by law, the State will pay for the costs and damages caused by the negligent acts of any officer, employee or agent acting within the scope of his or her State of Wisconsin authority. The State of Wisconsin is self-funded for liability purposes. All Claims must be filed pursuant to applicable Wisconsin Statutes.

~~Any transfer, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right of way pursuant to this permit shall not release Applicant from any of the indemnification requirements of this permit, unless the State is notified of such transfer in writing. Any acceptance by any other person or entity, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right of way pursuant to this permit, shall include acceptance of all of the indemnification requirements of this permit by the other person or entity receiving ownership or control.~~

~~Notwithstanding the foregoing, a private contractor or subcontractor with the State under Chapter 84 Wisconsin Statutes, that fails to comply with~~

~~175 Wisconsin Statutes (2013-2014), at to the Applicant of the actual cost of ligit damage by the contractor or nes or facilities placed by or on behalf of permit or any other permit issued by the nes or facilities on highway right of way, ent to the Applicant for losses due to ng from negligence by the contractor or~~

~~if the State, or its officers, employees with sections 66.0831 and 182.0175 4), the State or its officers, employees and agents, remain subject to the payment to the Applicant of the actual cost of repair of willful and intentional damage by the State, or its officers, employees and agents, to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right of way, and remain subject to payment to the Applicant for losses due to personal injury or death resulting from negligence by the State, its officers, employees and agents.~~

~~No indemnification of private contractors or subcontractors with the State under Chapter 84 Wisconsin Statutes, shall apply in the event of willful and intentional damage by such private contractors or subcontractors to the property, lines and facilities of the Applicant located on the highway right of way pursuant to this permit or any other permit issued by the State for the location of property, lines or facilities on highway right of way.~~

GENERAL PERMIT PROVISIONS AND CONDITIONS OF APPROVAL (#1-28)

Pursuant to Wisconsin Statutes and once approved by WisDOT, this permit allows performance of the specific work described over which WisDOT has permit authority. ***The permittee shall abide by these general provisions, and any supplemental and/or special provisions.*** (ROW = right-of-way)

1. Warning signs, devices and methods shall be in place and fully functional prior to the start of any permitted work within highway ROW, and shall protect the public until all permitted work is complete. Warning signs and devices shall conform to the appropriate sizes, designs and configurations specified within the [Wisconsin Manual of Uniform Traffic Control Devices](#), current edition. Provide and maintain the quantity of signs and devices therein described, and supplement those with additional signs, devices and flaggers as necessary to functionally protect people and property from injury or damage at all times and under all conditions, including changed or changing conditions. All personnel shall wear retro-reflective safety vests while working within the highway ROW.
2. Secure the work site and associated traffic control zone against any hazard to the public, both when the site is attended and is unattended during off-hours, holidays, and nighttime hours. This includes vehicles, equipment and materials. Any violation of this permit, particularly any failure to maintain safe work site and traffic control zone, will require immediately cure by the permittee, and may result in WisDOT stopping further work, removal of permittee from the highway ROW, and/or permit revocation.
3. Coordinate the permitted work and in no case interfere with any ongoing highway improvement project.
4. Keep a complete copy of the permit (which may be electronic) at the job site at all times the permitted work is ongoing along with a project manager or supervisor familiar with the permit and all of its details and requirements. Failure to comply with any part of this permit is the permittee's responsibility.
5. Determine the location of, and protect or cause to protect from any damage, any existing facilities in the area affected by the permitted work. All notifications to other facility owners are the permittee's responsibility.
6. Perform all permitted work without obstructing or closing any part of any traffic lane or fully closing any road unless specifically authorized by WisDOT.
7. Alter the permitted facilities as may be ordered by WisDOT to facilitate highway improvement, alteration, safety control, or maintenance. Accept all costs of constructing, maintaining, altering, temporarily moving or relocating the permitted facilities.
8. The permit authorizes only the described work of and for the permittee indicated on this permit. It does not grant authority for the work of any other, either by present or future installation.
9. Any disturbance to, operation within, or use of a highway median is expressly prohibited, unless specifically authorized by WisDOT. **The use of interstate or freeway median crossovers for any reason is prohibited and subject to law enforcement citation.**
10. Construction methods and restorations shall be in accordance with applicable parts of [WisDOT's Standard Specifications for Highway and Structure Construction](#), current edition.
11. Comply with all applicable regulations and codes, including, but not limited to, the U.S. Department of Labor, Occupational Safety and Health Administration, [29 CFR Part 1926](#) for construction safety precautions and operations.
12. Do not open at any time any greater length of trench than is necessary to maintain essential progress of the work.
13. Implement erosion control best management practices (BMPs) prior to and at all times during work operations. Provide and maintain erosion control BMPs to protect all restored areas upon completion of the permitted work until the replacement vegetation achieves sustained growth. Trans 401 designations for major and [minor](#) projects in this permit use the same meanings as utility projects. If a project is not "minor", then it is "major".
14. Derive no direct access to install, maintain or repair the permitted facility from the freeway travel lane or shoulder or any interchange ramp, unless specifically authorized by WisDOT or if needed due to an emergency. In the latter case, immediately contact the Wisconsin State Patrol and WisDOT Region Office as indicated on this permit.
15. Install the facility in the specified permit location. Move any part of the facility found to be otherwise located to the correct location upon WisDOT order. Any facility part located other than as specified in this permit is at permittee's sole risk. Accordingly, if the same is undetected or is suffered to remain in variance to the permit, the permittee shall hold the State, its employees, agents and officers harmless and free of any cost, claim or liability associated with any accidental damage to such facility that may result from a highway construction, maintenance, traffic control, or ROW management project or function.
16. Promptly restore all highway facilities disturbed by the permitted work or associated operation. This includes natural highway facilities, including but not limited to living snow fence, headlamp screens, and other such highway safety features. WisDOT may issue a notice setting a specific time by which the restoration must be complete if restoration is not done voluntarily without delay. If the permittee fails to satisfactorily complete the restoration within the time established, WisDOT shall arrange for the restoration to be completed and bill the permittee accordingly. The permittee shall pay for all restoration costs.
17. Collect any brush, trash or waste materials resulting from the permitted work, and dispose of said materials off the ROW in accordance with applicable solid waste disposal regulations.
18. Send notice **within 10 calendar days** via regular mail or email to the authorized WisDOT representative who approved the permit upon completion of the work and restoration.
19. Smooth and finished slopes shall be constructed at any location where any regraded portion of the highway ROW meets the lands of adjacent property owners.
20. Backfill any excavation permitted within the highway pavement limits or shoulder areas with suitable granular material, placed in lifts or layers 12 inches or less each in depth, and mechanically compact to meet the appropriate density as specified in [WisDOT's Standard Specifications for Highway and Structure Construction](#), current edition. Do not use water jetting to accomplish mechanical compaction. Repair to WisDOT's satisfaction any subsequent heavings, settlements, or other faultings attributable to the permitted work. Use temporary sheeting, shoring and/or trench boxes as needed to prevent trench/tunnel cave-ins.
21. Restore in-kind any curb, gutter, sidewalk, driveway, gravel base, ballast, shoulder material, or other highway ROW element/facility disturbed under this permit to the qualities, grades, compactions and conditions specified in [WisDOT's Standard Specifications for Highway and Structure Construction](#), current edition.
22. Restore any turfed ROW area disturbed under this permit with fine-graded topsoil having a depth of not less than 4 inches, and reseeded to perennial grass or sodded to WisDOT's satisfaction.
23. Adjust manhole covers, shut-off and regulator valves, and like facilities to the level of the immediately adjacent grades.
24. Cure faults related to work or facilities under this permit that, in WisDOT's opinion, obstruct highway drainage or in any other manner adversely affect highway maintenance or operation, and restore the ROW as directed by and to WisDOT's satisfaction.
25. Keep all vehicles/equipment/materials outside the ROW fence including all bore pits of any bored or augered installations under a freeway. Do not keep vehicles/equipment/materials between any freeway travel lane and a bore pit if WisDOT authorizes the pit location within the freeway ROW. Locate all bore pits outside the clear zone and as close to the ROW fence as possible.
26. Do not keep vehicles/equipment/materials related to this permit within the non-freeway ROW limits except as are actively engaged in the work operation.
27. Be aware that future highway improvements may require the adjustment of part or all of the permitted facility, at permittee's cost, to conform to WisDOT's [Utility Accommodation Policy](#).

28. Comply with appropriate laws, rules, policies, etc. when within tribal or federal lands. Provide documentation as needed when on WisDOT ROW to prove compliance or coordination with the following agencies:

- Wisconsin Historical Society to avoid/mitigate any potential cultural resource (archeological, historical, burial site, etc.) impacts per [Wis. Stat. s. 44.40](#).
- Department of Natural Resources to avoid/mitigate any potential storm water runoff, site erosion, wetland, waterway and endangered/threatened species impacts.

SUPPLEMENTAL PERMIT PROVISIONS (#29-__)

The permittee shall abide by the following checked provisions:

TREE & VEGETATION MANAGEMENT

- ☐ 29. Plant trees/vegetation only in such locations and in such species as indicated on the plans included and approved with this permit, or as WisDOT specifies in the field.
- ☐ 30. Maintain all plantings according to the attached special permit provisions.
- ☐ 31. Do not place any sign or marker identifying the plantings within the highway ROW limits.
- ☐ 32. WisDOT accepts no responsibility for loss that may occur to the plantings. Be fully aware that the plantings are subject to:
- Thinning and/or mortality
 - Normal hazards due to maintenance operations, snow control, and public utility installation or alteration
 - Trimming or removal, if or when the plantings cause restrictions to sight distance or hazardous snow/ice conditions on the highway
 - Destruction, if highway reconstruction is done
 - Partial or complete abandonment or obliteration, or return to private ownership, if future changes in highway location are made
- ☐ 33. Do not cut, trim or damage trees/vegetation to facilitate the installation or maintenance of the permitted facility except as authorized by the owner of such tree/vegetation. See Wis. Stat. ss. [86.03\(2\)](#), [\(4\)](#), [86.16\(3\)](#), and [182.017\(5\)](#).
- ☐ 34. Do not cut or prune oak trees between April 15 and October 15 to prevent Oak Wilt Disease from spreading unless a thick coat of asphalt base tree paint is applied immediately after **any** cut, pruning wound, or abrasion made between those dates. Cleanly cut the exposed ends of any roots encountered during grading or trenching with suitable pruning tools immediately after exposure. Adhere to any applicable laws, including local ordinances if they are stricter than WisDOT specifications.
- ☐ 35. Remove all stumps, branches, logs, and other debris resulting from the cutting and trimming operations and dispose of such materials off the ROW. Tree disposal may also occur by giving them to the adjacent property owner(s) at a storage location approved by the owner(s). Comply with applicable laws that regulate the sale, transport, or pruning/cutting of trees.
- ☐ 36. Cut trees flush with the ground. Any remaining stumps shall not interfere with mowing operations.
- ☐ 37. Cut trees may be chipped and used for mulch on the ROW in a layer not exceeding three inches.
- ☐ 38. Trim only the trees/vegetation necessary to provide safe clearances or by special provisions. Do not damage non-target trees/vegetation. Do not clear cut trees/vegetation.
- ☐ 39. Survey the trees/vegetation to be removed and inspect jointly with a WisDOT representative prior to starting any work on the highway ROW.
- ☐ 40. Treat all deciduous tree stumps with a herbicide approved for this use. Do not treat evergreen tree stumps.
- ☐ 41. Follow the conditions specified in WisDOT's "Vegetation Alteration Decision" for vegetation removed or trimmed pursuant to [Wis. Stat. s. 84.305](#).

RAILROAD CROSSING WORK

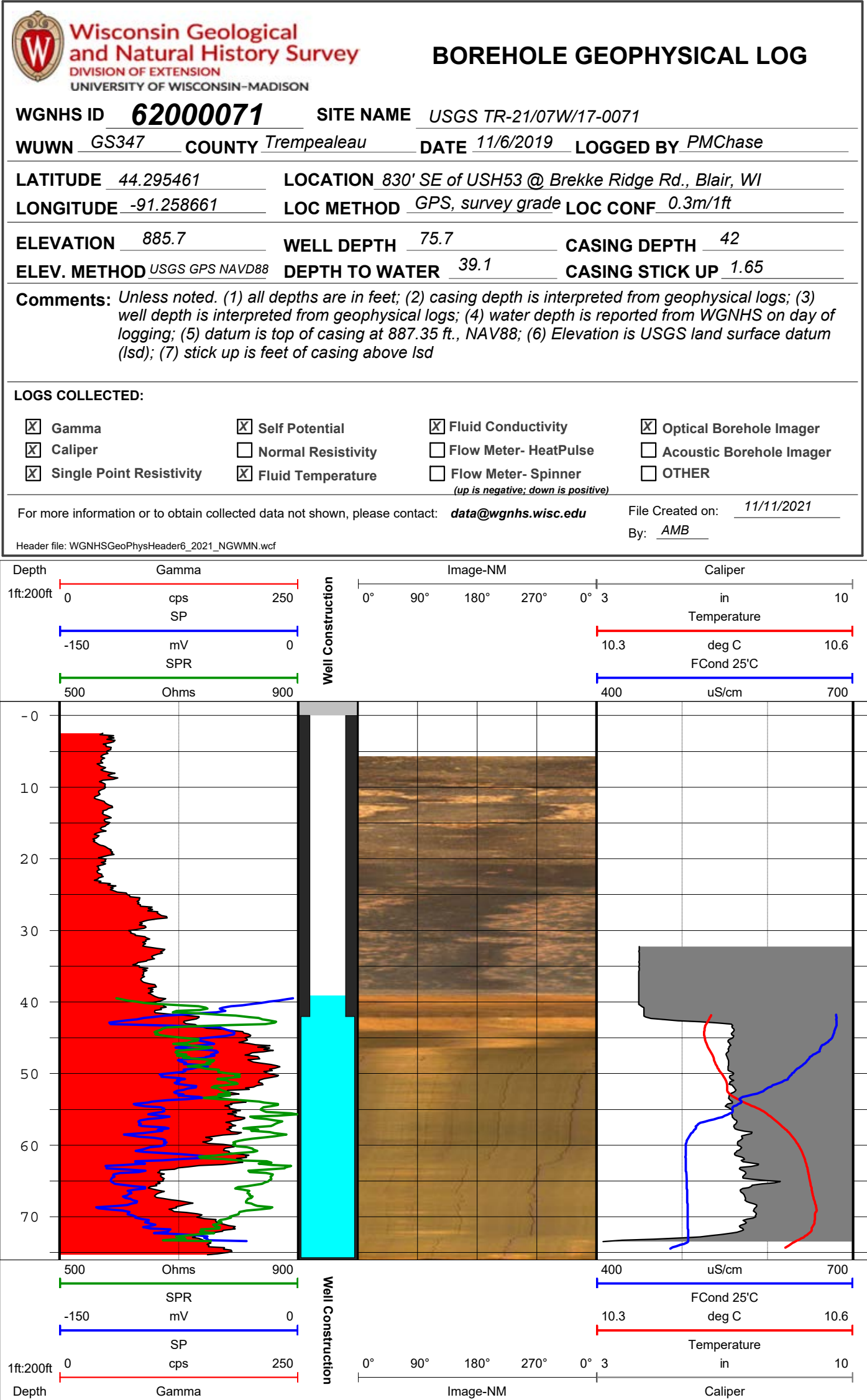
- ☐ 42. Complete a permit/application form to detour state highway traffic ([DT1479](#)). This DT1812 permit shall only be in effect if WisDOT approves the matching DT1479 permit.
- ☐ 43. Comply with the attached "Special Provisions for Railroad Crossing Work."

WORK RESTRICTIONS

- ☐ 44. Daily, holiday and/or seasonal work restrictions apply to the permitted work as detailed on page __. Review the restrictions with the WisDOT Region Office(s) identified on this permit.

MISCELLANEOUS

- ☐ 45. Contact the WisDOT Region Office(s) identified on this permit to arrange for a Region representative to inspect the work site. Perform no work under this permit prior to his/her arrival.
- ☐ 46. Contact the WisDOT Region Office(s) identified on this permit prior to completing the permitted work to arrange for a Region representative to inspect the work before the permittee's employees or contractor leaves the site.
- ☐ 47. Call the State Traffic Operations Center (STOC) / - on a weekly basis or as otherwise determined by the STOC before working on any interstate or other major freeway. The STOC may place restrictions on work times and lane/shoulder closures based upon various special events, oversize freight movements, or daily peak travel times.
- ☐ 48. Construction by open-trench methods is authorized only if the permitted installation can be accomplished in advance of the highway paving. Bore or dry auger the permitted facility if this cannot be accomplished.
- ☐ 49. At any location where open-trench installation across highway pavement is authorized, saw-cut the surface full depth to enable it to be restored with smooth joints. Restore concrete pavement to the nearest joint.
- ☐ 50. Backfill all excavations according to the attached detail.
- ☐ 51. Blasting within the highway ROW **is authorized** with this permit.
- ☐ 52.



Appendix 19: Well VE-117/271/272 documents

Historical Documents*

Basic well information for original well VE-117, 1980, updated 1987; well evaluation for original well VE-117, 1980; well location maps; hydrograph for original well VE-117 and piezometer VE-117, 1981-1999, 6 pages
well information historically compiled by WGNHS

WGNHS geologic log for original well VE-117, 1980, 4 pages

USGS site schedule for original well VE-117, 1981, 3 pages

USGS well construction information for well nest (original well VE-117 and piezometers VE-117, VE-271, and VE-272, 1982), 9 pages
includes handwritten notes and sketches detailing the construction of original well and three piezometers

USGS site schedule for VE-271, 1984, 4 pages

USGS site schedule for VE-272, 1984, 4 pages

Monitoring agreement, 1990, 4 pages

** Note: Due to the non-unique naming convention for this site, both the original well and the shallow piezometer were assigned the name: VE-117. Based on available records for this site, drilling and construction of original well VE-117 was completed on 11/19/1980. This well was subsequently outfitted with three piezometers (i.e., VE-117, VE-271 and VE-272) in September 1982 and the first recorded water-level measurement for these piezometers was in November 1982. Sketches detailing the construction of the piezometer nest are dated 12/13/1982.*

Documentation of work done for this report

WGNHS work application to Xcel Energy, 2018, 3 pages
application for gas and electric services at site

Monitoring agreement, 2019, 3 pages

Figure 3.
7/11/80

Fig 3 - BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number VE-117

Owner U.S. GEOLOGICAL SURVEY

Location (Co., T/R.sec)

SW NE SW 1/4 07W/28

Land surface altitude 650'

Drainage basin MISSISSIPPI RIVER - 600'

WELL DATA

Depth 633'

Casing depth 163'

Screened interval NONE

Diameter 10"

Aquifers open to well SANDSTONE

Geologic log available? YES

Construction report available? NO (has)

Use of well DOMESTIC

Access to measure well GOOD

Date checked:
November 19, 1980

+V271

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations La Crosse Ap - 15 mi North Cashton - 19 mi E
GENDA DAM 8, 7 mi South of WELL

Streamgaging stations

05382000 BLACK RIVER NEAR GALESVILLE, WZ
29 MILES NORTH OF WELL

Observation wells

VE 118 - 9 mi SE OF WELL ; VE 8 - 3 mi E OF WELL
VE 71 - 17 mi E OF WELL

Other piezometers: V271, V272

EXISTING RECORD

Measuring point TOP OF PIPE COUPLING

LSD: ft (above ?)

Measuring equipment STEEL TAPE

Frequency of measurement

Period of record --

Started NOVEMBER 17, 1982

Ended CONTINUING

Volume of missing record

1st measurement: 10.72 ft LSD
alt

VG

J. O. Peterson 4/87

Figure 2.

Ve-117

July 1980
R. D. Cotter

Fig 2 - CRITERIA FOR EVALUATION OF WATER-LEVEL OBSERVATION WELLS IN WISCONSIN

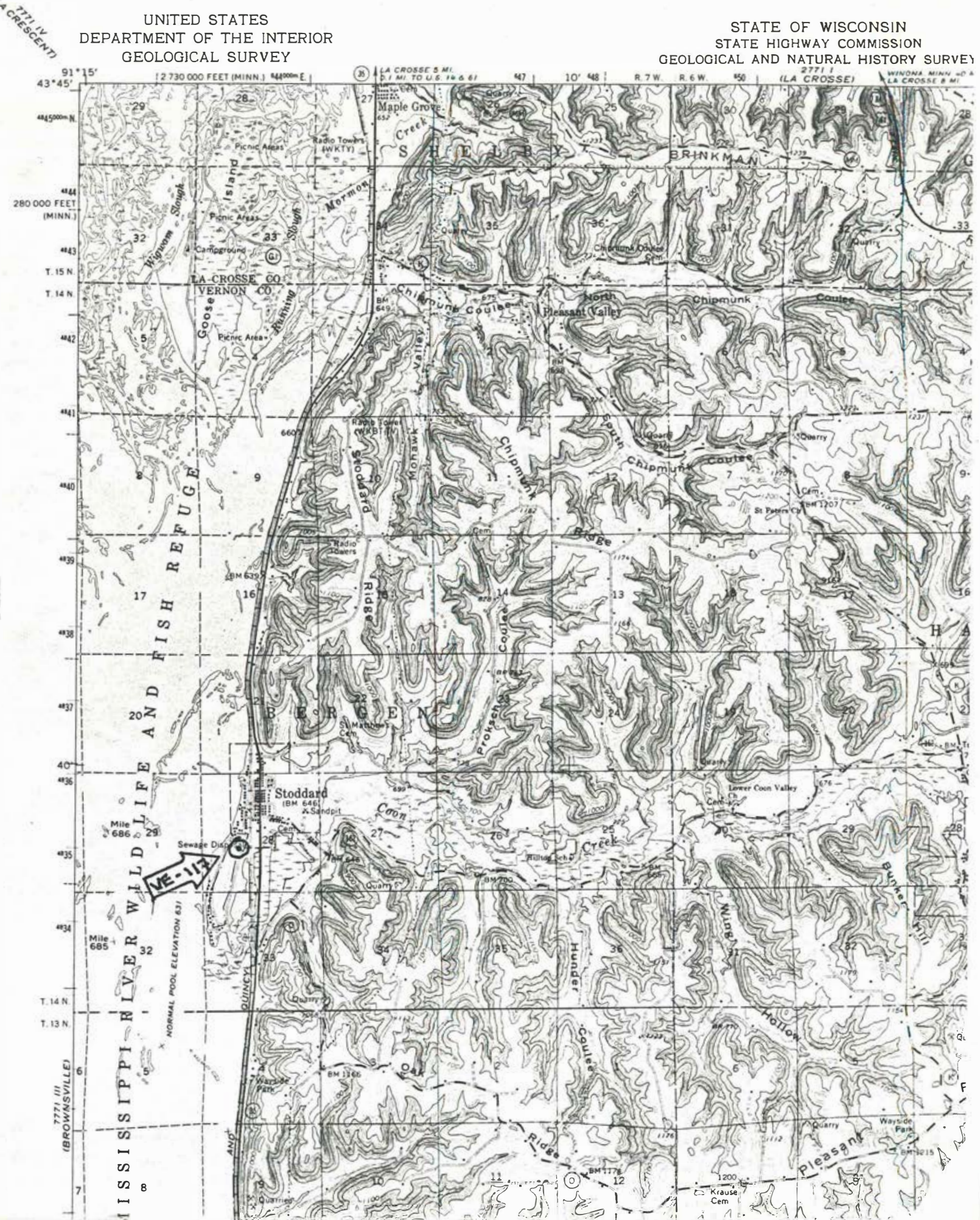
1. Areal spacing -- distance from any observation well
-- distance from observation well in same aquifer
2. Ownership -- private
-- public
3. Use of well DOMESTIC
4. Access -- physical
-- owner's permission
5. Condition of well -- casing Good
-- housing
6. Geologic log -- yes
-- no
7. Construction report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

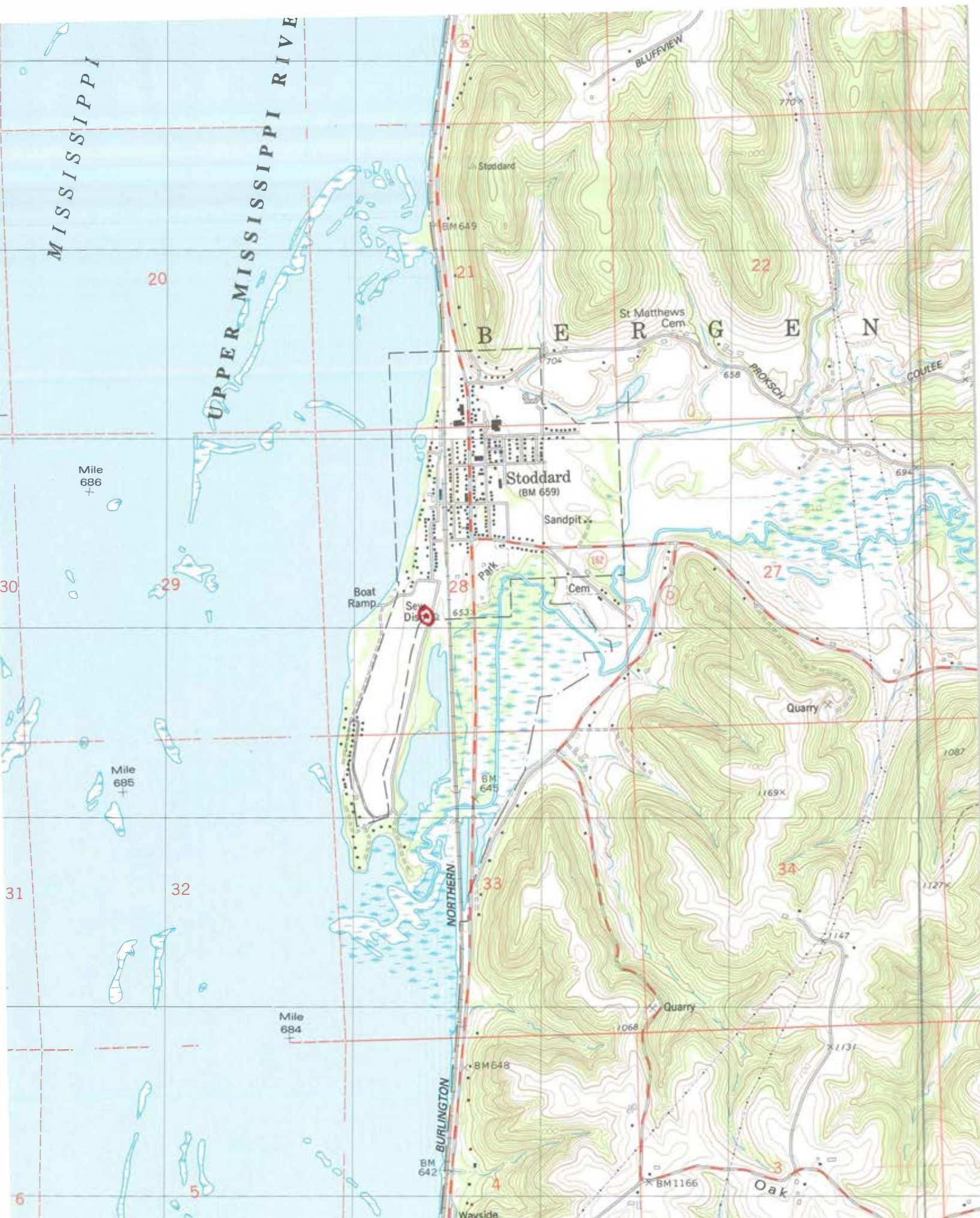
NOTES

Recommendations

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF WISCONSIN
STATE HIGHWAY COMMISSION
GEOLOGICAL AND NATURAL HISTORY SURVEY





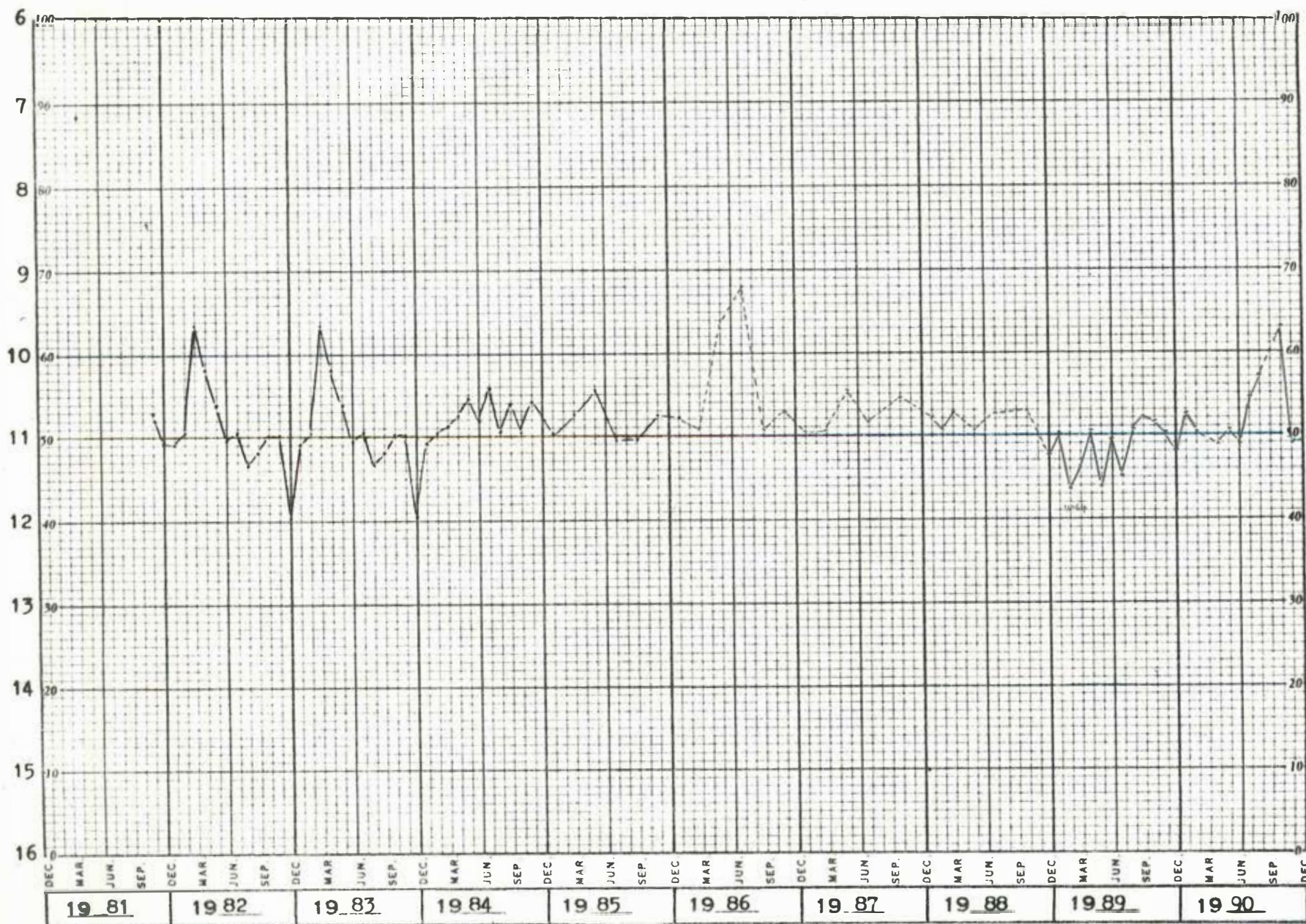
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EQU CLACE
VE-14/OTW/28-0117. U. S. Geol. Survey. NE $\frac{1}{4}$ SW $\frac{1}{4}$.

DEPTH TO WATER, IN FEET BELOW LAND SURFACE



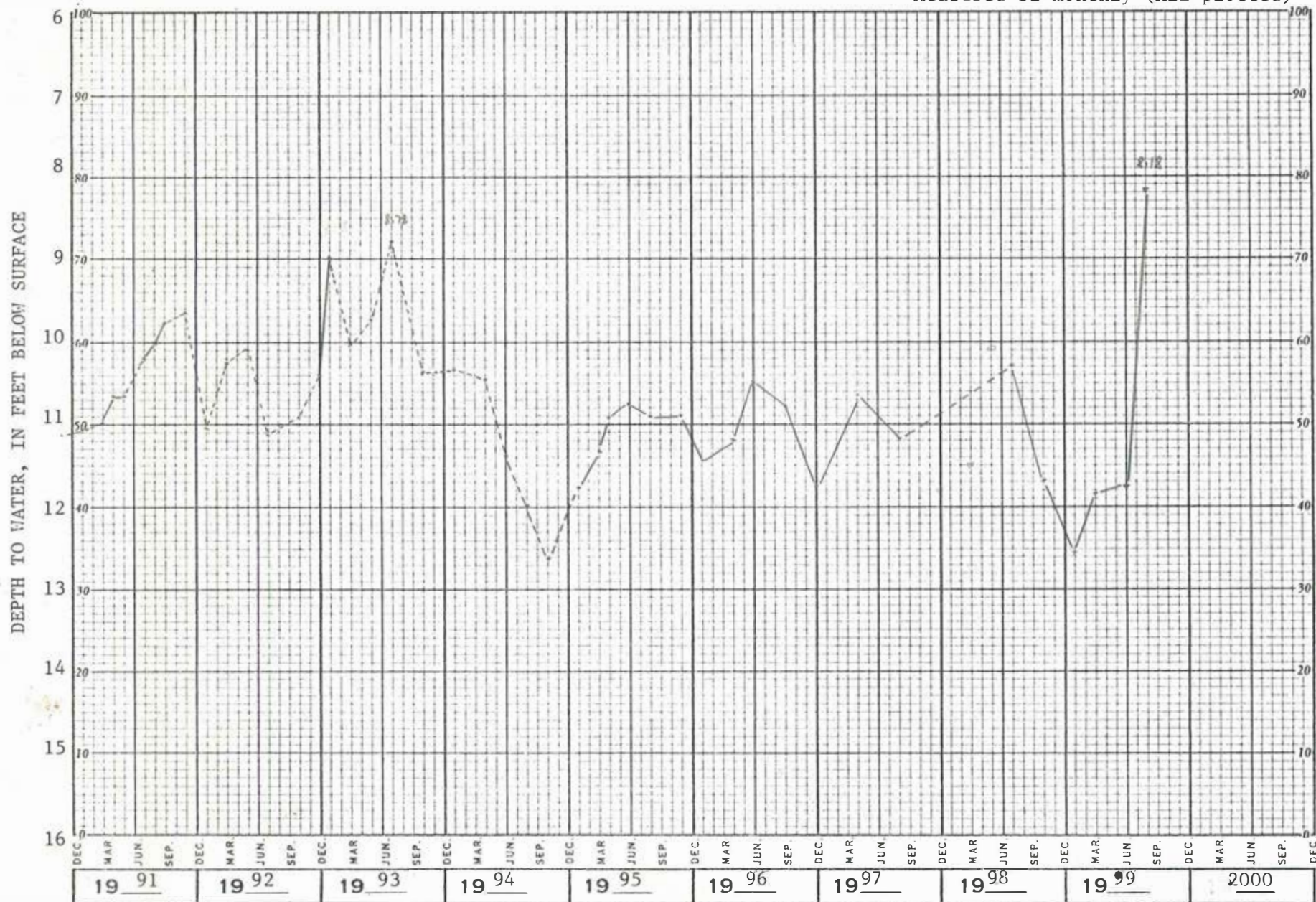
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CLEARPRINT CHARTS

VE-14/07W/28-0117. U.S. Geol. Survey. NE $\frac{1}{4}$ SW $\frac{1}{4}$.
Stoddard Test Well for RASA Study.

Measured bi-monthly (All plotted)



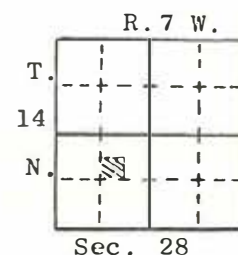
UNIVERSITY OF WISCONSIN GEOLOGICAL & NATURAL HISTORY SURVEY
1815 University Avenue, Madison, Wisconsin 53706

Log No. K146-Ve-117

Well name Stoddard Test Hole
Town of Bergen
Owner.... U.S. Geological Survey
Address.. 1815 University Ave.
Madison, WI 53706
Driller.. Layne-Western Co., Inc.
Engineer.

County: Vernon

Completed... 11/19/80
Field check. USGS-P. Emmons
Altitude.... 650' ETM
Use..... Test
Static w.l.. +16.4'
Spec. cap...



Quad. Stoddard 15'

Drill Hole						Casing & Liner Pipe or Curbing							
Dia.	from	to	Dia.	from	to	Dia.	Wgt. & Kind	from	to	Dia.	Wgt. & Kind	from	to
15"	0	163'				10"	.375" steel	+3'	163'				
10"	163'	633'											

Drilling method: Rotary
Samples from 0 to 633' Rec'd: 11/24/80

Grout	from	to
Neat cement	0	163'

Studied by: B.J. Socha (0-145')
Kathleen Massie (145'-633')

Issued: 7/21/82

Formations: Outwash, Eau Claire Formation, Mt. Simon Sandstone, Precambrian

Remarks: Samples 0-145' contain varying amounts of bentonite.
Driller reports bedrock at 144', Eau Claire/Mt. Simon boundary at 278',
and Precambrian at about 628'.
Pumping tests and caliper, natural gamma, temperature, and fluid conductance logs
are available from the U.S. Geological Survey.

LOG OF WELL:

	Depths	Graphic Section	Rock Type	Color	Grain Size		Miscellaneous Characteristics
					Mode	Range	
O U T W A S H	0-5		Gravel	Mixed	Gran	Gran/S peb	Granite, quartz, Fe form, rhyolite, trap, volc. Ltl sand. Tr silt.
	5-10		"	"	"	Gran/M peb	Grnt,qtz,rhy porph,trap,volc,Fe form,rhy. Ltl snd. Tr st.
	10-20		"	"	"	Gran/S peb	Grnt,qtz,rhy porph,trap,volc,ls,Fe form,ss. Ltl snd. Tr silt.
	20-25		"	"	"	Gran	Grnt,qtz,rhy porph,rhy,trap. Mch sand. Tr silt,olau,mica.
	25-35		Sand	"	C	Vfn/VC	Much gravel. Trace silt, glauconite, mica.
	35-45		"	Mxd pl bn	"	"	Trace gravel, silt, glauconite, mica.
	45-55		Gravel	Mixed	Gran	Gran	Grnt,qtz,rhy porph,ss,ls,dolic ss,ool dol,sch,trap,rhy. Mch sand, Tr silt,mica.
	55-60		Sand	Mxd pl bn	C	Vfn/VC	Little gravel. Trace silt, glauconite, mica.
	60-65		"	"	"	"	Trace gravel, silt, glauconite, mica.
	65-70		"	"	"	"	Little gravel. Trace silt, glauconite, mica.
	70-75		"	"	"	"	Same.
	75-80		"	"	"	"	"
	80-85		"	"	"	"	"
	85-90		Gravel	Mixed	S peb	Gran/M peb	Grnt,qtz,otzt,trap,rhy porph,sil & hem cem ss,ls,dolic ss,dol.
	90-95		Sand	Mxd pl bn	C	Vfn/VC	Trace gravel, silt, mica. Mch sand, Tr silt.
	95-100		"	"	"	"	Trace gravel, silt, mica.
	100-105		"	"	"	"	Little gravel. Trace silt, mica.
	105-110		Gravel	Mixed	Gran	Gran/S peb	Quartz,rhy,granite,trap,ool chert,rhy porph,ls. Much sand.
	110-120		"	"	S peb	Gran/M peb	Grnt,qtz,otzt,rhy,rhy porph,hem & sil cem ss,lim cem ss,shly dol,dol,hemic ss, ltl sand, Tr silt.
	120-125		"	"	"	"	Grnt,qtz,Fe form,rhy,hem cem ss,qtzt,trap,ls,rhy porph,hemic ss.
	125-130		Sand	Mxd pl bn	C	Vfn/VC	Little gravel. Trace silt. dol cem glaucic ss, Tr snd.
E.C.	130-135		"	"	"	"	Little gravel. Trace silt.
	135-140		"	"	"	"	Much gravel. sand,wh silt.
	140-145		Gravel	Mixed	S peb	Gran/S peb	Qtz,rhy porph,grnt,sil cem ss,Fe form,sh,ls,dol cem ss,cht, ltl
	145-150		Sandstone	Gray	Vfn	Vfn/C	Sand, Mch G dol cem,Vfn glauc,cvd snd. Ltl dry sh,st. Few fos
	150-155		"	"	"	"	See end of log. frags. Tr pyr,mica,cvd ovl.
	155-160		"	"	"	"	Subangular to subrounded. Much very good dolomite cement. Vfn/
							glauconite, silt. Few fossil fragments. Trace gray shale, mica, pyrite, caved gravel & sand.

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1815 University Avenue, Madison, Wisconsin 53706

Log No. K146-Ve-117

Well name: Stoddard Test Hole

	Depths	Graphic Section	Rock Type	Color	Grain Size		Miscellaneous Characteristics
					Mode	Range	
E A U C L A I R E	at 163		Sandstone	Gray	Vfn	Vfn/C	Same but many fossil fragments. mica, pyr, dol xls, cvd sand.
	163-165		"	Dark gray	"	"	Sang to srnd. Mch v G dol cem, Vfn/Fn glauc, st, drilling cl. Mny
	165-170		"	"	Vfn/Fn	"	Same plus trace Vfn-garnet.
	170-180		"	Gray	"	"	Sang to srnd. Mch v G dol cem, Vfn/Fn glauc, st, drilling cl. Few
	180-185		"	"	"	"	Same. fos frags, Ltl dk gry sh. Tr mica, pyr, cvd sand
	185-195		"	Light gray	Fn	"	Same but little Vfn/Fn glauconite.
	195-200		"	"	Fn/M	"	qtz arwths. Ltl st, Fn glauc, gry sh. Tr mica, pyr, cvd sand.
	200-210		"	"	Fn	Vfn/M	Sang to srnd. Mch v G dol cem, drilling cl. Few fos fraas, sec
	210-220		Shale	Dark gray	—	—	sec qtz grwths. Tr fos frags, Fn glauc, mica.
	220-225		Sandstone	Gray	Fn	Vfn/M	Sil. Ltl Vfn/M qtz sand, well cem fos & alauic ss (only sltly
130	225-230		"	"	M	Vfn/C	dolic). Few fos fraas, Tr pyr, mica.
	230-240		"	"	Fn	"	Sang to srnd. Mch v G dol cem, dk gry sh, st. Few fos fraas. Tr
	240-245		"	"	"	"	Srnd to sang. Mch G dol cem, gry & dk gry mic sh. glauc, pyr.
	245-255		Shale	Dark gray	—	—	Mny fos frags (wh, bn & bk), sec qtz arwths. Tr pyr, Fn glauc.
	255-260		Sandstone	Gray	Vfn/Fn	Vfn/C	Same but little glauconite.
	260-275		"	"	Fn	Vfn/VC	Srnd to sang. Mch v G dol cem, gry & dk gry mic sh (more than abv)
	275-280		"	"	C	"	See end of log. Mny fos frags (wh & bn), sec qtz arwths. Tr
	280-290		"	White	Fn	"	pyr Fn glauc.
	290-295		"	Wh & gray	Fn&C	"	Srnd. Mch v G dol cem, gry mic sh. Tr bk fos frags, pyr cem. C/V
	295-300		"	Light gray	C	"	qtz arns are well rnd, frosted & have tr sec qtz arwths.
Mt. S I M O N	300-320		"	"	Vfn/Fn	"	See end of log. Ltl drilling mud.
	320-330		"	Gray	C	"	Srnd. Mch v G sil cem. Tr pyrite, Fn-zircon, cvd drift gravel.
	330-335		"	"	"	"	Same as the two preceding intervals plus ltl v pl on mic sh.
	335-340		"	Light gray	"	"	Rnd to well rnd. Tr sil cem. Plus tr wea pyr. No fos frags.
	340-345		"	"	Fn&C	"	(finer grns), mfc incl, zircon incl. Mch frosting of arns, pyr
	345-355		"	"	M/C	"	(incl & webbing). Few sec qtz grwths. More finer arns than in
	355-360		"	"	Fn&C	"	Sang. Mch v G sil cem. Tr 275'-280' (approx 30% of same).
	360-365		"	"	Fn/M	"	bn shale, pyrite, Vfn garnet, Vfn zircon.
	365-370		"	"	"	"	Rnd to well rnd. Mch G sil cem, gry-pl on gry mic sh. Ltl frost
	370-375		"	"	"	"	of arns. Few sec qtz grwths. Tr pyr, mfc & pyr incl.
	375-380		"	White	M/C	"	Same plus much caved (?) sandstone as in 300-320'. bn sh.
	380-390		"	"	C	"	Few pyr incl. Ltl pyr webbing, ss as in 300-320'. Tr mfc incl.
	390-395		"	"	"	"	Srnd & well rnd. Tr sil & pyr cem, gry sh, frosting, mfc incl.
	395-400		"	"	"	"	Vfn zircon. Few pyr incl & webbing, sec qtz grwths.
	400-405		"	"	"	"	Well rnd. Tr pyr cem, pyr webbing/incl, frosting, sec qtz arwths.
	405-410		"	"	"	"	Same but Fn is srnd plus tr gry shale. Vfn zircon, zircon incl.
	410-415		"	"	"	"	Srnd. Tr pyr cem, pyr & zircon incl, Fn-zircon, fos fraas (cvd?).
	415-435		"	V pl brown	M	"	Same plus trace silica cement. wh sil sh, sec qtz arwths.
	435-440		"	"	"	"	Same.
	440-445		"	"	"	"	Well rnd. Tr pyr cem, zircon incl, Fn-zircon, sft wh sh, sec qtz
	445-450		"	"	"	"	Same plus trace very hard calcite cement. grwths.
	450-455		"	"	"	"	mfc incl, wh sil sh, sec qtz arwths.
	455-460		"	"	"	"	Rnd. Mch v G calc cem (breaking across grns). Tr pyr cem, pyr &
	460-465		"	"	"	"	Well rnd. Ltl v G calc cem. Tr pyr cem, gry mic sh, Fn-zircon, mfc
	465-470		"	"	"	"	See end of log. incl, wh sil sh, qtz grns, sec qtz arwths.
	470-475		"	"	"	"	Sang & well rnd. Mch v G sil cem. Ltl v mic on gry sh, st. Tr
	475-480		"	"	"	"	See end of log. pyr cem, sec qtz arwths, atz oran, mfc incl.
	480-485		NO SAMPLE				—
	485-490		Sandstone	V pl brown	Fn&C	Vfn/VC	Srnd. Tr G sil cem, G dol cem (cvd?), v mic rd bn sh interlayered
							w/v mic on gry sh mfc incl sec qtz arwths. Few atz oran.

UNIVERSITY OF WISCONSIN GEOLOGICAL & NATURAL HISTORY SURVEY
1815 University Avenue, Madison, Wisconsin 53706

Log No. K146-Ve-117

Well name: Stoddard Test Hole

	Depths	Graphic Section	Rock Type	Color	Grain Size		Miscellaneous Characteristics
					Mode	Range	
Mt. SIMON	490-495		Sandstone	V pl brown	M	Vfn/VC	qtz grans & S pebs. Srnd. Tr F sil cem, mfc incl, v mic rd bn sh, sec qtz grwths. Few
	495-500		"	Pale brown	"	"	Same but mch v mic rd bn shale & mny quartz grans & S pebbles.
	500-505		"	"	"	"	Srnd. Tr F sil cem, mfc incl, Fn zircon, wh sil sh. Ltl v mic rd
	505-510		"	"	"	"	Same. bn & bl qn sh sec qtz grwths qtz grans & S pebs.
	510-515		"	"	Fn&C	"	See end of log.
	515-520		"	V pl brown	"	"	Srnd & rnd. Tr lim & P sil cem, Fn zircon, mfc incl, wh sil sh, qtz
	520-525		"	Pale brown	Fn/M	"	See end of log.
	525-530		"	"	Fn/M&C	"	gran, st. Few sec qtz grwths.
	530-535		"	"	M/C	"	Sanq & rnd. Ltl v G sil cem, sec qtz grwths, v mic rd bn & on
	535-540		"	V pl brown	"	"	Same plus tr hem cement. gry sh. Mny qtz grans & S pebs. Tr
	540-545		"	"	"	"	See end of log. wh sil sh, mfc incl, biot(not w/sh).
	545-550		"	"	"	"	Srnd. Tr G sil & lim cem, mfc incl, Fn zircon, wh sil sh. Mny qtz
	550-555		"	"	"	"	Sanq to srnd. Ltl G sil cem, qtz gran/S peb. Mch gran/S peb.
	555-560		"	Lt brown	"	"	See end of log. v mic pl qn sh. Tr mfc incl, feld, sec qtz
	560-565		NO SAMPLE.				orwths.
	565-570		Sandstone	V pl brown	M/C	Vfn/VC	Srnd. Tr G sil & hem cem, wh sil sh, mfc incl. Few sec qtz grwths.
	570-575		"	Lt rd bn	"	"	Srnd. Tr G to F sil & hem cem, wh sil sh, mfc incl, feld, mica.
	575-580		"	"	"	"	Same plus trace Fn/C zircon. Mny qtz gran/S peb.
350' 8'	580-585		"	Red brown	"	"	Srnd. Ltl P to G hem cem, mny qtz gran/S peb. Tr mfc incl, mfc snd.
	585-590		"	"	Fn&C	"	Sanq & srnd. Ltl G sil cem(w/feld). Mny Fn feld rd bn sh.
	590-595		Cong	"	S peb	Gran/M peb	See end of log. grns(or), qtz grans/S peb. Tr G hem & calc cem
	595-600		"	"	"	"	Same but no mafic quartz S pebs. v mic sh, mfc incl, wh sil sh.
	600-605		Sandstone	Pink	C/VC	Vfn/VC	Rnd. Tr G calc cem, wh sil sh, mfc snd, mfc incl. Ltl or feld. Mch
	605-610		"	"	"	"	Same. qtz avl(Gran/M peb).
	610-615		"	Lt brown	"	"	Same but little quartz gravel (Gran/S pebble).
	615-620		"	"	"	"	Rnd. Ltl G calc cem, v mic sh(rd bn & pl on). Mch qtz avl(Gran/
	620-625		"	V pl brown	"	"	See end of log. S peb), or feld. Tr mfc incl, wh sil sh.
	625-630		Cong	Lt brown	S peb	Gran/M peb	Srnd but mny pebs are freshly broken(by drilling?). Mch sil cem
	at 633		Granite	Yellow red	M	Fn/M	See end of log. (or) feld rich ss, v mic rd bn sh, qtz snd. Tr
			"	"	"	"	Weathered. Quartz 50%, orthoclase mfc incl, mfc snd(Fn/M).
							30%, white plagioclase 4%, biotite 6%, Trace rounded quartz
							grains, hematite, rust stains from drilling.
							END OF LOG
							From Bulk Precambrian Sample.
			Granite	Yellow red	M	Fn/M	Weathered. Qtz 50%, orthoc 30%, wh plag 4%, biot 6%. Mny rust
							stains from drilling. Trace cvd v mic red brown shale, rnd
							quartz grains, hematite.
							Unlabeled Sample.
			Sandstone	V pl brown	M/C	Vfn/VC	Subrounded to rounded. Trace pyrite & silica cement, pale
							green micaceous shale, mafic inclusions, white siliceous
							shale, silt, quartz granules. Few secondary quartz growths;
							Two Duplicate Samples.
	at 255		Sandstone	Gray	Vfn/Fn	Vfn/C	Subrounded to subangular. Much very good dolomite cement, dark
							gray micaceous shale, black fossil fragments. Trace pyrite,
							secondary quartz growths, caved glauconitic sandstone.
	628-632		Granite	Yellow red	M	Fn/M	Weathered. Quartz 40%, orthoclase feldspar (orange) 30%, white
							plagioclase 25%, biotite 5%. Few rounded quartz grains. Trace
							hematite.
	150-155		Sandstone	Gray	Vfn	Vfn/C	Subangular. Much very good dolomite cement, Vfn-glauconite,
							silt. Few fossil fragments. Little caved gravel & sand.
							Trace gray shale, mica, pyrite.
	245-255		Shale	Dark gray	--	--	Much mica. Many fossil fragments/molds, most are very different
							from adjoining intervals-yellow brown in color, trace dark
							gray-black fragments as above. Little sandstone as above.
							Few secondary quartz growths. Trace floating sand, pyrite.
							Fn-glauconite.

Well name: Stoddard Test Hole

Depths	Graphic Section	Rock Type	Color	Grain Size		Miscellaneous Characteristics
				Mode	Range	
275-280		Sandstone	Gray	C	Vfn/VC	Well rounded. 95% of sample is C/VC (small end of VC) well rounded quartz. Many pyrite inclusions & webbing. Little frosting. Few secondary quartz growths. Trace black & pyritized fossil fragments. Trace dolomite cement associated with finer grains (shows layering).
400-405		Sandstone	Gray	Fn&C	Vfn/VC	Subrounded & well rounded. Little fair silica cement. Much very micaceous green gray shale. Trace pyrite cement, pyrite, quartz granules, mafic inclusions.
410-415		Sandstone	Light gray	Fn&C	Vfn/VC	Subangular & well rounded. Little good dolomite cement, very micaceous green gray shale. Few quartz granules. Trace pyrite cement, mafic inclusions, white siliceous shale.
510-515		Sandstone	Pl brown	Fn&C	Vfn/VC	Subangular & subrounded to rounded. Little good silica cement (especially with Fn sandstone), quartz granules & small pebbles, secondary quartz growths. Much very micaceous red brown & pale green shale. Trace M-zircon, mafic inclusions, white siliceous shale.
520-525		Sandstone	Pl brown	Fn/M	Vfn/VC	Subangular to subrounded. Little very good silica cement, quartz granules & small pebbles, secondary quartz growths, very micaceous red brown & pale green shale. Trace Fn-zircon, mafic inclusions, white siliceous shale.
535-540		Sandstone	V pl brown	M/C	Vfn/VC	Subangular to subrounded. Trace good silica cement, very micaceous red brown & green gray shale, white siliceous shale, mafic inclusions, Fn-zircon. Few secondary quartz growths, quartz granules.
550-555		Sandstone	Lt brown	M/C	Vfn/VC	Subangular to subrounded. Little good silica & hematite cement, quartz granule/small pebble, very micaceous shale (pale green, red brown & yellow brown). Trace mafic inclusions, white siliceous shale, secondary quartz growths.
585-590		Cong	Red brown	S peb	Gran/M peb	Subrounded but many freshly broken (from drilling?). Much sandstone as above. One mafic quartz small pebble. Same as 580-585' but coarser.
615-620		Sandstone	V pl brown	C	Vfn/VC	Rounded. Little good calcite cement. Much quartz gravel (Gran/medium pebble). Few secondary quartz growths. Trace mafic inclusions, Fn/M zircon, white siliceous shale, orange feldspar.
625-630		Granite	Yellow red	M	Fn/M	Weathered. Quartz 50%, orthoclase feldspar (orange) 40%, biotite 5%, white plagioclase 5%. Many rounded quartz grains (up to granules). Little sandstone as above.

Recorded by P. EmmonsU.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
SITE SCHEDULESITE NO. VE-117/271/272-0117
(USGS STODDARD TEST WELL)Date 12/1/81Check One ☒ English ☐ Metric Units

GENERAL SITE DATA (1)

Site Ident No 433921091132101 RG Number R-0* Transaction T-ADMV*
 add, delete, modify, verified

Site-Type 2-CDEHIMGPSTW* Data 3-CULM* Reliability 3-CULM* Reporting Agency 4-USGS*
 surface drain, seepage sink, connection multi-out pond, spring, tunnel well, or shaft, field checked, unchecked, location not, minimal accurate date

Project No. 5-445509700* District 6-55* State 7-55* County (or town) Vernon 8-123*

Latitude 9-433921* Longitude 10-0911321* Lat-Long Accuracy 11-SFTM*
 deg min sec deg min sec sec, 5 sec, 10 sec, Min

Local Number 12-VE-117/271/272-0117 Land Net Loc. 13-SW/4SW/4S/28T/014N R007W/4*
 1/4 1/4 1/4 section, township, range, merid

Location Map 14-STODDARD NW(T) Scale 15-24000*

Altitude 16-650* Method of Measurement 17-ALM* Accuracy 18-10*
 altimeter, level, map

Topo Setting 19-ABCDEFGHIJKLMOPSTUVW* Hydrologic Unit (OWDC) 20-
 alluvial, plays, stream, depress, dunes, flat, flood hill, sink, swamp, mangrove, off-podi, hill, terrace, undulating, valley, upland, draw

Use of Site 23-ACDEGHOMPRSTUWXZ* Secondary Site Use 301-* Tertiary Site Use 302-*
 arid, sandy, drain, gas, seismic, heat, observe, mine, oil or, recharge, repress, test, unused, with-waste, destroyed, drawal

Use of Water 24-ABCDEFGHIJKLMNPQRSTUWYZ* Secondary Water Use 25-* Tertiary Use of Water 26-* Depth of Hole 27-633* Depth of Well 28-633* Source of Depth Data 29-S*
 air-cond., bot-tling, com-merical, do-power, fire, do-mestic, irri-gation, industrial, mining, medi-cinal, indu-rial, public, equi-culture, recreation, stock, institution, unused, disposal, other

Water Level 30-116.4* Date Measured 31-11/21/1981* Source 33-S*
 month day year

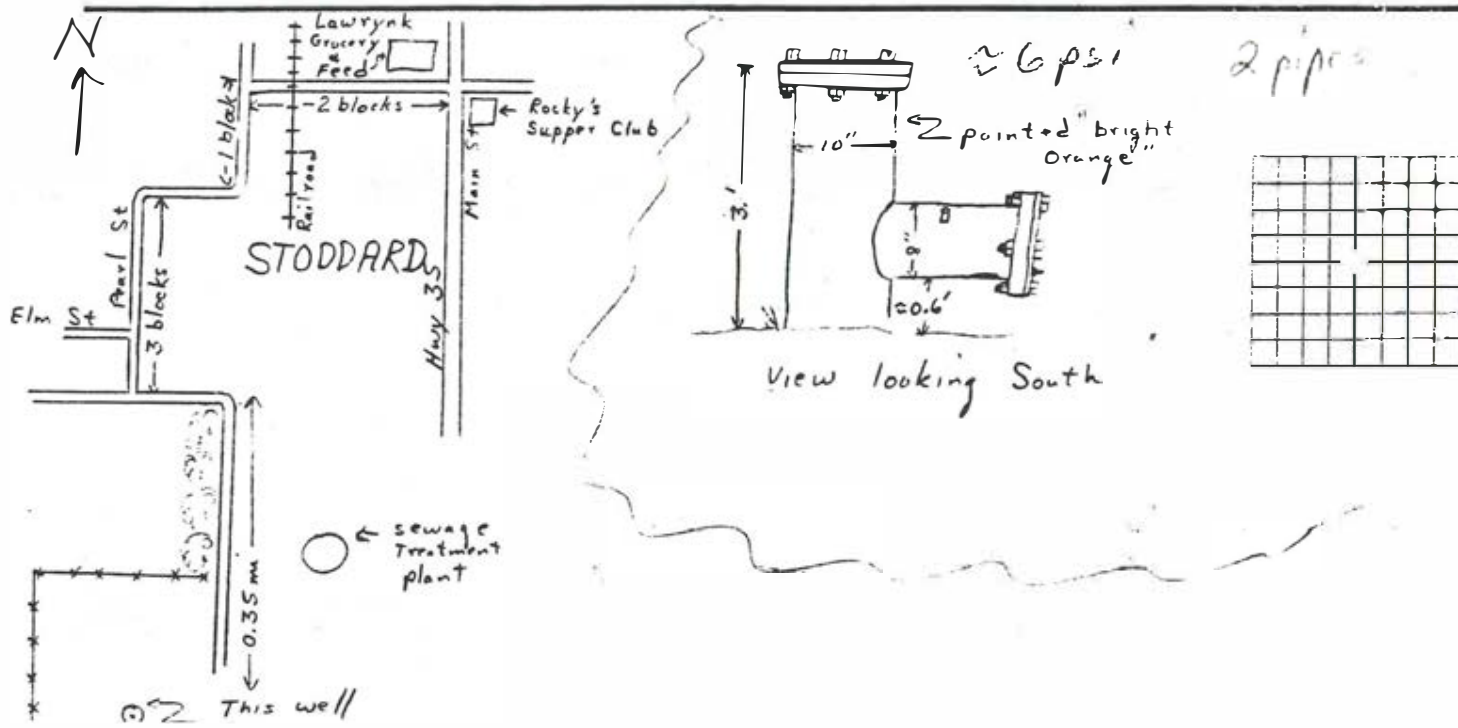
Method of Measurement 34-ABCDEFGHIJKLMNPQRSTVZ* Source of Geohydrologic Data 36-S* Pump Used 35-X* Date of First Construction/Completion 21-11/19/1980*
 airline, analog, calibrated, estimated, pressure, calibrated, geophysical, manometer, non-rec. reported, steel, electric, calibrated, other, tape, pressure gauge, logs, tape, tape, electric tape

Site Status 37-DE* Source of Geohydrologic Data 36-S* Pump Used 35-X* Date of First Construction/Completion 21-11/19/1980*
 dry, recently, flowing

OWNER IDENTIFICATION (1)

R-158* T-ADM* Date of Ownership 159-11/19/1980*
 add, delete, modify month day year

Name: Last 161-US G E O L O G I C A L First 162-SURVEY Middle Initial 163-*



CONSTRUCTION DATA (1)

Entry No. 59#00.1 Date of Construction Completion 60-11/19/1980 Source of Const. Data 64-S

Name of Contractor/Driller 63-LAYNE, W. C. Layne-Western Company, Inc., Aurora, ILL.

Method of Construction 65-A B C D H J P R T V W Z *

air, rotary, bored, or augured, cable tool, dug, hydraulic, jetted, air-per., jetted, reversed, trenching, driven, drive, wash, other

Finish 66-C F G H S P S T W X Z * Type of Seal 67-B C G Z *

porous, gravel w. concrete, gravel, screen, horizontal, open, perforated, screen, sand point, welded, open, other, bentonite, clay, cement, other grout

Bottom of Seal 68-163 Method of Development 69-A B C J N P S Z * Number of Hours in Development 70-1

air-lift, bailed, compressed, jetted, none, other, surged, other pump

Special Treatment During Development 71-C D E F H M Z *

chemicals, dry ice, explosives, deflocculant, hydrofracturing, mechanical, other

DIMENSIONS OF THE HOLE CONSTRUCTED (2)

R = 72 * T = A D M * Construction Entry No. 59#00.1

add, delete, modify

Top of Hole Segment Below LSD

73#	<u>0.</u>	*
73#	<u>1.63.</u>	*
73#	<u>.</u>	*
73#	<u>.</u>	*
73#	<u>.</u>	*

Bottom of Hole Segment below LSD

74#	<u>1.63.</u>	*
74#	<u>6.33.</u>	*
74#	<u>.</u>	*
74#	<u>.</u>	*
74#	<u>.</u>	*

Diameter of Hole Segment

75#	<u>1.5.</u>	*
75#	<u>1.0.</u>	*
75#	<u>.</u>	*
75#	<u>.</u>	*
75#	<u>.</u>	*

New Card for Each Hole Segment Same R, T & Field 59

CASING SCHEDULE (2)

R = 76 * T = A D M * Construction Entry No. 59#00.1

add, delete, modify

Top of Casing Segment Below LSD

77#	<u>-3.</u>	*
77#	<u>.</u>	*
77#	<u>.</u>	*
77#	<u>.</u>	*
77#	<u>.</u>	*

Bottom of Casing Segment Below LSD

78#	<u>1.63.</u>	*
78#	<u>.</u>	*
78#	<u>.</u>	*
78#	<u>.</u>	*
78#	<u>.</u>	*

Diameter of Casing Segment ②

79#	<u>1.0.</u>	*
79#	<u>.</u>	*
79#	<u>.</u>	*
79#	<u>.</u>	*
79#	<u>.</u>	*

Casing Material

80#	<u>S</u>	*
80#	<u>.</u>	*
80#	<u>.</u>	*
80#	<u>.</u>	*
80#	<u>.</u>	*

Thickness of Casing

81#	<u>3.75</u>	*
81#	<u>.</u>	*
81#	<u>.</u>	*
81#	<u>.</u>	*
81#	<u>.</u>	*

New Card for Each Casing With Same R, T & Field 59

OPENINGS SCHEDULE (2)

R = 82 * T = A D M * Construction Entry No. 59#00.1

add, delete, modify

Top of Section Below LSD 83# 1.63. *

Bottom of Section Below LSD 84# 6.33. *

Type of Openings ③ 85# X *

Type of Material ④ 86# . *

Diameter of Open Section 87# . *

Width of Opening 88# . *

Length of Opening 89# . *

(Openings Data)

83#	<u>.</u>	*
84#	<u>.</u>	*
85#	<u>.</u>	*
86#	<u>.</u>	*
87#	<u>.</u>	*
88#	<u>.</u>	*
89#	<u>.</u>	*

(Openings Data)

83#	<u>.</u>	*
84#	<u>.</u>	*
85#	<u>.</u>	*
86#	<u>.</u>	*
87#	<u>.</u>	*
88#	<u>.</u>	*
89#	<u>.</u>	*

(Openings Data)

83#	<u>.</u>	*
84#	<u>.</u>	*
85#	<u>.</u>	*
86#	<u>.</u>	*
87#	<u>.</u>	*
88#	<u>.</u>	*
89#	<u>.</u>	*

New Card for Each Open Section With Same R, T and Field 59

PRODUCTION DATA (1)

R = 134 146 * T = . * Construction Entry No. 17# * Date 148- / / *

flowing, pumped add, delete, modify

Discharge: 150- * Source of Data 151- * Draw down: 309- *

Method of Measurement 152-B C E F M D P R T U V W Z *

bailey, current, estimated, flume, totaling, orifice, pitot-tube, reported, trajectory, venturi, volumetric, weir, other

Production Level 153- * Static Level 154- * Source of Data 155- * Specific Capacity 272- *

Method of Measurement 156-A B C E G H L M N R S T V Z *

online, analog, calibrated, estimated, pressure, calibrated, geophysical, manometer, non-rec., reported, steel, electric, calibrated, other

Pumping Period 157- *

AVAILABLE LOG DATA (1)

R = 198 * T = A D M * Construction Entry No. 17# * Date 148- / / *

add, delete, modify

Type of Log ⑤ 199# C * 199# D * 199# E * 199# J *

Begin Depth 200- 68. * 200- 0. * 200- . * 200- 0. *

End Depth 201- 623. * 201- 633. * 201- . * 201- 627. *

Source of Data ① 202- S * 202- S * 202- S * 202- S *

T 0
G 0
F 5

623
633
623

S
A
S

13 DEC 82
R. GIFFORD

PIEZOMETER CONSTRUCTION IN STODDARD TEST WELL - VE-14/07W/28. 0117

County Well no.	Ve-271	Ve-272	Ve-117
PIEZOMETER No.	1	2	3
COLOR	RED	GREEN	YELLOW
MP* ABOVE LSD (ft)	3.23'	3.23'	3.23'
DEPTH BELOW LSD (ft)	618.63'	313.63'	36.98'
SCREEN INTERVAL ^{LSD} (ft)	603.63'-618.63'	298.63'-313.63'	NONE
VOP - JOHNSON SS WIRE-WOUND			
WELL POINT TYPE	304	304	NONE
SCREEN DIAMETER (IN)	1.25	1.25	
SCREEN SLOT (IN)	0.020	0.020	
FORMATION	LOWER MT. SIMON	UPPER MT. SIMON	FAU CLARE
DATE COMPLETED	10 SEPT 82	15 SEPT 82	15 SEPT 82
CASING DETAILS (BELOW MP)			
STEEL ADAPTER (DIA, LENGTH)	1.5", 21.29'	1.5", 21.29'	STEEL & PLASTIC ADAPTER, 1.21'
2" TImco SCH. 80 PVC			
2.0"-1.5" REDUCTION FITTING			
1.5" TImco SCH. 80 PVC	21.29'-606.29'	21.29'-301.29'	1.21'-40.21'
TImco TO SCREEN ADAPTER	606.29'-606.86'	301.29'-301.86'	
SCREEN INTERVALS	606.86'-621.86'	301.86'-316.86'	

STEEL CASING - - 3' TO 163' (10")

CEMENT PLUG 198' TO 274'

GRAVEL PACK 274' TO 524'

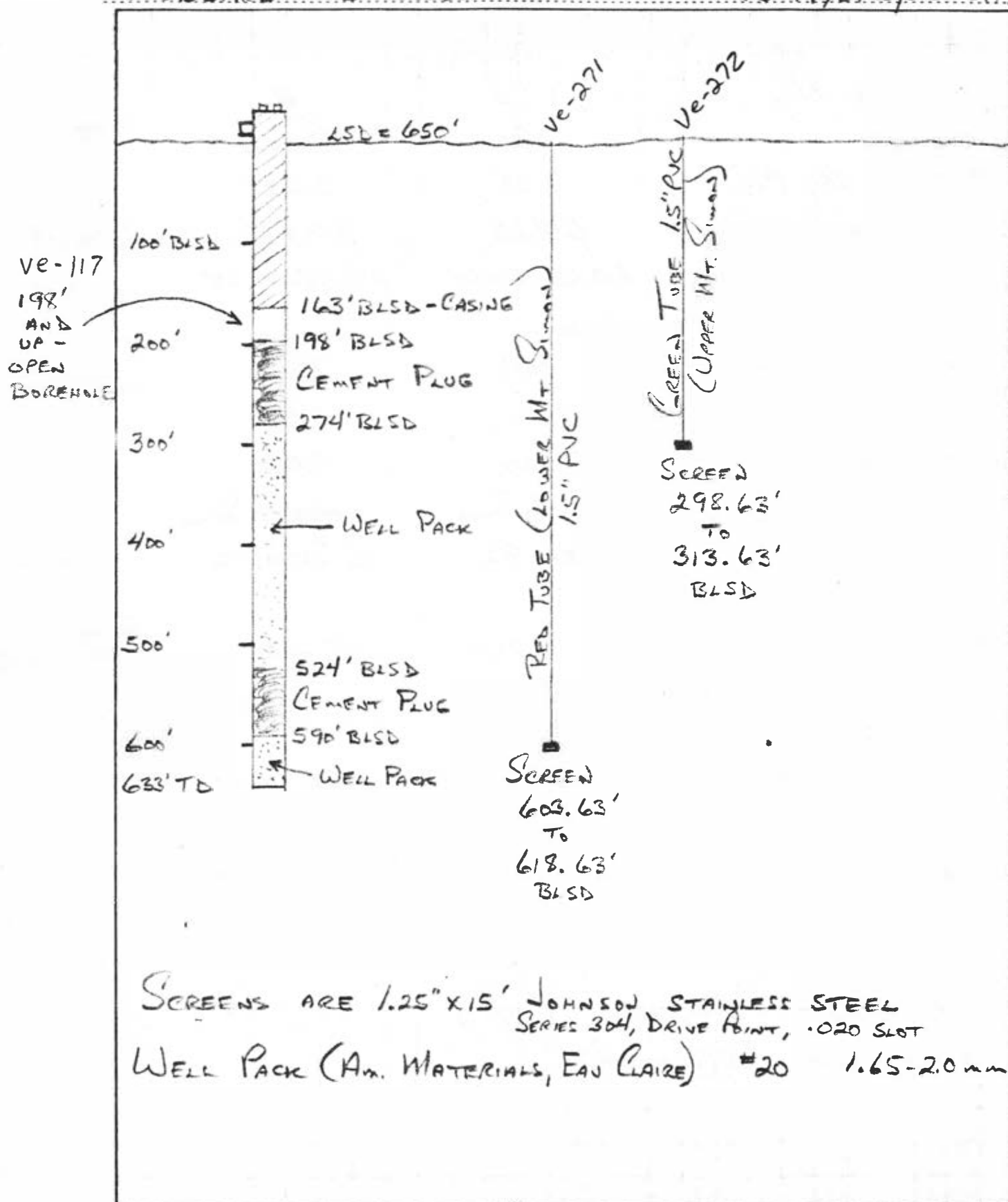
CEMENT PLUG 524' TO 590'

GRAVEL PACK 590' TO 633'

*MP = TOP OF PIPE COUPLING

STODDARD TEST WELL

Ve-14/07W/28-0117



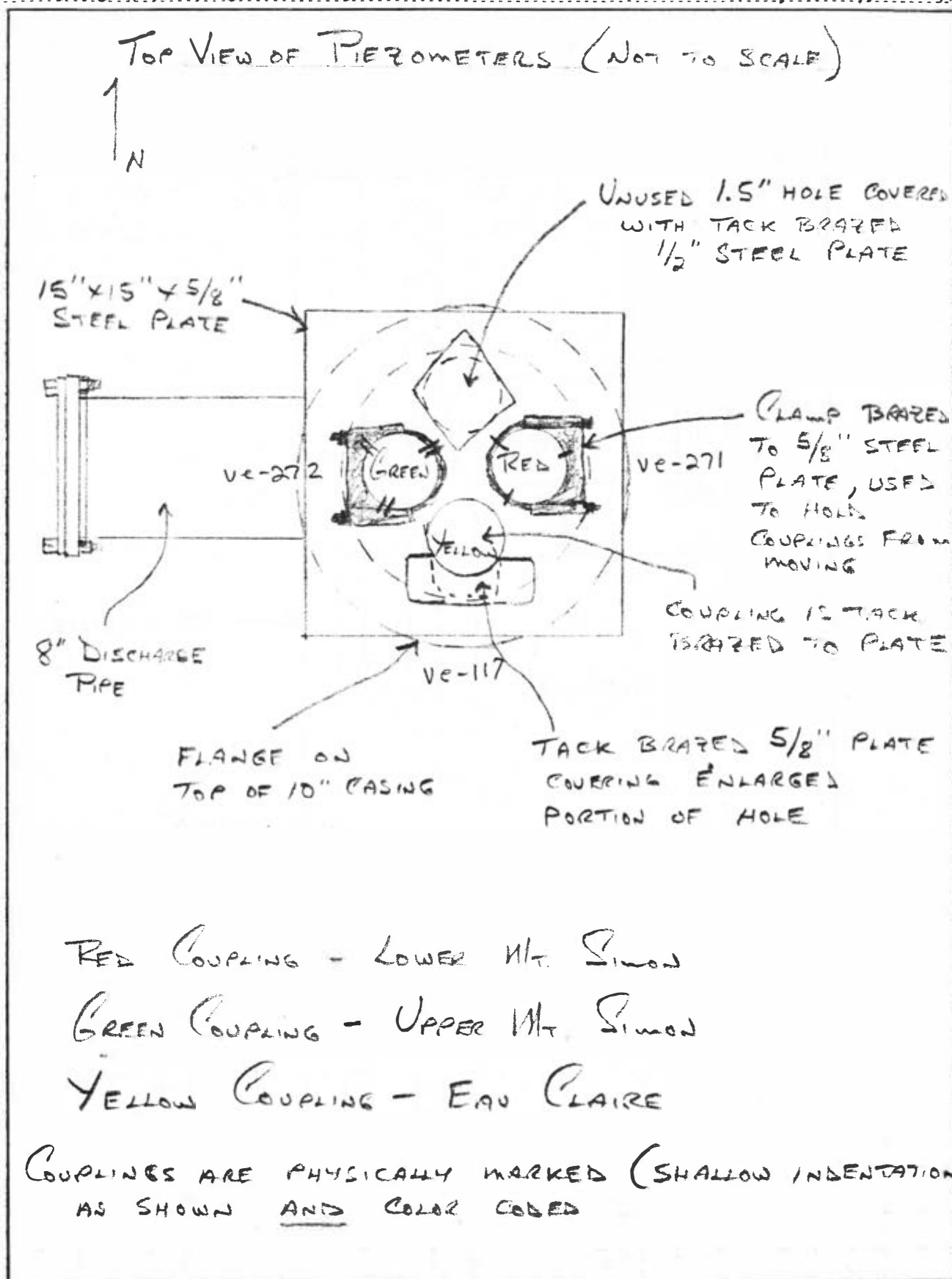
9-213H

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File

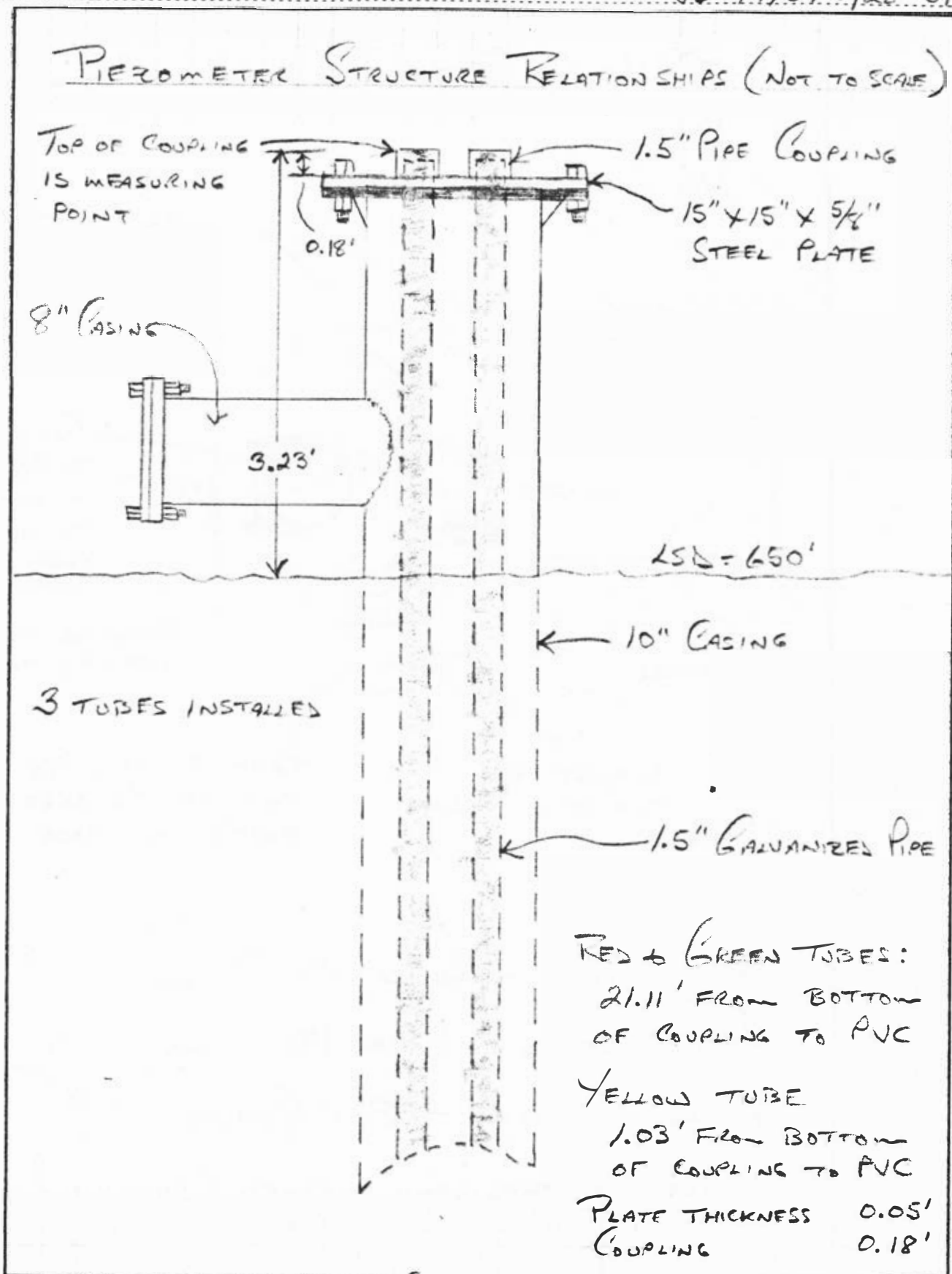
STOLLARD TEST WELL

Ve-14/074/28-0117



STODDARD TEST WELL

Ve-14/07W/22-017

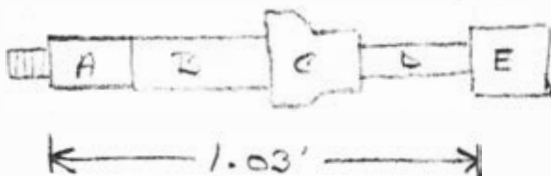


STODDARD TEST WELL

VE-14/07W/22-0117

PIEZOMETER TUBE CONSTRUCTION DETAILS

YELLOW TUBE (FAS CLAIRE)



- A - 2.0" to 1.5" Timco PVC REDUCTION FITTING
- B - 2.0" Timco to 2.0" PIPE THREAD - PVC PIPE
- C - 2.0" to 1.5" STEEL REDUCTION FITTING
- D - 1.5" PIPE NIPPLE
- E - 1.5" PIPE COUPLING

BELOW THIS ADAPTER IS 39' OF
1.5" Timco PVC

END OF TUBE IS FILED SMOOTH

- NO SCREEN -

OPEN END IS - 40.21' BELOW MEASURING POINT
36.92' BELOW LAND SURFACE DATUM

STANDARD TEST WELL

Ve-14/07W/28-0271

PIEZOMETER TUBE CONSTRUCTION DETAILS

RED TUBE (LOWER MT. SIMON)

1.5" GALVANIZED PIPE ADAPTER + COUPLING	21.29'
1.5" Timco Sch. 80 PVC PIPE	585.00'
1.5" Timco to 1.50" PIPE THREAD ADAPTER (STEEL)	0.57'
	606.86'

TOP OF SCREEN

606.86' BELOW MEASURING POINT
603.63' BELOW LAND SURFACE DATUM
46.37' MSL

BOTTOM OF SCREEN

621.86' BMP
618.63' BLSD
31.37' MSL

STODDARD TEST WELL

Ve-14/07W/22-0272

PIEZOMETER TUBE CONSTRUCTION DETAILS

GREEN TUBE (UPPER Mt. Simon)

1.5" GALVANIZED PIPE ADAPTER + COUPLING	21.29'
1.5" TIMCO SCH. 80 PVC PIPE	280.00'
1.5" TIMCO TO 1.50" PIPE THREAD ADAPTER (STEEL)	0.57'
	<u>301.86'</u>

TOP OF SCREEN

301.86' BELOW MEASURING POINT
 292.63' BELOW LAND SURFACE DATUM
 351.37' MSL

BOTTOM OF SCREEN

314.86' BMP
 313.63' BLSL
 336.37' MSL

STANDARD TEST WELL

Ve-14/07W/28-0117

FLOW RATE MEASUREMENTS

USING - WATER WELL HANDBOOK (ORANGE COVER)
p 156 - FOR ESTIMATES OF 10" CASING
DISCHARGEOPEN HOLE - 24 HRS AFTER REMOVAL OF PACKER
140 GPM

LOWER Mt. Simon - PACK AROUND SCREEN - 120 GPM

LOWER Mt. Simon - FROM TUBE - 8.3 GPM FROM 10" CASING

LOWER Mt. Simon - PLUG IN - 68 GPM
FROM 10" CASING

LOWER Mt. Simon - FROM TUBE - 12.5 GPM

UPPER Mt. Simon - PACK AROUND SCREEN - 12.5 GPM
FROM 10" CASING

LOWER Mt. Simon - FROM TUBE - 14.3 GPM

UPPER Mt. Simon - FROM TUBE - 8.3 GPM

LOWER Mt. Simon - FROM TUBE - 14.3 GPM
PLUG IN OVER UPPER Mt. Simon

UPPER Mt. Simon - PLUG IN - FROM TUBE - 11 GPM

DISCHARGE FROM 10" CASING CEASED
DURING PLACEMENT OF PLUG OVER
UPPER Mt. Simon

WATER LEVEL IN CASING - 9.45' BLS (16 SEPT 82)

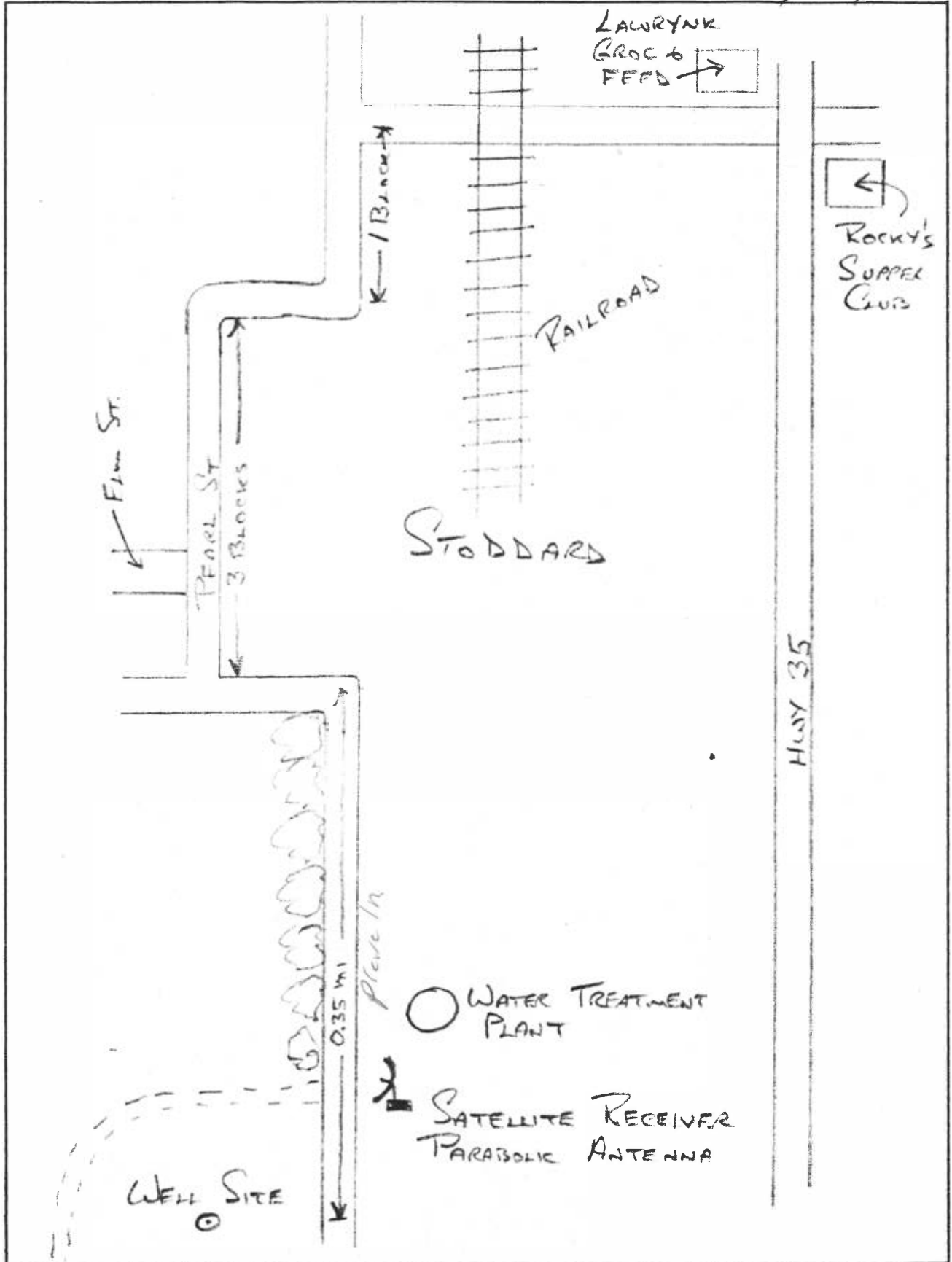
9-213H

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GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File

STODDARD TEST WELL

Ve-14/074/28-0117



Sheet No. of Sheets. Prepared by R. Gifford Date 1 Oct 82 Checked by Date

SITE NO. VE-14/07W/28-0271Recorded by R. GIFFORDU.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
SITE SCHEDULEDate 3 May 84Check One ☒ English ☐ Metric Units

GENERAL SITE DATA (0)

Site Ident No 4339.21 09.11.32.10.2 * RG Number R-0 * Transaction T- (A) D M V *
 add, delete, modify, verified

Site-Type 2- C D E H I M Ø P S T W * Data Reliability 3- (C) U L M * Reporting Agency 4- U.S.G.S. *
 colluv-drain, escavo sink, connect multi-out pond, spring, tunnel well, tar, tion, hole, or well, pie, crop, or shaft, field checked, unchecked, location not, minimal accurate data

Project No. 5- 4400094.00 * District 6- 55 * State 7- 55 * County VERNON *
 (for town) 8- 123 *

Latitude 9- 43 39 21 * Longitude 10- 09 11 32 1 * Lat-Long Accuracy 11- (S) F T M *
 deg min sec deg min sec sec, 5 sec, 10 sec, Min

Local Number 12- VE-14/07W/28-0271 * Land Net Loc. 13- SW NE SW S 28 T 01 4 N R 00 7 W 4 *
 1/4 1/4 1/4 section, township, range, merid

Location Map 14- STODDARD, NW (T) * Scale 15- 24000 *

Altitude 16- 650 * Method of Measurement 17- A L (M) * Accuracy 18- 10 *
 altimeter, level, map

Topo Setting 19- A B C D E F G H K L M Ø P S T U (V) W * Hydrologic Unit (OWDC) 20- *
 alluv-plays, stream, dunes, flat, flood hit sink, swamp, mangrove, on- ped hit terraces, undulating, valley, upland
 at fan, channel, dion, plain, top, swamp shore, morr, slide, flat draw

Use of Site 23- A C D E G H (Ø) M P R S T U W X Z * Secondary Site Use 301- * Tertiary Site Use 302- *
 anoda, standby, drain, geo- solmic, heat, observe- mine, oil or, recharge, repress, test, unused, with- waste, destroyed
 caner, thermal, resort, tion, gas, drawal,

Use of Water 24- A B C D E F H I J K M N P Q R S T (U) Y Z *
 air- hot- con- de- power, fire, de- kri- industrial mining, mod- indu- public, aqua- recreation, stock, institution, unused, desal, other
 cond, ting, cretal, water, marsh, section, (cooling), clinal, trial, supply, culture

Secondary Water Use 25- * Tertiary Use of Water 26- * Depth of Hole 27- 633 * Depth of Well 28- 633 *
 Source of Depth Data 29- S *

Water Level 30- * Data Measured 31- / / * Source 33- *
 month day year

Method of Measurement 34- A B C E G H L M N R S T V Z *
 airline, analog, calibrated, estimated, pressure, calibrated, geophysical, manometer, non-rec. reported, steel, electric, calibrated, other
 airline gage pressure gage logs gage tape tape electric tape

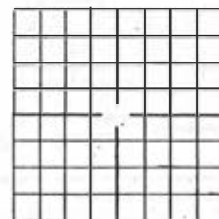
Site Status 37- D (E) F * Source of Geohydrologic Data 36- S * Pump Used 35- * Date of First Construction/Completion 21- 09/10/1982 *
 dry, recently, flowing flowing no month day year

OWNER IDENTIFICATION (1)

R-158 * T- (A) D M * Date of Ownership 159 # 09/10/1982 *
 add, delete, modify month day year

Name: Last 161 # U.S. GEOLOGICAL SURVEY * First 162 # SURVEY * Middle Initial 163- *

SEE VE-14/07W/28-0117 FOR LOCATION SKETCH



Appendix 19: VE-117/271/272 documents, USGS site schedule for piezometer VE-271, 1984, continued

WELL CONSTRUCTION DATA (1)

R = 58 * T = A D M * Entry No 59 # 1 * Date of Construction Completion 60 = 09/10/1982 * Source of Const. Data 64 = S *
 add, delete, modify
 Name of Contractor/Driller 63 = U.S.G.S *
 Method of Construction 65 = A B C D H J P R T V W Z *
 air, rotary, bored, cable, dug, hydraulic, jetted, air-per., reverse, trenching, driven, drive, other
 or augered, tool, or slotted, rotary, cussion, rotary, hole
 Finish 66 = C F G H P S T W X Z * Type of Seal 67 = B C G Z *
 porous, gravel w., gravel, horizontal, open, perforated, screen, sand point, walled, open, other
 concrete, perf, screen, gallery, and, or slotted, none, oth, surged, other
 Bottom of Seal 68 = 59.0 * Method of Development 69 = A B C J N P S Z *
 air-lift, bailed, compressed, jetted, none, oth, surged, other
 pump, air, pump
 Number of Hours in Development 70 = *
 Special Treatment During Development 71 = C D E F H M Z *
 chemicals, dry ice, explosives, deflocculent, hydrofracturing, mechanical, other

DIMENSIONS OF THE HOLE CONSTRUCTED (2)

R = 72 * T = A D M * Construction Entry No 59 # 1 *
 add, delete, modify
 Top of Hole Segment Below LSD
 73 # 73 # 73 # 73 # 73 #
 Bottom of Hole Segment below LSD
 74 = 74 = 74 = 74 = 74 =
 Diameter of Hole Segment
 75 = 75 = 75 = 75 = 75 =
 New Card for Each Hole Segment Same R, T & Field 5 9

CASING SCHEDULE (2)

R = 76 * T = A D M * Construction Entry No 59 # 1 *
 add, delete, modify
 Top of Casing Segment Below LSD
 77 # 77 # 77 # 77 # 77 #
 Bottom of Casing Segment Below LSD
 78 = 78 = 78 = 78 = 78 =
 Diameter of Casing Segment ②
 79 # 79 # 79 # 79 # 79 #
 Casing Material
 80 = 80 = 80 = 80 = 80 =
 Thickness of Casing
 81 = 81 = 81 = 81 = 81 =
 New Card for Each Casing With Same R, T & Field 5 9

OPENINGS SCHEDULE (2)

R = 82 * T = A D M * Construction Entry No 59 # 1 *
 add, delete, modify
 (Openings Data)
 Top of Section Below LSD 83 # 59.0 *
 Bottom of Section Below LSD 84 = 603.63 *
 Type of Openings ③ 85 = X *
 Type of Material ④ 86 = *
 Diameter of Open Section 87 = 10. *
 Width of Opening 88 = *
 Length of Opening 89 = *
 (Openings Data)
 83 # 603.63 *
 84 = 618.63 *
 85 = R *
 86 = R *
 87 = 1.25 *
 88 = *
 89 = *
 (Openings Data)
 83 # 618.63 *
 84 = 633. *
 85 = X *
 86 = *
 87 = 10. *
 88 = *
 89 = *

PRODUCTION DATA (1)

R = 132 * T = A D M * Entry No 147 # 1 * Date 148 = 09/10/1982 *
 flowing, pumped add, delete, modify
 Discharge: 150 = 14.3 * Source of Data 151 = S * Draw-down 309 = *
 Method of Measurement 152 = B C E F M O P R T U V W Z *
 boiler, current, estimated, flume, totalling, orifice, pitot-tube, reported, trajectory, venturi, volumetric, weir, other
 meter
 Production Level 153 = * Static Level 154 = * Source of Data 155 = * Specific Capacity 272 = *
 Method of Measurement 156 = A B C E G H L M N R S T V Z *
 airline, analog, calibrated, estimated, pressure, calibrated, geophysical, manometer, non-rec., reported, steel, electric, calibrated, other
 airline, gauge, pressure gauge, logs, gauge, tape, tape, electric tape
 Pumping Period 157 = *

AVAILABLE LOG DATA (1)

R = 198 * T = A D M *
 add, delete, modify
 New Card for Each Log Type Same R & T
 Type of Log ⑤ 199 # 199 # 199 # 199 #
 Begin Depth 200 = 200 = 200 = 200 =
 End Depth 201 = 627. * 201 = * 201 = * 201 = *
 Source of Data ① 202 = S * 202 = * 202 = * 202 = *

HYDROLOGIC UNIT DESCRIPTIONS (1)
 R = 90 * T = A D M * add, delete, modify
 Entry No 256 # 100 * Depth to Top 91 = 275 * Depth to Bottom 92 = 628 *

93 = 300 SANDS * 6 304 = U * 96 = SANDS * 97 = 372 MNSN LOWER *
 Unit Identifier Contributing Unit Lithology Lithologic Modifier

AQUIFER DATA (2)

R = 94 * T = A D M *
 add, delete, modify

Geohydrologic Unit Entry No 256 # 100 *

Date 95 # 09/10/1982 *
 month day year

Water Level 126 = *

% Water Contributed 132 = 100 *

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * T = A D M * Entry No 256 # * Depth to Top 91 = * Depth to Bottom 92 = *
 add, delete, modify

93 = * 6 304 = * 96 = * 97 = *
 Unit Identifier Contributing Unit Lithology Lithologic Modifier

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 1

R = 183 * T = A D M * New Card Same R&T
 add, delete, modify

2 C66-1/SCREEN - JOHNSON 304 PT, .020 SLT
 Remark No. 311 # 3 * 185 = C66-1/ONLY LOWER MNSN CONTRIBUTES? *
 311 # 4 * 185 = C66-1/WEEL PACK, 1.65-2.00MM *
 311 # 5 * 185 = C69-1/ARTESIAN FLOW PRIOR TO CAPPING *
 311 # 6 * 185 = C198/SEE ORIGINAL LOG VE-117 FOR OTHERS *

7 CGST REMIE TUBE FOR PACK AND GROUT

WATER PUMPAGE/WITHDRAWAL DATA COLLECTION (1)

R = 127 * T = A D M * Begin Year 128 # * End Year 129 = * Source Agency 130 # *
 add, delete, modify
 Frequency of Collection 7 131 = * 8 Network Site 259 # * Method of Collection 133 = C E M Z *
 calculated, estimated, metered, other

OTHER DATA AVAILABLE (1)

Entry Number Type of Data Loc Format
 R = 180 * T = A D M * 312 # 1 * 181 = FIELD NOTE * 182 = C D R Z * 261 = F M P Z *
 add, delete, modify
 New Card Same R & T 312 # * 181 = * 182 = C D R Z * 261 = F M P Z *

FOOT NOTES:

Source of Data Codes:

① A D G L M O R S Z
 other, driller, geologist, logs, memory, owner, other, reporting, other
 gov't reported agency

Casing Material Codes

② B C D G I M P R S T U W Z
 brick, concrete, copper, galv, wrought, other, PVC or, rock or, steel, tile, coated, wood, other
 iron iron metal plastic stone steel

Type of Openings Codes

③ F L M P R S T W X Z
 fracture, louvered, mesh, perforated, wire, screen, sand, walled, open, other
 shuttered or slotted wound (unknown) point hole

Type of Material Codes for Open Sections

④ B C G I M P R S T Z
 brass or, concrete, galv, wrought, other, PVC or, stainless, steel, tile, other
 bronze iron iron metal plastic steel

Type of Log Codes

⑤ A B C D E F G H I J K L M N O P Q R S T U V X Z
 time, collar, caliper, driller's, electric, fluid, geologist, magnetic, induction, gamma, dipmeter, laterlog, microlog, neutron, μ later, photo, radio, tonic, temp, gamma, fluid, core, other
 conduct rdy active gamma velocity

Contributing Unit Codes

⑥ P S N U
 primary secondary non- unknown
 contributing contributing contributing

Frequency of Collection Codes

⑦ A B C D E F I M O Q S W Z
 annual, bi-monthly, continuous, daily, semi, intermittent, monthly, onetime, quarter, semi, weekly, other
 monthly only annual annual

Network Codes

⑧ 1 2 3 4
 national district project cooperator

Site Status

⑨ D F G H O P R S T Z *
 dry, flowing, nearby, nearby, obstruction, pumping, recently, nearby, nearby, other
 flowing recently flowing pumped pumping recently pumped

Method of Measurement

⑩ A C E G H L M R S T Z *
 airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel, electric, other
 airline gage pressure gage logs tape tape

Type of Quality Analyses Codes

⑪ A B C D E F G H I J K L M N Z
 physical, common, trace, pesticides, nutrients, sanitary, codes, codes, codes, codes, codes, all or, codes, other
 chemical elements B&D B&E B&F D&E C,D&E most radioactive

Appendix 19: VE-117/271/272 documents, USGS site schedule for piezometer VE-271, 1984, continued

OTHER SITE IDENTIFICATION NUMBERS (1)

R=189 * T= (A) D M * Ident 190 # VE-027.1 * Assigner 191- U.S.G.S *

New Card Same R & T
Ident 190 # T.46.5.1 * Assigner 191- OWNER
RED OWNER

SITE VISIT DATA (1)

R=186 * T= (A) D M * Date of Visit 187# 09/10/1982 * Name of Person 188- GLEFFORD R J *

LIFT DATA (1)

R=42 * T= A D M * Type of Lift 43# A B C J P R S T U Z * Entry No 254 # *

Pump Intake Setting 44 = * Type of Power 45 = D E G H L N W Z *
diesel, electric, gasoline, hand, LP gas, natural, windmill, other gas

Date 38 = / / * Horsepower 46 = *

MAJOR PUMP DATA (2)

R=47 * T= A D M * Type of Lift 43# * Lift Entry No 254 # * Manufacturer of Pump 48 = *

Serial No of Pump 49 = * Name of Power Company 50 = *

Power Company Account No 51 = * Power Meter No 52 = * Pump Rating 53 = *

Person or Company Who Maintains the Pump 54 = * Additional Lift 255 = * Rated Pump Capacity 266 = *

STANDBY POWER DATA (2)

(See LIFT DATA for codes of fields 43 and 56 below)

R=55 * T= A D M * Type of Lift 43# * Type of Power 56 = * Horsepower 57 = * Lift Entry No 254 # *

WATER LEVEL DATA COLLECTION (1)

R=121 * T= (A) D M * Begin Year 122# 1982 * End Year 123 = * Source Agency 124# U.S.G.S *

Frequency of Collection 7 125 = * 8 Network Site 258 # 1 *

MEASURING POINT

R=320 * T= (A) D M *

Begin Date 321 # 09/10/1982 * End Date 322 = * Height 323 = 3.23 *

Remark 324 = TOP OF PIPE COUPLING *

WATER LEVEL DATA

R=234 * T= A *

DATE
235 # / / *
235 # / / *
235 # / / *
235 # / / *

WATER LEVEL (BELOW LSD)

237 = *
237 = *
237 = *
237 = *

9 STATUS

238 = *
238 = *
238 = *
238 = *

10 METHOD

239 = *
239 = *
239 = *
239 = *

HOLD	CUT	DEPTH BELOW MP	REMARKS	DATE PUNCHED	DATE ENTERED

WATER QUALITY DATA COLLECTION (1)

R=114 * T= A D M * Begin Year 115 # * End Year 116 = * Source Agency 117 # *

Frequency of Collection 7 118 = * 8 Network Site 257 # * 11 Type of Analysis 120 = * Analyzing Agency 307 = *

FIELD WATER QUALITY MEASUREMENTS (1)

R=192 * T= A D M * Date 193 # / / * Geohydro-logic Unit 195 # *

New Card Same R thru 195
Temperature 196 # 0.0010 * Degree C 197 = *

Conductance 196 # 0.0095 * μ Mhos 197 = *

Other (STORET) Parameter 196 # * Value 197 = *

Other (STORET) Parameter 196 # * Value 197 = *

SITE NO. VE-14/07W/28-0272Recorded by R. GIFFORDU.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
SITE SCHEDULEDate 3 MAY 84Check One ☒ English ☐ Metric Units

GENERAL SITE DATA (0)

Site Ident No 433921091132103 * RG Number R-0 * Transaction T- (A) D M V *
 add, delete, modify, verified

Site-Type 2- C D E H I M Ø P S T W * Data 3- (C) U L M * Reporting Agency 4- USGS *
 add, delete, modify, verified

Project No. 5- 4400094.00 * District 6- 55 * State 7- 55 * County VERNON *
 accurate data

Latitude 9- 43 39 21 * Longitude 10- 09 11 32 10 * Lat-Long Accuracy 11- (S) F T M *
 deg min sec deg min sec sec, 5 sec, 10 sec, Min

Local Number 12- VE-14/07W/28-0272 * Land Net Loc. 13- SWNE SW S 28 T 014N R 007W 4 *
 1/4 1/4 1/4 section, township, range, meridian

Location Map 14- ST. JOHNS RIVER NW (T) * Scale 15- 24000 *

Altitude 16- 650 * Method of Measurement 17- A L (M) * Accuracy 18- 10 *
 altimeter, level, map

Topo Setting 19- A B C D E F G H K L M Ø P S T U (V) W * Hydrologic Unit (OWDC) 20- *
 alluvial, playa, stream, delta, flood plain, terrace, undulating, valley, upland, draw

Use of Site 23- A C D E G H (Ø) M P R S T U W X Z * Secondary Site Use 301- * Tertiary Site Use 302- *
 arroyo, standby, drain, geo-atomic, heat, observatory, mine, oil or, recharge, repress, test, unused, with- waste, destroyed, drawal

Use of Water 24- A B C D E F H I J K M N P Q R S T (U) Y Z *
 air- cond., bat- tling, com- mercial, water, power, fire, do- mestic, liv- ing, industrial, mining, medi- cinal, indus- trial, public, aqua- culture, recreation, stock, institution, unused, desal, other

Secondary Water Use 25- * Tertiary Use of Water 26- * Depth of Hole 27- 633 * Depth of Well 28- 524 *
 Source of Depth Data 29- S *

Water Level 30- * Data Measured 31- / / * Source 33- *
 month day year

Method of Measurement 34- A B C E G H L M N R S T V Z *
 airline, analog, calibrated, estimated, pressure, calibrated, geophysical, manometer, non-rec. reported, steel, electric, calibrated, other
 airline gage pressure gage logs gage tape tape electric tape

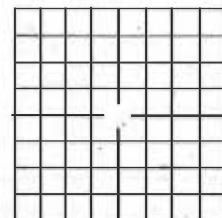
Site Status 37- D (E) F * Sources of Geohydrologic Data 36- S * Pump Used 35- * Date of First Construction/Completion 21- 09/15/1982 *
 dry, recently, flowing month day year

OWNER IDENTIFICATION (1)

R-158 * T- (A) D M * Date of Ownership 159- 09/15/1982 *
 add, delete, modify month day year

Name: Last 161- U.S. GEOLOGICAL SURVEY * First 162- SURVEY * Middle Initial 163- *

SEE VE-14/07W/28-0117 FOR LOCATION SKETCH



WELL CONSTRUCTION DATA (1)

R = 58 * T = A D M * Entry No 59 # 1 / 1 * Date of Construction Completion 60 = 09/15/1982 * Source of Const. Data 64 = S *

Name of Contractor/Driller 63 = D.S.G.S. *

Method of Construction 65 = A B C D H J P R T V W Z *
 air, rotary, bored, cable, dug, hydraulic, jettied, air-per., reverse, trenching, driven, drive, other
 or augered tool screen and or slotted

Finish 66 = C F G H P S T W X Z * Type of Seal 67 = B C G Z *
 porous, gravel w. gravel, horizontal, open, perforated, screen, sand point, walled, open, other
 concrete, peat, screen, and

Bottom of Seal 68 = 274 * Method of Development 69 = A B C J N P S Z * Number of Hours in Development 70 = *
 air-lift, bailed, compressed, jettied, none, other, surged, other pump

Special Treatment During Development 71 = C D E F H M Z *
 chemicals, dry ice, explosives, deflocculant, hydrofracturing, mechanical, other

DIMENSIONS OF THE HOLE CONSTRUCTED (2)

R = 72 * T = A D M * Construction Entry No 59 # 1 / 1 *

New Card for Each Hole Segment Same R, T & Field 59

Top of Hole Segment Below LSD	Bottom of Hole Segment below LSD	Diameter of Hole Segment
73 # 1.0 *	74 = 1.0 *	75 = 1.0 *
73 # 1.0 *	74 = 1.0 *	75 = 1.0 *
73 # 1.0 *	74 = 1.0 *	75 = 1.0 *
73 # 1.0 *	74 = 1.0 *	75 = 1.0 *
73 # 1.0 *	74 = 1.0 *	75 = 1.0 *

CASING SCHEDULE (2)

R = 76 * T = A D M * Construction Entry No 59 # 1 / 1 *

New Card for Each Casing With Same R, T & Field 59

Top of Casing Segment Below LSD	Bottom of Casing Segment Below LSD	Diameter of Casing Segment	Casing Material	Thickness of Casing
77 # 1.8.06 *	78 = 1.8.06 *	79 # 1.5 *	80 = S *	81 = 1.0 *
77 # 1.8.06 *	78 = 298.06 *	79 # 1.5 *	80 = P *	81 = 1.0 *
77 # 298.06 *	78 = 298.63 *	79 # 1.5 *	80 = S *	81 = 1.0 *
77 # 1.0 *	78 = 1.0 *	79 # 1.0 *	80 = *	81 = 1.0 *
77 # 1.0 *	78 = 1.0 *	79 # 1.0 *	80 = *	81 = 1.0 *

OPENINGS SCHEDULE (2)

R = 82 * T = A D M * Construction Entry No 59 # 1 / 1 *

New Card for Each Open Section With Same R, T and Field 59

Top of Section Below LSD	Bottom of Section Below LSD	Type of Openings	Type of Material	Diameter of Open Section	Width of Opening	Length of Opening
83 # 274.0 *	84 = 298.63 *	85 = X *	86 = R *	87 = 1.0 *	88 = 1.0 *	89 = 1.0 *
83 # 298.63 *	84 = 313.63 *	85 = R *	86 = R *	87 = 1.25 *	88 = 1.0 *	89 = 1.0 *
83 # 313.63 *	84 = 524.0 *	85 = X *	86 = *	87 = 1.0 *	88 = 1.0 *	89 = 1.0 *

PRODUCTION DATA (1)

R = 134 146 * T = A D M * Entry No 147 # 1 / 1 * Date 148 = 09/15/1982 * Draw-down 309 = 1.0 *

Discharge: 150 = 1.0 * Source of Data 151 = S *

Method of Measurement 152 = B C E F M O P R T U V W Z *
 baffle, current, estimated, flume, totalling, orifice, pitot-tube, reported, trajectory, venturi, volumetric, weir, other meter

Production Level 153 = * Static Level 164 = * Source of Data 165 = * Specific Capacity 272 = *

Method of Measurement 166 = A B C E G H L M N R S T V Z *
 airline, analog, calibrated, estimated, pressure, calibrated, geophysical, manometer, non-rec., reported, steel, electric, calibrated, other
 airline, pressure gauge logs, tape, tape electric tape

Pumping Period 167 = *

AVAILABLE LOG DATA (1)

R = 198 * T = A D M * Construction Entry No 59 # 1 / 1 *

New Card for Each Log Type Same R & T

Type of Log	Begin Depth	End Depth	Source of Data
199 # 1 *	200 = 0.0 *	201 = 627.0 *	202 = S *
199 # *	200 = *	201 = *	202 = *
199 # *	200 = *	201 = *	202 = *
199 # *	200 = *	201 = *	202 = *

90 = 3.00.SN.D.S. * (6) 3 04 * 96 = SN.D.S. * 97 = 37.2 MNSW UPPER *
 Unit Identifier Contributing Unit Lithology Lithologic Modifier

AQUIFER DATA (2)

R = 94 * T = A D M * add, delete, modify
 Date 95 # 09/15/1982 * month day year
 Water Level 126 = * * * * *
 % Water Contributed 132 = 1.00 *

GEOHYDROLOGIC UNIT DESCRIPTIONS (1)

R = 90 * T = A D M * add, delete, modify Entry No 256 # * Depth to Top 9 = 1 * Depth to Bottom 9 = 2 *
 93 = * (6) 304 = * 9 = 6 * 9 = 7 *
 Unit Identifier Contributing Unit Lithology Lithologic Modifier

AQUIFER DATA (2)

R = 94 * T = A D M * add, delete, modify
 Date 95 # / / month day year
 Water Level 126 = * * * * *
 % Water Contributed 132 = *

PERTINENT REMARKS 1

R = 183 * T = A D M * New Card Same R&T
 2 add, delete, modify C66-1/SCREEN-JOHNSON 304 PT. .020 SLOT
 Remark No. 311 # 3 * 185 = C90-100/ONLY UPPER MNSW CONTRIBUTES?
 311 # 4 * 185 = C66-1/WELL PACK, 1.65-2.00MM
 311 # 5 * 185 = C69-1/ARTESIAN FLOW PRIOR TO CAPPING
 311 # 6 * 185 = C198/SEE ORIGINAL LOG VE-117 FOR OTHERS

WATER PUMPAGE/WITHDRAWAL DATA COLLECTION (1)

R = 127 * T = A D M * add, delete, modify Begin Year 128 # * End Year 129 = * Source Agency 130 # *
 Frequency of Collection (7) 131 = * (8) Network Site 259 # * Method of Collection 133 = C E M Z *
 calculated, estimated, metered, other

OTHER DATA AVAILABLE (1)

Entry Number Type of Data Loc Format
 R = 180 * T = A D M * 312 # 181 = FIELD NOTE * 182 = C D R Z * 261 = F M P Z *
 add, delete, modify
 New Card Same R & T 3 2 # 1 8 182 = C D R Z * 261 = F M P Z *

FOOT NOTES:

Source of Data Codes:

(1) A D G L M O R S Z
 other, driller, geologist, logs, memory, owner, other, reporting, other gov't reported agency

Casing Material Codes

(2) B C D G I M P R S T U W Z
 brick, concrete, copper, galv, wrought, other, PVC or, rock or, steel, tile, coated, wood, other iron iron metal plastic stone steel

Type of Openings Codes

(3) F L M P R S T W X Z
 fracture, louvered, mesh, perforated, wire, screen, sand, walled, open, other shuttered or slotted wound (unknown) point

Type of Material Codes for Open Sections

(4) B C G I M P R S T Z
 brass or, concrete, galv, wrought, other, PVC or, stainless, steel, tile, other bronze iron iron metal plastic steel

Type of Log Codes

(5) A B C D E F G H I J K L M N O P Q R S T U V X Z
 time, collar, caliper, driller's, electric, fluid, geologist, magnetic, induction, gamma, dipmeter, laterlog, microlog, neutron, μ later, photo, radio, sonic, temp, gamma, fluid, core, other conduct ray

Contributing Unit Codes

(6) P S N U
 primary secondary non-unknown contributing contributing contributing

Frequency of Collection Codes

(7) A B C D F I M O Q S W Z
 annual, bi-monthly, continuous, daily, semi, intermittent, monthly, one time, quarter, semi, weekly, other monthly only annual annual

Network Codes

(8) 1 2 3 4
 national district project cooperator

Site Status

(9) D F G H O P R S T Z *
 dry, flowing, nearby, nearby, obstruction, pumping, recently, nearby, other flowing recently flowing pumped pumping recently pumped

Method of Measurement

(10) A C E G H L M R S T Z *
 airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel, electric, other airline gage pressure gage logs tape tape

Type of Quality Analyses Codes

(11) A B C D E F G H I J K L M N Z
 physical, common, trace, pesticides, nutrients, sanitary, codes, codes, codes, codes, codes, codes, all or, codes, other chemical elements B&D B&E B&C B&F D&E C,D,E most B&C & radioactive

Appendix 19: VE-117/271/272 documents, USGS site schedule for piezometer VE-272, 1984, continued

OTHER SITE IDENTIFICATION NUMBERS (1)

R=189 * T= (A) D M * add, delete, modify Ident 190 # VE-0272 * Assigner 191- USGS

New Card Same R & T Ident 190 # TUBE 2 GREEN * Assigner 191- OWNER OWNER

SITE VISIT DATA (1)

R=186 * T= (A) D M * add, delete, modify Date of Visit 187# 09/15/1982 * month day year Name of Person 188- GIFFORD R.A. *

LIFT DATA (1)

R=42 * T= A D M * Type of Lift 43# A B C J P R S T U Z * add, delete, modify air, bucket, centrifugal, jet, piston, rotary, submergible, turbine, unknown, other Entry No 254# * *

Pump Intake Setting 44= * Type of Power 45= D E G H L N W Z * diesel, electric, gasoline, hand, LP gas, natural, windmill, other gas

Date 38= / / * month day year Horsepower 46= * *

MAJOR PUMP DATA (2)

R=47 * T= A D M * Type of Lift 43# * add, delete, modify Lift Entry No 254# * Manufacturer of Pump 48= * *

Serial No of Pump 49= * Name of Power Company 50= * *

Power Company Account No 51= * Power Meter No 52= * Pump Rating 53= * *

Person or Company Who Maintains the Pump 54= * Additional Lift 255= * Rated Pump Capacity 268= * *

STANDBY POWER DATA (2)

(See LIFT DATA for codes of fields 43 and 56 below)

R=55 * T= A D M * Type of Lift 43# * Type of Power 56= * Horsepower 57= * Lift Entry No 254# * *

WATER LEVEL DATA COLLECTION (1)

R=121 * T= (A) D M * add, delete, modify Begin Year 122# 1982 * End Year 123= * Source Agency 124# USGS *

Frequency of Collection 7 125= * Network Site 258# 1 *

MEASURING POINT

R=320 * T= A D M * add, delete, modify

Begin Date 321# 09/15/1982 * End Date 322= * Height 323= 3.23 *

Remark 324= TOP OF PIPE COUPLING *

WATER LEVEL DATA

R=234 * T= A * DATE

DATE	WATER LEVEL (BELOW LSD)	STATUS	METHOD
235 # / / *	237 = * *	238 = *	239 = *
235 # / / *	237 = * *	238 = *	239 = *
235 # / / *	237 = * *	238 = *	239 = *
235 # / / *	237 = * *	238 = *	239 = *

HOLD	CUT	DEPTH BELOW MP	REMARKS	DATE PUNCHED	DATE ENTERED

WATER QUALITY DATA COLLECTION (1)

R=114 * T= A D M * add, delete, modify Begin Year 115# * End Year 116= * Source Agency 117# *

Frequency of Collection 7 118= * Network Site 257# * Type of Analyses 120= * Analyzing Agency 307= *

FIELD WATER QUALITY MEASUREMENTS (1)

R=192 * T= A D M * add, delete, modify Date 193# / / * month day year Geohydro-logic 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= * *



REPLY TO
ATTENTION OF

Real Estate Division

DEPARTMENT OF THE ARMY

ST. PAUL DISTRICT, CORPS OF ENGINEERS
1421 U.S. POST OFFICE & CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101-9808

October 2, 1990

~~BF-0118~~

VE-0117

Robert M. Erickson
U.S. Dept. of Interior
Geological Survey
Water Resources Division
6417 Normandy Lane
Madison, Wisconsin 53719-1133

Dear Mr. Erickson:

Enclosed is Permit DACW37-4-91-0004 for the test well on Corps administered land on Pool 8, Mississippi River near Stoddard, Wisconsin.

The permit is to maintain the well now on the site. If additional work is to be done on the well this office must be informed prior to commencing construction activities.

Sincerely,

Carol S. Vierck

Carol S. Vierck
Realty Specialist

Enclosure

Contract No. DACW37-4-91-0004

DEPARTMENT OF THE ARMY
PERMIT TO OTHER FEDERAL GOVERNMENT DEPARTMENT OR AGENCY
TO USE PROPERTY ON

UPPER MISSISSIPPI RIVER Lock and Dam No. 8
.....

United States Department of the Interior Geological Survey, 1815 University
Avenue, Madison, Wisconsin

is hereby granted a permit for a term of five (5) years

beginning 15 September , 1990 , and ending 14 September , 1995 ,

but revocable at will by the Secretary of the Army, to drill and maintain a test well

OFFICE OF THE SECRETARY OF THE ARMY
WASHINGTON, D.C. 20315-5000

*as shown substantially in red on Exhibit A, attached hereto and made a part hereof, and described
as follows: a site in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 33, T14N, R7W, Vernon County,
Wisconsin*

THIS PERMIT is granted subject to the following conditions:

1. That the use and occupation of the said premises shall be without cost or expense to the Department of the Army, under the general supervision and subject to the approval of the officer having immediate jurisdiction over the premises, and subject also to such rules and regulations as he may from time to time prescribe.

2. That the permittee shall, at its own expense and without cost or expense to the Department of the Army, maintain and keep in good repair and condition the premises herein authorized to be used.

3. That any interference with or damage to property under control of the Department of the Army incident to the exercise of the privileges herein granted shall be promptly corrected by the permittee to the satisfaction of the said officer.

4. That the permittee shall pay the cost, as determined by the said officer, of producing and/or supplying any utilities and other services furnished by the Department of the Army or through Department of the Army facilities for the use of the permittee.

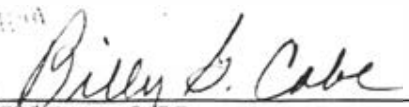
5. That no additions to or alterations of the premises shall be made without the prior consent of the said officer.

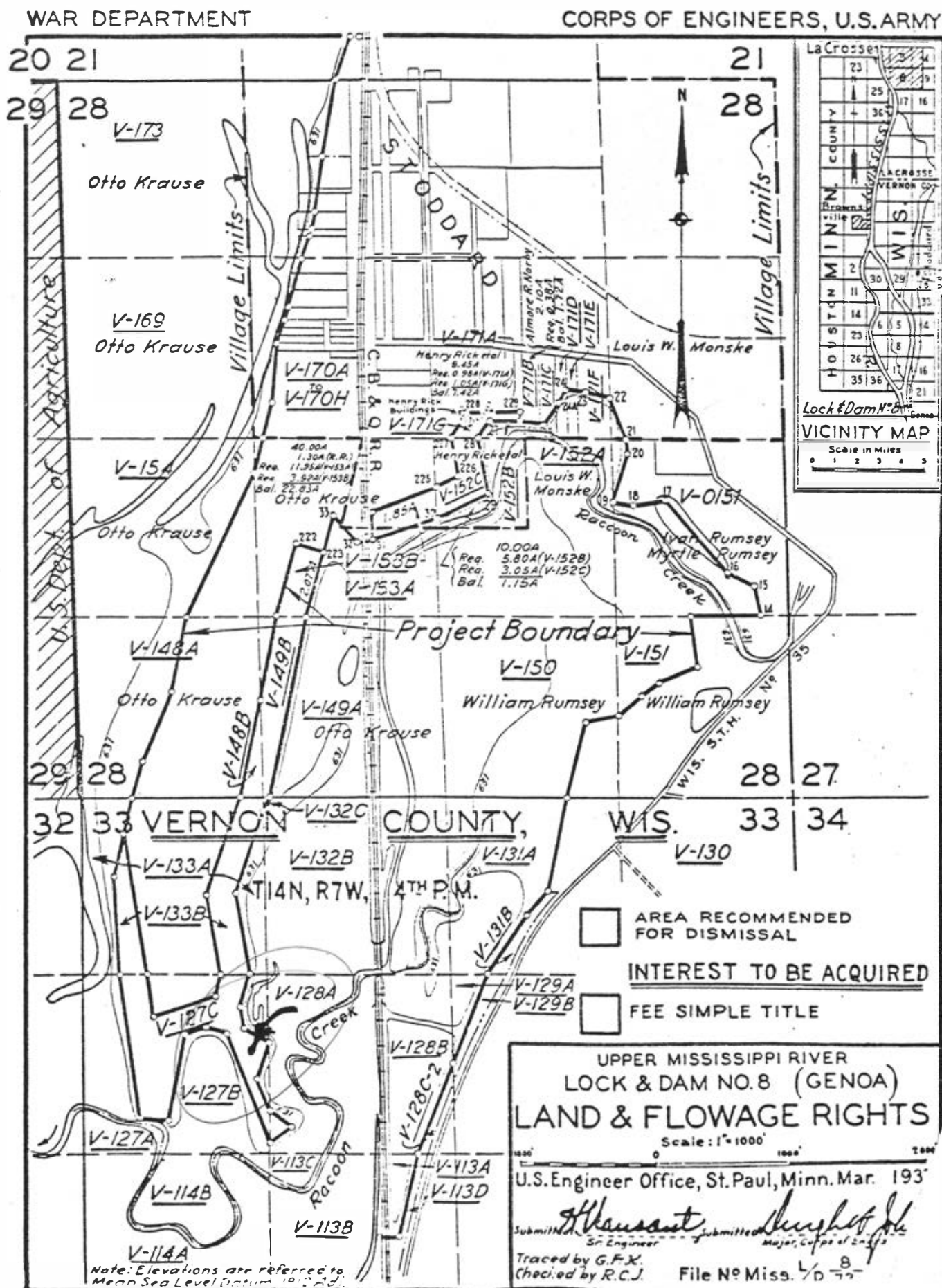
6. That if for any reason it should be deemed necessary or expedient for the Department of the Army to perform functions and/or render services which are the responsibility of the permittee, the said officer may, in lieu of reimbursement, require the permittee to furnish the personnel and/or materials required for the performance of said functions and/or for the rendering of said services. In addition to furnishing personnel and/or materials, the permittee shall reimburse the Department of the Army for any costs incurred by the Department of the Army in connection with said functions and/or services, such as for supervision and/or equipment furnished. Selection of such personnel will be subject to the approval of the said officer.

7. That on or before the date of expiration of this permit or its relinquishment by the permittee, the permittee shall vacate the said premises, remove its property therefrom, and restore the premises to a condition satisfactory to the said officer, ordinary wear and tear and damage beyond the control of the permittee excepted. If, however, this permit is revoked, the permittee shall vacate the premises, remove its property therefrom, and restore the premises as aforesaid within such time as the Secretary of the Army may designate.

IN WITNESS WHEREOF I have hereunto set my hand by authority of the Secretary of the Army this 2nd day of October, 1990.

U. S. GOVERNMENT PRINTING OFFICE 16-73248-1


BILLY G. CABE
Chief, Real Estate Division



APPLICATION
WISCONSIN

Application For Gas And Electric Services

Please photocopy both sides of this page for multiple use.

DATE <u>11/5/2018</u>		BCLWI@xcelenergy.com	PHONE: 1-800-628-2121	FAX: 1-888-742-5623
SERVICE ADDRESS (PLEASE PRINT)				
House or Fire Number _____		Full Street Name <u>500Z Prairie Lane</u>		
City <u>Stoddard</u>		State <u>WI</u>		Zip <u>54658</u>
Urban _____	Rural _____	Direction to service location (Rural required)		
Subdivision Name _____	County <u>Vernon</u>	<u>The well is about 120 ft. from the</u>		
Lot Number _____	Township <u>14 N</u>	<u>entrance of the waste water treatment</u>		
Block Number _____	Range <u>7 W</u>	<u>plant, about 40 ft from Prairie Lane.</u>		
County _____	Section <u>28</u>			
<input type="checkbox"/> Unincorporated <input type="checkbox"/> Incorporated		Cross Street/Road _____		
CONSTRUCTION INFORMATION (PLEASE PRINT)				
Owner Information (Party to be billed during construction)		Contractor Information (include phone number)		
Owner/Builder Name <u>Wisconsin Geological and Natural History Survey</u>		Builder <u>not yet selected</u>		
Mailing Address <u>3817 Mineral Point Road</u>		Phone Number _____		
City <u>Madison</u> State <u>WI</u> Zip <u>53705</u>		Email _____		
Phone Number <u>(608) 262-1705</u>		Heating Contractor _____		
Contact during construction <u>Ana Genthe</u>		Phone Number _____		
Address <u>3817 Mineral Point Road</u>		Email _____		
City <u>Madison</u> State <u>WI</u> Zip <u>53705</u>		Electrical Contractor <u>not yet selected</u>		
Email <u>analiese.genthe@wgnhs.uwex.edu</u>		Phone Number _____		
Daytime phone <u>(608) 263-4004</u>		Email _____		
Fax _____		A & E Firm _____		
Cell _____		Phone Number _____		
		Email _____		
Required services: <input checked="" type="checkbox"/> Electric <input type="checkbox"/> Gas <input type="checkbox"/> New <input type="checkbox"/> Relocate <input type="checkbox"/> Conversion <input type="checkbox"/> Demolition				
SERVICE INFORMATION (COMPLETE ALL SECTIONS)				
Electric Service <u>not determined</u>		Gas Service (For gas service, please fill out second page of application.)		
<input type="checkbox"/> overhead <input checked="" type="checkbox"/> underground Service size (amps) _____		Is this service being used for primary heat? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Air conditioning tonnage: _____ ton		Total gas load (BTUs/hour): _____		
<input type="checkbox"/> single phase <input type="checkbox"/> three phase Voltage _____		Pressure <input type="checkbox"/> 6 or 7 inch <input type="checkbox"/> 2 lb <input type="checkbox"/> Other _____		
Is temporary electric service needed? <input type="checkbox"/> Yes		Date needed _____ / _____ /20 _____		
<input type="checkbox"/> single phase <input type="checkbox"/> three phase <input type="checkbox"/> at pole		Foundation backfill / To grade _____ / _____ /20 _____		
<input type="checkbox"/> at transformer <input type="checkbox"/> pedestal <input type="checkbox"/> other _____		On-demand water heater <input type="checkbox"/> Yes <input type="checkbox"/> No		
Date needed <u>December</u> / <u>31</u> /20 <u>19</u>				
Foundation backfill / To grade _____ / _____ /20 _____				
FACILITY INFORMATION (COMPLETE ALL SECTIONS)				
Building Type <input type="checkbox"/> single home <input type="checkbox"/> duplex <input type="checkbox"/> multi-dwelling/no. of units _____ <input type="checkbox"/> commercial bldg. <input type="checkbox"/> mobile				
Building Class <input type="checkbox"/> residential <input type="checkbox"/> commercial <input type="checkbox"/> farm <u>monitoring shelter, specifics not determined</u>				
Building square footage _____		Building setback from property line (feet) <u>< 25 ft</u>		
Electric Meter location preference (when you are facing the front of the house from the outside) <input type="checkbox"/> on house <input type="checkbox"/> on garage				
<input type="checkbox"/> right side <input type="checkbox"/> left side <input type="checkbox"/> front <input type="checkbox"/> other _____ Feet from front corner (indicate corner) _____				
Gas Meter location preference (when you are facing the front of the house from the outside) <input type="checkbox"/> on house <input type="checkbox"/> on garage				
<input type="checkbox"/> right side <input type="checkbox"/> left side <input type="checkbox"/> front <input type="checkbox"/> other _____ Feet from front corner (indicate corner) _____				
For Commercial				
Total motor load _____ HP _____ Largest HP _____ Code _____ BTU input _____ See second page of form				

GAS AND ELECTRIC SERVICES

APPLICATION

WISCONSIN

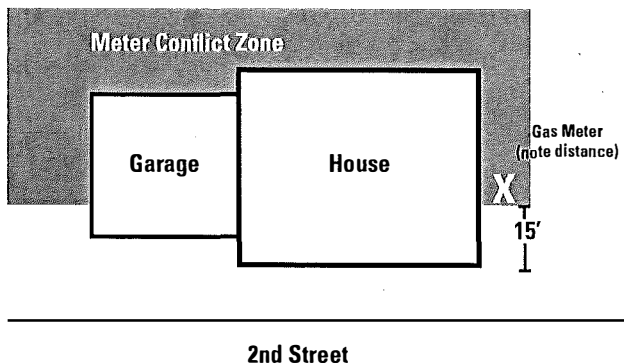
END USES			
Equipment type	Gas (specify BTUs/hours input)	Electric (specify kW)	Other Fuel Type
Heating		electric powered	
Water heating		anti Freeze thermostat	
Cooking		with heating element	
Air conditioning		to prevent freezing	
Clothes drying		in monitoring shelter	
Fireplace			
Lighting (Commercial Only)			
Heat source (check type)	<input type="checkbox"/> Forced air furnace	<input type="checkbox"/> Heat storage	<input type="checkbox"/> Underfloor/slab heat
			<input type="checkbox"/> Baseboard
Meter Option (if applicable)	<input type="checkbox"/> Time of use	<input type="checkbox"/> Dual fuel	<input type="checkbox"/> Limited off-peak
			<input type="checkbox"/> Saver's Switch

Site plan must include the sewer lateral/septic system with connection line and the meter location(s) to process the application. Use Site Plan form or draw a sketch below as if you are facing the front of the house from the outside. Indicate streets.



Service Address _____

Please
indicate
north



Contact: Builders Call Line
Xcel Energy
Phone: 1-800-628-2121
Fax: 1-888-742-5623
BCLWI@xcelenergy.com

1. Customer-owned facilities must be located and identified by customer.
 2. Indicate distances for meters from nearest corner of building. Meters should be on the same side as the Xcel Energy source.
 3. Sewer lateral/septic system and connection location must be provided on the site plan.
 4. Inspection(s) must be complete before service is energized.
 5. If no Inspector, Proof of Compliance (Electric) and/or Certificate of Compliance (Gas) must be complete.
 6. Site must be within 4 to 6 inches of final grade (for new construction) and a clear 10-foot-wide path from Xcel Energy source to meter.
 7. Winter construction charges may apply from 10/1 to 4/15.
 8. Water and sewer must be installed prior to electric or gas service.
- Meter Conflict Zone any potential area for a deck, patio, pool, etc.

Application

Wisconsin | Michigan



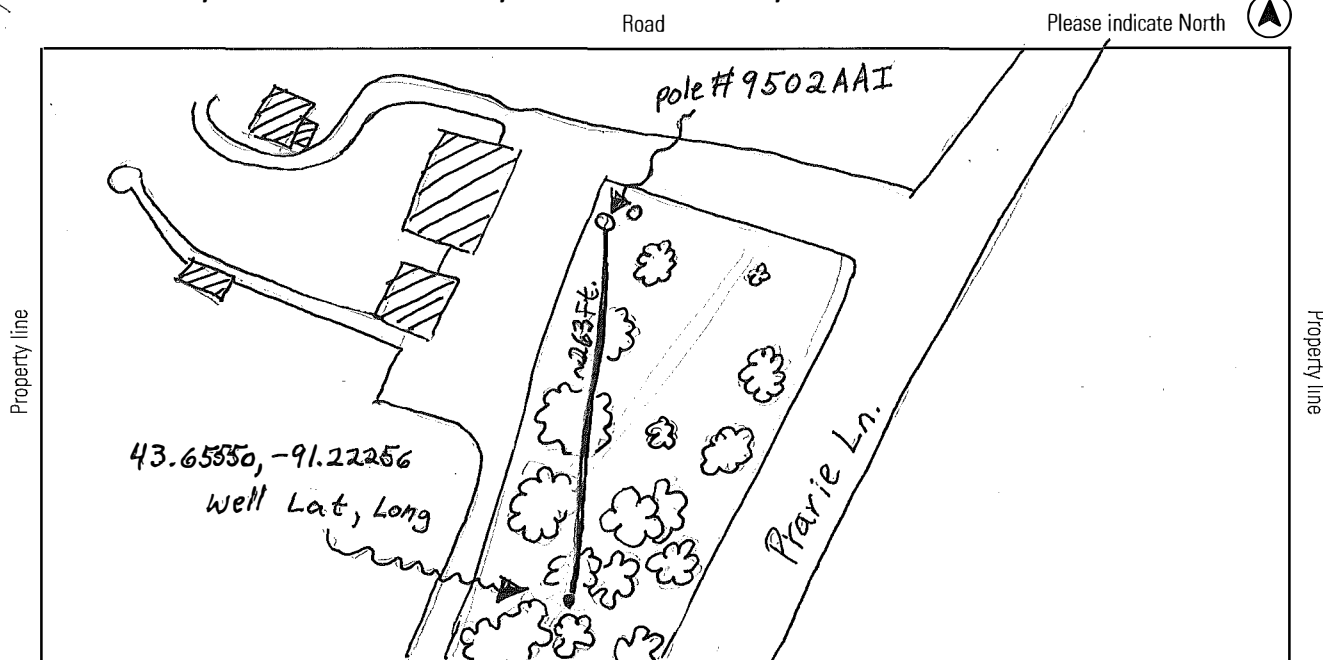
Site Sketch Form

All new and modified electric and/or gas service

Account holder information

Customer name (Print) United States Geological Survey Date 11/5/2018Installation address 500Z Prairie Lane City Stoddard State WI ZIP 54658Phone (608) 821-3868 Cell phone —Email rjwaschb@usgs.govSite contact during construction (If different than above) Pete ChaseSite contact daytime phone (608) 592-3500 Site contact cell phone (608) 333-3785Preparer Analiese Genthe Preparer signature Analiese Genthe

An accurate sketch will ensure the installation will occur in a timely manner. The sketch must include the location of the sewer lateral or septic system and meter(s) plus the distance (in feet) from the corner of your home to the meter(s). If the sewer information is not known please check the box below.

☒ Please check here if you do not know the location of your sewer lateral or sewer system.


Distance from corner of house to gas meter location feet. Distance from the corner of house to electric meter location feet.

Please use the symbols below to show us where customer-owned buried facilities or obstructions are located on the property.

- Pole
- Proposed gas route
- Gas meter location
- Private buried facilities
- Sidewalk or driveways
- Trees, shrubs, & flowerbeds
- Retaining walls
- Grade changes
- Electric meter location

Use these codes to distinguish the type of customer-owned buried facility

- | | |
|--|--------------------------------|
| Electronic lines to detached buildings | Lighting |
| Propane gas lines | Invisible fence |
| Telephone lines to detached buildings | Septic system or Sewer Lateral |
| Cable TV lines to detached buildings | Satellite TV |
| Sprinkler system | Water lines |

FOR INTERNAL USE ONLY Xcel Energy project number



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, ST. PAUL DISTRICT
180 FIFTH STREET EAST, SUITE 700
ST. PAUL, MN 55101-1678

July 22, 2019

Real Estate Division

United States Department of the Interior
U.S. Geological Survey
ATTN: Robert J. Waschbusch
8505 Research Way
Middleton, Wisconsin 53562-3581

Mr. Waschbusch:

The Secretary of the Army hereby grants to the United States Geological Survey (USGS), hereinafter referred to as the Grantee, permission to use property located on Upper Mississippi Navigation Project – Lock and Dam No. 8 in Vernon County, Wisconsin for the construction, operation and maintenance of monitoring well VE-271/272, over, across, in and upon the lands identified in Exhibit "A", attached hereto and made a part hereof, hereinafter referred to as the premises. This letter of permission is in effect until such time that permission is rescinded. Conditions that must be met by the Grantee are as follows:

1. The use and occupation of the premises by the Grantee shall be without cost or expense to the Department of the Army.
2. The Grantee shall, at its own expense and without cost or expense to the Department of the Army, maintain and keep the premises in good repair and condition.
3. Any interference with the use of or damage to property under control of the Department of the Army incident to the exercise of the permission herein granted shall be promptly corrected by the Grantee to the satisfaction of the Real Estate Contracting Officer (RECO).
4. No additions to or alterations of the premises shall be made by the Grantee without the prior written approval of the Real Estate Contracting Officer (RECO).
5. The Grantee shall comply with all applicable Federal, state, county and municipal laws, ordinances and regulations wherein the premises are located.
6. It is understood that the requirements pertaining to maintenance, repair, protection, and restoration of the premises, shall be effective only insofar as they do not conflict with any agreement, pertaining to such matters made between local

representatives of the Department of the Army and Grantee in accordance with existing regulations.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Kevin Sommerland', with a stylized, cursive script.

Kevin Sommerland
Chief, Real Estate
Real Estate Contracting Officer



Appendix 20: Well WK-31 documents

Historical Documents

Basic well information (1980), well evaluation (1980), well location maps, hydrographs (1947-1950, 1991-2000, 8 pages

well information historically compiled by WGNHS

Well construction report, 1944/1945, 2 pages

USGS well schedule, 1947, 1 page

Geologic log and notes, 1948, 2 pages

USGS well schedule, 1967, 1 page

Map from Batten and Conlon (1993), 1 page

map showing location of WK-31 in relation to preglacial bedrock valley from USGS Water-Resources Investigations Report 92-4077, pp6

Geophysical, hydrological, and well construction information from Dunning and others (1996), 1 page

hydrograph (1955 - 1995), slug test, horizontal hydraulic conductivity, geophysical logs, and well measurements from unpublished report to DNR (DNR project number 118) by Dunning and others (1996)

datum is top of casing, approximately 1.0 ft above land surface in 1996, data courtesy of U.S. Geological Survey

WGNHS geophysical logs, 2010, 1 page

self potential, single point resistivity

datum is assumed to be top of casing, approximately 1.0 ft above land surface in 2010, data courtesy of U.S. Geological Survey

Documentation of work done for this report

WGNHS Geophysical Log, 2019,

gamma, self potential, single point resistivity, optical borehole image, fluid temperature, fluid conductivity, caliper

datum is top of casing (1.03 ft above land surface in 2019)

WK-0031

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number WK-05/19E/02-0031

Owner WILLIAM M. FOSS

Location (Co., T/R.sec) WAUKESHA Co.

T. 5 N., R. 19 E., SEC. 2 NE 1/4 NW 1/4

Land surface altitude 962 FT.

Drainage basin Redwing Creek 1 mi N

Fox River Basin

WELL DATA

Depth 508 FT.

Casing depth 434 FT.

Screened interval

Diameter 6 in.

Aquifers open to well NIAGARA

Geologic log available? NO

Construction report available? YES

Use of well UNUSUAL

Access to measure well OK

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations Waukesha - 7 mi N

Eagle - 16 mi W

Streamgaging stations Milwaukee A.P. - 14 mi E

05546500 - Fox River at Wilmet

Observation wells WK 50 - 15 mi N

ML 94 - 9 mi E

WK 20 - 20 mi NW

ML 118 - 18 mi NE

Other

WK 14 - 6.5 mi N

EXISTING RECORD

Measuring point TOP OF CASING, 1.00 FT. ABOVE L30

Measuring equipment CONTINUOUS RECORDER

Frequency of measurement SAME

Period of record --

Started 1947

Ended CONTINUING

Volume of missing record

WK-0031

July 1980
R. D. Cotter

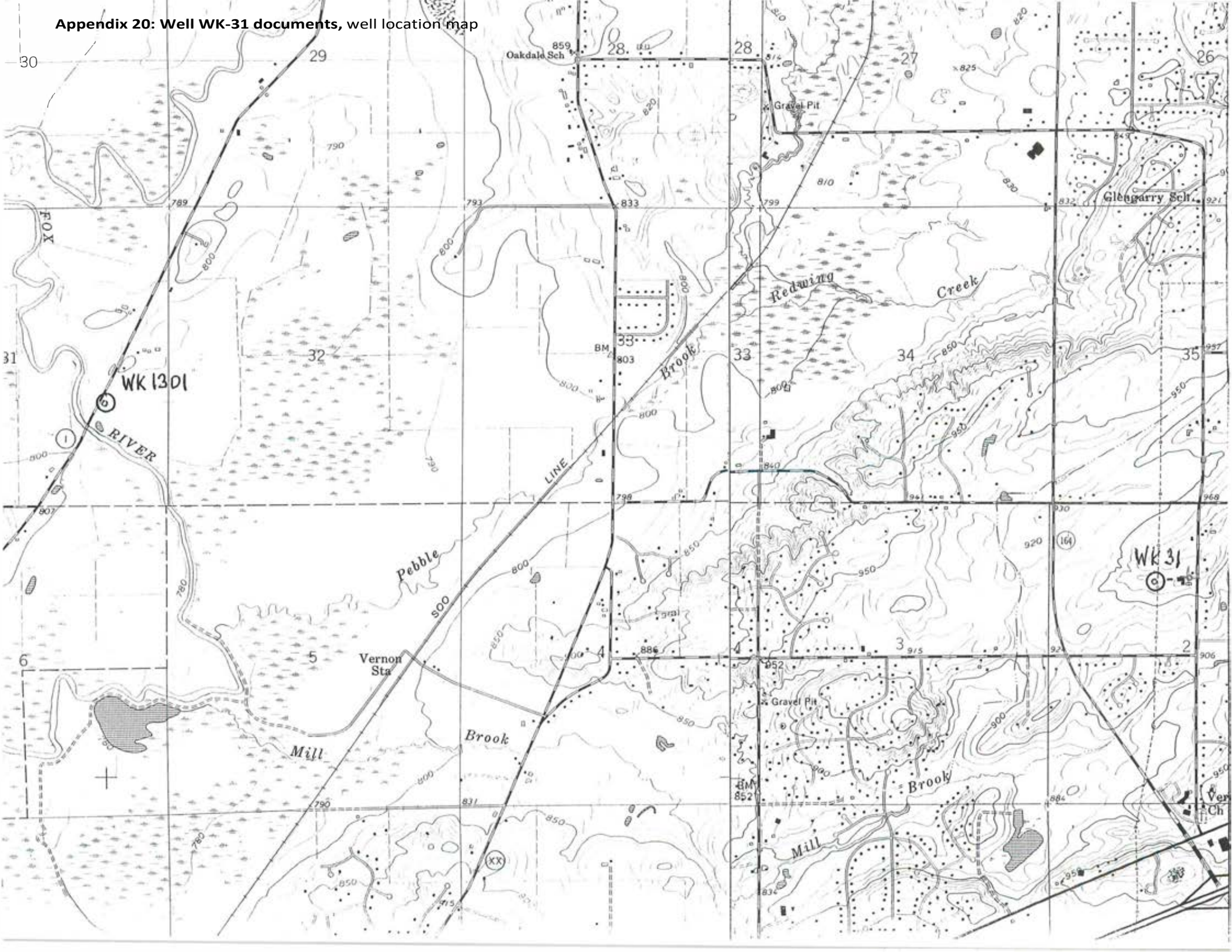
CRITERIA FOR EVALUATION OF WATER-LEVEL OBSERVATION WELLS IN WISCONSIN

1. Areal spacing -- distance from any observation well 6 mi.
-- distance from observation well in same aquifer 10 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 GOOD
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 OK
11. Knowledge of pumping effects
12. Range and character of water level fluctuations 12 ft.
13. Length of record 34 yrs.
14. Missing record
15. Adequacy of current measuring frequency GOOD
16. Probability of permanance GOOD

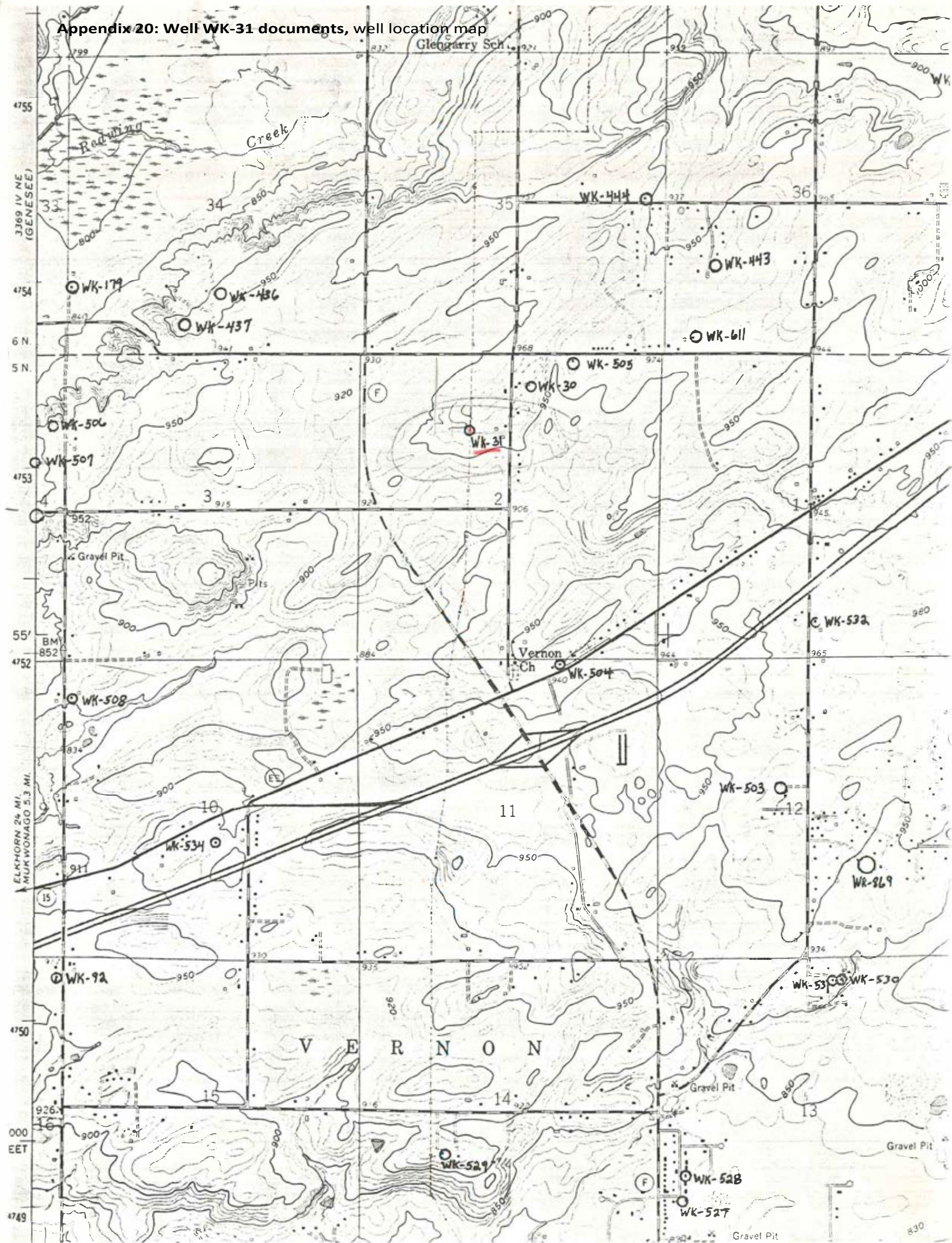
NOTES

Recommendations

Appendix 20: Well WK-31 documents, well location map



Appendix 20: Well WK-31 documents, well location map

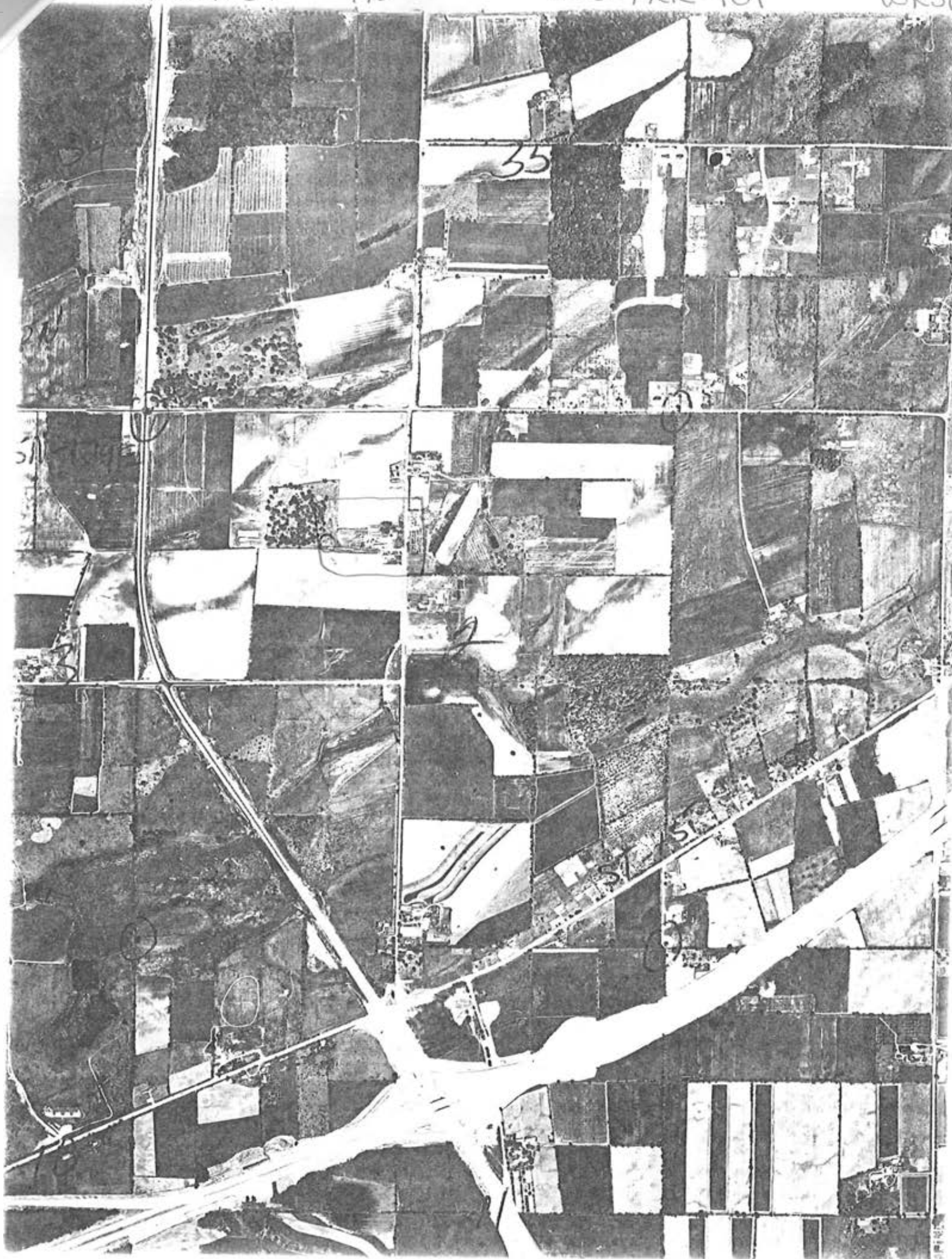


6/13/1969

7N

WW-1KK-101

WK-31



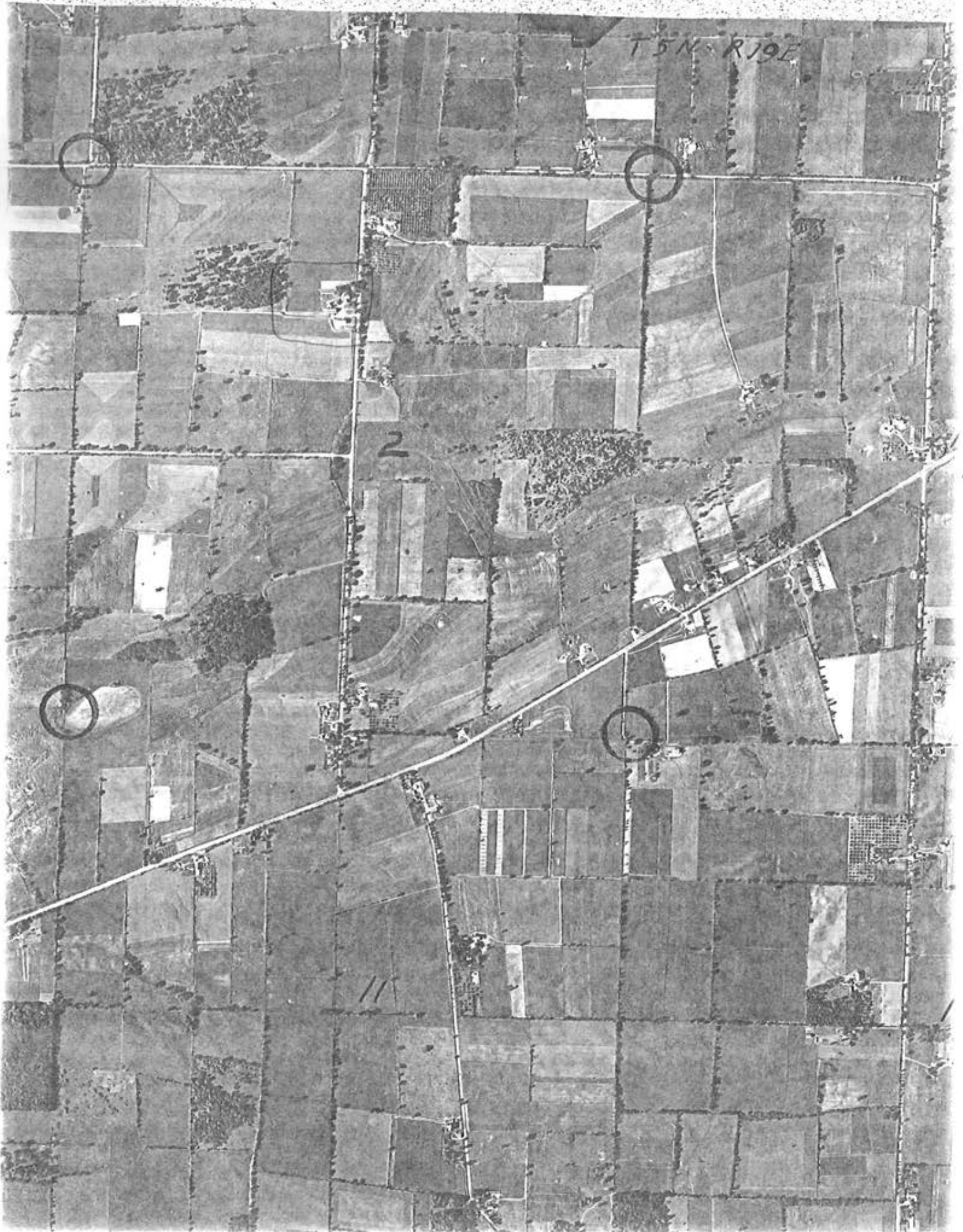
14/20 enlargement

9/5/1950

↑N

WW-2G-143

WK-31



141% enlargement

Appendix 20: Well WK-31 documents, hydrograph

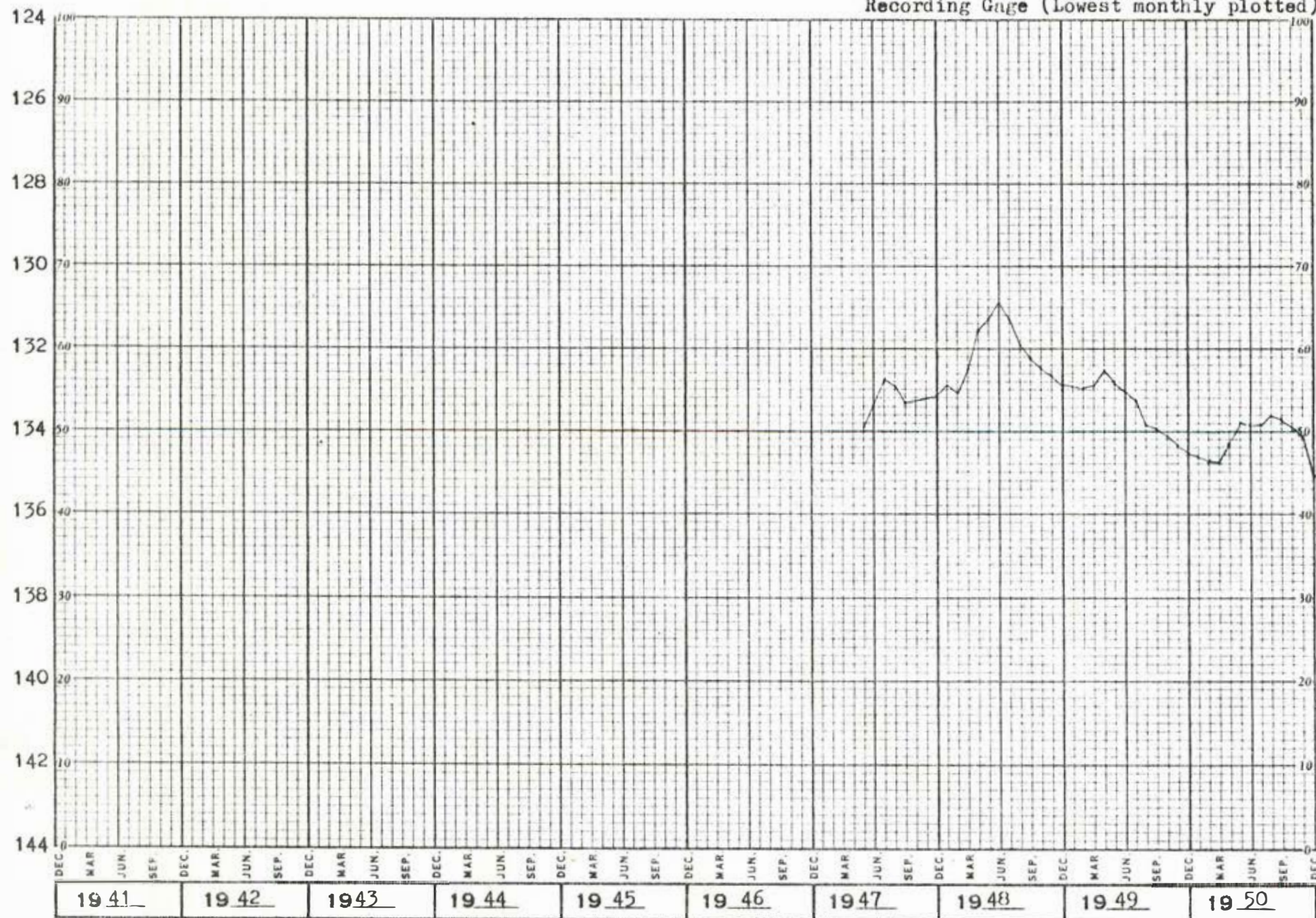
CLEARPRINT PAPER CO. NO. C356 TEN YEARS BY MONTHS X 100 DIVISIONS.

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015

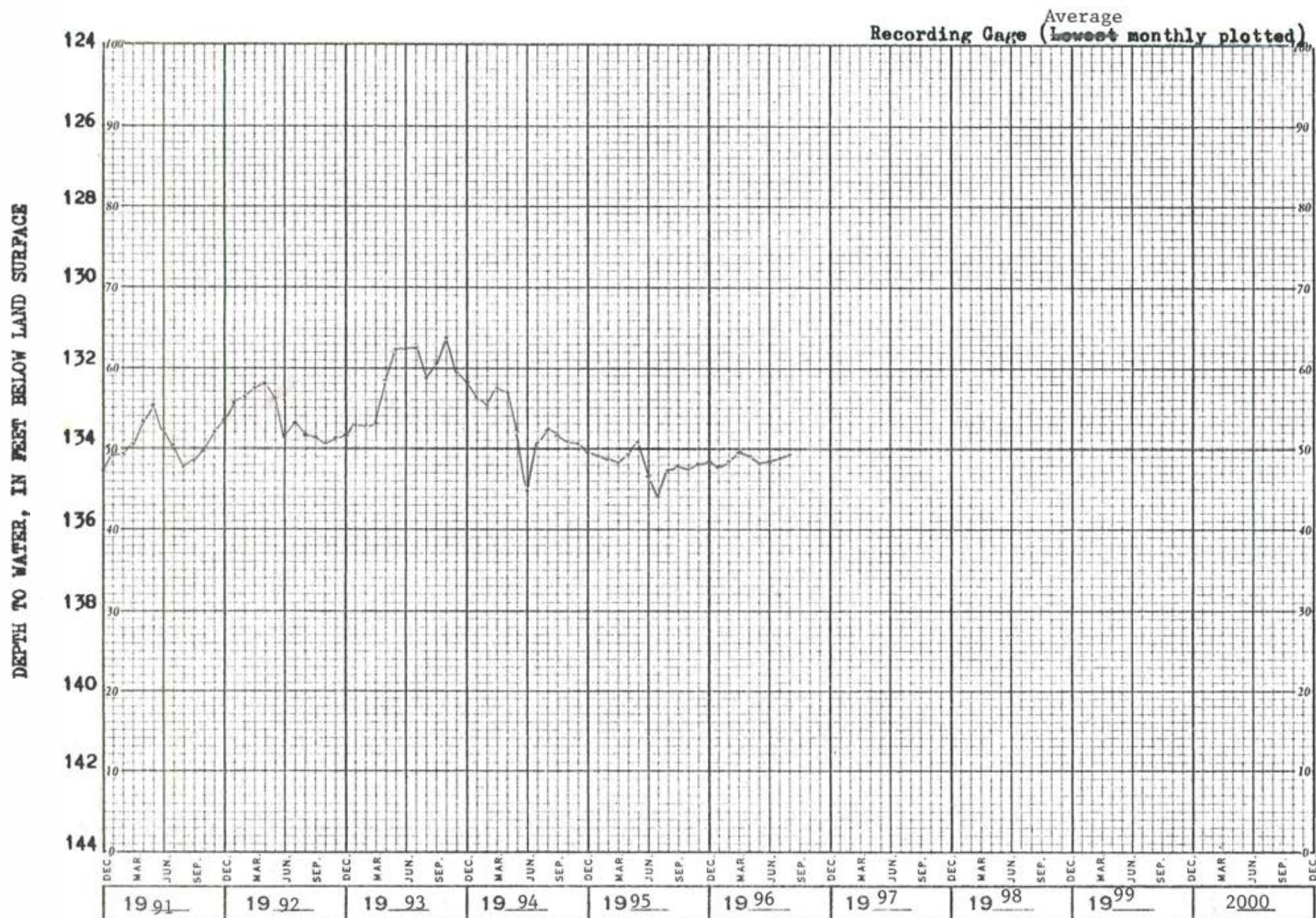
CLEARPRINT CHARTS

Wk-5/19/2-31. William M. Foss. NE 1/4 SW 1/4. Drilled unused artesian well in Niagara Dolomite of Silurian age, diam 6 in, depth 508 ft, cased to 434. Lsd 962 ft above msl. MP top of casing, 1.00 ft above lsd.

Recording Gage (Lowest monthly plotted)



WK-05/19E/02-0031. William M. Foss. NE $\frac{1}{4}$ SW $\frac{1}{4}$. Drilled unused artesian well in Niagara Dolomite of Silurian age, diam 6 in, depth 508 ft, cased to 434. Lsd 962 ft above msl. MP top of casing, 1.00 ft above lsd.



FEB 26 1945

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

See Instructions on Reverse Side

WK-31-B

E, SE, SW, N E 1/4, NW Sec 2, T5N R19E

1. County Waukesha { Town Vernon T5R19
Village
City
2. Location County Hwy. 1 mi. North of Hwy 15
3. Owner or Agent Sam A. Fults
4. Address same
5. From well to nearest: Building 200 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: farm

7. DRILLHOLE OR EXCAVATION:

Dia. (in.)	From (ft.)	To (ft.)
10	0	20
6	20	508

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind	From (ft.)	To (ft.)
6	steel	0	429

9. GROUT:

Kind	From (ft.)	To (ft.)
mud	0	429

10. FORMATIONS:

Kind	Thick-ness (ft.)	Total Depth (ft.)
Clay & boulders	70	
Hydram	65	135
Clay	50	185
muddy sand	140	325
stone clay	104	429
skel. limestone	76	505
shale	3	508

11. MISCELLANEOUS DATA:

Yield test: 7 Hrs. at 10 GPM.

Depth from surface to water: 145 ft.

Water-level when pumping: 150 ft.

Water sample sent to laboratory at

Kenosha on July 20 1944

Signature

Earl Aker
Registered Well Driller

Construction of the well was completed on

July 20 1944

The well is terminated 6 inches (above) (below) the permanent grade.

Was the well disinfected upon completion?

Yes ☒ No ☐

Was the well sealed watertight upon completion?

Yes ☒ No ☐

Complete Mail Address

owner in 1952

Well Name William M. Foss WellLog No. WK-31 -B, D

Owner _____

Sample Nos. _____

Address _____

County Waukesha

Remarks _____

Township VernonLocation SE, SE 3/4, NE, NW Sec 2R.I. 6 Elevation 973 ft ± 5Driller AckerQuad. MustegoCompleted 1945 C.R. Yes/No YesMap No. 703Depths 508 ft

Platbook Check (date & page) _____

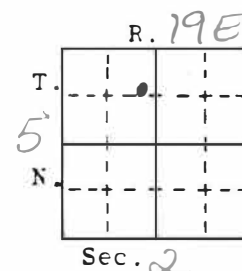
Date Rec'd _____

Examined by _____

Date _____

GWSI Records checked Yes / No

Field checked by _____

date 24 Oct 67map Yes / NoREMARKS missing

5/19/2

July 1935
revised

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

WELL SCHEDULE

Date 5-22, 1947 Field No. WK-31
Record by W. J. Drescher Office No. _____
Source of data Mrs. Duncan

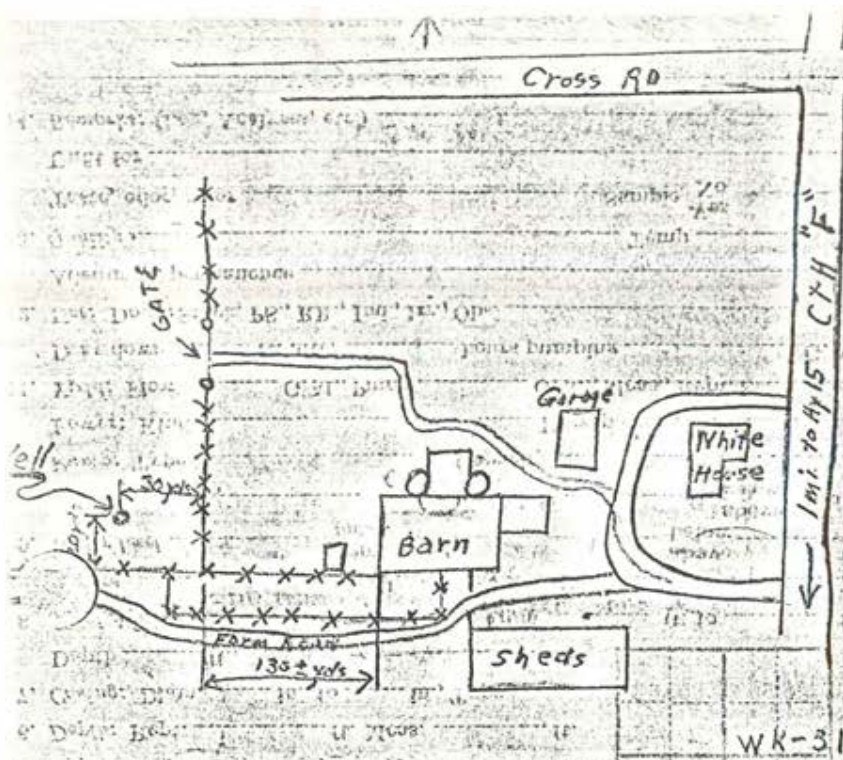
- Location: State Wisconsin County Waukesha
Map NE 1/4 NW 1/4 sec. 2 T. 5 N. R. 19 E. W.
- Owner: Fulton M. Eds 1952 Address West Allis, Wis.
Tenant L. B. Duncan Address Waukesha R #3
Driller Acker Address _____
- Topography Hill Top
- Elevation 993 ft. above sea level
below
- Type: Dug, drilled, driven, bored, jetted 1945
- Depth: Rept. 600 ft. Meas. 508 ft.
- Casing: Diam. 6 in., to _____ in., Type _____
Depth 434 ft., Finish _____
- of Aquifer St. Peter / Niagara From _____ ft. to _____ ft.
ers _____
- Water level 131.87 ft. rept. 5-22 1947 above Top
of casing meas. 1 below surface
- Pump: Type none Capacity _____ G. M.
Power: Kind _____ Horsepower _____
- Yield: Flow _____ G. M., Pump _____ G. M., Meas., Rept. Est. _____
Drawdown _____ ft. after _____ hours pumping _____ G. M.
- Use: Dom., Stock, PS., RR., Ind., Irr., Obs. None (drilled for
stock)
Adequacy, permanence _____
- Quality _____ Temp _____ °F.
Taste, odor, color _____ Sample No. _____
Unfit for _____
- Remarks: (Log, Analyses, etc.) _____
WILLIAM M. ED'S INCORPORATED 1952
Electric 109-6-57

[illegible]

429 ft of 6" casing o/w = 145' static
o/w = 150' @ 10 gpm

weekly recorder installed 7-23-48
changed to monthly 7-20-53

ARMY RESOURCES BRANCH
GEOLOGICAL SURVEY
DEVELOPMENT OF THE NATION
LIMITED SURVEY



Log from Acker -- August '48 by E.D.

Clay and bould.	70	962
Hardpan	65	892
Clay	50	827
Muddy sand	140	777
Stoney clay	104	637
Limestone	76	533
Shale	3	457
		454

429' of 6" casing D/W 145' station 20

D/W 150' 10 gpm 20

Weekly recorder installed 7-23-48

Changed to 100' or 20' 53"

GEOLOGICAL SURVEY
DEPARTMENT OF THE INTERIOR
UNITED STATES

Appendix 20: Well WK-31 documents, USGS well schedule, 1967

WLD Exp. (G)
April 1966

U. S. DEPT. OF THE INTERIOR

WELL SCHEDULE
GEOLOGICAL SURVEY
W.J. Drescher
22 MAY 1947Verified FCH
WATER RESOURCES DIVISION

Well No. WK-5/19/2-31

MUSKEGO 1124000

MASTER CARD

Record by E.J. DASPIT Source of data MND, U.S. Date 2/10/67 Map HALES CORNERS 112500

State WISCONSIN 58 County (or town) WAUKESHA 101

Latitude: 42° 55' 35" N Longitude: 88° 13' 17" W Sequential number: 1

Lat-long accuracy: 2 T 5 S 19 Sec 2 NE 1/4 NW 1/4 4

Local well number: 95 N 19 E 02 R 1 A 1 Other number: B & H

Local use: W 10 0 3 1 Owner or name: W. J. Fox

Ownership: County, City, Corp or Co, State Agency, Water Dist

Use of water: (A) Air cond, Bottling, Comm, Dewater, Power, Fire, Dom, Irr, Mod, Ind, P S, Rec, (S) (T) (U) (V) (W) (X) (Y) (Z) (U) Stock, Instrt, Unused, Repressure, Recharge, Desal-P S, Desal-other, Other

Use of well: (A) (B) (C) (D) (E) (F) (G) (H) (I) (J) (K) (L) (M) (N) (O) (P) (Q) (R) (S) (T) (U) (V) (W) (X) (Y) (Z) (U) Anode, Drain, Seismic, Heat Res, Obs, Oil-gas, Recharge, Test, Unused, Withdraw, Waste, Destroyed

DATA AVAILABLE: Well data 1 Freq. W/L meas.: Continuous C Field aquifer char. 72

Hyd. lab. data: 73

Qual. water data: type: 74

Freq. sampling: 75 Pumpage inventory: yes no period: 76

Aperture cards: 77

Log data: Electric (June 1957) Driller E.D. 78

WELL-DESCRIPTION CARD

NAME AS ON MASTER CARD Depth well: 508 ft 508 Head Electric 4

Depth cased: 434 ft 434 Casing type: 6 in 6

Finish: porous gravel w. gravel w. horiz. open perf., screen, ad. pt., shored (open) (X)

Method: (A) (B) (C) (D) (E) (F) (G) (H) (I) (J) (K) (L) (M) (N) (O) (P) (Q) (R) (S) (T) (U) (V) (W) (X) (Y) (Z) (U) Drilled: air bored, cable, dug, hyd jetted, air reverse trenching, driven, drive wash, other

Date Drilled: 1945 9:45 Pump intake setting: ft 34 34

Driller: ACKER Blue Mound Road

Lift: (A) (B) (C) (D) (E) (F) (G) (H) (I) (J) (K) (L) (M) (N) (O) (P) (Q) (R) (S) (T) (U) (V) (W) (X) (Y) (Z) (U) (type): air, bucket, cent, jet, multiple, multiple, (cent.) nose, piston, rot, submerg, turb, other N Deep D Shallow

Power: (type): diesel, elec, gas, gasoline, hand, gas, wind; H.P. 41

Descrip. MP Top of casing 100 ft below LSD, Alt. MP 963

Alt. LSD: 962 962 Accuracy: (source) TOP 10' CE 4

Water level: 135.83 ft above MP; Ft below LSD 135 Accuracy: TAPE 32

Date measured: 24 OCT 67 0:67 Yield: 10 gpm 10 Method determined 31

Drawdown: 5 ft 5 Accuracy: DR 3 Pumping period: hrs 40

QUALITY OF WATER DATA: Iron Sulfate Chloride Hard. 73

Sp. Conduct: K x 10⁶ 73 Temp. 74 Date sampled 75

Tests, color, etc. Punched ERC

CHECKED AGAINST DATA SOURCE: E.D. 1/68 CHECKED E.D. 1/68

Well No. WK-5/19/2-31

Latitude-Longitude 42.55.35 S 88.13.17 W

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD Physiographic Province: CENT LAW 17 Section: FLS

Drainage Basin: UP MISS 241F Subbasin: FOX-ILL 20

Topo of well site: (D) depression, stream channel, dunes, flat, hilltop, sink, swamp, (E) (F) (G) (H) (I) (J) (K) (L) (M) (N) (O) (P) (Q) (R) (S) (T) (U) (V) offshores, pediment, hillside, terrace, undulating, valley flat 27

MAJOR AQUIFER: Silurian 5 Niagara 6 NY

Lithology: Dolomite D Origin: MAR L Aquifer Thickness: 76

Length of well open to: 71 ft 71 Depth to top of: 429 ft 429

Lithology: Dolomite D Origin: MAR L Aquifer Thickness: 76

Length of well open to: 71 ft 71 Depth to top of: 429 ft 429

Lithology: Dolomite D Origin: MAR L Aquifer Thickness: 76

Length of well open to: 71 ft 71 Depth to top of: 429 ft 429

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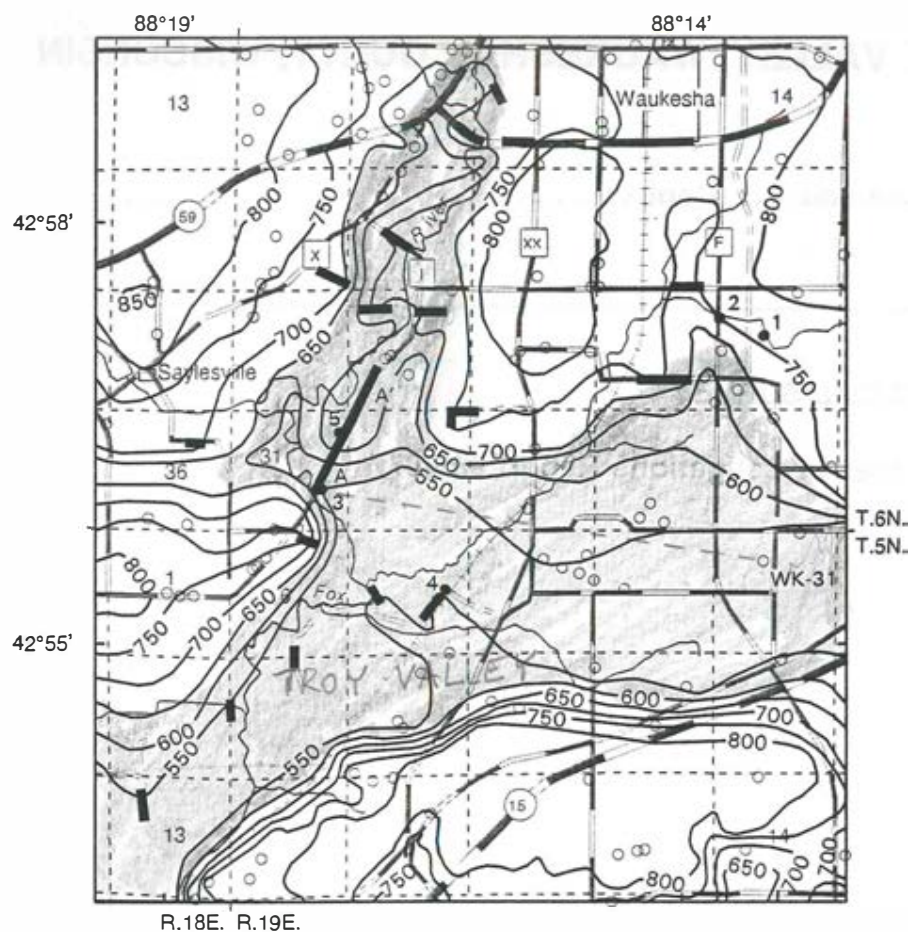
Length of well open to: 71 ft 71 Depth to top of: 429 ft 429

Lithology: Dolomite D Origin: MAR L Aquifer Thickness: 76

Length of well open to: 71 ft 71 Depth to top of: 429 ft 429

Lithology: Dolomite D Origin: MAR L Aquifer Thickness: 76

Length of well open to: 71 ft 71 Depth to top of: 429 ft 429




Base modified from U.S. Geological Survey
1:24,000, Genesee, WI, 1960 and
Muskego, WI, 1959

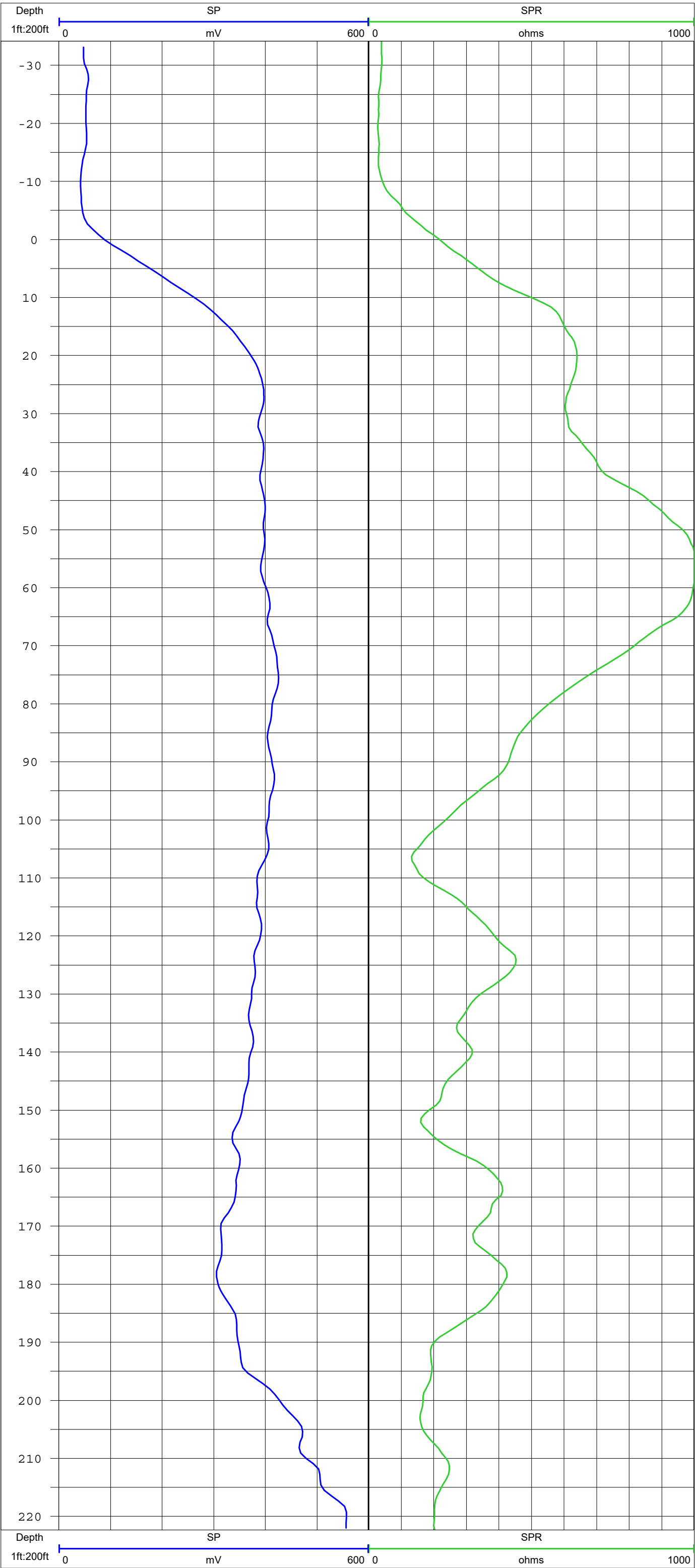
0 1 2 MILES
0 1 2 KILOMETERS

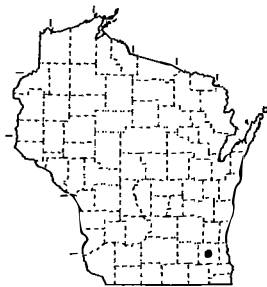
EXPLANATION

- | | |
|--|--|
| | APPROXIMATE EXTENT OF PREGLACIAL (TROY) BEDROCK VALLEY WITHIN THE STUDY AREA |
| | BEDROCK CONTOUR--Shows altitude of bedrock surface. Contour interval 50 feet. Datum is sea level |
| | SEISMIC-REFLECTION SURVEY LINE |
| | SEISMIC-REFRACTION SURVEY LINE |
| | TEST HOLE AND IDENTIFICATION NUMBER |
| | WELL WITH DRILLERS' CONSTRUCTION DATA |
| | GROUND-WATER-LEVEL OBSERVATION WELL AND IDENTIFICATION NUMBER |

Figure 2. Approximate extent of preglacial bedrock valley, altitude of bedrock surface, and location of seismic-survey lines, test holes, and wells with drillers' construction data.

		Wisconsin Geological and Natural History Survey	
Well Owner: William M. Foss		Well / Hole Name: William M. Foss Well	
Well Address: Rt. 3		City, State, Zip Code: Waukesha, WI	
WGNHS Well ID:		WI Unique Well #:	
Property Owner: William M. Foss		WGNHS Well ID:	
Address: Rt. 3		WK-31	
Line 2:			
City: Waukesha		WI Unique Well #	
State: WI		Zip Code:	
GPS Latitude:			
GPS Longitude:			
WTM83_N: 42 degrees, 55', 35" N			
WTM83_E: 088 degrees, 13', 17"			
Elevation & Method: 962'			
Location: NE 1/4, NE 1/4, NW 1/4			
SEC. 2		T. 5N R. 19E	
PERMANENT DATUM: GROUND SURFACE		ELEVATION: 962'	
LOG MEAS. FROM: Top of Casing		SU: 1'	
DRILLING MEAS. FROM		DTW: 135.83'	
Date:	06/1957	Log 8 Performed on Borehole:	
Logged by:		Log 9 Performed on Borehole:	
Witness:		Log 10 Performed on Borehole:	
Log 1 Performed on Borehole:	SP	DEPTH-DRILLER:	
Log 2 Performed on Borehole:	SPR	DEPTH-LOGGER:	
Log 3 Performed on Borehole:		TYPE FLUID IN HOLE	
Log 4 Performed on Borehole:		CASING	
Log 5 Performed on Borehole:		DENSITY	
Log 6 Performed on Borehole:		WATER LEVEL	
Log 7 Performed on Borehole:		MAX. REC. TEMP.	
Comment:			



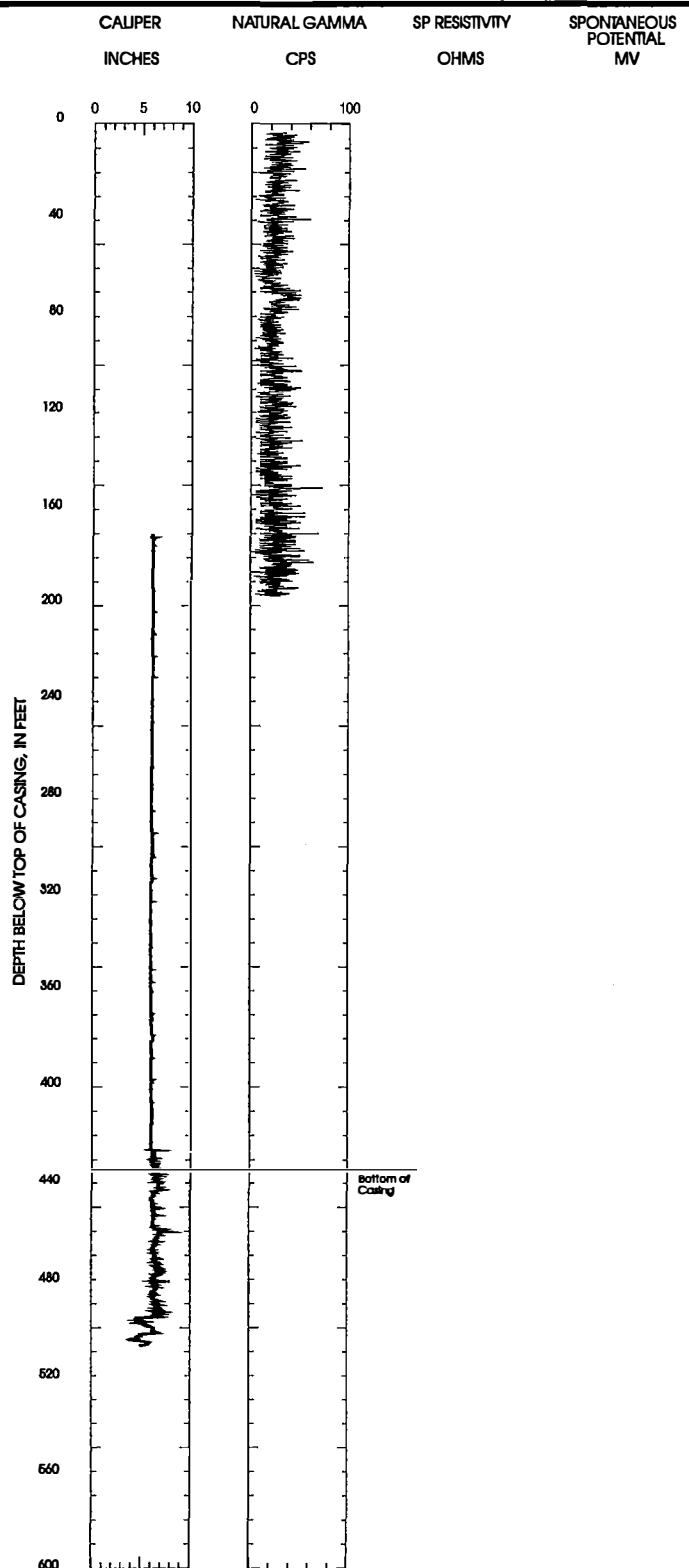


Waukesha County

WK-05/19E/02-0031

SILURIAN AQUIFER

Geophysical Logs



Well Information

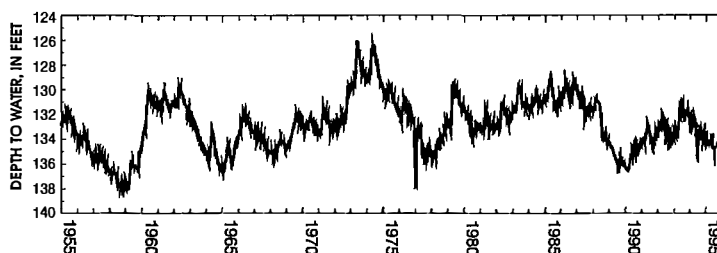
Total Depth 508 feet

Cased Depth 434 feet

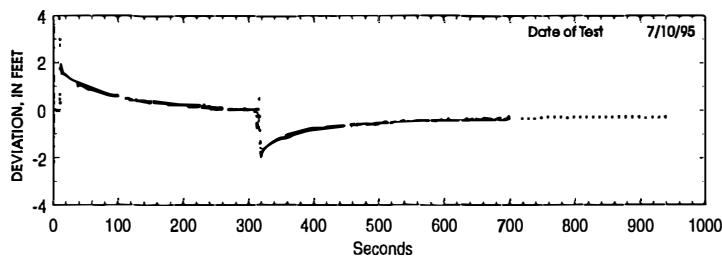
Casing Diameter 6 inches

Use of Well Non-pumping

Depth to Water Below Land Surface For Period of Record



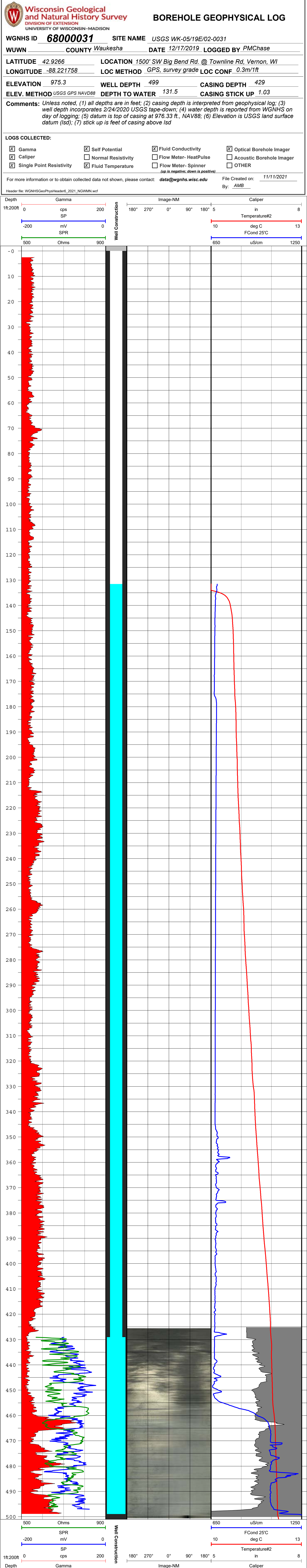
Deviation From Static Water Level During Displacement \ Recovery Test



Horizontal Hydraulic Conductivity

Hvorslev K

2.0 ft/day



Appendix 21: Well WW-83 and WW-2194 documents

Well WW-2194 replaced well WW-83

Historical Documents: WW-83

Basic well information, date unknown; well evaluation, date unknown; hydrographs, 1977-1980 and 1991-1999, 4 pages

well information historically compiled by WGNHS

Letter from Miller Well And Pump Co. regarding well construction information, 1956, 1 page

WGNHS geologic log, 1956, 1 page

USGS well schedule, 1964, 1 page

USGS site schedule, 1979, 2 pages

Hand-written correspondence about well measurements, 1979, 3 pages

USGS water-level data, 1977 and 1979, 1 page

Hydrological and well construction information from Dunning and others (1996), 1 page
hydrograph (1979 - 1995), slug test, horizontal hydraulic conductivity, and well measurements from unpublished report to DNR (DNR project number 118) by Dunning and others (1996)

Documentation of work done for this report: WW-83

Letter explaining inability to redevelop well, 2019, 1 page
from Maas and Sons

WDNR fill and seal report, 2021, 2 pages

Documentation of work done for this report: WW-2194

Well owner document, 2019, 2 pages

WDNR monitoring well construction form, 2019, 1 page
4400-113A

WDNR monitoring well development form, 2019, 1 page
4400-113B

WDNR soil boring information form, 2019, 1 page
4400-112

NW-0033

7/11/80

BASIC DATA ON WATER-LEVEL OBSERVATION WELL

Well number WW-01/16E/10-0033

Owner VILLAGE OF FONTANA

Location (Co., T/R.sec) WAUWATOSH Co.

T. 1N., R. 16E., Sec. 10 SE 1/4 SE 1/4

Land surface altitude 1030 ft.

Drainage basin

1/4 mi. to Lake Geneva

Rock Fox Basin

WELL DATA

Depth 150 ft.

Casing depth 134 ft.

Screened interval 134-144 ft.

Diameter 6 in.

Aquifers open to well S&G

Geologic log available?

Yes

Construction report available?

Use of well UNUSUAL

Access to measure well OK

NEAREST SUPPLEMENTAL DATA POINTS

Precipitation stations

Lake Geneva - 8 mi. NE

Beloit - 23 mi. W

Clinton - 13 mi. W

Streamgaging stations

05431486 - Turtle Creek near Clinton - 13 mi. W

Observation wells

WW 9 - 11 mi. NW

Ro

491 - 20 mi. W

WW 37 - 8 mi. NE

Ro

8 - 23 mi. NW

Other

EXISTING RECORD

Measuring point TOP OF CASING, 1.30 FT. ABOVE WSD

Measuring equipment TAPE

Frequency of measurement ~~Monthly~~ WEEKLY

Period of record --

Started ~~1977-1979~~ 1980

Ended CONTINUING

Volume of missing record

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 *Unused*
4. Access -- physical *OK*
-- owner's permission *OK*
5. Condition of well -- casing *OK*
-- housing *OK*
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 *4-5 ft.*
13. Length of record *2 yrs.*
14. Missing record
15. Adequacy of current measuring frequency *OK*
16. Probability of permanence *OK*

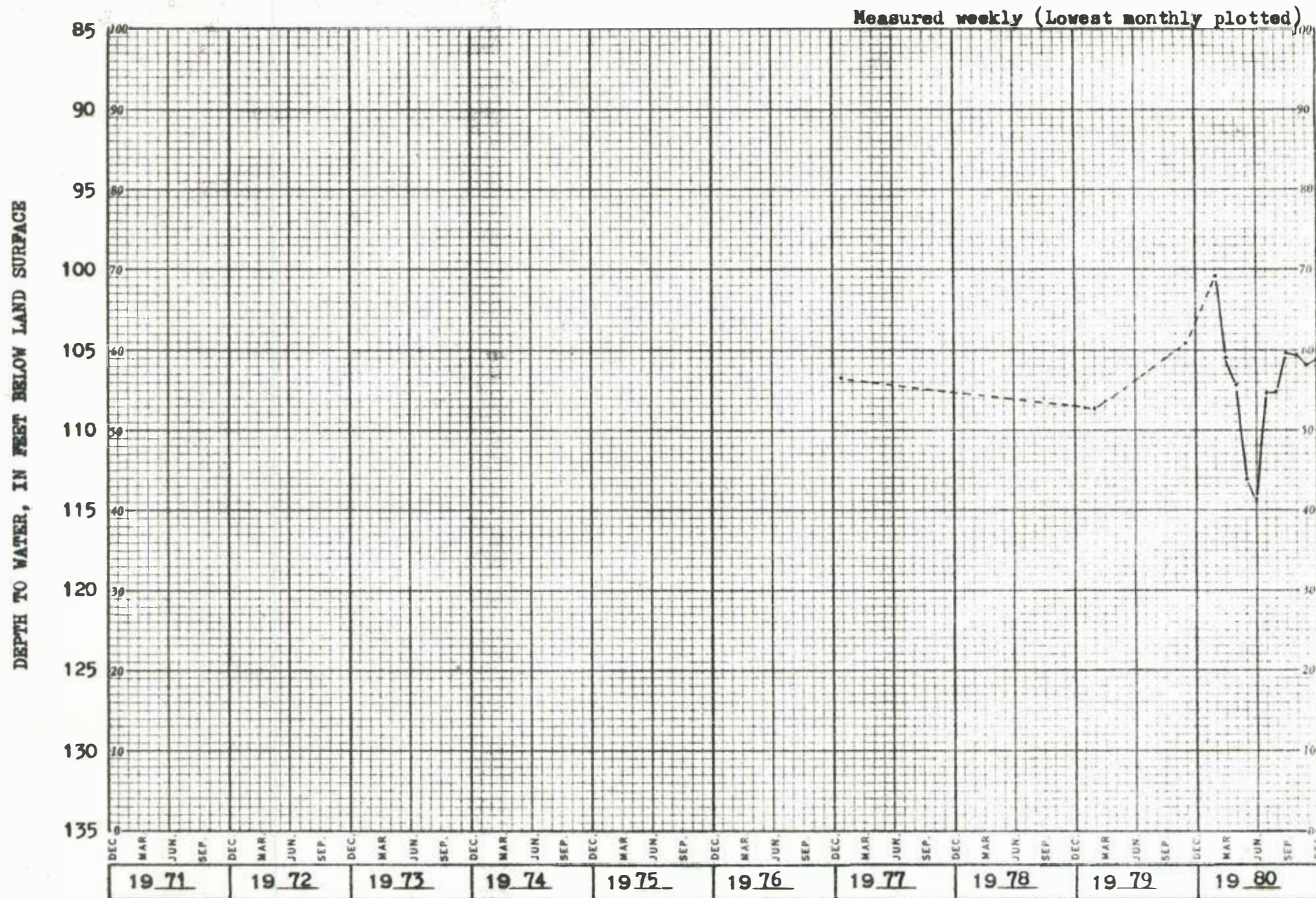
NOTES

Recommendations

CLEARPRINT PAPER CO. NO. C356. TEN YEARS BY MONTHS X 100 DIVISIONS.

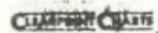
PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015

WW-01/16E/10-0083. SE₁SE₁. Village of Fontana on Geneva Lake. Drilled unused water-table well in sand and gravel of Pleistocene age, dia 6 in, depth 150 ft, cased to 134, 4-in screen 134-144. Lad 1,030 ft above msl. MP top of casing, 1.30 ft above lad.

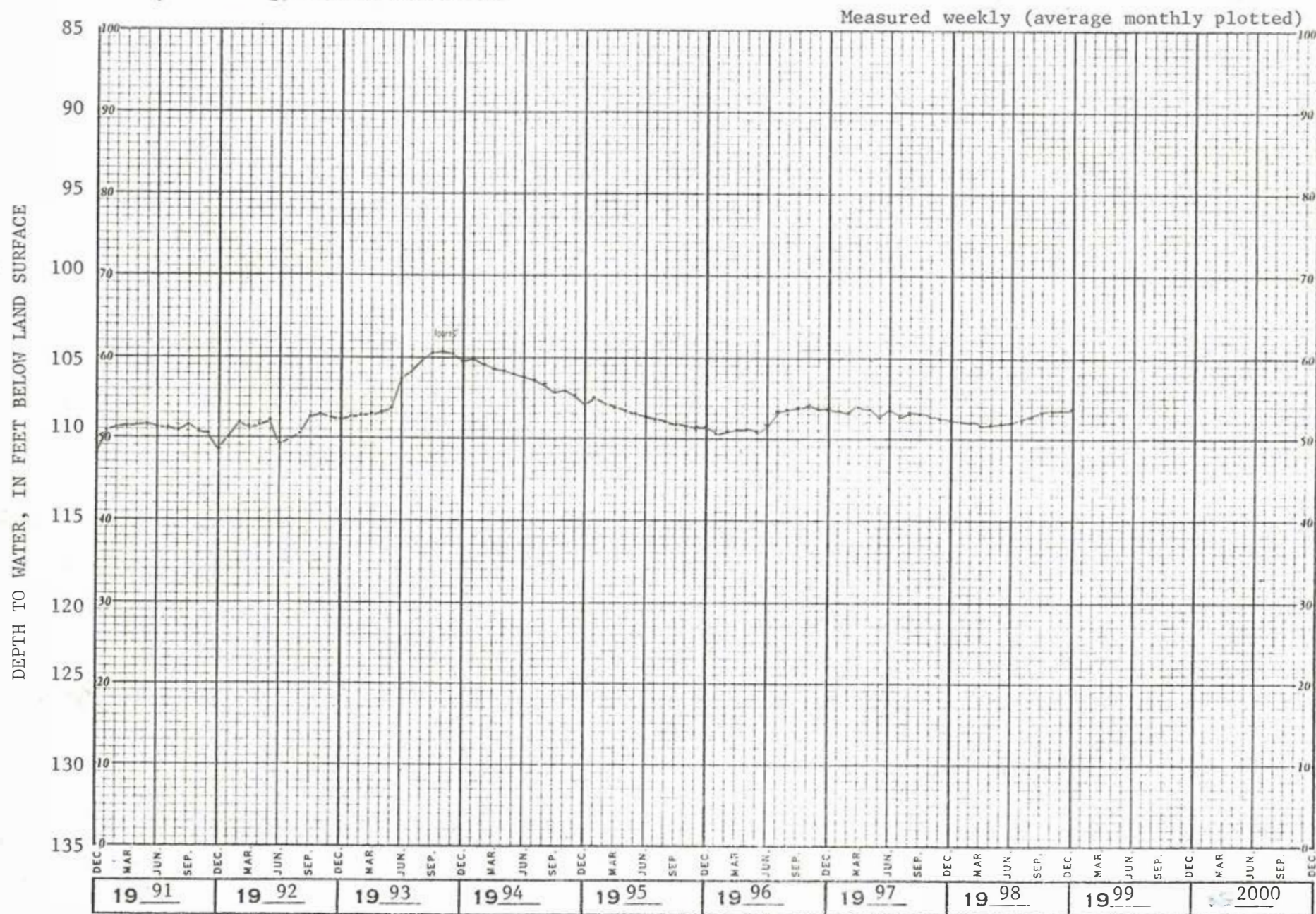


CLEARPRINT PAPER CO. NO. C336. TEN YEARS BY MONTHS X 100 DIVISIONS

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015



WW-01/16E/10-0083. SE $\frac{1}{4}$ SE $\frac{1}{4}$. Village of Fontana on Geneva Lake. Drilled unused water-table well in sand and gravel of Pleistocene age, diam 6 in, depth 150 ft, cased to 134, 4-in screen 134-144. Lsd 1,030 ft above msl. MP top of casing, 1.30 ft above lsd.



MILLER WELL AND PUMP CO.

WATER WELLS — WELL REPAIRS — SOUNDINGS — DEEP WELL — HORIZONTAL — VERTICAL PUMPS

161 W. WISCONSIN AVENUE TELEPHONE BROADWAY 6-6367

MILWAUKEE, WISCONSIN

August 10, 1956

Wisconsin Geological Survey
Science Hall
Madison 6, Wisconsin

Attn: Prof. F. T. Thwaites

Subject: Fontana, Wisconsin

Dear Prof. Thwaites:

We are pleased to submit samples and information on results obtained in the construction of a 6" diameter well, for the Village of Fontana disposal plant. *near city hall to W new ground pit*

This well was drilled under the supervision of Jensen and Johnson, Consulting Engineers in Elkhorn, for the purpose of securing sufficient water supply to take care of necessary plant water at the disposal plant. The well was started with 8" drive pipe, driven to a depth of 20' with 6" drive pipe being driven to a depth of 150'. The hole was filled from 150' to 149'. A 10' length of 4" screen with 2' length packer on top of screen and 5' length of 4" I. D. pipe with plug on bottom was installed. Top of packer and seal was set at 132', bottom of 4" pipe at 149'. The 6" pipe was then withdrawn to 134' and the well surged free of sand. A bailer test was conducted for a period of 2 hours on this well and at the end of 2 hours time, the well delivered 20 GPM, with a 4' drawdown. *Q-L = 5.0 gpm* The static water level being 111', before and after the pumping test. The 8" drive pipe was then removed and the annular space outside of the 6" pipe was filled with puddled clay.

Trusting the information as furnished above is sufficient for you to prepare the final well log on this well, we are,

Very truly yours,

MILLER WELL AND PUMP CO.

Morrill Nelson
M. O. Nelson



(DISTRIBUTORS OF PEERLESS PUMPS)

Ww 83

SEWAGE DISPOSAL PLANT WELL, FONTANA, WALWORTH CO., WIS.

Near City Hall SW $\frac{1}{4}$, SE $\frac{1}{4}$, SE $\frac{1}{4}$ Sec. 10, T. 1 N., R. 16 E.

Jensen and Johnson, Engineers Millwer Well and Pump Co., Contractor

Samples examined by F. T. Thwaites, Nos. 190775-190803 1956

Elevation = 1030'

D R I F T	0-5	5		No sample	
	5-10	5	o o o o	Gravel, silty, brown-gray, weathered	9" hole, clay
	10-40	30	o o o o	Gravel, coarse to sandy, silty	20
	40-65	25	o o o o	Gravel, very sandy to stony	6" pipe
	65-70	5	o o o o	Gravel, very stony.	
	70-100	30	o o o o	Gravel, some sand	111 water
	100-110	10	o o o o	Gravel, silty	
	110-145	35	o o o o	Sand, fine to pebbles, light gray	
	150	5	o o o o	Gumbotil, dark gray, slightly dolomitic	132 4" pipe 134 4" pipe Screen 144 4" pipe

149

Tested with bailer for 2 hours specific capacity = 5.0 g.p.m./ft.

Bailed 20 g.p.m.

Additional copies may be secured from Wisconsin Geological Survey, Science Hall, Madison 6, Wis.

9-185
(October 1950)

Lat. 42 33 15
Long. 88 35 03 DK-77

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

WELL SCHEDULE

Date 29 July + 8 Sept, 1964 Ww. 1/16/10-83
Record by J. H. Green Field No. _____
Source of data S. B. O. H., Field, + Mr. Stevenson Office No. _____

1. Location: State Wisconsin County Walworth
Map Walworth 7 1/2 T Walworth

SE 1/4 SE 1/4 sec. 10 T 1 NSR 16 (E)

2. Owner: Village of Fontana Address Fontana
Tenant _____ Address Disposal Plant

Driller (Miller) Nelson Address Milwaukee

3. Topography

4. Elevation 1030 ft. above S.L.
below

5. Type: Dug, drilled, driven, bored, jetted 7 1956

6. Depth: Rept. 150 ft. Meas. _____ ft.

7. Casing: Diam. _____ in., to _____ in., Type _____

Depth _____ ft, Finish 4" 144'-148'

8. Chief Aquifer _____ From _____ ft. to _____ ft.

Others

9. Water level 112.00 ft. rept. NOV. 2 ° 1965 above TOP
meas. below

6" LONG NIPPLE TOP CASING which is 3.0 ft. above LAND
below surface

10. Pump: type _____ Capacity _____ G. M.

Power Kind _____ Hrs power _____

11. Yield: Flow _____ G. M., Pump 20 G. M., Meas., Rept. Est. _____

Drawdown 1'-11.5 ft. after 2 hours pumping 20 G. M.

12. Use: Dom., Stock, PS., RR., Ind., Irr., Obs Plant Operations

Adequacy, permanence

13. Quality _____ Temp. _____ °F.

color _____ Sample Yes _____ No _____

14. Remarks: (Log, Analyses, etc.) Log in reverse, D.W. Log

NEW COPY MADE

FORM NO 9-190

WGS
REVISION

SITE NO.

WW-01/16E/10-0083

Recorded by

Su Toms

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

Date

8/17/1979

Check One

English

Metric Units

GENERAL SITE DATA (0)

Site Ident No

423315088350301

RG Number

R=0*

Transaction

T= A D W V *

Site Type

2= C D H I M P T W * Data3= C U L M * Reliability

Reporting Agency

4= USGS *

Project No.

5= *

District 6= 55 *

State 7= 55 *

County (or town)

8= 127 *

Latitude

9= 423315 *

Longitude

10= 1833503 *

Lat-Long Accuracy

11= 3 F T M *

Local Number

12= WW-01/16E/10-0083 *

Land Net Loc.

13= 505050 S 10 T 001 R 016 4 *

Location Map

14= NA/UNORTA *

Scale

15= 62500. *

Altitude

16= 1030. *

Method of Measurement

17= A L M *

Accuracy

18= 10 *

Topo Setting

19= D C E F H K L Ø P S T U V W *

Hydrologic Unit (OWDC)

20= *

Date of First Construction/Completion

21= 0000/1956 *

Use of Site

23= A D E G H Ø M P R S T U W X Z *

Use of Water

24= A B C D E F H I L M N P R S T U Y Z *

Secondary Water Use

25= *

Tertiary Use of Water

26= *

Depth of Hole

27= 150. *

Depth of Well

28= 149. *

Source of Depth Data

29= N *

Water Level

30= 111. *

Date Measured

31= 0000/1956 *

Source

33= N *

Method of Measurement

34= A C E G H L M R S T V Z *

Site Status

37= D F G H Ø P R S T V X Z *

Source of Geohydrologic Data

36= D *

Pump Used

35= *

Measuring Point

266= -3. *

Measuring Point Date

267= 11/02/1965 *

OWNER IDENTIFICATION (1)

R=158 *

T= A D M *

Date of Ownership

159= 0000/1956 *

Name: Last

161= FONTANA *

First

162= NILLAGE OF *

Middle Initial

163= *

OTHER SITE IDENTIFICATION NUMBERS (1)

R=189 *

T= A D M *

Ident

190= WW-0083 *

Assigner

191= USGS *

New Card Same R & T

Ident

190= *

Assigner

191= *

SITE VISIT DATA (1)

R=186 *

T= A D M *

Date of Visit

187= 0908/1964 *

Name of Person

188= GREEN J. H. *

FIELD WATER QUALITY MEASUREMENTS (1)

R=192 *

T= A D M *

Date

193= / / *

Geohydro-logic 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:

reporting, driller, own.
agency

FACILITY

In 2K Data Base verified

Appendix 21: Well WW-83 and WW-2194 documents, USGS site schedule for WW-83, 1979, continued

PRODUCTION DATA (1)

R = 134 146 * T = A D M * Entry No 147 # 1 * Date 148 = 00 00 1956 *
 flowing, pumped add, delete, modify month day year
 Discharge: 150 = 20 * Source of Data 151 = N *
 Method of Measurement 152 = B C E F M O P R T U V W Z *
 bailer, current, estimated, flume, totaling, orifice, pitot-tube, reported, trajectory, venturi, volumetric, weir, other
 Production Level 153 = * Static Level 154 = * Source of Data 155 = 0 * Specific Capacity 272 = 5 *
 Method of Measurement 156 = A C E G H L M R S T V Z *
 airline, calibrated, estimated, pressure, calibrated, geophysical, manometer, reported, steel, electric, calibrated, other
 airline gage pressure gage logs tape tape electric tape Pumping Period 157 = 2 *

LIFT DATA (1)

R = 42 * T = A D M * Type of Lift 43 # A B C J P R S T U Z *
 add, delete, modify air, bucket, centrifugal, jet, piston, rotary, submersible, turbine, unknown, other
 Pump Intake Setting 44 = * Type of Power 45 = D E G H L N W Z *
 diesel, electric, gasoline, hand, LP gas, natural, windmill, other
 Date 38 = month day year Horsepower 46 = *

MAJOR PUMP DATA (2)

R = 47 * T = A D M * Type of Lift 43 # * Lift Entry No 254 # * Manufacturer of Pump 48 = *
 add, delete, modify
 Serial No of Pump 49 = * Name of Power Company 50 = *
 Power Company Account No 51 = * Power Meter No 52 = * Pump Rating 53 = *
 Person or Company Who Maintains the Pump 54 = * Additional Lift 255 = * Rated Pump Capacity 268 = *

STANDBY POWER DATA (2)

(See LIFT DATA for codes of fields 43 and 56 below)

R = 55 * T = A D M * Type of Lift 43 # * Type of Power 56 = * Horsepower 57 = * Lift Entry No 254 # *

AVAILABLE LOG DATA (1)

R = 198 * T = A D M * New Card for Each Log Type Same R & T
 add, delete, modify
 Type of Log 199 # S * Begin Depth 200 = 5 * End Depth 201 = 150 * Source of Data 202 = A *
 199 # * 200 = * 201 = * 202 = *
 199 # * 200 = * 201 = * 202 = *
 199 # * 200 = * 201 = * 202 = *

WATER QUALITY DATA COLLECTION (1)

R = 114 * T = A D M * Begin Year 115 # * End Year 116 = * Source Agency 117 = *
 add, delete, modify
 Frequency of Collection 118 = * Network Site 257 = * Type of Analyses 120 = *

WATER LEVEL DATA COLLECTION (1)

R = 121 * T = A D M * Begin Year 122 # * End Year 123 = * Source Agency 124 = *
 add, delete, modify
 Frequency of Collection 125 = * Network Site 258 = *

WATER PUMPAGE/WITHDRAWAL DATA COLLECTION (1)

R = 127 * T = A D M * Begin Year 128 # * End Year 129 = * Source Agency 130 = *
 add, delete, modify
 Frequency of Collection 131 = * Network Site 259 = * Method of Collection 133 = C E M U Z *
 calculated, estimated, metered, unknown, other

OTHER DATA AVAILABLE (1)

R = 180 * T = A D M * Type of Data 181 # * Loc 182 = C D Z * Format 261 = F M P Z *
 add, delete, modify cooperators, district, other files, machine, published, other
 New Card Same R & T Type of Data 181 # * Loc 182 = C D Z * Format 261 = F M P Z *
 readable

FOOT NOTES:

① Source of Data Codes:

S D Ø A R L G Z
 reporting, driller, owner, other gov't, other logs, geologist, other agency reported,

③ Frequency of Collection Codes

A B C D F I M Ø Q S W Z
 annual, bi-monthly, continuous, daily, semi, intermittent, monthly, one time, quarter, semi-, weekly, other
 monthly annual annual

② Type of Log Codes

A B C D E F G H I J K L M N Ø P O
 time, collar, caliper, driller's, electric, fluid, geologist, magnetic, induction, gamma, dipmeter, laterolog, microlog, neutron, μ later, photo, radio-,
 conduct ray active
 S T U V Z
 sonic, temp, gamma, fluid, other gamma velocity

④ Type of Quality Analyses Codes

A B C D E F G H J K L M Z
 physical, common, trace, pesticides, nutrients, sanitary, codes, codes, codes, codes, codes, all or, other
 chemical elements B&D B&E S&F D&E C&D&E most

12-27-79

Bob Erickson
U.S.G.S
1815 University Av.
Madison Wis 53706

Dear Bob,

I received the information you sent me regarding the well located at the Fontana Disposal Plant. It appears that a few changes have take place since the information was recorded. Please see the inclosed drawing of the well. The location of the well is as stated on the information sheet you sent. However, based upon an engineer's drawing of the S.T.P. which includes elevations, it is difficult to see the top of the casing elevation as 1030 ft above sea level. Although I did not measure it, the 1st floor is not more than 5 ft lower than the casing top. Certainly not the 12.89 ft as would be if all elevations were true. In addition, the casing is not the recorded 3 ft above ground.

It appears that the top 20 ft of the well has since been changed. It is no longer 9" hole clay as shown on the log. It appears to be a 2" casing that's over 6 ft long, yet only sticks above ground approximately 1.29 ft. I believe the next step is to shoot an elevation to the top of the present casing using sea level as datum.

over



Below are listed these elevations that I have measured to date. I have talked to the village and they do not have any additional levels. The Village Engineer is out of town for the next week so I don't know if he would have any.

Date	Ft below casing top.
Jan. 28, 1977	108.0 ft'
Jan. 29, 1979	16.92 ft * Error
Feb. 21, 1979	109.90'
March 20, 1979	109.50'
Nov. 26 1979	105.84'

If I can be of any further help, Give me a call. Let me know what's next.

Sincerely,

Theodore W. Peters,

Field Man - Water Analyst.

Well WW 83

Plant Well

Near Treatment Plant
SW 1/4 SE 1/4 Sec 10 T1N, R
Walworth County Wis.

12-12-79

Service
Building
1st Floor

Floor Elevation 1042.89'

approx.
4.75'

Service
Building
Basement

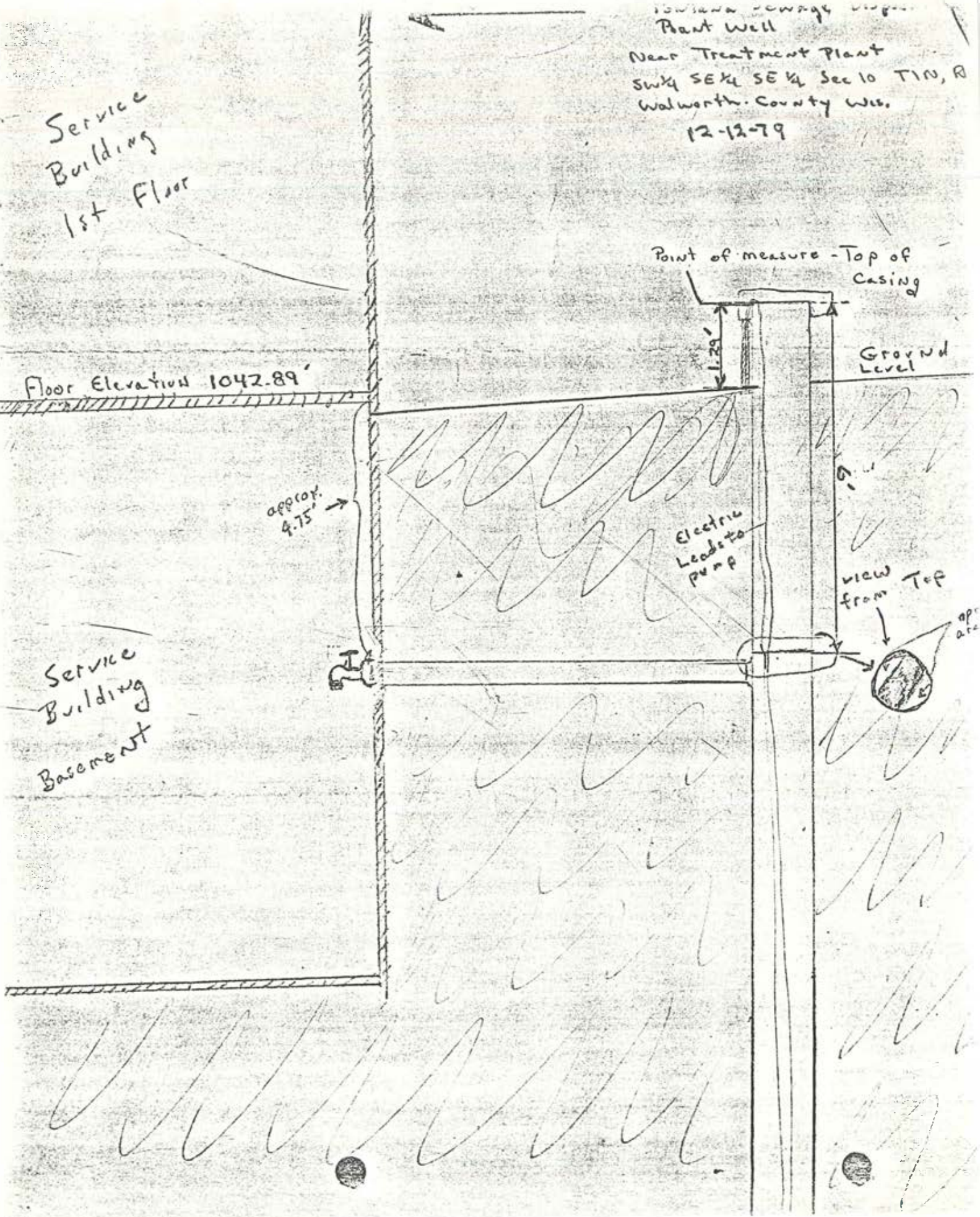
Point of measure - Top of
Casing

Ground
Level

Electric
Leads to
pump

view
from Top

ap
are



WRD/Mad-26

WW-0416E/10-0083

Site Ident. No. 423315088350301

U.S. DEPT. OF INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
GROUND WATER SITE INVENTORY
WATER-LEVEL DATA

HIGHEST WATER LEVEL _____ 19____

LOWEST WATER LEVEL _____ 19____

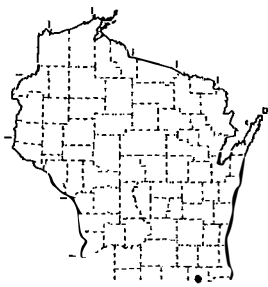
RECORDS AVAILABLE _____

R = 234	*	T =	A	*
---------	---	-----	---	---

DATE			WATER LEVEL (BELOW LSD)			STATUS		METHOD		DATE			WATER LEVEL (BELOW LSD)			STATUS		METHOD		
235 #	01/28/1977	*	237 =	108.0	*	238 =	*	239 =	R *	235 #	/	/	/	/	*	237 =		*	239 =	*
235 #	02/21/1979	*	237 =	109.9	*	238 =	*	239 =	R *	235 #	/	/	/	/	*	237 =		*	239 =	*
235 #	03/20/1979	*	237 =	109.5	*	238 =	*	239 =	R *	235 #	/	/	/	/	*	237 =		*	239 =	*
235 #	11/26/1979	*	237 =	105.84	*	238 =	*	239 =	R *	235 #	/	/	/	/	*	237 =		*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
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235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
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235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
235 #	/	*	237 =	.	*	238 =	*	239 =	*	235 #	/	/	/	/	*	237 =	.	*	239 =	*
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Method of Measurement	239	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	D	E	F	G	H	Ø	P	R	S	T	V	X	Z
	dry,	flowed	flowing,	nearby,	nearby,	obstruction,	pumping,	recently,	nearby,	nearby,	foreign,	surface-water,	other
	recently		flowing	recently	flowing			pumped	pumping	recently	substances	effect	



Walworth County

WW-01/16E/10-0083

SAND AND GRAVEL AQUIFER

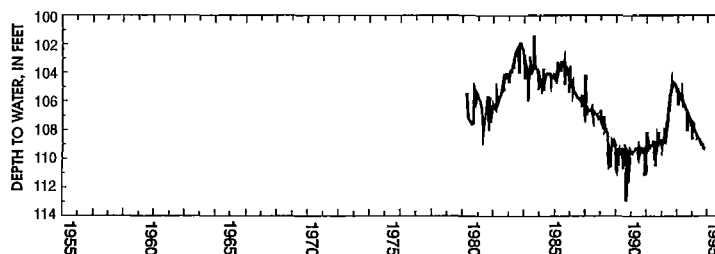
Geophysical Logs

No Logs Available

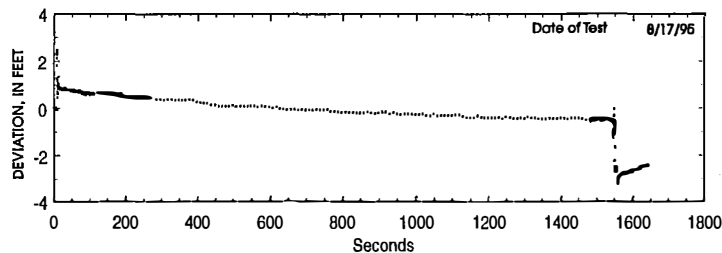
Well Information

Total Depth 149 feet
Cased Depth 134 feet
Casing Diameter 6 inches
Use of Well Non-pumping

Depth to Water Below Land Surface For Period of Record



Deviation From Static Water Level During Displacement \ Recovery Test



Horizontal Hydraulic Conductivity

Hvorslev K

3.3 ft/day



2807 Beck Drive
Waterford, WI 53185

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Fax (262) 534-2155

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WATERWORKS & PLUMBING

**U.S. GEOLOGICAL SOCIETY
ATTN: PETER CHASE**

May 9, 2019

**Re: WELL # WW-83
VILLAGE OF FONTANA PUBLIC WORKS DEPT.
300 WILD DUCK RD.
FONTANA, WI. 53125**

To Whom It May Concern:

On Friday, May 3, 2019, we went to the address above to attempt to clean out or clear the bottom of the well described as Well # WW-83. We were provided with depths and water levels but could not match them up to any well logs we were able to find on any of the DNR databases.

We made several unsuccessful attempts at different methods of "sucking" the debris out of the bottom of the well or "air lifting" it out. Each different method required pulling the piping back out of the well and lowering it back down to the bottom again to start over.

We set the truck up over the well and assembled the vacuum head and air line and began lowering it down the well on threaded, schedule 80 PVC drop pipe for discharging the water and debris from the bottom of the well. No matter what we did or how much air we sent down, we weren't unable to get much water out. When we would get water, there was just a little bit of normal sized scale and sand, but not much volume.

We pulled the vacuum assembly out and re-sized the discharge pipe in an attempt to get more water up and out but we still could not get much to flow out of the well. So we pulled it out again and ran just an air line down to the bottom in an attempt blow the debris and scale up out of the top of the well. This is not advised in a well that flows a lot of water because the water coming in can heave the sand and shut the well off. But here, we're trying to get the well to flow and can't. So by lifting all of the water in the 6" casing, we were hoping it would suck the debris or sand or whatever filled the 4" casing or screen below out of there and make the well start to flow. The water lifted most of the way out, but then ran out of water and stopped. There was not enough water in the well and not enough came into the well to allow it to start to feed and clear that 4" section out. This tells me that the lower, 4" section of the well that has filled in is basically plugged. It could have slowly filled in and hardened or it could be compromised somehow and filled right away and plugged. The 4" section could be broken off and that's why the current "bottom" of the well matches the depth that the diameter changes from 6" to 4".

We could have attempted bailing the well, but when a well is this old and slow, blowing is the best option. Trying to bail it could have just further compacted whatever is in the bottom even tighter. And really, if the vacuum didn't lift anything out, the bailer wasn't going to. It may flow enough to rise and fall with the level of the lake, but it's never going to be able to have a pump put in it or apparently be cleaned out with anything less than a well drilling rig; which I would not recommend. I wish would've been able to clean it up for you. But I think this at least should put an end to it for you. Call or email if you have any further questions. Thank you.

Sincerely,

Todd Bruesewitz
Maas & Sons

WW-83 abandoned and replaced by WW-2194 (VQ875)

7/14/2021

Filed out by driller

Wisconsin Department of Natural Resources

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295 and 299, Wis. Stats., and ch. NR 141 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.

Date of Filling & Sealing: 07/09/2021

Rec #: 169646

Verification. Check only if well filling & sealing was done previously and you are just verifying that work.: No

1. Well Location Information

County: Walworth		WI Unique Well #: not found		DNR Hicap Well #:	
Latitude: (DD.DDDDD°) 42.552 °N		Longitude: (DD.DDDDD°) 88.5883 °W		GPS Method Code: GPS008	
Gov't Lot #:	Qtr/Qtr:	Quarter:	Section #:	Township #: North	Range #:
Well Street Address: 300 WILD DUCK RD				Subdivision Name:	
Well City/Village/Town: Village of FONTANA ON GENEVA LAKE		Well Zip Code: 53125	Lot #:	Does a new well replace this well? yes, WW-2194	
Reason for Filling & Sealing: WW-83 was found to be obstructed and unrepairable				WI Unique Well # of Replacement Well: VQ875	

2. Facility / Owner Information

Facility Name: Public Works	FID #:	Well Name: 65000083 (aka WW-83)	
Original Well Owner: Village of Fontana on Geneva Lake	Service Category:		
Present Well Owner: Village of Fontana on Geneva Lake	Mailing Address of Present Owner: 3817 MINERAL POINT ROAD		
	City: MADISON	State: WI	Zip Code: 53705

3. Well / Drillhole / Borehole Information

Well Type: Water Well	Original Construction Date: 1956	Construction Type: Drilled
Formation Type:	Total Well Depth From Ground Surface (ft.): 149.00	(specify Other):
Casing Diameter (in.): 6.00	Lower Drillhole Diameter (in.):	Casing Depth (ft.): 132
Was well annular space grouted?	If yes, to what depth (ft.):	Depth to Water (ft.): 111.00

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

Pump and piping removed?	Yes	Liner(s) removed? If no liner mark as N/A	N/A	If no, was liner perforated?	
Screen removed?	no	Well casing (or loop if geothermal) left in place?	Yes	Was casing cut off below surface?	Yes
Did sealing material rise to surface?	Yes	Did material settle after 24 hours?	No	If yes, was hole retopped?	
If bentonite chips/pellets were used, were they hydrated from a known water source?					Yes
Method of Placing Sealing Material: Conductor Pipe-Gravity		(Explain Other): FIRST 9', SCREENED AND POURD 140'			
Well Sealing Materials: Bentonite Chips		Product Name and Manufacturer:			
Other Drillholes:					

5. Material Used to Fill Well / Drillhole

Material:	From (ft.):	To (ft.):	# and Units of Sealant:	Mix Ratio or Mud Weight:
BENTONITE CHIPS	Surface	149.00	38	

7/14/2021

Well / Drillhole / Borehole Filling & Sealing

6. Comments			
6" WELL, REDUCING TO 4" @132'			
7. Supervision of Work			
Name of Person or Firm Doing Filling & Sealing: TYDE FOURCE INC DBA MAAS & SONS		License #: 7023	Phone: <u>262-534-2170</u>
29110 EVERGREEN DR WATERFORD WI 53185		Email Address: MAASWATERWORKS@TDS.NET	
8. DNR Use Only			
Signed On: 07/14/2021	Submitted By: Maascentral	Received On: 07/14/2021	Approved On:

The Official Internet site for the Wisconsin Department of Natural Resources
 101 S. Webster Street . PO Box 7921 . Madison, Wisconsin 53707-7921 . 608.266.2621



Wisconsin Geological and Natural History Survey

DIVISION OF EXTENSION
UNIVERSITY OF WISCONSIN-MADISON

October 4, 2019

Wisconsin Groundwater-Level Monitoring Network – Well Owner Document

Re: 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 the Village of Fontana-on-Geneva Lake property. Collaboration by organizations such as yours 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

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 WW-83 (USGS Site No: 423315088350301, USGS Site Name: WW-01/16E/10-0083, WGNHS Well ID: 65000083) 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 WW-83 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 Village property.
- 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 WW-83.
- 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

Pete Chase

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

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

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: **WIGROUNDWATER-LEVEL MONITORING NETWORK**
Local Grid Location of Well: **WW-83 REPLACEMENT WELL**

Well Name: **65002194 (AKA: WW-2194)**
Wis. Unique Well No.: **VQ875**
DNR Well ID No.: **65002194**
Date Well Installed: **10/8/2017**

Type of Well: Well Code **12 / pz**
Distance from Waste/Source: **12 / pz** ft. Enf. Stds. Apply ☐

Section Location of Waste/Source: 1/4 of **1/4** of Sec. **T** N. R. **E**
Location of Well Relative to Waste/Source: ☐ Upgradient ☐ Sidegradient ☐ Downgradient ☐ Not Known

Well Installed By: Name (first, last) and Firm
Chad VanDeKacht
Ground Source

A. Protective pipe, top elevation: **1048.28** ft. MSL
B. Well casing, top elevation: **1048.1** ft. MSL
C. Land surface elevation: **1045.5** ft. MSL
D. Surface seal, bottom: **1044.5** ft. MSL or **1** 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 ☒ **501**
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: **1044.5** ft. MSL or **1** ft.
F. Fine sand, top: **915.9** ft. MSL or **129.6** ft.
G. Filter pack, top: **915.9** ft. MSL or **129.0** ft.
H. Screen joint, top: **913.9** ft. MSL or **131.6** ft.
I. Well bottom: **898.9** ft. MSL or **146.6** ft.
J. Filter pack, bottom: **895.5** ft. MSL or **150** ft.
K. Borehole, bottom: **895.5** ft. MSL or **150** ft.
L. Borehole, diameter: **7** in.
M. O.D. well casing: **2.37** in.
N. I.D. well casing: **1.94** in.

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: **4** in.
b. Length: **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: Bentonite ☒ **30**
Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☐ **33**
b. **35** Lbs/gal mud weight **Bentonite-sand slurry**
c. **31** Lbs/gal mud weight **Bentonite slurry**
d. **50** % Bentonite **Bentonite-cement grout**
e. **3** Ft³ 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. **Bentonite Pellets** Other ☒
7. Fine sand material: Manufacturer, product name & mesh size
a. _____
b. Volume added _____ ft³
8. Filter pack material: Manufacturer, product name & mesh size
a. **#40 Red Flint**
b. Volume added **4.5** ft³
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 **Johnson**
c. Slot size: **0.010** in.
d. Slotted length: **15** ft.
11. Backfill material (below filter pack): None ☒ **14**
Other ☐

PVC SCREEN INTERVAL IS 15'

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

Signature: **Chad VanDeKacht** Firm: **Ground Source**

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.

State of Wisconsin
Department of Natural ResourcesMONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name WI GROUNDWATER-LEVEL MONITORING NETWORK WW-83 REPLACEMENT WELL		County Name WALWORTH	Well Name 65002194 (AKA: WW-2194)	
		County Code 65	Wis. Unique Well Number VQ875	DNR Well ID Number ---

<p>1. Can this well be purged dry? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>2. Well development method</p> <table style="width: 100%;"> <tr><td>surged with bailer and bailed</td><td><input type="checkbox"/> 41</td></tr> <tr><td>surged with bailer and pumped</td><td><input checked="" type="checkbox"/> 61</td></tr> <tr><td>surged with block and bailed</td><td><input type="checkbox"/> 42</td></tr> <tr><td>surged with block and pumped</td><td><input type="checkbox"/> 62</td></tr> <tr><td>surged with block, bailed and pumped</td><td><input type="checkbox"/> 70</td></tr> <tr><td>compressed air</td><td><input type="checkbox"/> 20</td></tr> <tr><td>bailed only</td><td><input type="checkbox"/> 10</td></tr> <tr><td>pumped only</td><td><input type="checkbox"/> 51</td></tr> <tr><td>pumped slowly</td><td><input type="checkbox"/> 50</td></tr> <tr><td>Other</td><td><input type="checkbox"/></td></tr> </table> <p>3. Time spent developing well <u>120</u> min.</p> <p>4. Depth of well (Below land surf.) <u>146.6</u> ft.</p> <p>5. Inside diameter of well <u>205</u> in.</p> <p>6. Volume of water in filter pack and well casing <u>13</u> gal.</p> <p>7. Volume of water removed from well <u>75</u> gal.</p> <p>8. Volume of water added (if any) <u>0</u> gal.</p> <p>9. Source of water added <u>NA</u></p> <p>10. Analysis performed on water added? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, attach results)</p> <p>17. Additional comments on development:</p>	surged with bailer and bailed	<input type="checkbox"/> 41	surged with bailer and pumped	<input checked="" type="checkbox"/> 61	surged with block and bailed	<input type="checkbox"/> 42	surged with block and pumped	<input type="checkbox"/> 62	surged with block, bailed and pumped	<input type="checkbox"/> 70	compressed air	<input type="checkbox"/> 20	bailed only	<input type="checkbox"/> 10	pumped only	<input type="checkbox"/> 51	pumped slowly	<input type="checkbox"/> 50	Other	<input type="checkbox"/>	<p>11. Depth to Water (from top of well casing)</p> <table style="width: 100%;"> <tr> <th style="text-align: left;">Before Development</th> <th style="text-align: left;">After Development</th> </tr> <tr> <td>a. <u>104.40</u> ft.</td> <td><u>139.98</u> ft.</td> </tr> </table> <p>Date b. <u>11/20/2019</u> <u>11/20/2019</u> m m d d y y y y m m d d y y y y</p> <p>Time c. <u>11:30</u> <input checked="" type="checkbox"/> a.m. <u>14:20</u> <input checked="" type="checkbox"/> p.m.</p> <p>12. Sediment in well bottom <u>0.9</u> inches <u>0.0</u> inches</p> <p>13. Water clarity</p> <table style="width: 100%;"> <tr> <td>Clear <input type="checkbox"/> 10</td> <td>Clear <input checked="" type="checkbox"/> 20</td> </tr> <tr> <td>Turbid <input checked="" type="checkbox"/> 15</td> <td>Turbid <input type="checkbox"/> 25</td> </tr> </table> <p>(Describe) <u>Red brown</u></p> <p>Fill in if drilling fluids were used and well is at solid waste facility:</p> <p>14. Total suspended solids <u> </u> mg/l <u> </u> mg/l</p> <p>15. COD <u> </u> mg/l <u> </u> mg/l</p> <p>16. Well developed by: Name (first, last) and Firm</p> <p>First Name: <u>Peter</u> Last Name: <u>Chase</u></p> <p>Firm: <u>WI Geological Survey</u></p>	Before Development	After Development	a. <u>104.40</u> ft.	<u>139.98</u> ft.	Clear <input type="checkbox"/> 10	Clear <input checked="" type="checkbox"/> 20	Turbid <input checked="" type="checkbox"/> 15	Turbid <input type="checkbox"/> 25
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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: Peter M ChasePrint Name: Peter M ChaseFirm: Wis Geological Survey

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

Appendix 21: Well WW-83 and WW-2194 documents, soil boring form for WW-2194, 2019

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**
WW-83 REPLACEMENT WELL

Well Name
65 002194 (AKA: WW-2194)

Boring Drilled By: Name of crew chief (first, last) and Firm
First Name: **Chad** Last Name: **VandeYacht**

Date Drilling Started
10 / 07 / 2019

Date Drilling Completed
10 / 08 / 2019

Drilling Method
**Air Rotary w/
casing hammer**

Firm: **Groundsource**

WI Unique Well No.
VQ875

DNR Well ID No.

Well Name
WW-2194

Final Static Water Level
944.1 Feet MSL

Surface Elevation
1045.5 Feet MSL

Borehole Diameter
6 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane **N** **E**

Lat **42 033 '11 "**

Local Grid Location

SE 1/4 of **SE** 1/4 of Section **10** , T **1** N, R **16E**

Long **-88 035 '04 "**

Feet ☐ N ☐ E

Facility ID

County
Walworth

County Code
65

Civil Town/City/ or Village
Fontana-on-Geneva Lake

Sample Number and Type	Length An. & 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					RQD/ Comments
									Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	
1			0-5	FILL sandy gravel w/ 15% fines, moist, dark brown 7.5YR3/2										
2			5-10	SILTY SAND 25% fines, dark brown 7.5YR3/4	SM									
3-7			10-35	SILTY SAND W/ GRAVEL, 60% sand 20%fines 20% gravel, brown 7.5YR6/3, moist	SM									
8			35-40	As above but driller reports cobbly										
9-16			40-80	POORLY SORTED GRAVEL W/SAND 75% gravel 25% sand, Light brown 7.5YR6/3,moist	GW									
17-28			80-140	POORLY SORTED SAND W/ GRAVEL 75% sand 25% gravel, trace silt, brown 10YR5/3, wet at about 105 ft	SW									
29-30			140-150	SILTY SAND W/ GRAVEL, 60% sand 20%fines 20% gravel, wet, dark greyish brown 10YR4/2	SM									
All Grab samples				END OF BORING 150 feet (below land surface) Set 2" Sch 80 PVC monitoring well w/ screen 147-132' bgs										

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

Signature

PMChase

Firm

WGNHS

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.