

GROUNDWATER QUALITY REPORT FOR DEWITT TOWNSHIP

2021

Project Description

A majority of people in DeWitt Township, Clinton County Michigan, obtain their water from wells which are completed in the Pennsylvanian-age Saginaw bedrock groundwater aquifer. However, there are some wells which were completed in the Jurassic-age Red Bed Aquifers which consist of primarily clay, shale, and gypsum.

From 1983 to 1987 a groundwater survey was conducted in Ingham County as part of a larger project that included 18 other counties which assessed the groundwater quality. A total of 326 wells were sampled throughout the county to get a quality understanding of the groundwater. In addition, the wells were selected in a fashion to provide an adequate spread over the township. The purpose of this study was to establish a baseline of water chemistry to determine potential changes over time in the area.

The 1983 study indicated some local concerns associated with activities such as road salting, levels of arsenic, nitrate, boron, and fluoride above drinking water standards and recommendations. Another concern was the nearby landfills contaminating the groundwater. The results helped Ingham County start programs to protect ground water. An updated study for Ingham County was conducted from 2015 to 2020 to compare the data from the 1983 study to the new data.

Similar to past studies conducted in Ingham County, this 2021 study on DeWitt township aims to collect baseline water chemistry data for the area, as DeWitt Township currently doesn't have historical water quality data. In addition, the information collected during this study is useful for water quality and groundwater management. The 17 wells that were sampled in Dewitt Township were spread evenly throughout the township. The survey is best conducted every 10 to 20 years to monitor minor changes in the groundwater quality.

Benefits for DeWitt Township

1. Provide the community with a report on the condition of their sole source of drinking water and if any Public Health concerns need to be addressed. This may include levels of important main drinking water parameters such as arsenic, nitrates, boron, fluoride, and chloride test results.
2. Participating homeowners will receive their own individual extensive water test report which can be used to help manage and plan their individual water treatment needs, such as the installation of water softener devices or filters.

3. A presentation of the results and what it means for the community would be provided during a meeting at the Township Hall. This information can be used for future planning and management associated with the future protection of this important and exclusive resource for drinking water. The information can also be used in connection with Well Head Protection projects currently being done in the County.

How sampled wells with problem drinking water test results were addressed

Homeowners will each receive a copy of their individual test results. If a test result, or test results, indicate a drinking water concern and or exceed an established drinking water standard that represents a public health issue, the homeowner will be notified as soon as possible by phone or email. The homeowner will be consulted about the test results and options for correcting the drinking water concern.

For example, if the test results indicate an arsenic level above the drinking water standard of 10 ppb, they will be informed of the risks involved with drinking water with levels this high and the possible filtration devices available to treat the water. The goal is to inform the homeowner of the conditions of their drinking water resource. This would be analogous to having a blood test done by your family doctor and they find your cholesterol levels are too high. The doctor will then consult with the patient on the steps they should take to correct this concern. This will also be explained in a cover letter to the homeowner which will include some educational material on the test results. If homeowners still have further questions about the test results, there will be phone numbers and resources available for them to discuss the results with.

Results of the 2021 Survey

A total of 17 wells were sampled over the duration of this 2021 study. Coliform Bacteria presence was tested and found in only three of the wells. Of these three wells, E. Coli was not present in any of the wells. Various water chemistry parameters were also tested from the samples collected in order to assess the groundwater quality. Average values of the primary parameters tested were calculated.

Table 1: Mean values of 2021 water chemistry data. All values are shown in parts per million (ppm) except pH and conductivity which is shown in units of micro-Siemens per centimeter.

Parameter	2021 Mean
Alkalinity	298.24
Arsenic	0.0050
Boron	0.267
Calcium	77.47
Chloride	12.70
Conductivity	571.00
Fluoride	0.44
Hardness	307.06
Iron	0.89
Magnesium	27.94
Nitrate	<0.10
pH	7.48
Potassium	2.46
Silica	12.79
Sodium	13.34
Sulfate	23.39

For parameter results that were non-detectable, the value inputted to calculate the average was estimated to be one third of the reporting limit for all reported non-detectable levels for a given parameter. This was done because parameter results reported as non-detectable don't guarantee the parameter is completely absent from the sample. In the study, nitrate was non-detectable in all well samples and therefore the mean was less than the reporting limit of 0.10 ppm.

Results of the study reveal very hard groundwater in the area with an average hardness level was 307.06 ppm. Water is considered very hard when levels are above 180 ppm. Extreme hardness in the area is most likely a result of high levels of magnesium and calcium present in surrounding soil and rock in the area that dissolve into the groundwater. High levels of hardness are not a health concern but can be an inconvenience as it could cause mineral build up in piping or affect the efficacy of soaps. Similarly, iron concentrations in 12 of the wells sampled were at or above the recommended limit of 0.30 ppm. This is also not a health concern but could affect the taste and odor of the water and cause discoloration and staining.

Conductivity levels are reflective of the concentration of ions in the groundwater. Elevated levels of conductivity can potentially be attributed to the use of road salt or water softener discharges. Home water softeners are often installed in houses in the area because of hard well water. Water softeners discharge wastewater containing calcium, magnesium and iron removed from the hard water as well as excess sodium and chloride from the resin tank of the water softener. If this wastewater is discharged too close to the water supply well, it may impact the well water concentrations of chloride, sodium, magnesium or calcium.

Outside the primary parameters analyzed, other water chemistry parameters were tested to ensure safe drinking water based on the National Primary Drinking Water Regulations.

Table 2: Comparison of 2021 survey data with parameters regulated by the EPA as part of the National Primary Drinking Water Regulations. All values are in parts per million (ppm).

Parameter	National Primary Drinking Water Regulations	2021 Mean
Arsenic	0.010	0.0050
Barium	2.00	0.18
Cadmium	0.005	<0.001
Chromium	0.10	0.0019
Copper	*TT action level =1.30	0.0027
Fluoride	4.00	0.44
Lead	*TT action level =0.015	<0.0010
Mercury	0.002	<0.0002
Nitrate	10.00	<0.10
Selenium	0.050	<0.001
Nitrite	1.00	<0.10

*Lead and Copper are monitored through Treatment Techniques (TT) set by the Lead and Copper Rule (LCR). LCR requires action if more than 10% of customers taps sampled exceed the action level.

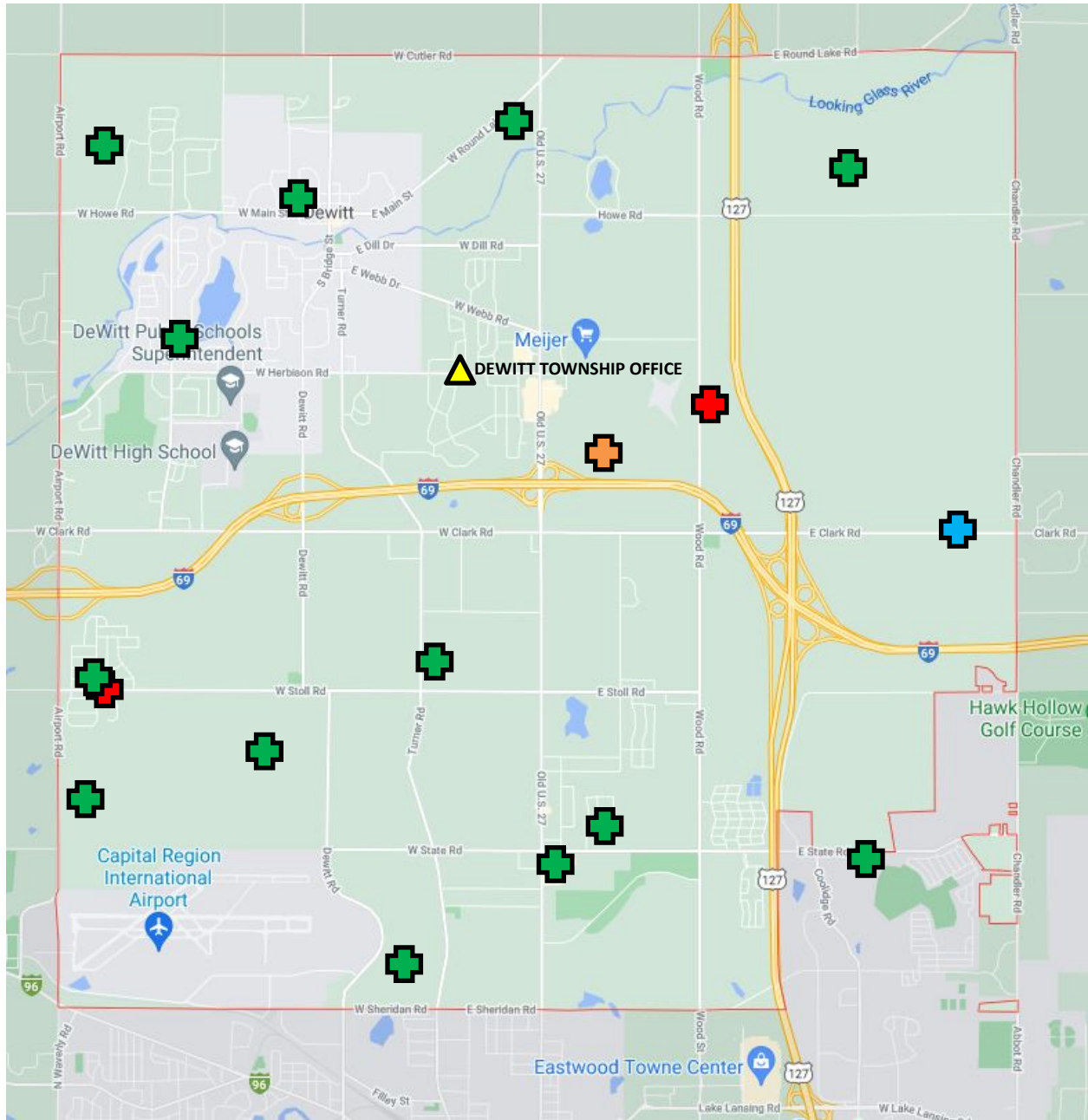
Parameters were non-detectable for all wells sampled for cadmium, mercury, nitrate, selenium and nitrite. Only one well showed detectable levels of lead, however this level was still below the EPA action level. All other parameters tested, though detectable, were under the Primary Drinking Water Standards for all wells sampled in DeWitt Township. The average arsenic level in the township was below the EPA standard; however, arsenic was above the standard in three of the wells tested. These homeowners will be contacted via phone or email to discuss potential options to address these levels of arsenic.

DeWitt Township groundwater data was compared to that of neighboring Ingham County and Bath Township data. Comparison between the three areas revealed higher levels of chloride and conductivity levels in Ingham County than Bath and DeWitt Townships. This difference could potentially be a result of higher usage of road salt in Ingham County.





Table 3: Comparison of 2021 DeWitt Township survey data with 2020 Ingham County survey data and 2021 Bath Township survey data. All values are in parts per million (ppm) except pH and conductivity which is shown in units of micro-Siemens per centimeter.

Parameter	2021 Bath Township Mean	2020 Ingham County Mean	2021 DeWitt Township Mean
Alkalinity	262.6	325.4	298.24
Arsenic	0.0028	0.0026	0.0050
Boron	0.688	0.627	0.267
Calcium	76.2	85.6	77.47
Chloride	5.7	33.3	12.70
Conductivity	542.0	797.7	571.00
Fluoride	0.57	0.44	0.44
Hardness	289.1	328.9	307.06
Iron	0.52	1.11	0.89
Magnesium	24.09	26.18	27.94
Nitrate	<0.10	0.12	-0.10
pH	7.46	7.40	7.48
Potassium	3.50	2.95	2.46
Silica	10.5	12.4	12.79
Sodium	14.7	42.2	13.34
Sulfate	38.4	51.1	23.39

DEWITT TOWNSHIP WELL TESTING SITES

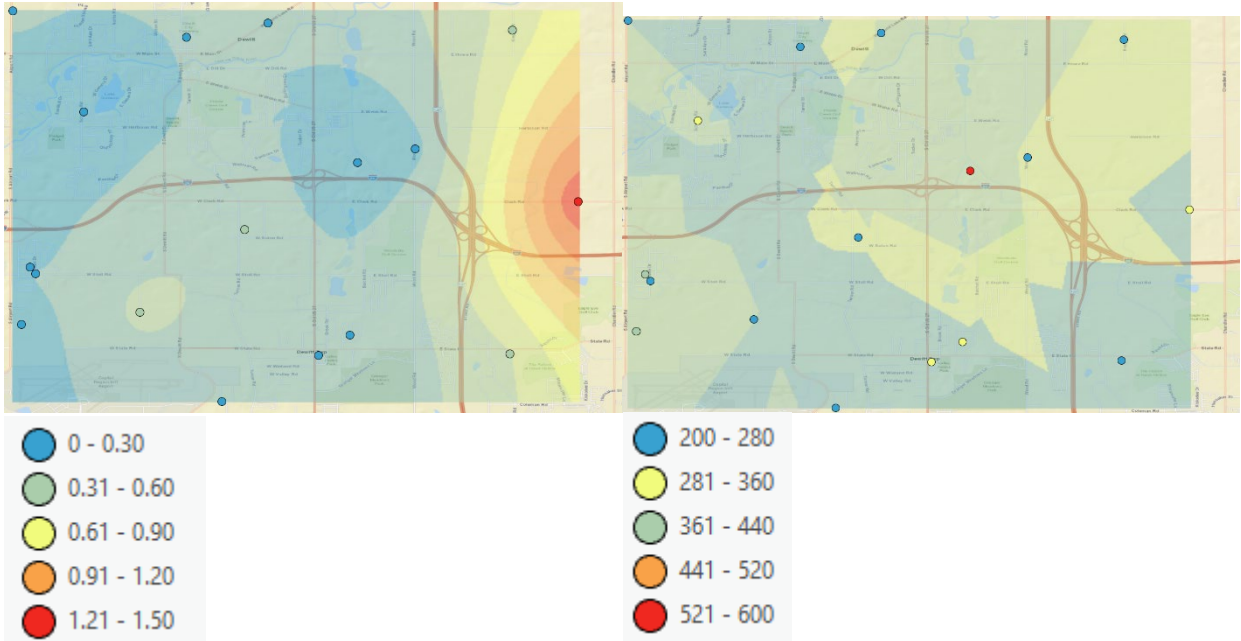


SCALE
ONE MILE

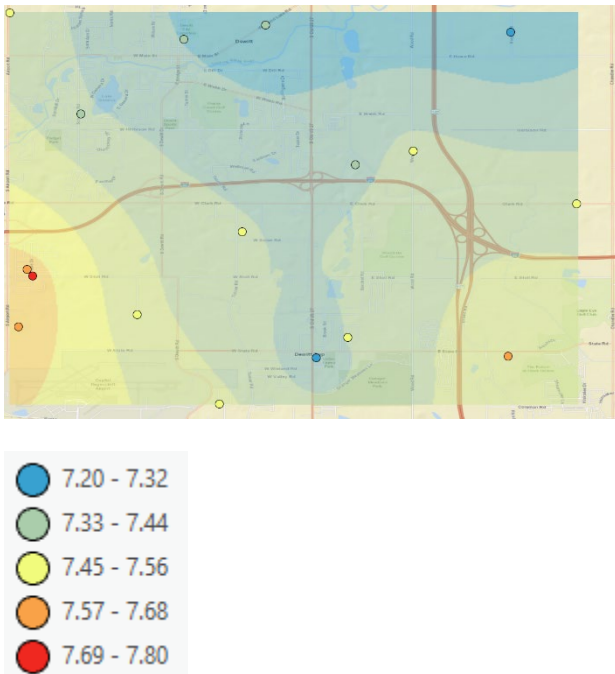
-  AVERAGE WATER CHEMISTRY
-  BORON AT 1.0 PPM OR HIGHER
-  ARSENIC AT EPA STANDARD OF 10 PPB OR HIGHER
-  ARSENIC AT EPA STANDARD OF 10 PPB OR HIGHER AND CHLORIDE ABOVE AVERAGE LEVELS

Boron Levels for DeWitt Township

pH Levels for DeWitt Township



Hardness Levels for DeWitt Township



These three maps show the distribution of boron, pH, and water hardness in DeWitt Township groundwater. The water quality data to create these chemistry level or topographic maps used data from the 17 wells sampled in 2021.

Acknowledgements

This project would like to thank Garry Rowe for his important contribution to the organization and execution of this project. The project would not have been possible without his assistance with field work, data analysis and development of the DeWitt Township Water Quality Report.

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Finally, this study would not have been possible without the support from DeWitt Township and the willingness of the homeowners who participated in the study.

References

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- World Health Organization (WHO), 1996, Iron in Drinking-water at https://www.who.int/water_sanitation_health/dwq/chemicals/iron.pdf

GROUNDWATER QUALITY REPORT

FOR

DEWITT TOWNSHIP 2021

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September 27, 2021