

GROUNDWATER MONITORING PROGRAM

Date	05/02/2024
To / Contact info	BCWD Board of Managers; Karen Kill, District Administrator
From / Contact info	Stu Grubb, PG; John Sarafolean, EOR
Regarding	2023 Groundwater Elevations and Trends

Background

BCWD has established a network of wells for measuring groundwater levels. The network includes residential wells, golf course wells, and DNR observation wells. Water level measurements are collected annually at the residential wells and golf course wells. Water level measurements are recorded hourly at the DNR observation wells using data loggers.

The data has been collected since 2012. The data is used to identify trends in groundwater levels and changes to groundwater flow over time. Changes to levels and groundwater flow can have significant effects on Brown’s Creek and other groundwater dependent natural resources, flooded areas such as Kimbro Basin, and stormwater infiltration basins.

The well network was established to cover the entire watershed district, and also to monitor each of the major drinking water aquifers in the watershed district. The distribution of wells by aquifer is:

- Quaternary (Glacial) – 7
- St. Peter - 1
- Prairie du Chien – 10
- Jordan/St. Lawrence – 2
- Tunnel City Group – 4
- Multi-Aquifer – 1

Analysis

Residential Wells

Groundwater elevation data from the golf course wells, residential wells, and DNR observation wells) are shown in Table 1. Groundwater elevations decreased from 2022 to 2023 with an average decrease of 0.97 feet. The decrease is not surprising considering below average rainfall and snowfall in 2022 and 2023.

DNR Observation Wells

DNR measures water elevations monthly in four observation wells:

- Brown’s Creek Park – Deep well completed in the Jordan aquifer
- Brown’s Creek Park – Shallow well completed in the Quaternary (glacial) aquifer
- Brown’s Creek Park – Middle well completed in a confined Quaternary aquifer
- Withrow School – Well completed in the Prairie du Chien aquifer
- Kimbro – Shallow well completed in the Quaternary (glacial) aquifer

Groundwater elevation data from the DNR observation wells are shown on Figure 1. The data for the Withrow well shows that the water level has been dropping since reaching a high level of 960.05 in June 2020. The groundwater elevation in the Brown’s Creek Park – Shallow well does not fluctuate much from year to year (due to its hydraulic connection and influenced by the elevation of Brown’s Creek) but has also been dropping since mid-summer 2020. The Brown’s Creek Park – Shallow well was abandoned and sealed in 2021. The Brown’s Creek Park – Deep well groundwater

elevations have also dropped during the recent time period and can fluctuate by as much as six feet over short time periods. This observation is the result of pumping from a nearby well (probably Oak Glen Golf Course) and will be investigated more in the upcoming months. The Brown's Creek Park – Middle well shows dropping groundwater elevations since the beginning of the observation period in October, 2020. Note that the 2023 data is still considered provisional at this time. The Kimbro – Shallow well was added to the report this year and the groundwater elevations decreased from 2021 to 2022, increased in late spring 2023 to a high of 930.31, and decreased into 2023.

Golf Course Wells

The golf course wells showed similar trends to the other wells.

Change in Water Levels in Each Aquifer

Groundwater levels in each aquifer were compared to identify trends over time. Residential well and DNR observation well levels were used for the analysis. The golf course wells have not been measured for as long, and the water level readings tend to be less reliable due to the large pumping volume.

Quaternary (Glacial) Aquifer

Groundwater levels in the shallow Quaternary aquifer wells are shown on Figure 2. Three of the wells show an increase of about 8 feet since 2012 (although down slightly from 2020). Three of the wells show significantly less increase, about 3 feet. Two wells shows very little increase, less than two feet. The well that shows the least increase is located in Brown's Creek Park, near Brown's Creek. The water level in the well is stabilized by the relatively constant water level in the Creek and the discharge of groundwater from the aquifer to the Creek. The variation in water levels among the wells indicates the importance of having water level readings from several areas across the watershed.

Prairie du Chien Aquifer

Groundwater levels in the Prairie du Chien aquifer are shown in Figure 3. Most of the wells showed a consistent increase of 8 to 10 feet from 2012 to 2020 and then dropped from 2021 to 2023. One well, the Wiersma well, shows less of an increase. This well has a shallow depth to water and is located closest to Brown's Creek (about 300 feet). The relatively stable water level may indicate that this well and this aquifer are influenced by Brown's Creek.

Other Aquifers

Groundwater levels from the St. Peter, Jordan, and Tunnel City Group aquifers are shown on Figure 4. The wells show similar trends over time, a rise from 2012 to 2020 followed by a drop from 2021 to 2023.

Recommendations

BCWD should continue to collect groundwater elevation data on an annual basis. The long-term data and analyses are important for understanding groundwater conditions and groundwater/surface water interactions throughout the District. The data will be particularly useful for understanding the thermal impairment of Brown's Creek and water level fluctuations in landlocked areas such as the Kimbro Basin.

Table 1. Groundwater Elevations

Unique Number	Name	2016 Water Elevation	2017 Water Elevation	2018 Water Elevation	2019 Water Elevation	2020 Water Elevation	2021 Water Elevation	2022 Water Elevation	2023 Water Elevation	Change since last measure
Approximate Date		Oct-16	Oct-17	Oct-18	Oct-19	Oct-20	Oct-21	Oct-22	Oct-23	
Golf Course Wells										
515171	Applewood Hills	891.84	895.42	894.14		897.65	895.58	891.45	890.67	-0.78
151580	Oak Glen Country Club	825.50	825.88	823.56	826.12	825.63	823.00			
151581	Oak Glen Country Club	829.71	830.12	828.16	828.23	828.78	829.19	827.95	828.41	0.46
208038	Stillwater Country Club	769.17	>200	>200	>200					
Stillwater Oaks 1	Stillwater Oaks Golf Club	910.31	913.42	910.11	912.41					
Stillwater Oaks 2	Stillwater Oaks Golf Club	908.89	910.27	909.05	913.60	913.72	909.95			
Stillwater Oaks 3	Stillwater Oaks Golf Club	910.27	911.26	910.07	911.90	912.46	911.02			
Stillwater Oaks 4	Stillwater Oaks Golf Club	963.06	Artesian	957.69	970.29	970.16	970.81			
566145	Logger's Trail Golf Course	904.41	905.62	904.16	905.93	907.20				
667998	Logger's Trail Golf Course	911.29	906.28	905.10	907.34	908.40	905.30	905.08	903.48	-1.60
761112	Logger's Trail Golf Course	900.53	901.16	900.09	901.94	903.55	900.71	899.18	898.15	-1.03
Domestic Wells										
428563	Ed and Laurie Francis	900.51	902.53	900.91	903.36	906.14	903.71	900.80	898.79	-2.01
410987	Dan and Lori Gunderson	904.96	906.98	905.62	907.22	910.22	908.10	905.35	903.18	-2.17
196839	Louis J. Bruno	862.92	867.75	866.75	866.40	870.28	868.23	931.72		
Leiser	Craig Leiser	932.63	935.11	933.99	935.85	937.65	934.01	932.67	931.34	-1.33
James	Alan and Molly James	939.62	941.71	940.20	942.14	944.20	940.56	938.70	937.55	-1.15
184049	Kirk and Tracy Hillquist	942.27		942.48	944.77	945.61	941.11	939.87	939.12	-0.75
Thatcher	Jyneen Thatcher	953.76	955.68	953.19	957.18	958.63	953.89	951.60	950.91	-0.69
138188	Rick Vanzwol	937.89	940.02	939.36	941.45	943.96	940.84	937.81	936.11	-1.70
479665	John and Michelle Weaver	907.27	907.41	906.86	907.77	908.87	907.23	905.85	907.22	1.37
493250	Mark and Sharon Olien	721.88	719.97	721.50	721.54	721.89	721.01	711.66		
525197	James and Marilyn Opp	912.08	913.88	913.02	914.69	917.18	914.69	912.42	910.66	-1.76
505390	Larry J and Pamela J Larson	928.67	930.48	929.18	932.29	933.50	932.93	930.09	927.93	-2.16
153485	John P and Carolyn A Rydel	897.42	899.51	898.47	899.31	901.08	897.14	896.83		
138904	Duane and Margaret Burmeister	829.25	829.91	828.41	830.33	832.27	828.69	827.62	827.55	-0.07
406204	Michael and Rita Wiersma	941.10	941.38	940.98		942.78	940.28	939.17	938.86	-0.31
Boughten	Larry Boughten		953.73	951.32	954.28	956.81	949.52	948.51	947.53	-0.98
DNR Observation Wells										
595649	Brown's Creek Park - Deep	866.32	864.77	865.81	868.11	868.20	866.17	865.21	864.38	-0.83
623066	Brown's Creek Park - Shallow	875.53	875.77	875.05	876.84	876.88	875.30	875.01		
551565	Withrow Elementary School	954.17	956.88	954.91	958.64	959.50	954.83	951.99	951.10	-0.89
834170	Brown's Creek Park - Middle					875.59	874.15	873.43	873.09	-0.34
281129	Kimbro - Shallow						929.73	926.75	926.82	0.07
							Average			-0.97

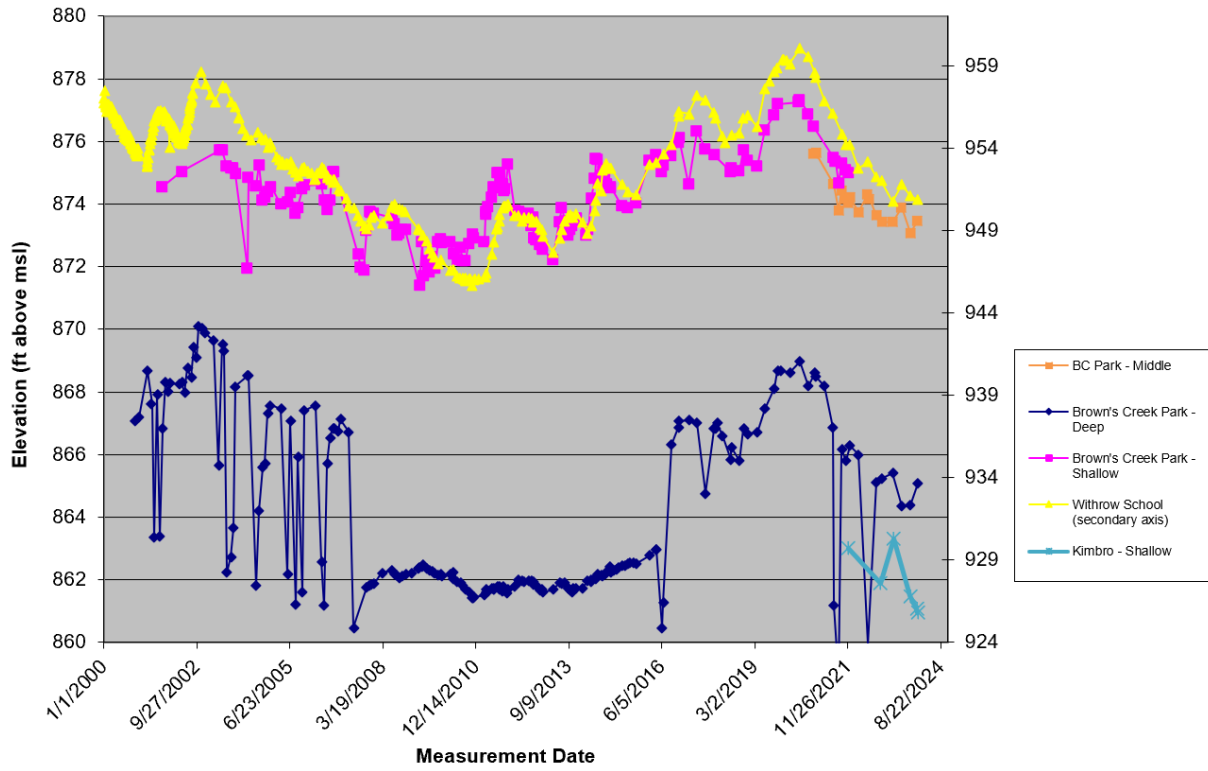


Figure 1. Groundwater Elevations – DNR Observation Wells

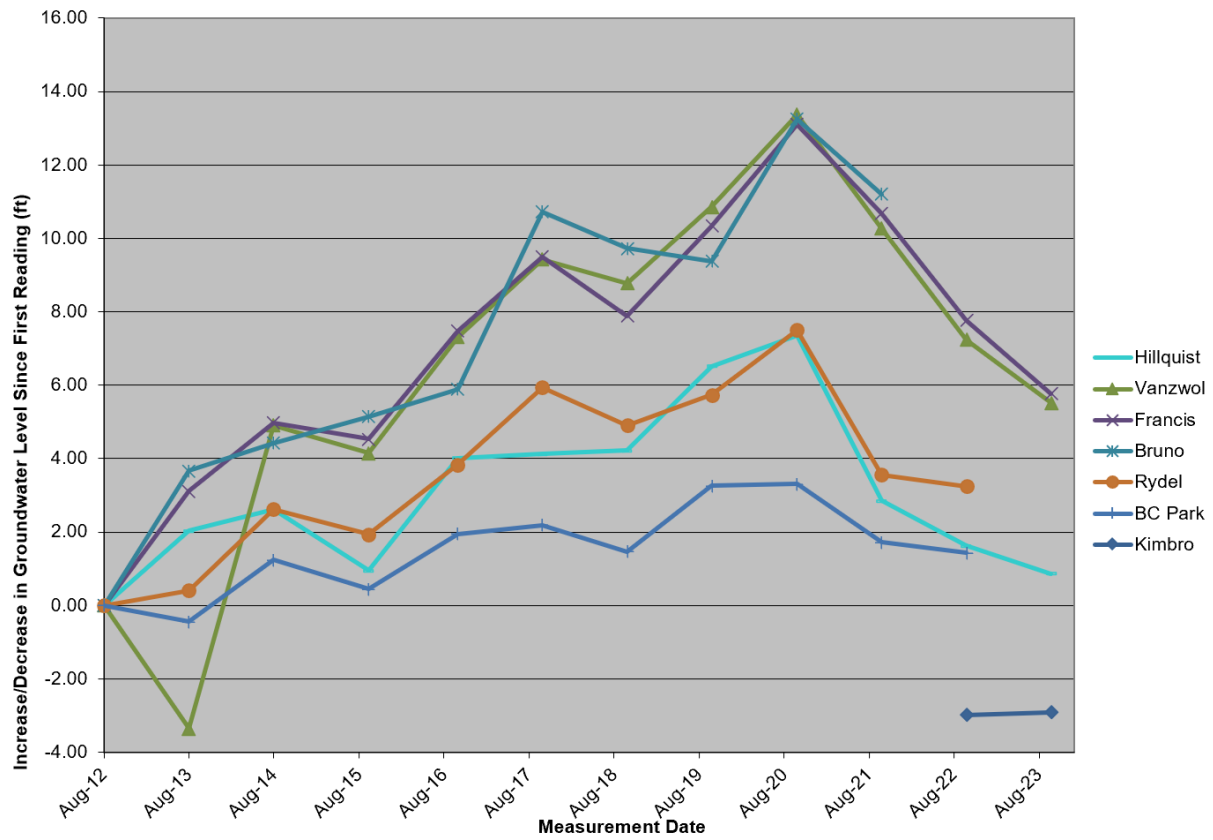


Figure 2. Groundwater Level Change Over Time - Quaternary (Glacial) Aquifer Wells

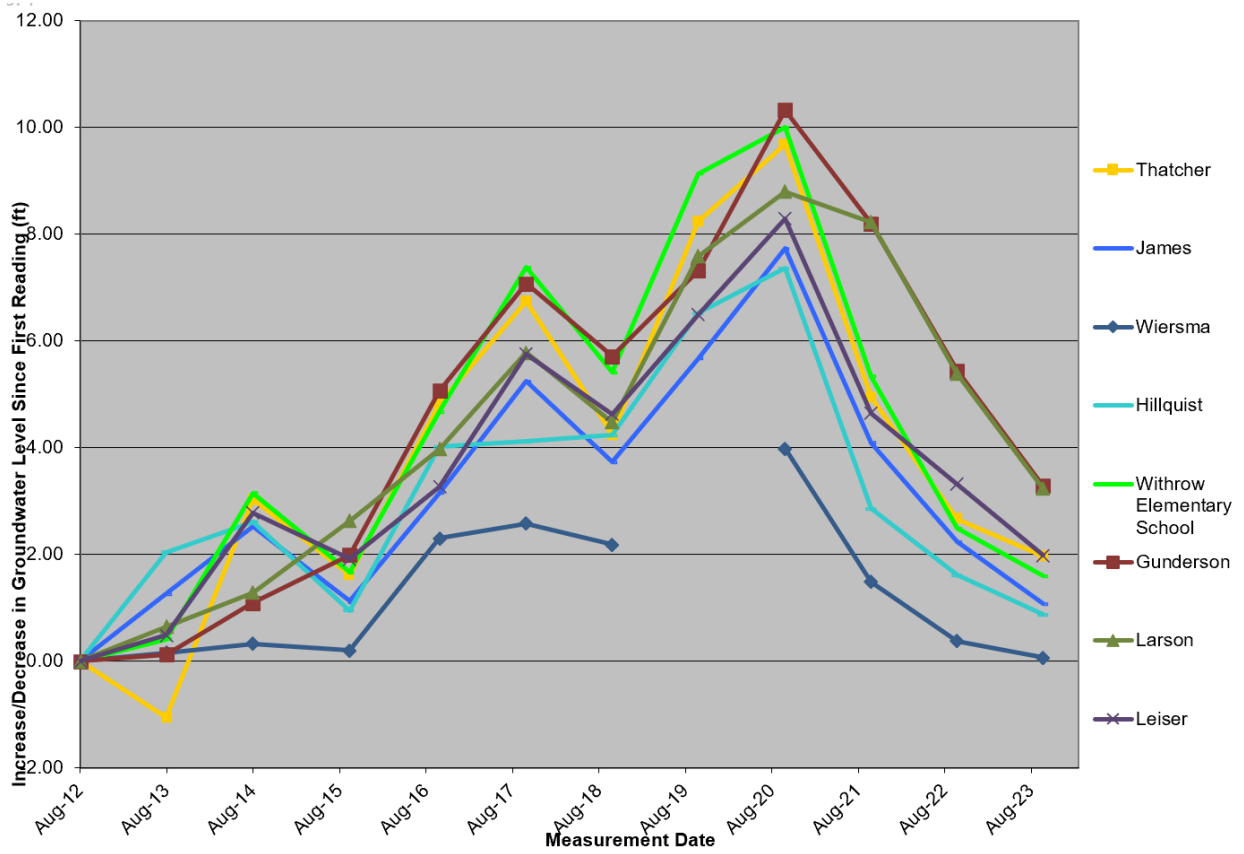


Figure 3. Groundwater Level Change Over Time – Prairie du Chien Aquifer Wells

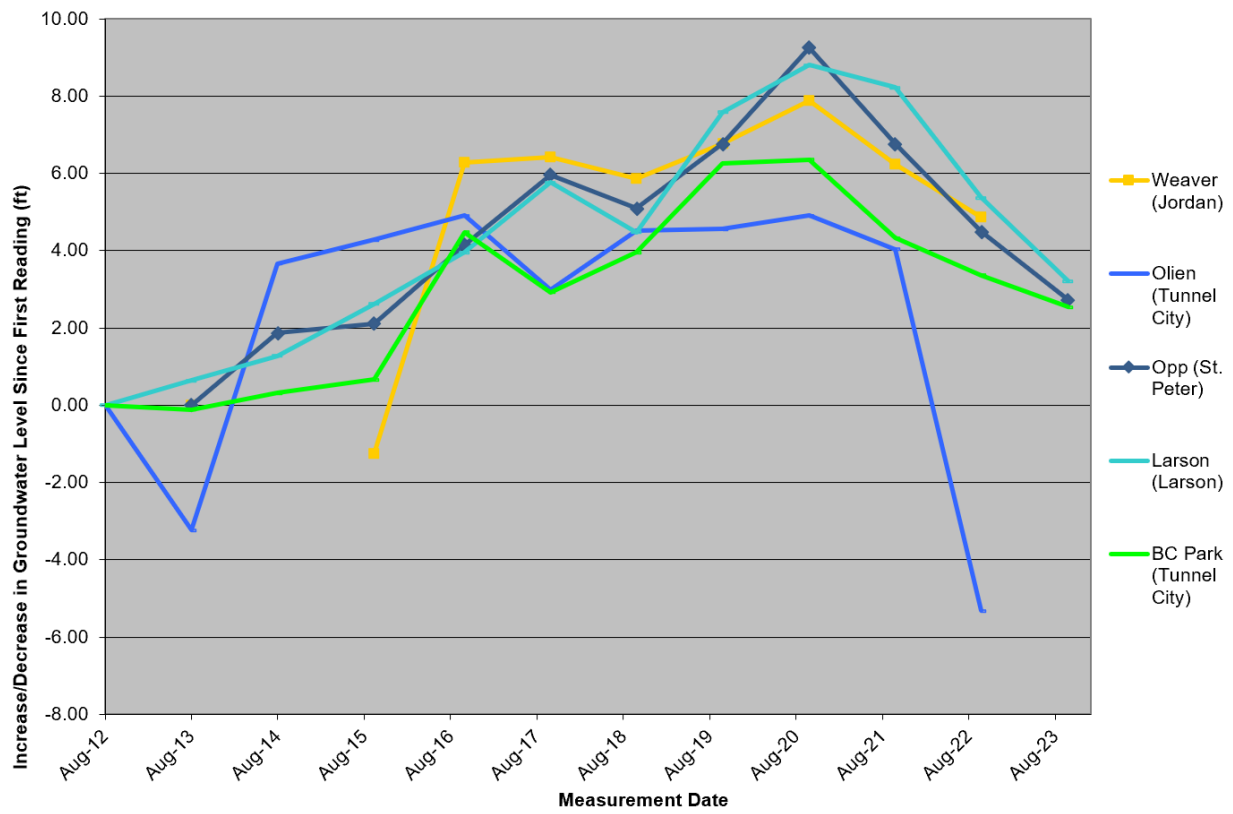


Figure 4. Groundwater Level Change Over Time - Wells in All Other Aquifers