memo

Project Name |	Groundwater Monitoring Program	**Date** |	03/03/2025
To / Contact info |	BCWD Board of Managers		
Cc / Contact info |	Karen Kill, District Administrator		
From / Contact info |	Stu Grubb, PG; Dan Heikes, EOR		
Regarding |	2024 Groundwater Elevation 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

See Figure 1 for a cross-section of aquifers (underground layer of water-bearing material, consisting of permeable or fractured rock, or of unconsolidated materials such as gravel, sand or silt) and aquitards (any geological formation that transmits water at slower rates than an aquifer) in the Twin Cities Metro Area.

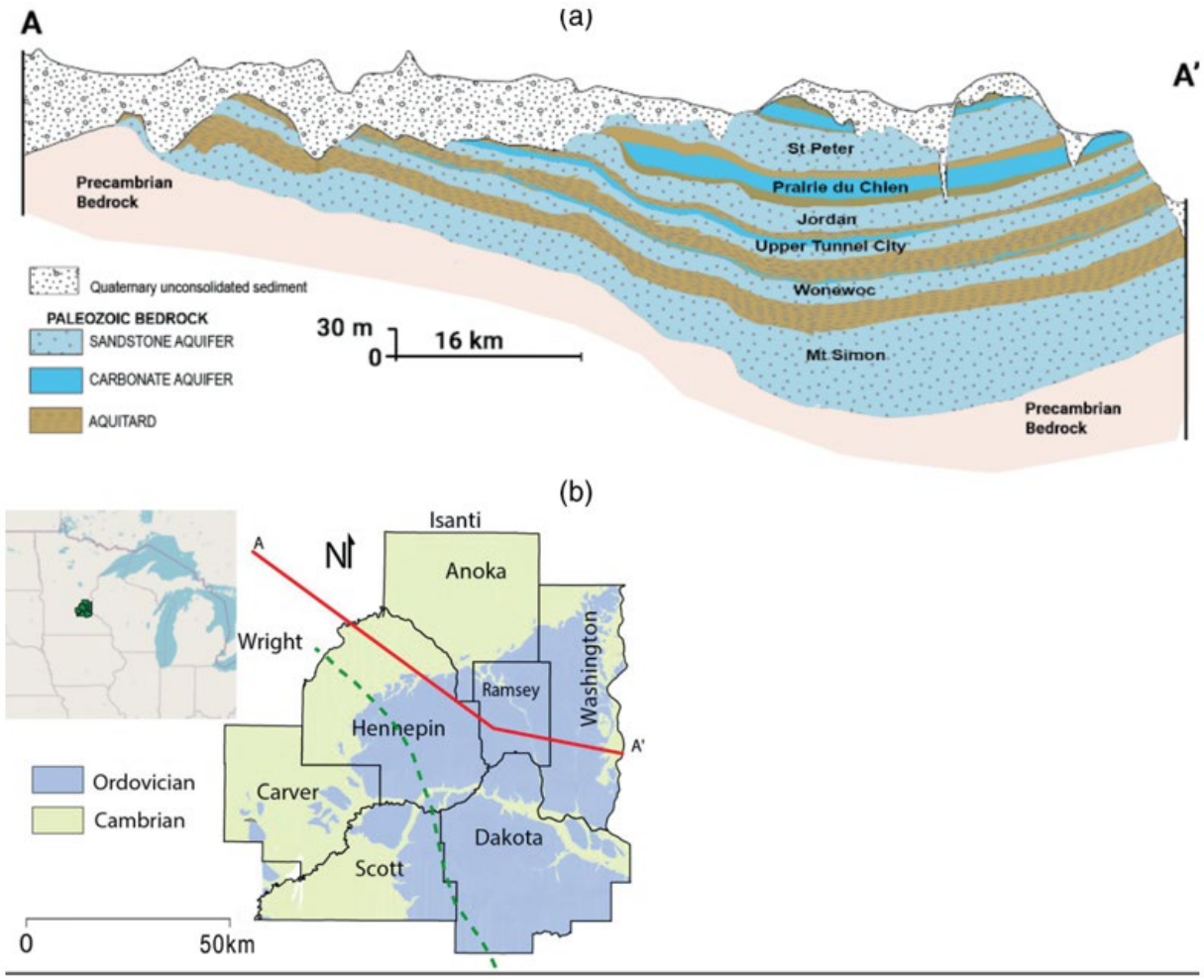

Figure 1. (a) Cross-section of Aquifers and Aquitards in the Twin Cities Metro Area; (b) Location of Cross-section

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 2023 to 2024 with an average decrease of 0.64 feet. The decrease is not surprising considering below average rainfall and snowfall in 2023 and 2024.

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 [abandoned]
- 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 2. 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, but has seen a slight increase over the past year. The Brown's Creek Park – Shallow well was abandoned and sealed in 2021. The Brown's Creek Park – Deep well groundwater elevations 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 when the District obtains pumping data from the Oak Glen Golf Course. The Brown's Creek Park – Middle well shows dropping groundwater elevations since the beginning of the observation period in October, 2020, but has increased by 1.71 feet from 2023-2024. The Kimbro – Shallow well became part of the monitoring program in 2021. All the DNR observation wells water levels have increased from 2023 to 2024.

Golf Course Wells

Some of the water levels in the golf course wells did not change much, but there were some notable decreases (See Table 1). Oak Glen Country Club (151581) saw a decrease of 17.45 feet and Logger's trail Golf Course (761112) saw a decrease of 8.83 feet from 2023 to 2024. The reason for the decreases is unclear. It is possible that the wells had not yet recovered from their most recent pumping event. For now, we will use the annual monitoring data to review whether the water levels stabilize or continue to decrease next year.

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 3. Two of the wells show an increase of about 6 feet since 2012 (slightly up from 2023, but down from 2020). Two of the wells show significantly less increase since 2012, about 0-2 feet. Out of the five Quaternary wells that were measured this year, three showed decreasing water levels and two showed increasing water levels. Variations across the aquifer may indicate a number of influences, including changes to discharge/recharge areas, changes in pumping rates, and variable precipitation and snowmelt rates. It is important to have multiple sampling locations to see not only the general gradient of groundwater flow, but also differences between aquifers (vertical) and areas within the aquifer (horizontal). These local differences can result in challenges that require special solutions as well as larger trends that may warrant changes to watershed management policies.

Prairie du Chien Aquifer

Groundwater levels in the Prairie du Chien aquifer are shown in Figure 4. Most of the wells showed a consistent increase of 8 to 10 feet from 2012 to 2020, a decrease from 2021 to 2023, and an increasing trend from 2023 to 2024.

Other Aquifers

Groundwater levels from the St. Peter, Jordan, and Tunnel City Group aquifers are shown on Figure 5. The wells show similar trends over time, a rise from 2012 to 2020 followed by a drop from 2021

to 2024. Only one well has seen a slight increase in groundwater level, the Brown's Creek Park Well in the Tunnel City Group aquifer. Note that the Olien well was not available for measurement again this year. We will investigate the apparent decline in the water level during future monitoring events.

Recommendations

It is recommended that the BCWD 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. The addition of well locations in 2025 will be useful in developing a more accurate picture of regional groundwater levels.

Table 1. Groundwater Elevations from 2017 to 2024

Unique Number	Name	2017 Water Elevation	2018 Water Elevation	2019 Water Elevation	2020 Water Elevation	2021 Water Elevation	2022 Water Elevation	2023 Water Elevation	2024 Water Elevation	Change since last measure
Approximate Date		Oct-17	Oct-18	Oct-19	Oct-20	Oct-21	Oct-22	Oct-23	Sep-25	
Golf Course Wells										
515171	Applewood Hills	895.42	894.14		897.65	895.58	891.45	890.67	890.53	-0.14
151580	Oak Glen Country Club	825.88	823.56	826.12	825.63	823.00			844.32	
151581	Oak Glen Country Club	830.12	828.16	828.23	828.78	829.19	827.95	828.41	810.96	-17.45
208038	Stillwater Country Club	>200	>200	>200						
Stillwater Oaks 1	Stillwater Oaks Golf Club	913.42	910.11	912.41						
Stillwater Oaks 2	Stillwater Oaks Golf Club	910.27	909.05	913.60	913.72	909.95				
Stillwater Oaks 3	Stillwater Oaks Golf Club	911.26	910.07	911.90	912.46	911.02				
Stillwater Oaks 4	Stillwater Oaks Golf Club	Artesian	957.69	970.29	970.16	970.81				
566145	Logger's Trail Golf Course	905.62	904.16	905.93	907.20					
667998	Logger's Trail Golf Course	906.28	905.10	907.34	908.40	905.30	905.08	903.48	904.48	1.00
761112	Logger's Trail Golf Course	901.16	900.09	901.94	903.55	900.71	899.18	898.15	889.32	-8.83
Domestic Wells										
428563	Ed and Laurie Francis	902.53	900.91	903.36	906.14	903.71	900.80	898.79	899.46	0.67
410987	Dan and Lori Gunderson	906.98	905.62	907.22	910.22	908.10	905.35	903.18	903.88	0.70
196839	Louis J. Bruno	867.75	866.75	866.40	870.28	868.23	931.72			
Leiser	Craig Leiser	935.11	933.99	935.85	937.65	934.01	932.67	931.34	930.78	-0.56
James	Alan and Molly James	941.71	940.20	942.14	944.20	940.56	938.70	937.55	938.87	1.32
184049	Kirk and Tracy Hillquist		942.48	944.77	945.61	941.11	939.87	939.12	938.99	-0.13
Thatcher	Jyneen Thatcher	955.68	953.19	957.18	958.63	953.89	951.60	950.91	952.35	1.44
138188	Rick Vanzwol	940.02	939.36	941.45	943.96	940.84	937.81	936.11	936.68	0.57
479665	John and Michelle Weaver	907.41	906.86	907.77	908.87	907.23	905.85	907.22	905.91	-1.31
493250	Mark and Sharon Olien	719.97	721.50	721.54	721.89	721.01	711.66		870.87	
525197	James and Marilyn Opp	913.88	913.02	914.69	917.18	914.69	912.42	910.66	909.23	-1.43
505390	Larry J and Pamela J Larson	930.48	929.18	932.29	933.50	932.93	930.09	927.93	927.96	0.03
153485	John P and Carolyn A Rydel	899.51	898.47	899.31	901.08	897.14	896.83		895.76	
138904	Duane and Margaret Burmeister	829.91	828.41	830.33	832.27	828.69	827.62	827.55	825.59	-1.96
406204	Michael and Rita Wiersma	941.38	940.98		942.78	940.28	939.17	938.86	940.98	2.12
Boughten	Larry Boughten	953.73	951.32	954.28	956.81	949.52	948.51	947.53	950.52	2.99
DNR Observation Wells										
595649	Brown's Creek Park - Deep	864.77	865.81	868.11	868.20	866.17	865.21	864.38	866.10	1.72
623066	Brown's Creek Park - Shallow	875.77	875.05	876.84	876.88	875.30	875.01			
551565	Withrow Elementary School	956.88	954.91	958.64	959.50	954.83	951.99	951.10	953.31	2.21
834170	Brown's Creek Park - Middle				875.59	874.15	873.43	873.09	874.8	1.71
281129	Kimbro - Shallow					929.73	926.75	926.82	926.84	0.02
							Average			-0.64

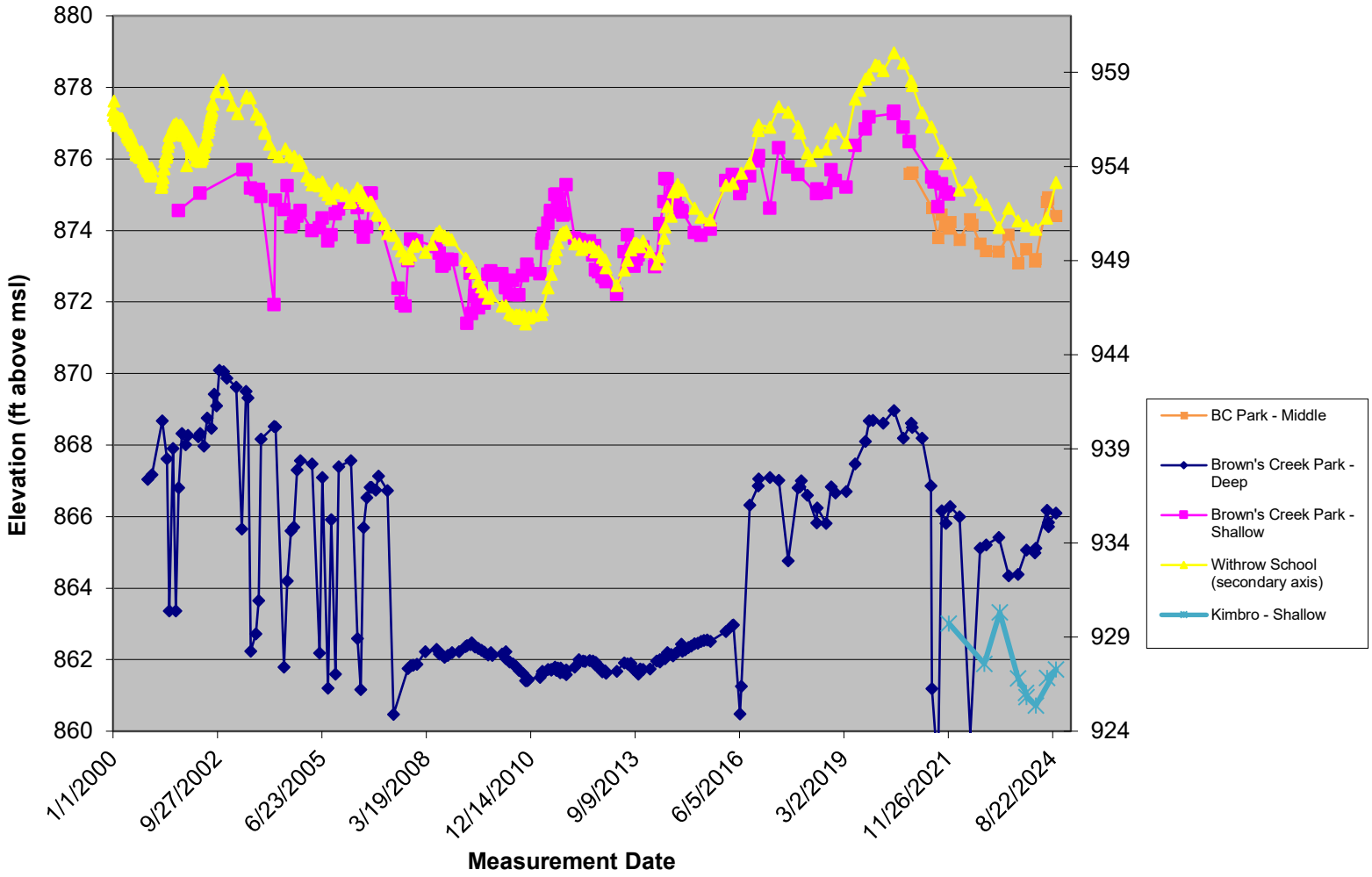

Figure 2. Groundwater Elevations - DNR Observation Wells

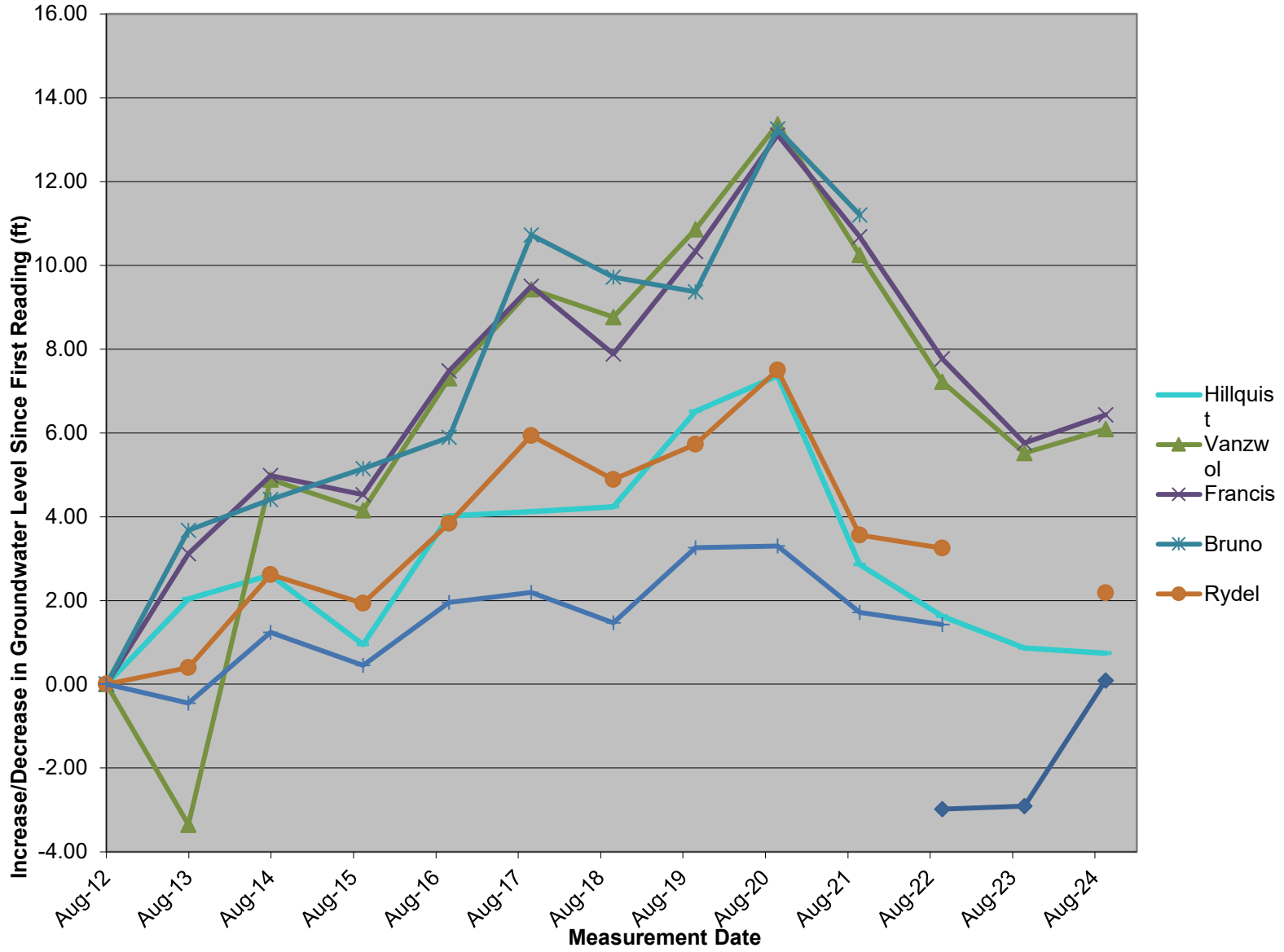

Figure 3. Groundwater Level Change Over Time – Quaternary (Glacial) Aquifer Wells.

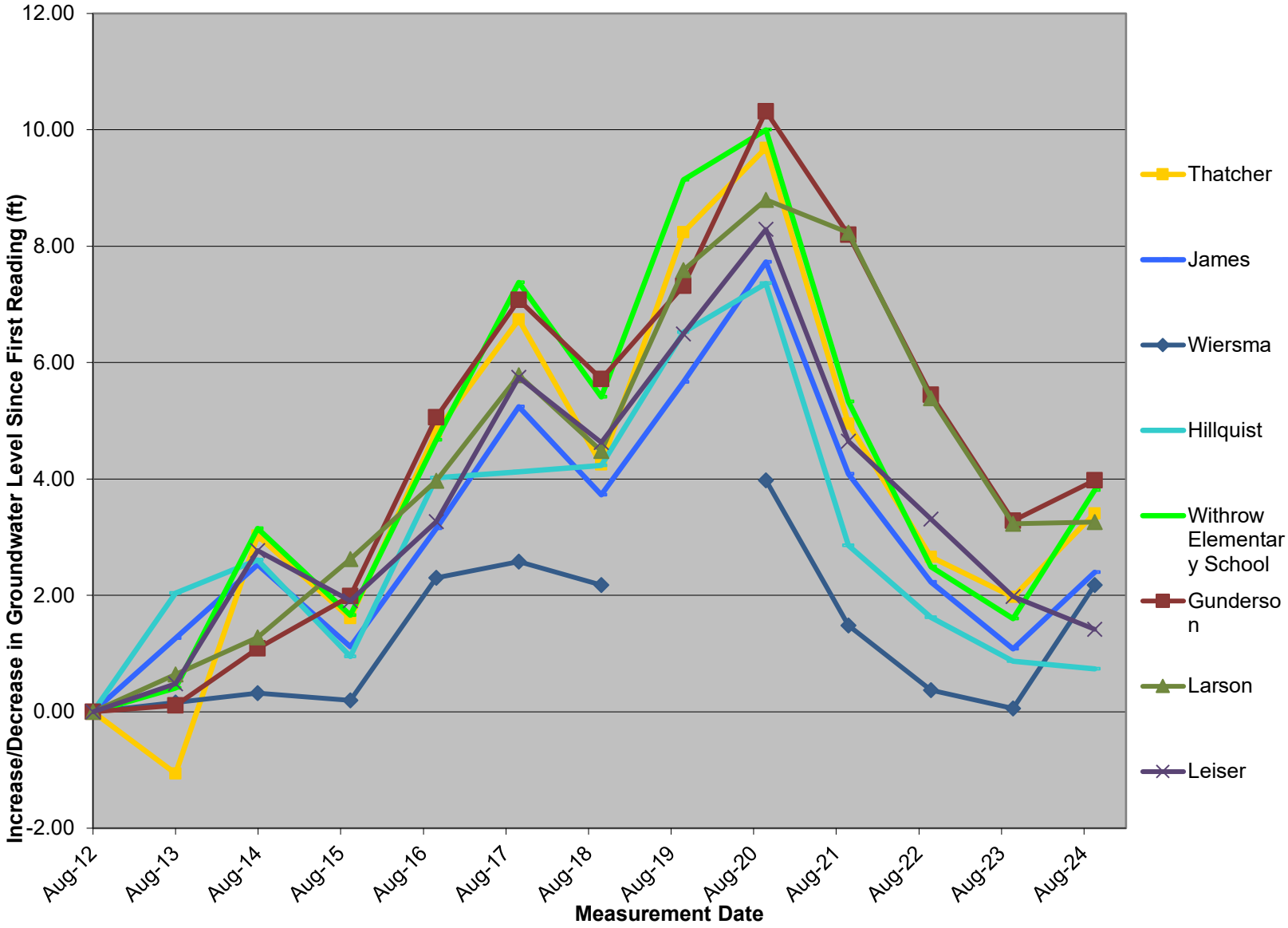

Figure 4. Groundwater Level Change Over Time – Prairie Du Chien Aquifer Wells.

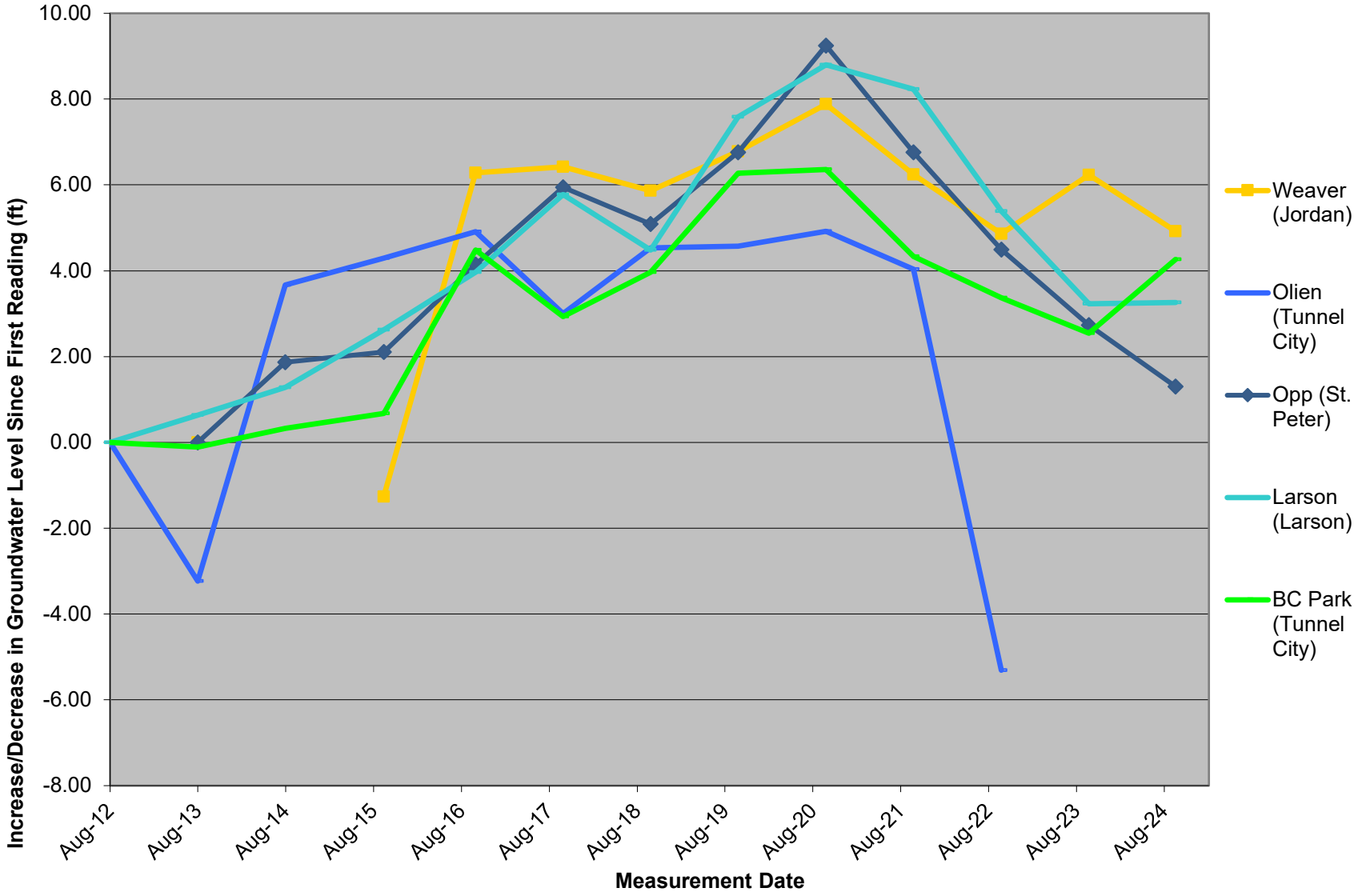

Figure 5. Groundwater Level Change Over Time – Wells in All Other Aquifers