

RECENT TRENDS IN SUGAR GROVE TOWNSHIP'S SHALLOW GROUNDWATER INFORMED BY 5 YEARS OF WATER LEVEL MONITORING AND 3 YEARS OF WATER QUALITY SAMPLING

Cecilia Cullen, Assistant Research Scientist
Dan Hadley, Associate Research Scientist
Illinois State Water Survey
Northwest Water Planning Alliance
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ILLINOIS STATE WATER SURVEY CONTRACT REPORT 2024-02
FEBRUARY 2024

RECENT TRENDS IN SUGAR GROVE TOWNSHIP'S SHALLOW GROUNDWATER INFORMED BY 5 YEARS OF WATER LEVEL MONITORING AND 3 YEARS OF WATER QUALITY SAMPLING

Cecilia Cullen and Daniel R. Hadley



**Prairie Research
Institute**

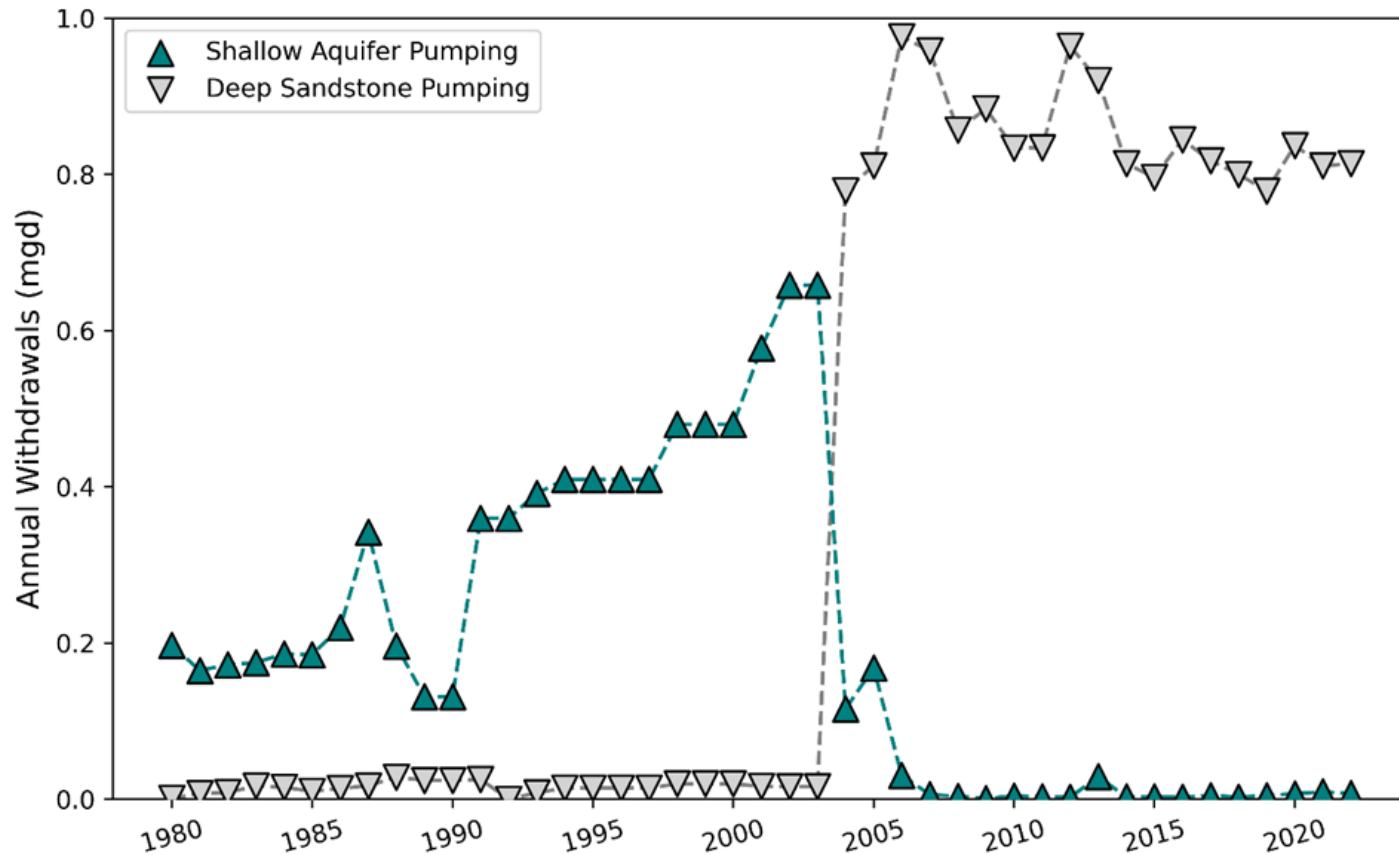
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Goals of ISWS-Sugar Grove Contract

- Analyze water level data from groundwater monitoring wells throughout the township
- Sample wells throughout the township to understand the water quality of untreated aquifer water



Sugar Grove Township Water Use



Even so, the shallow aquifer is an important aquifer source to many in Sugar Grove on private domestic wells

IWIP data shows a switch in the early 2000s from shallow aquifer to deep sandstone

Monitoring well installation in Sugar Grove



Monitoring well installation in Sugar Grove

Table 1. List of monitoring wells and well attributes in Sugar Grove Township. Dashes indicate that no data is available.

Well Name	Well Type	Well Depth (ft)	Land Surface Elevation (ft AMSL)	Aquifer	Year Drilled	Depth to water (ft) when drilled	Sensor Type
Elliott	Private - domestic	100	671.69	Dolomite Bedrock	< 1991	10	Acoustic
Aurora Airport	Municipal	204	703.65	Dolomite Bedrock	1960	18	Transducer
Heartland Drive	Private – industrial	165	718.30	Dolomite Bedrock	-	-	Transducer
Hannaford Woods	Observation Well	116	715.97	Sand and Gravel	2003	-	Transducer
SUGR-18-03	Observation Well	122	711.60	Sand and Gravel	2018	27	Transducer
Ratos	Private - domestic	300	716.15	Dolomite Bedrock	2019	52	Transducer

Acoustic versus transducer wells

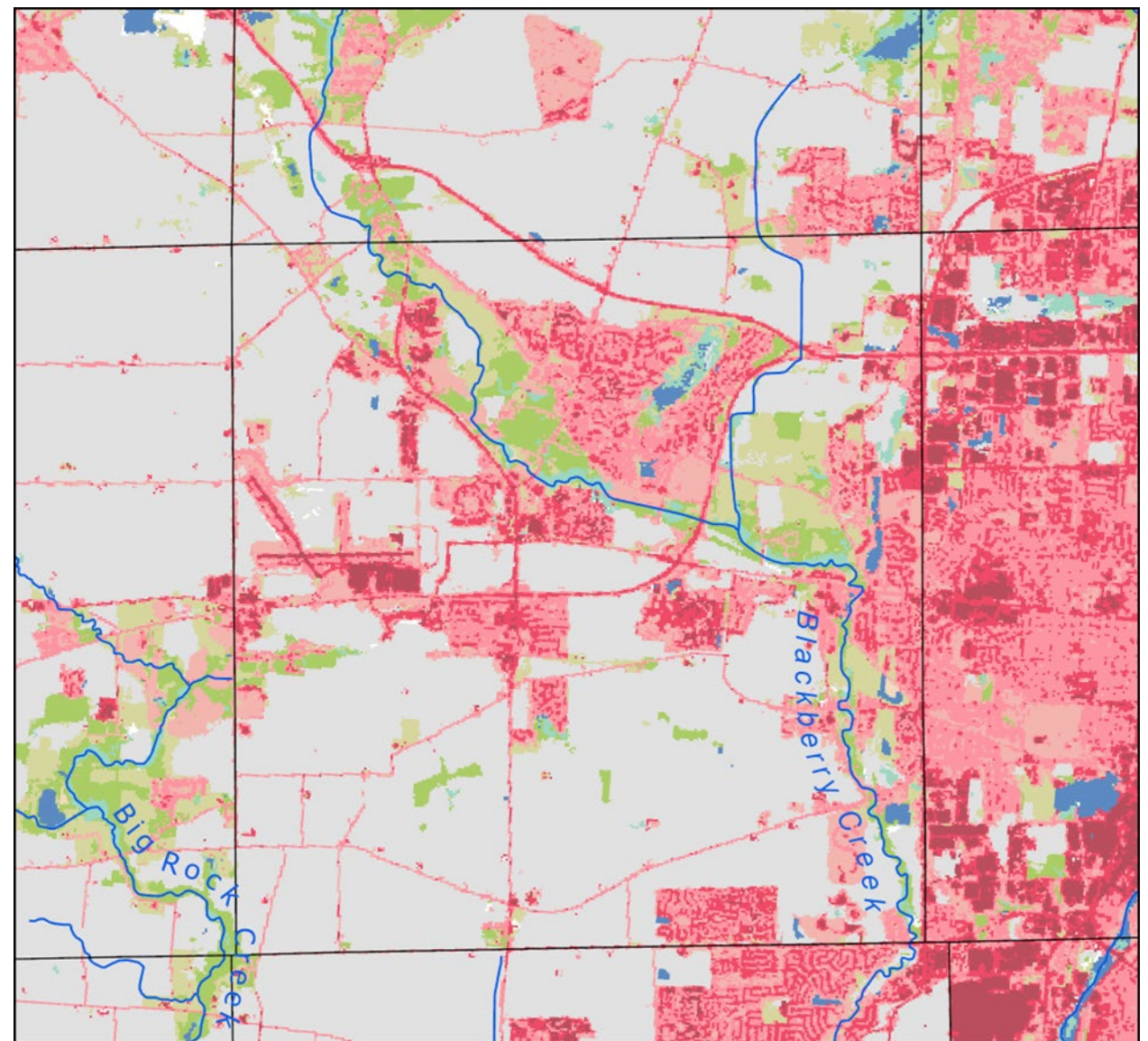
The Elliott well is an acoustic sensor, that takes a water level measurement by sending a sound pulse and then converting the refraction from water into a depth measurement



The rest of the monitoring wells were transducer stations that are more reliable for water level monitoring

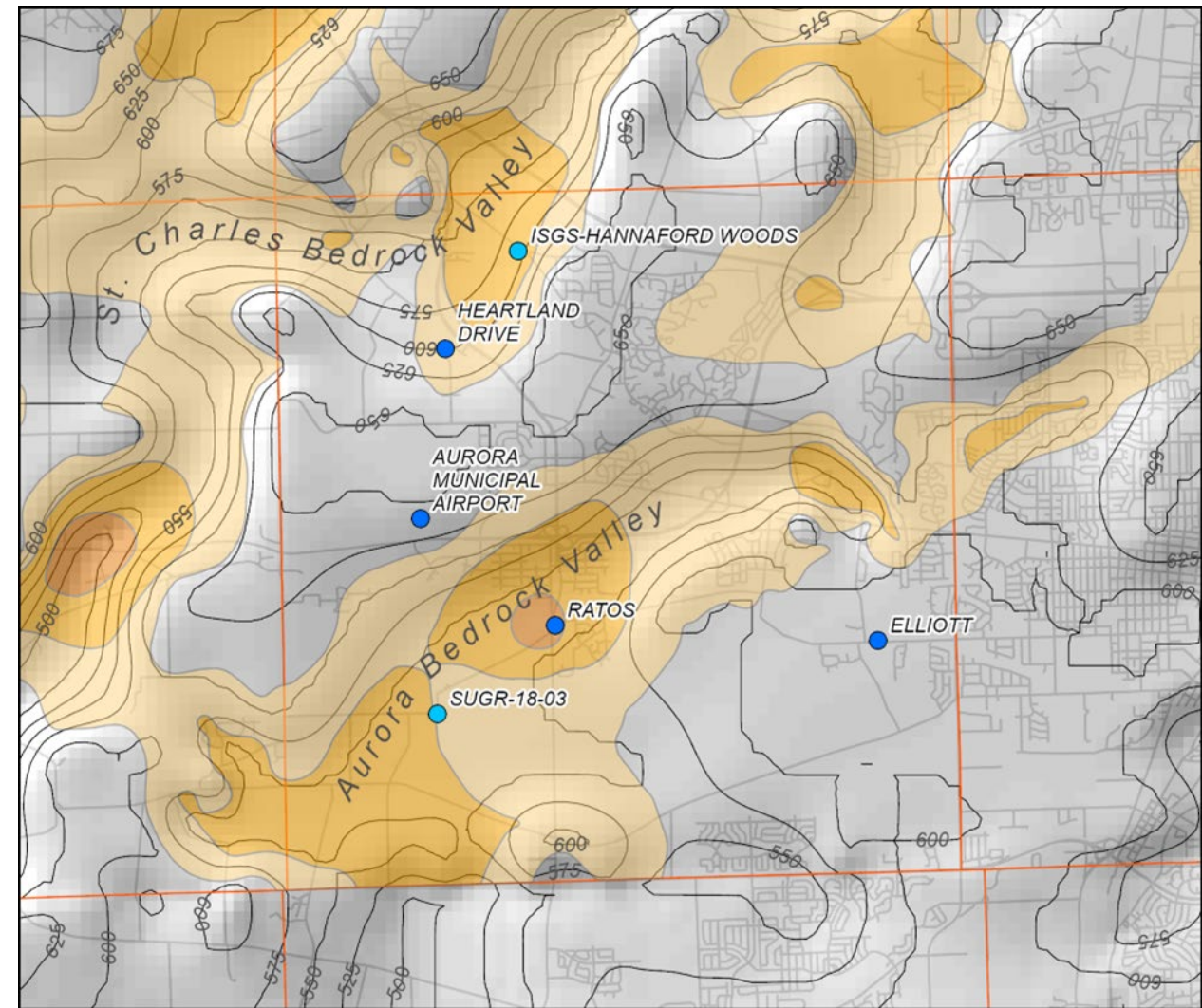
Sugar Grove Land Use

- Eastern township near Aurora is most developed area
- Most of the township is agricultural land



Monitoring Well Locations

- Four of the monitoring wells are installed in the shallow bedrock
- Two of the monitoring wells are in sand and gravel layers in the bedrock valleys



St. Charles Aquifer
Thickness (ft)

< 20

20 to 50

50 to 100

Bedrock Elevation
Contour (ft AMSL)

Monitoring Well Type

● Sand and Gravel

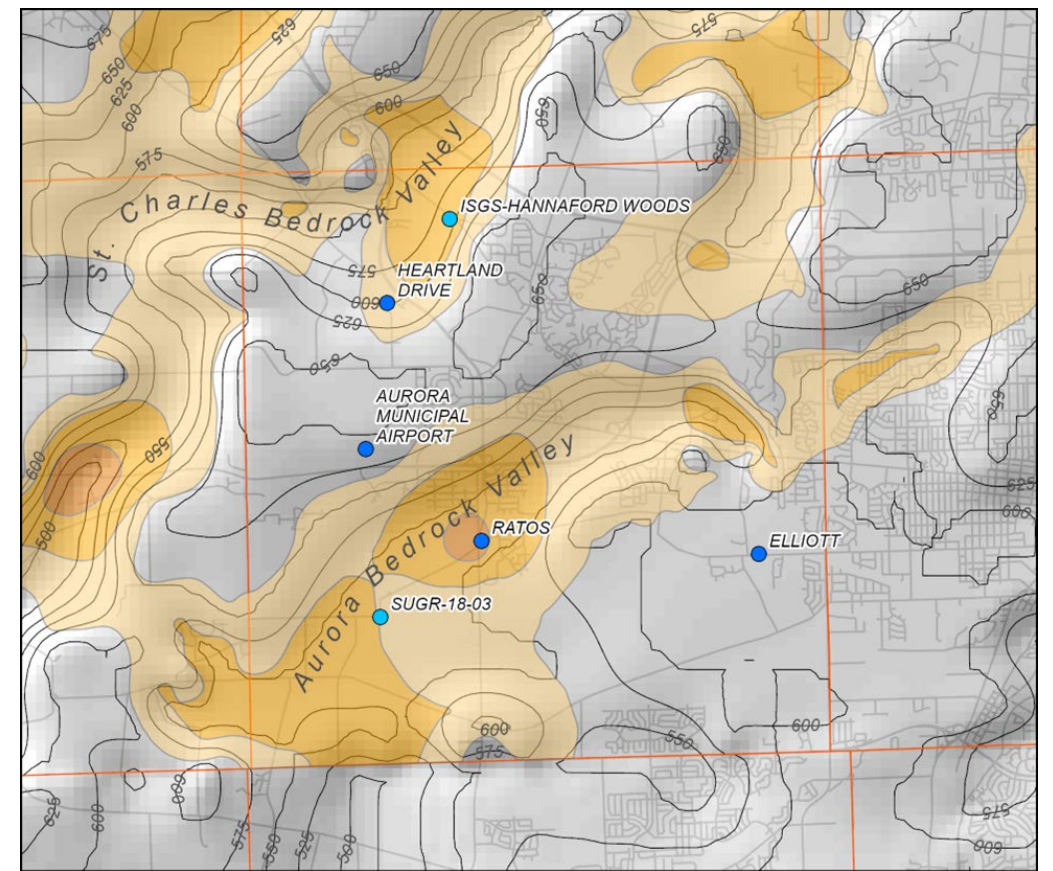
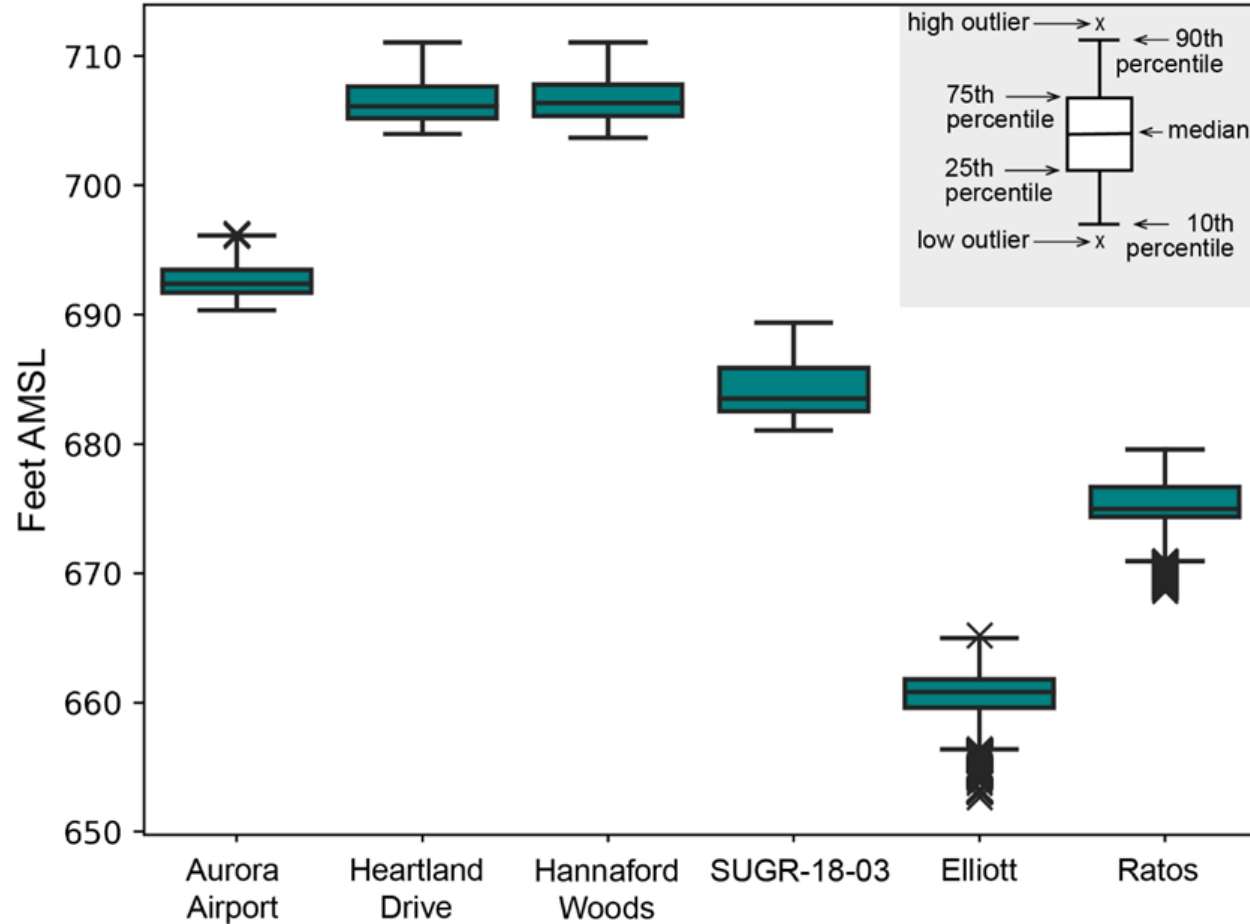
● Shallow Bedrock

□ Township Boundary

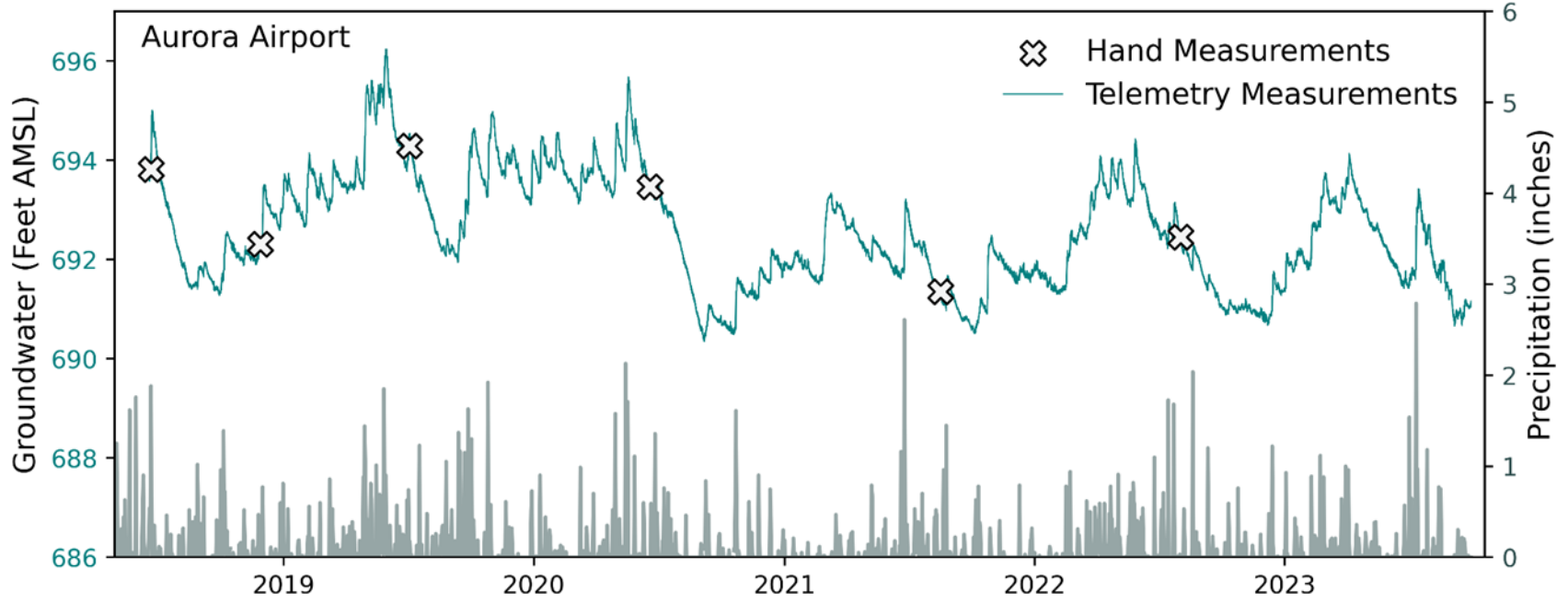
— Road



Monitoring Well Locations

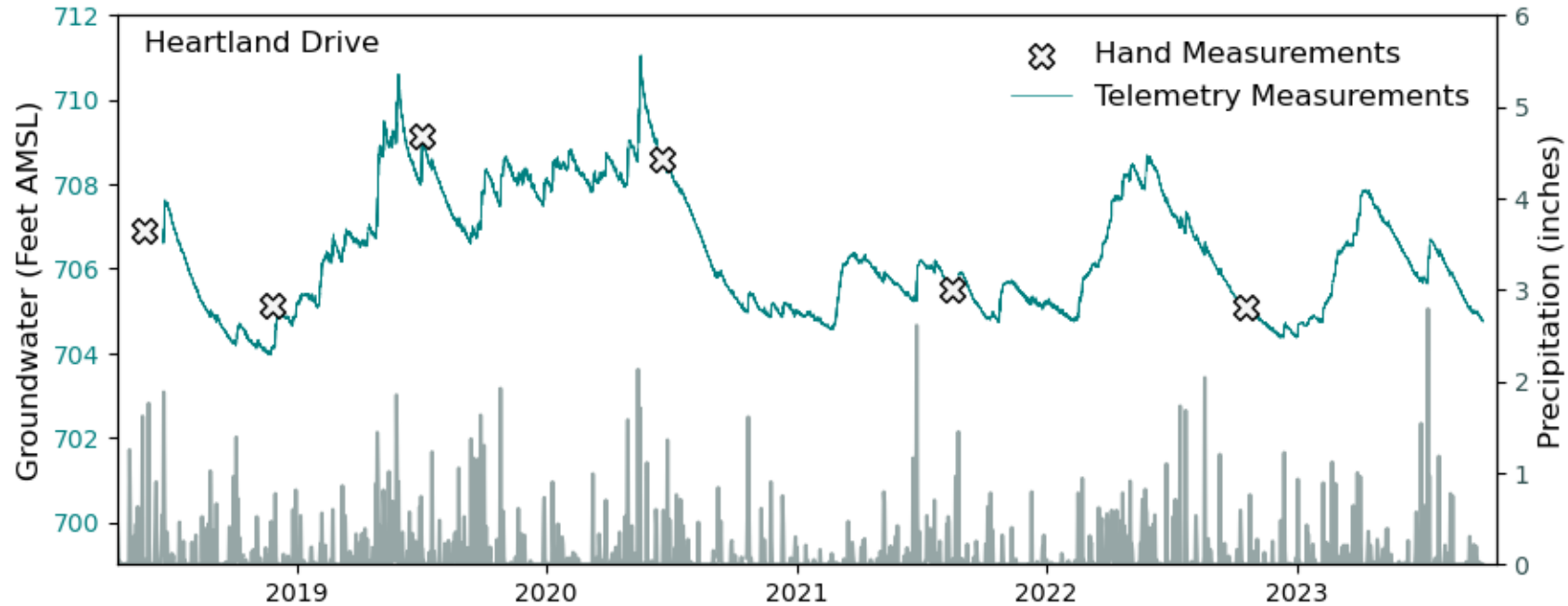


Aurora Airport Hydrograph: 2018 – 2023



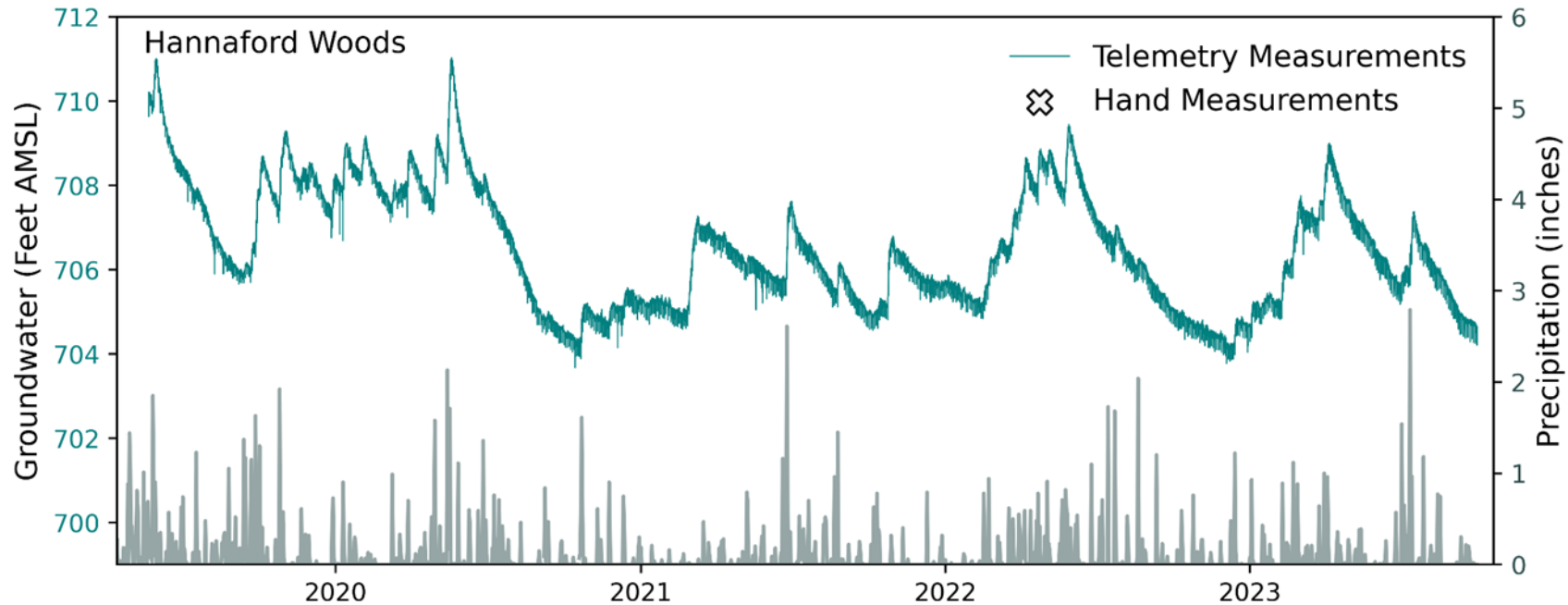
Water levels are decreasing at this well

Heartland Drive Hydrograph: 2019 - 2023



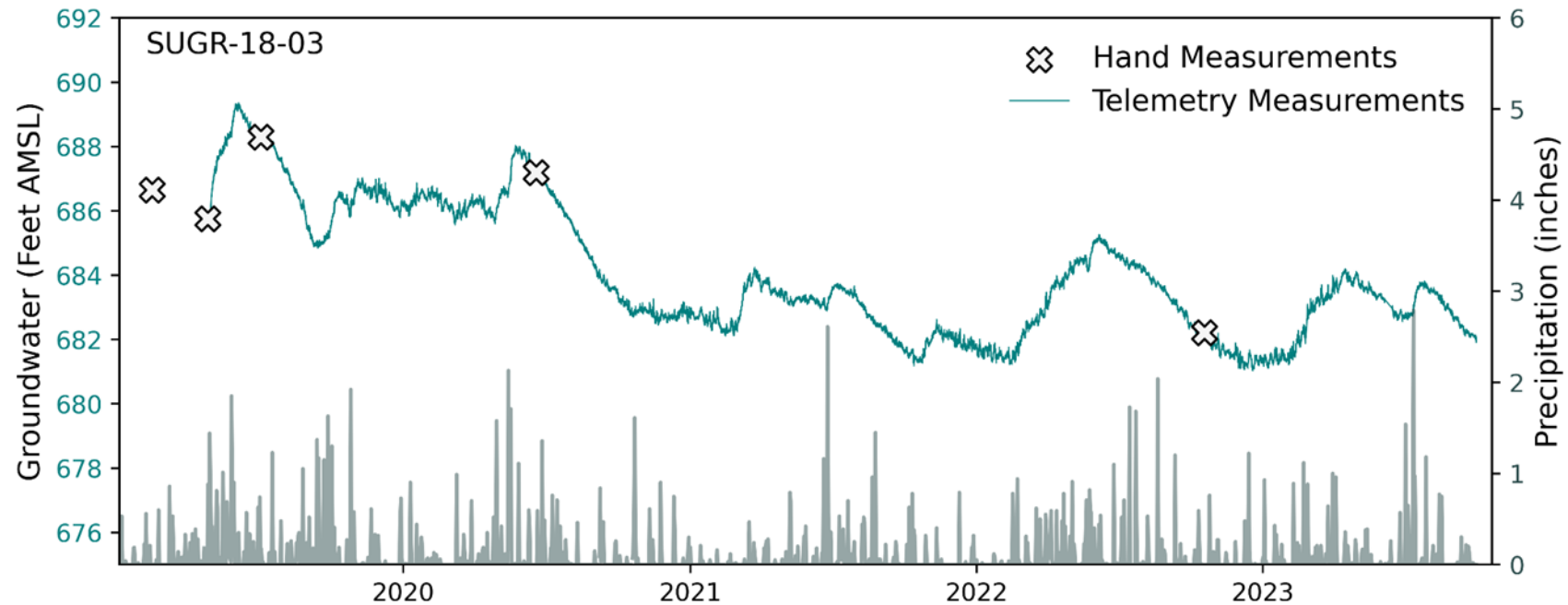
Water levels are neither decreasing or increasing at this well.

Hannaford Woods Hydrograph: 2019 - 2023



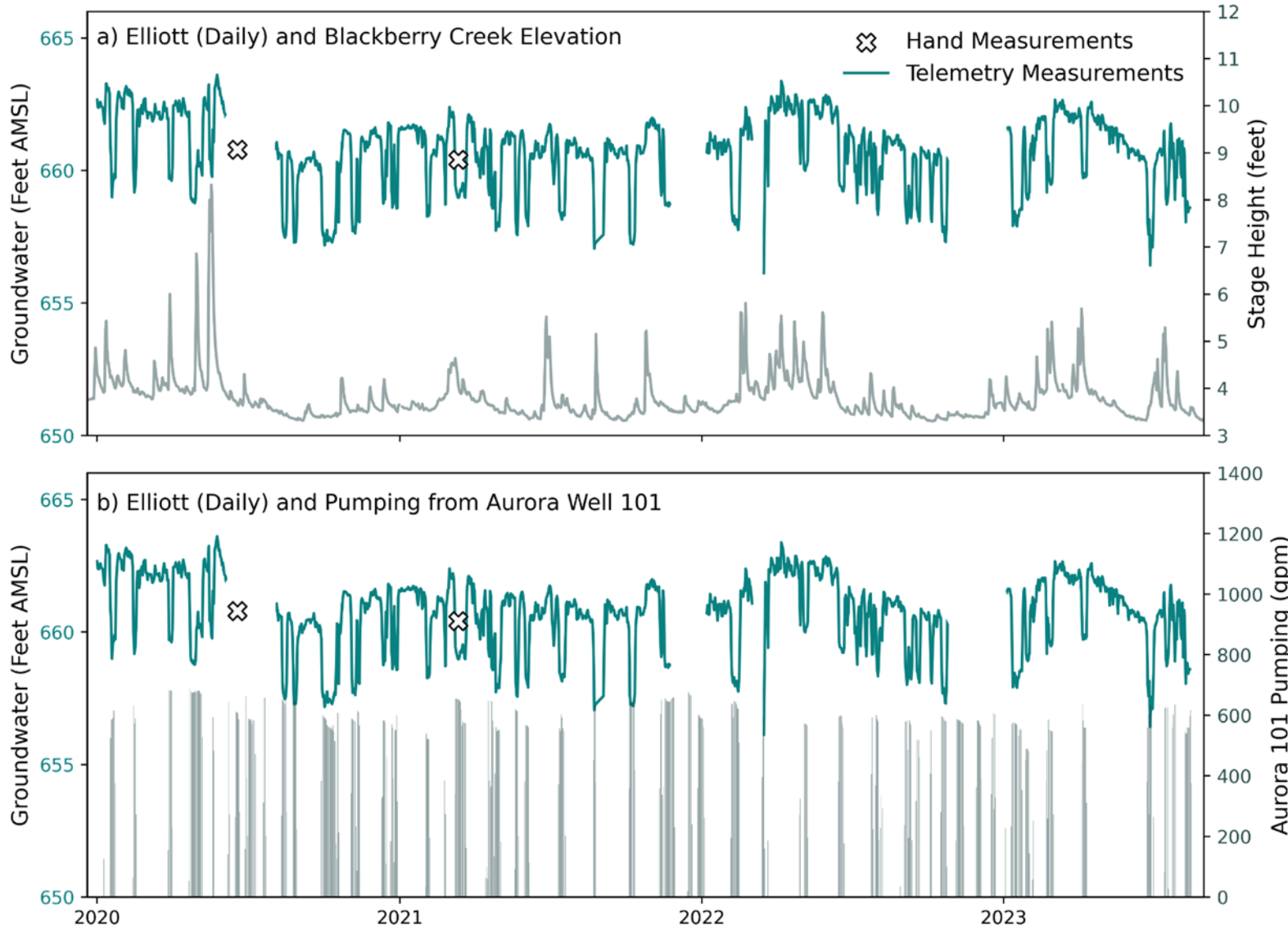
Water levels are decreasing at this well

SUGR-18-03 Hydrograph: 2019 - 2023



Water levels are decreasing at this well

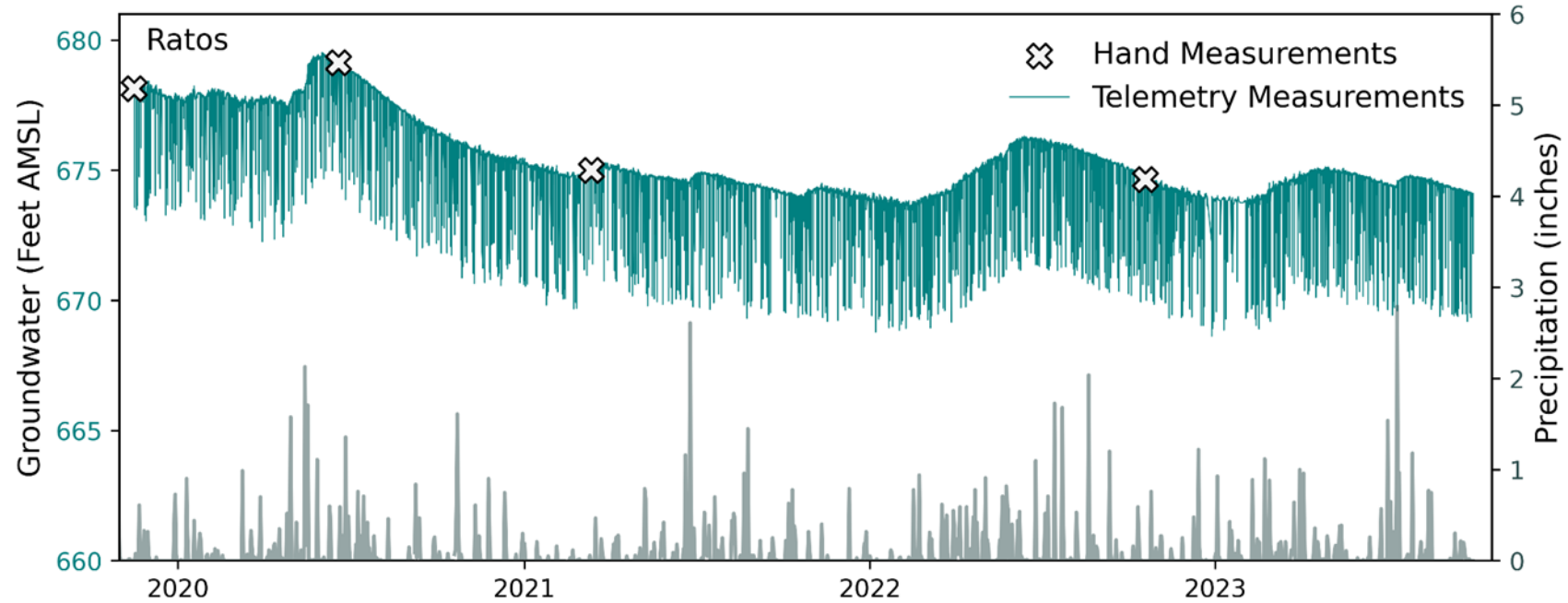
Elliott Hydrograph: 2020 - 2023



Water levels are neither decreasing or increasing at this well.

Groundwater here is affected by Blackberry Creek River stage and pumping from Aurora Well 101.

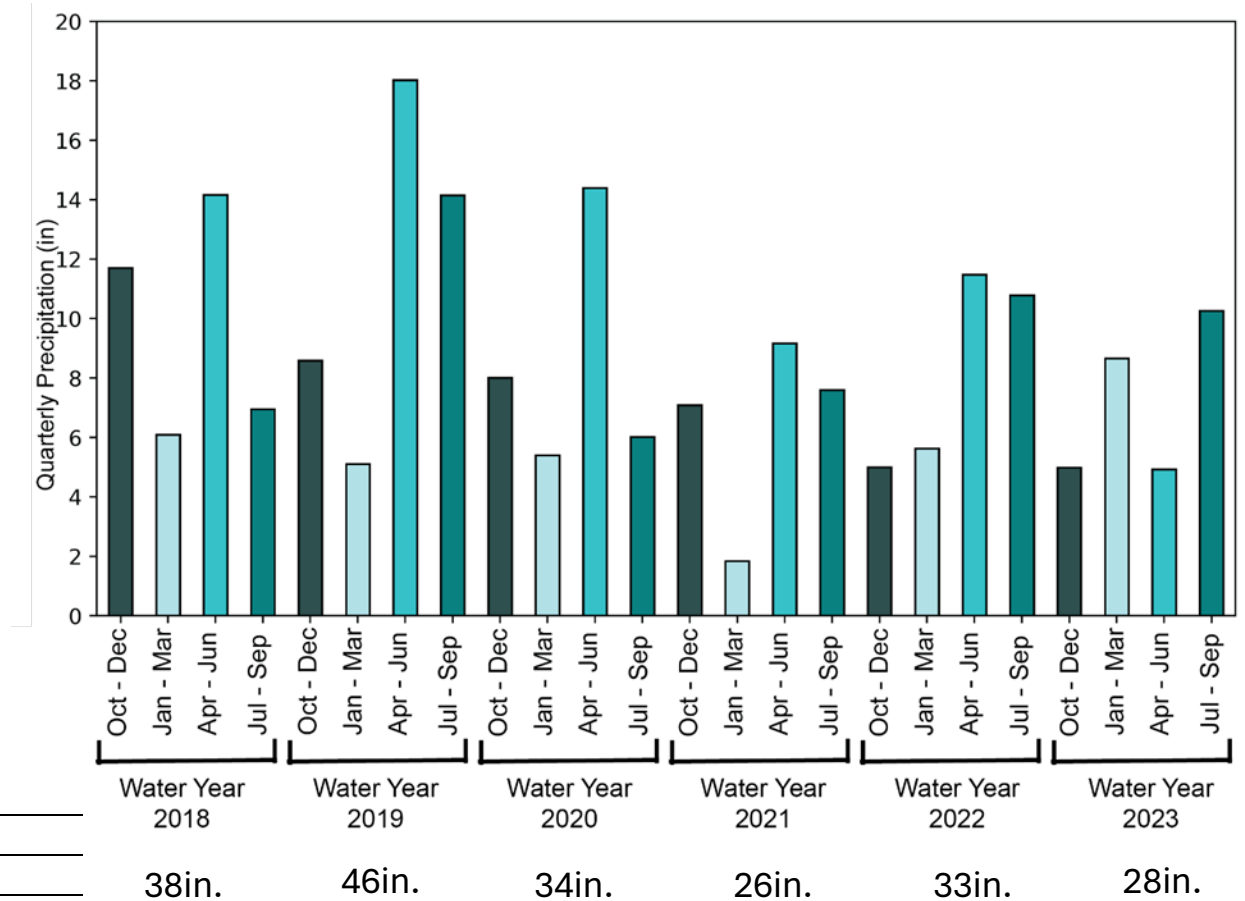
Ratos Hydrograph: 2020 – 2023



Water levels are decreasing at this well.

Why are water levels decreasing at two-thirds of monitoring wells?

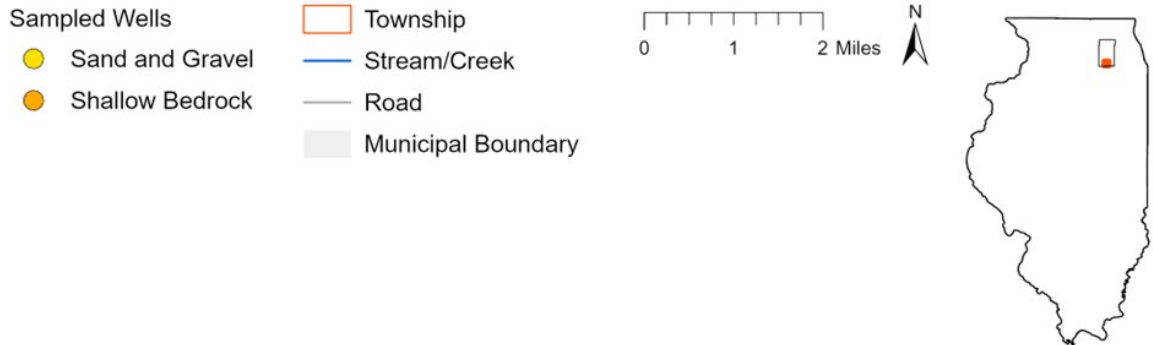
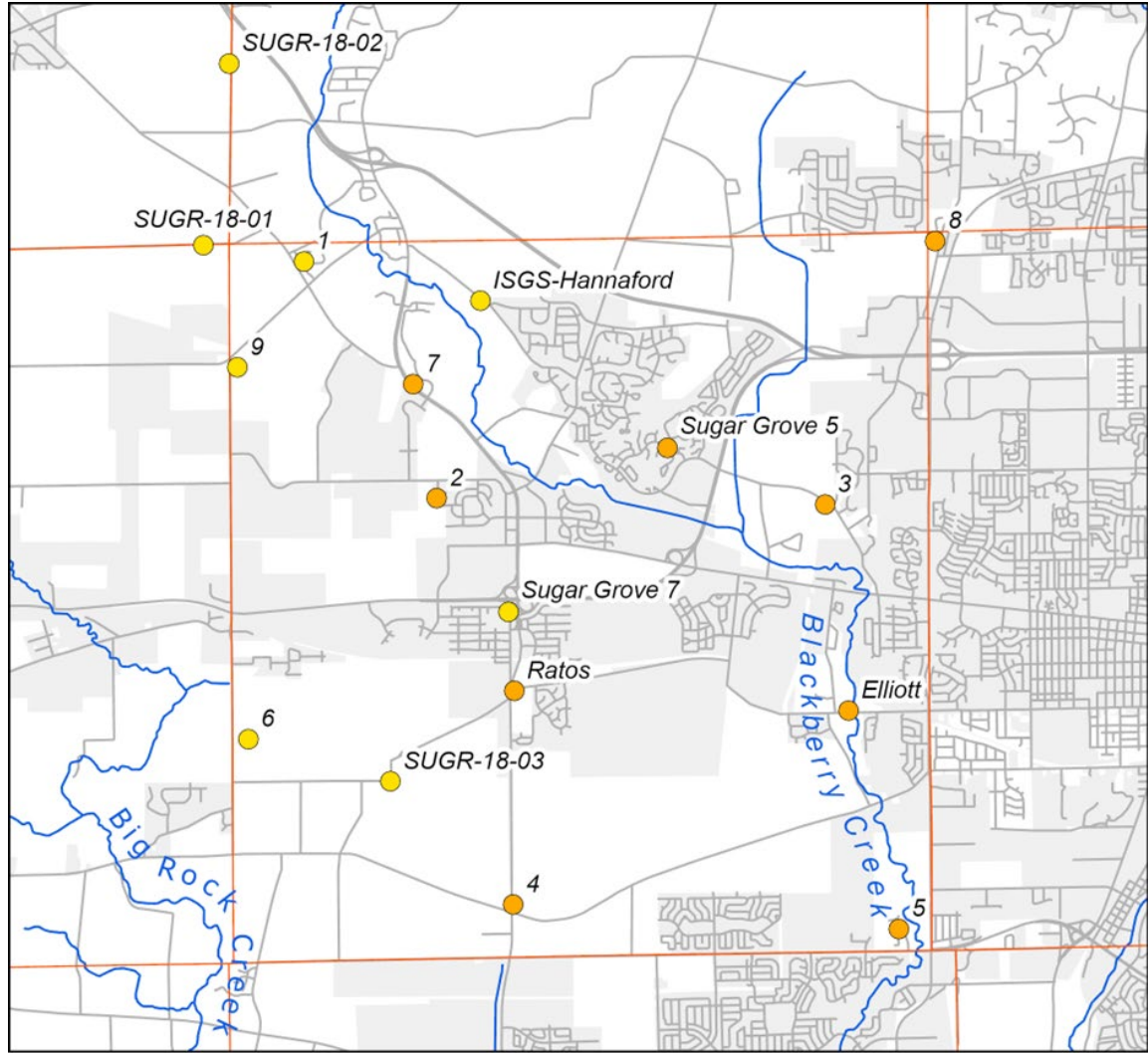
The start of monitoring coincided with two wet water years (2018 and 2019). Water years 2021, 2022, and 2023 have been drier and less water has recharged to the aquifer.



Monitoring Site	Start of Continuous Data	Trend
Elliott	Nov. 2017	No Trend
Aurora Airport	Feb. 2018	Decreasing
Heartland Drive	May 2018	No Trend
SUGR-18-03	Apr. 2019	Decreasing
Hannaford Woods	May. 2019	Decreasing
Ratos	Nov. 2019	Decreasing

Wells Sampled for Water Quality

- Seventeen wells were sampled to understand groundwater quality in Sugar Grove Township
- Some were resampled in 2022 and 2023



Arsenic was the only USEPA Primary Standard exceeded at these wells

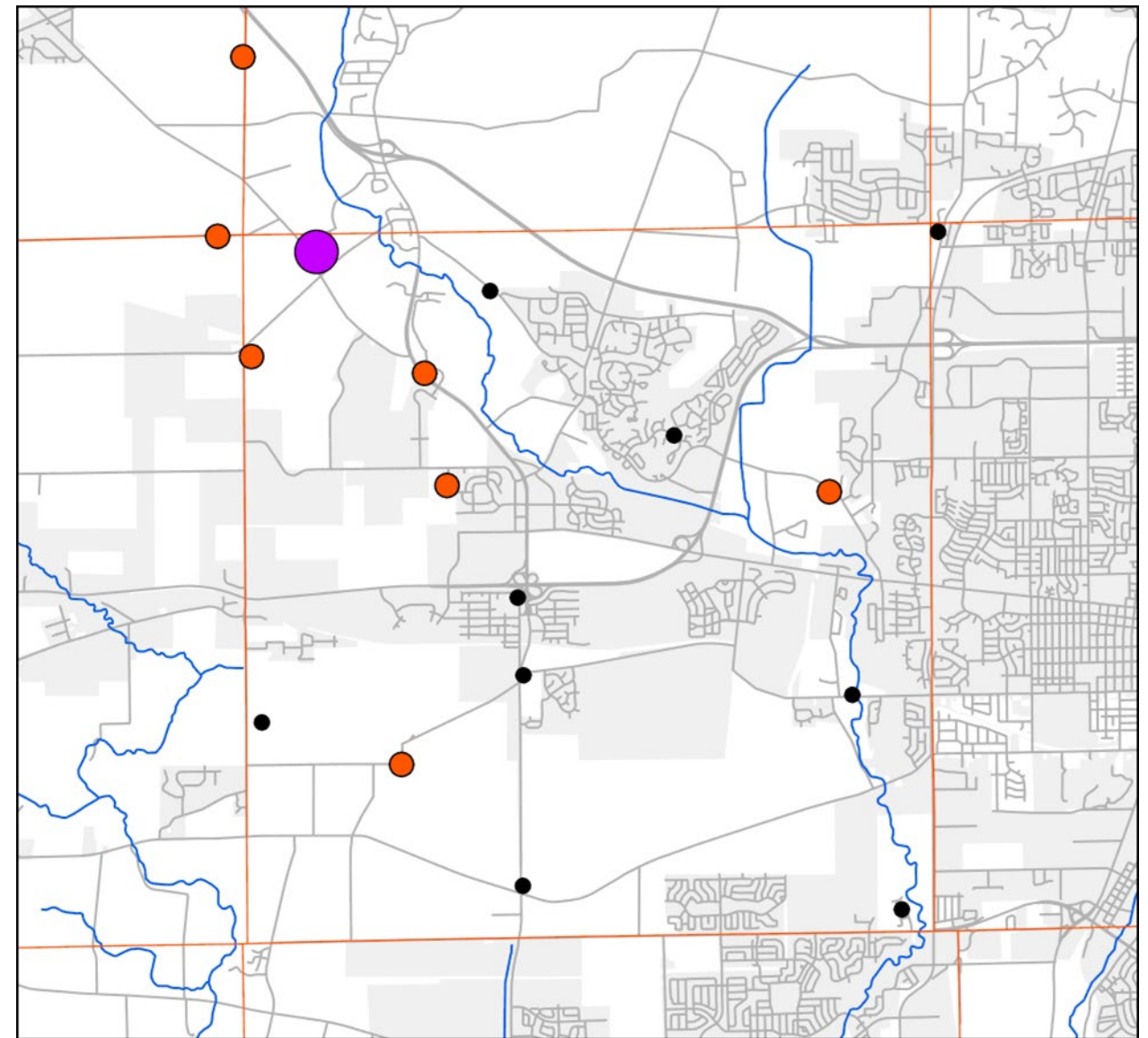
Table 7. Comparison of 2021 water quality results to USEPA primary and secondary standards. SUGR-18-01 and SUGR-18-02 were sampled in 2023, the rest were sampled in 2021.

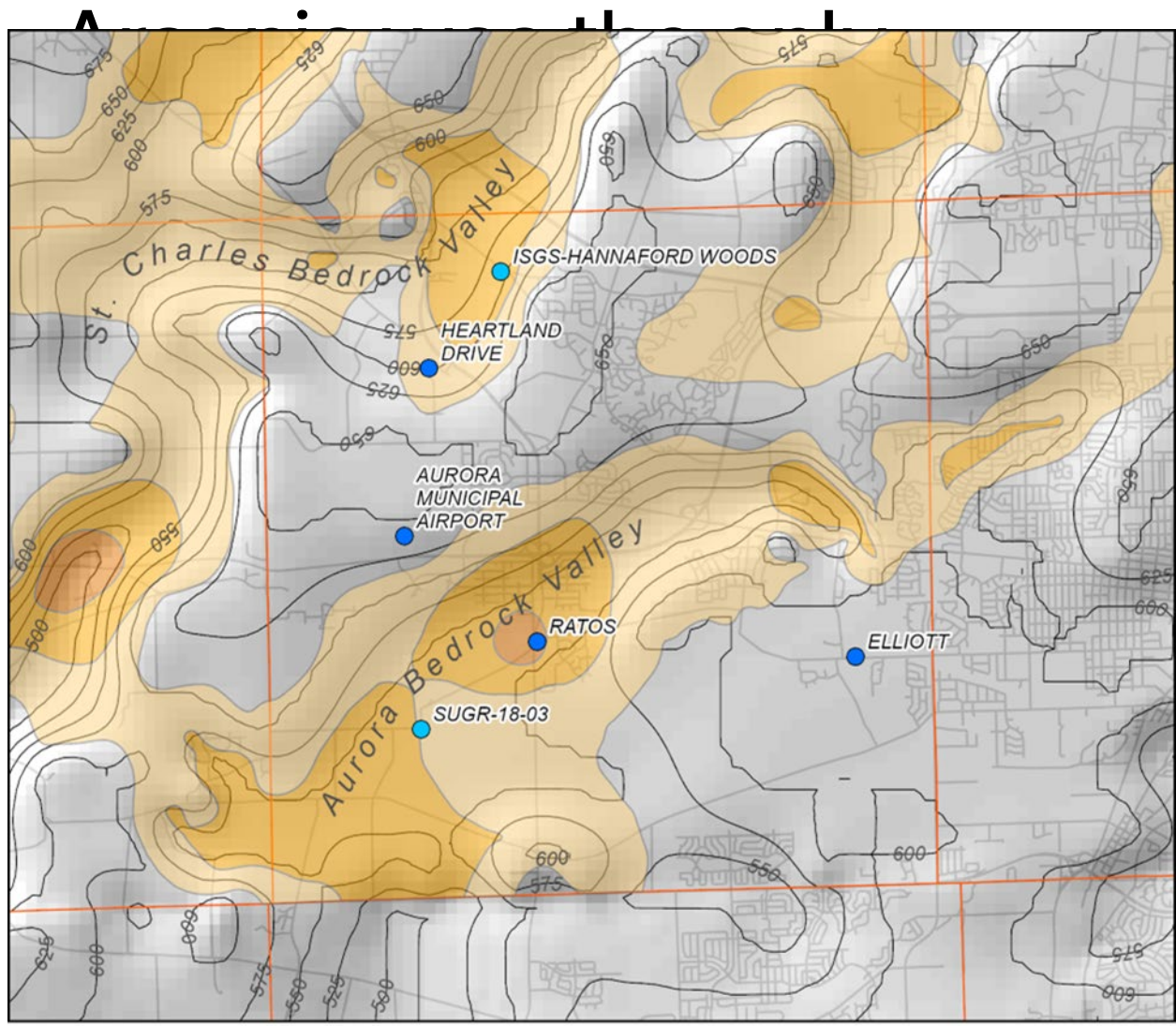
Well	Primary Standards											Secondary Standards											
	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Fluoride	Lead	Nitrate-nitrogen	Selenium	Thallium	Aluminum	Chloride	Copper	Corrosivity	Fluoride	Iron	Manganese	pH	Sulfate	TDS	Zinc
Sugar Grove 5																	X	X				X	
Sugar Grove 7																						X	
Hannaford Woods																	X						
SUGR-18-01																			X				
SUGR-18-02																	X	X					
SUGR-18-03																	X						
Elliott																	X					X	
<u>Ratos</u>																	X					X	
Well 1		X															X						
Well 2																	X	X				X	
Well 3																	X					X	
Well 4																	X	X				X	
Well 5																	X						
Well 6																		X				X	
Well 7																	X						
Well 8																	X	X				X	
Well 9																	X						

Arsenic was the only USEPA Primary Standard exceeded at these wells (purple point)

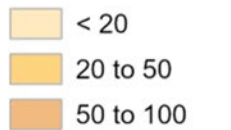
Is arsenic more pervasive in the northwest part of the township?

Arsenic was also sampled in the Fall 2023 Kane County study, more analysis on this soon.

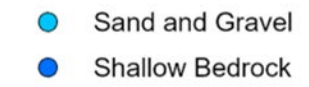




St. Charles Aquifer Thickness (ft)



Monitoring Well Type



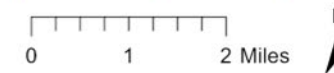
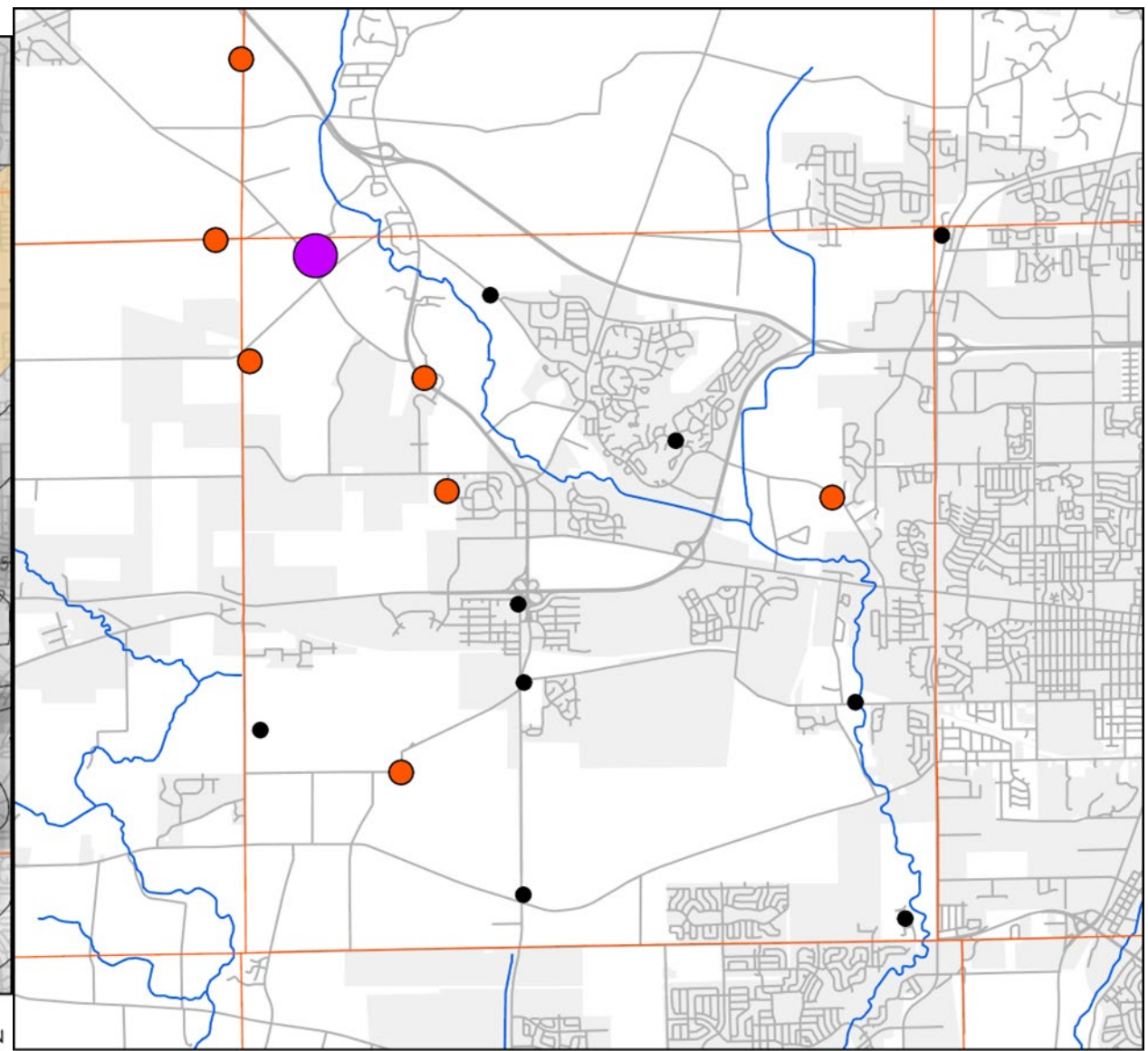
Township Boundary

Road



N

Bedrock Elevation Contour (ft AMSL)



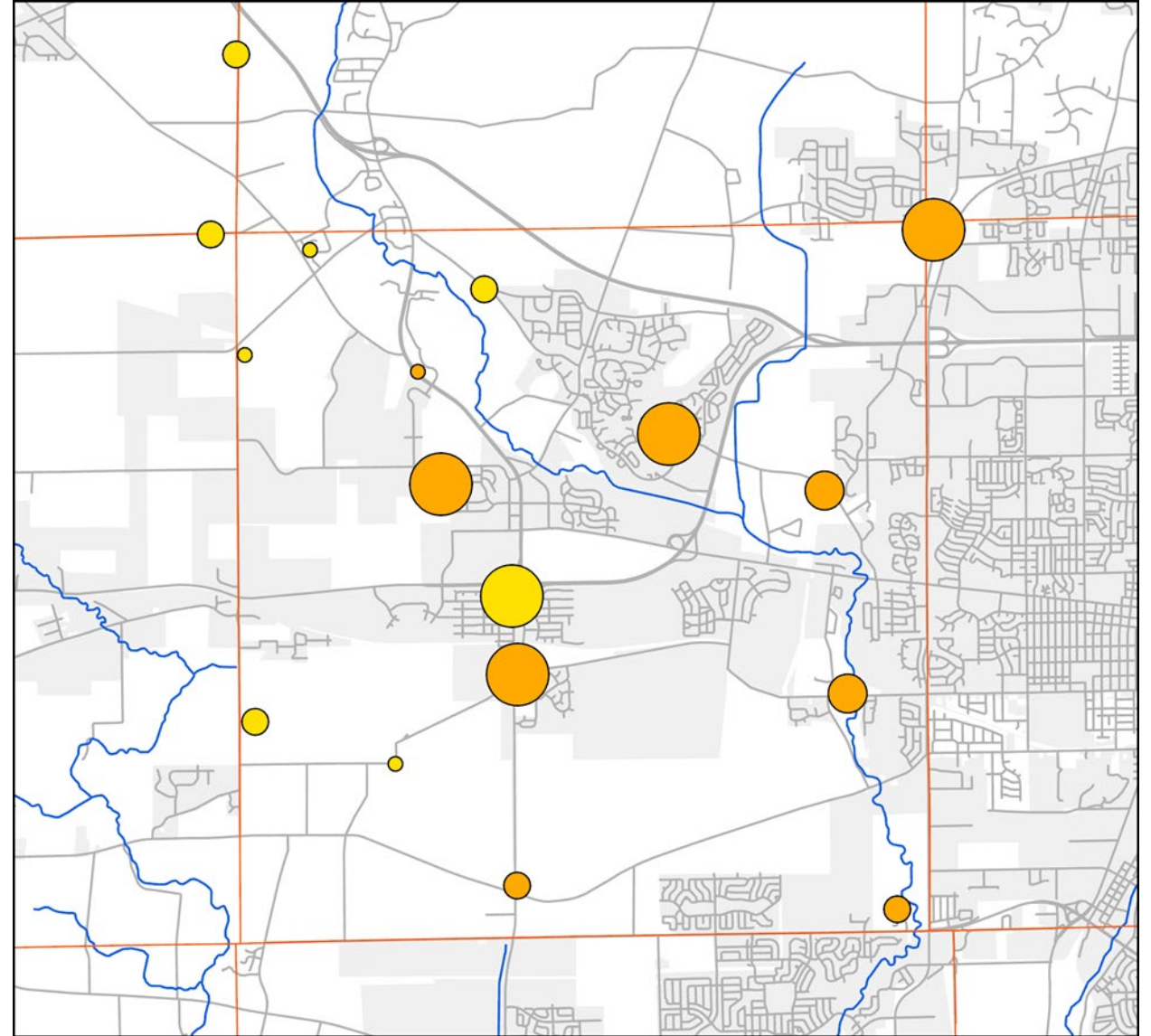
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Chloride in Sugar Grove

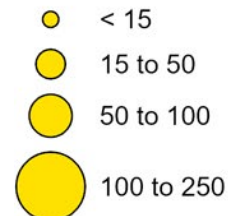
Chloride is highest at wells in the urbanized areas of Sugar Grove Township

Geochemical ratios indicate that the source of chloride is winter deicers.

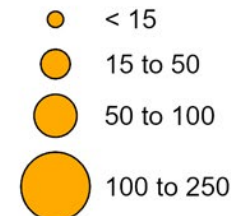
One well in rural area had chloride sourced from field fertilizers.



Chloride, SG (mg/L)



Chloride, SB (mg/L)



Township

Stream/Creek

Road

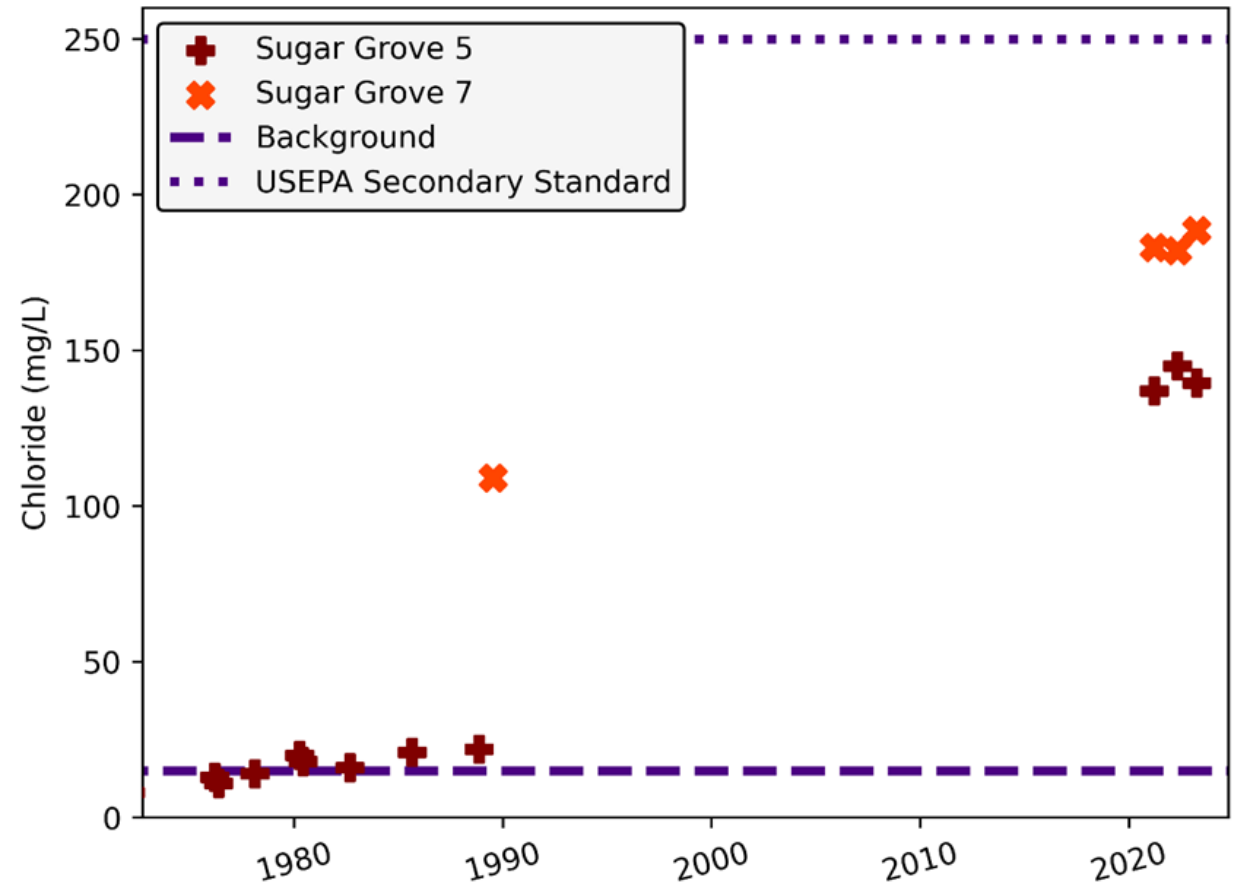
Municipal Boundary

0 1 2 Miles

N

Chloride in municipal wells

- At Sugar Grove 5 and Sugar Grove 7, concentrations have increased in the past 50 years
- In the 1970s, chloride at Sugar Grove 5 was at natural background levels
- In the future they may exceed the USEPA Secondary Standard (where water begins to taste salty)



Conclusions (All this and more in the report!)

- Groundwater in the shallow aquifer is responsive to pumping, creek stage levels, and climate
- Because the last few years have been drier, water levels are decreasing at some wells
- Groundwater in Sugar Grove is largely of good drinking water quality. Although, high arsenic was observed at one well in the northwest township
- Chloride is increasing in the shallow aquifer; salt reduction efforts could prevent chloride accumulating past the USEPA Secondary Standard (250 mg/L)

Questions for KGSG Project

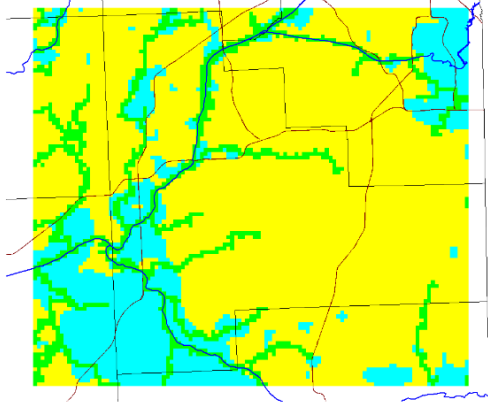
- Expanding the Kane County well monitoring network and continuing observation at these wells to build understanding of climate and water levels in the shallow aquifer
- Do elevated arsenic concentrations correspond to specific units of areas within larger Kane County ?
- What are trends of chloride accumulation within central Kane County? (where most development is happening within the county)

This and more on IDEALS

ILLINOIS STATE WATER SURVEY CONTRACT REPORT 2023-04
DECEMBER 2023

GROUNDWATER FLOW MODELS OF ILLINOIS 2023.0: DATA, PROCESSES, MODEL PERFORMANCE, AND KEY RESULTS

Daniel B. Abrams, Cecilia Cullen, Devin H. Mannix, Daniel R. Hadley



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<https://hdl.handle.net/2142/121782>

ILLINOIS STATE WATER SURVEY CONTRACT REPORT 2024-01
JANUARY 2024

Groundwater Quality within Natural Areas of Lake County: How Past and Present Data Illuminate Characteristics of the Shallow Aquifer

Cecilia Cullen, Michael P. Krasowski, Daniel B. Abrams, Allan E. Jones, Pu Xia, Vlad Iordache, Valerie Smykalov, Walton R. Kelly



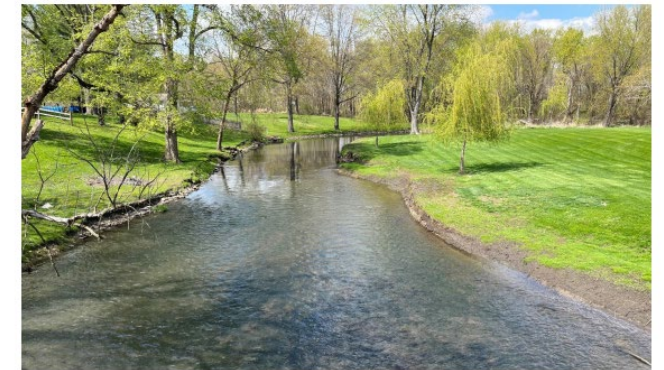
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