SC DEPARTMENT *of* ENVIRONMENTAL SERVICES

Groundwater Resources of the Santee Basin

Brooke Czwartacki, Hydrologist

Bureau of Water, South Carolina Department of Environmental Services

February 11, 2025

Santee River Basin Council

Meeting #3, Moncks Corner, SC

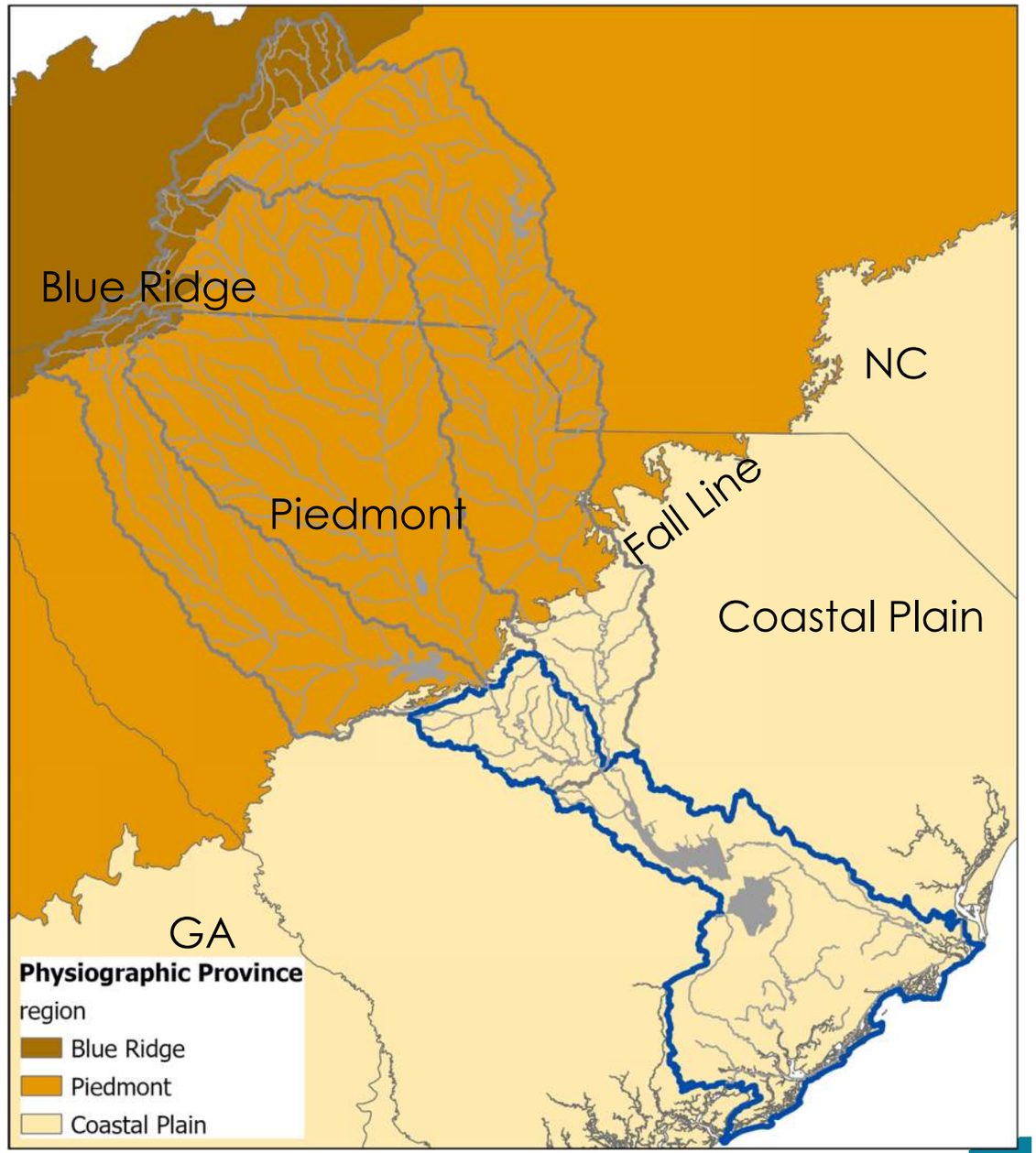
Physiographic Provinces

Blue Ridge and Piedmont

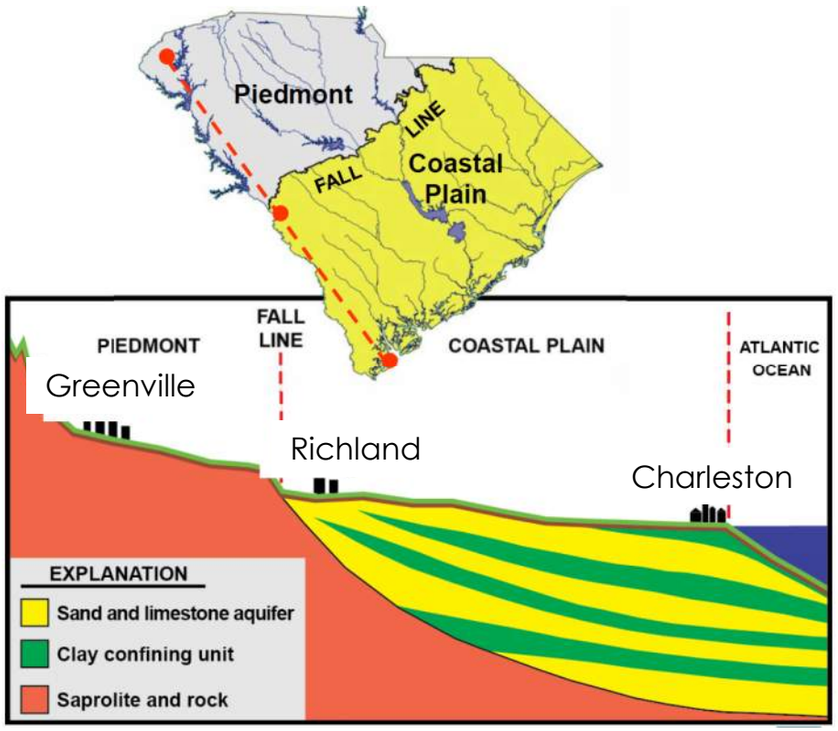
- Elevation range; 3,300 ft (Blue Ridge) to 1,000 ft at the foothills (Piedmont) to 450 ft near the Fall Line
- Underlain by metamorphic and igneous bedrock
- Groundwater wells tap crystalline rock fractures and saprolite

Coastal Plain

- Elevation range; 450 ft at Fall Line to Sea level at the coast
- Sediments thicken from zero at the Fall line to 4,000 feet in Beaufort County
- A wedge of sand, clay, silt, and limestone Permeable sand and limestone form the State's most important aquifers



SC Hydrogeologic Framework Along Dip



415 Feet

Fall Line (Richland County)

7 Feet

(Charleston County)

Surficial aquifer

Gordon confining unit

Gordon aquifer

Crouch Branch confining unit

Crouch Branch aquifer

McQueen Branch confining unit

McQueen Branch aquifer

Charleston confining unit

Charleston aquifer

Gramling confining unit

Gramling aquifer

McQueen Branch aquifer

PIEDMONT PHYSIOGRAPHC PROVINCE

SOUTHEASTERN COASTAL PLAIN PYSIOGRAPHIC PROVINCE

Limestone/ Sand

Sand

Sand

Sand

Sand/Clay

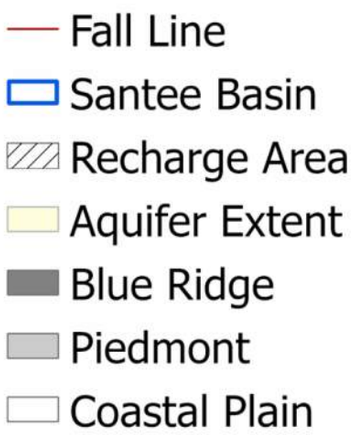
Aquifer

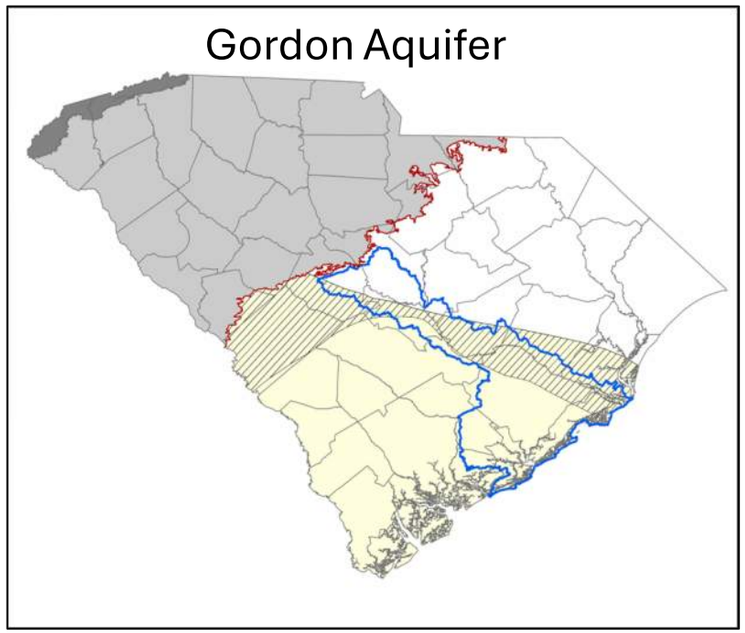
Confining unit

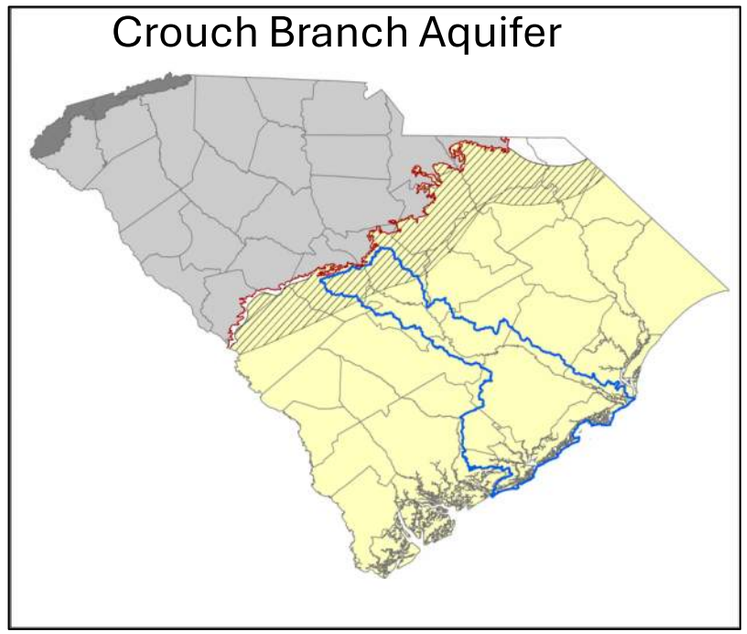
not drawn to scale

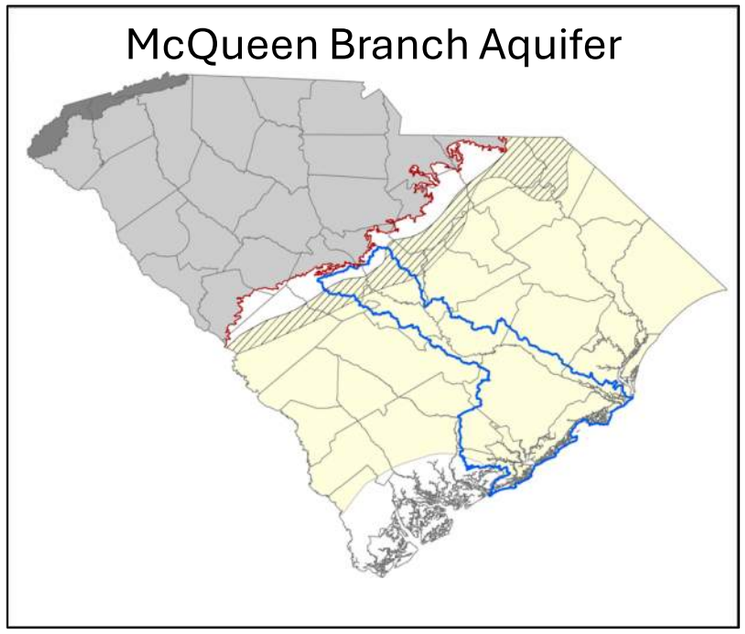
-2800 Feet

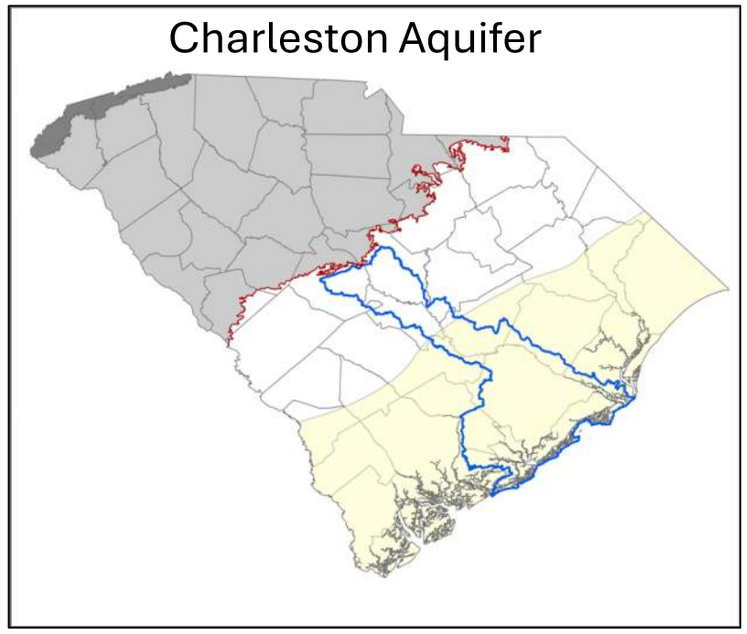
Coastal Plain Aquifer Extents and Recharge Areas











Groundwater Monitoring Network

- 24 well sites actively monitored completed in 5 aquifers
- Period of record ranges from 5 to 45 years

Aquifer

- Surficial aquifer system
- Gordon
- Upper Floridan
- Middle Floridan
- Crouch Branch
- McQueen Branch
- Charleston
- Gramling
- Gramling confining unit
- Crystalline rock

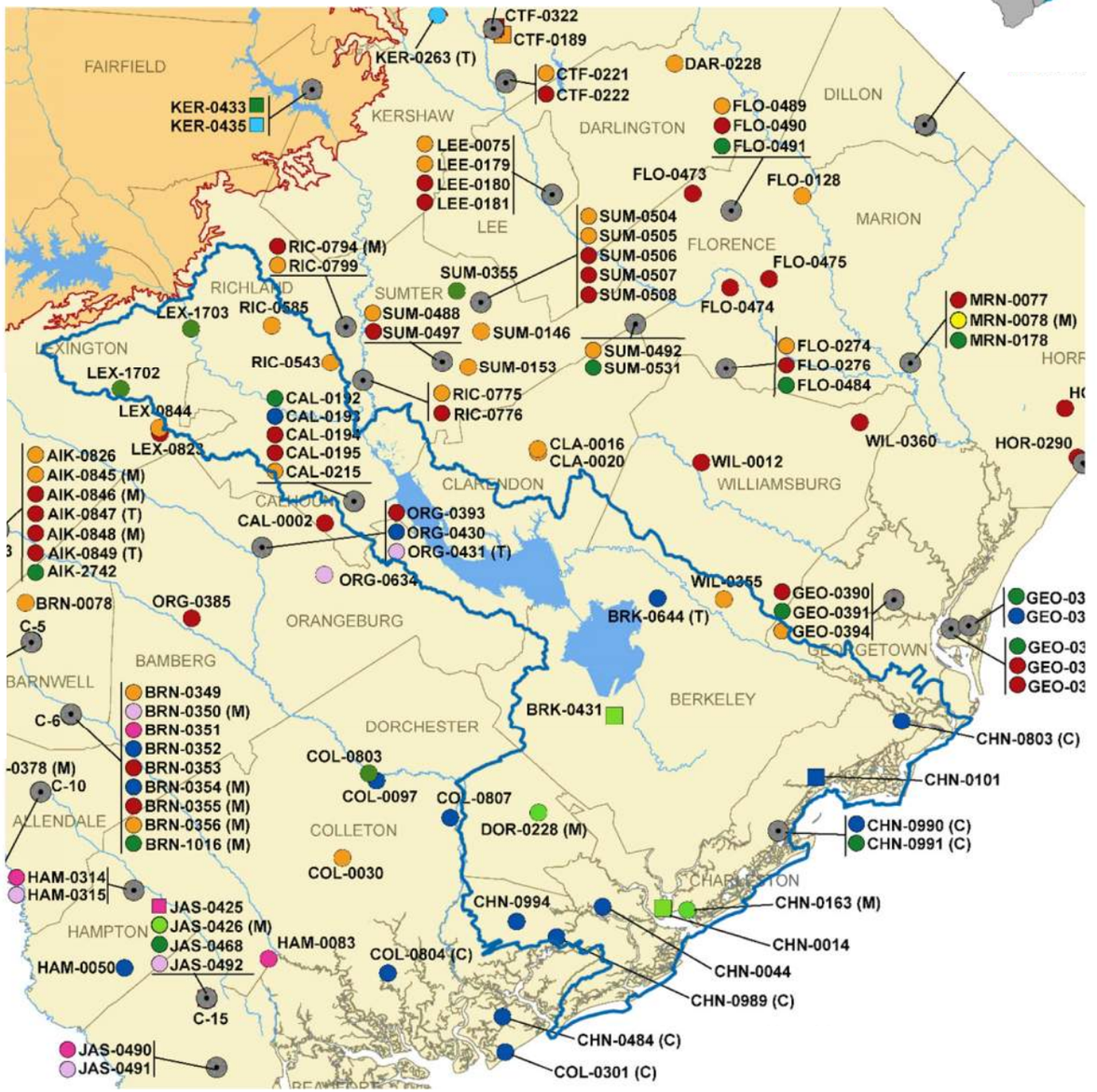
Santee Basin

Agency

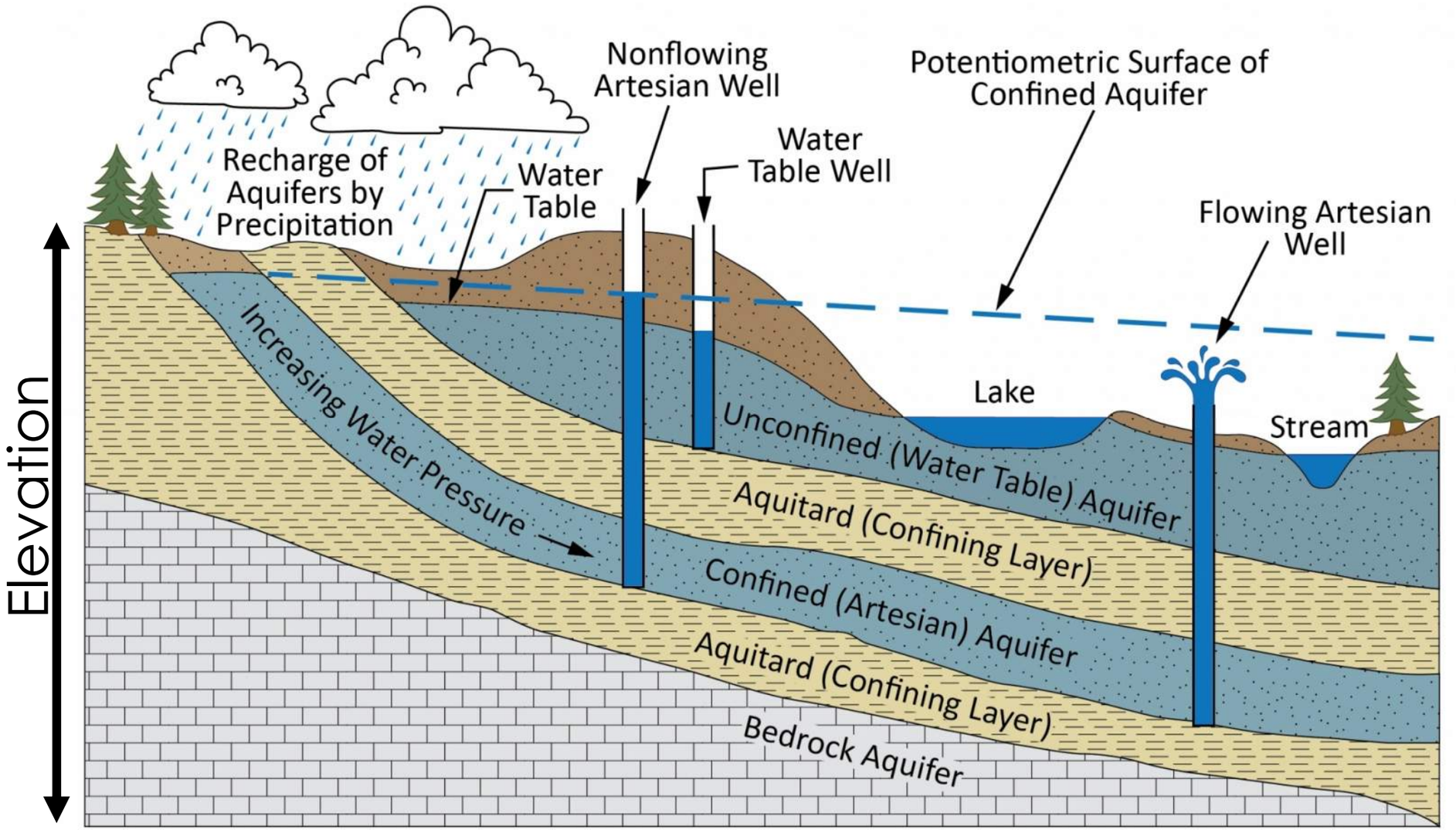
- SCDNR
- USGS
- Cluster site

(M) Manual water level measurement
(C) Water level and conductivity measurement
(T) Telemetry Site

USGS science for a changing world



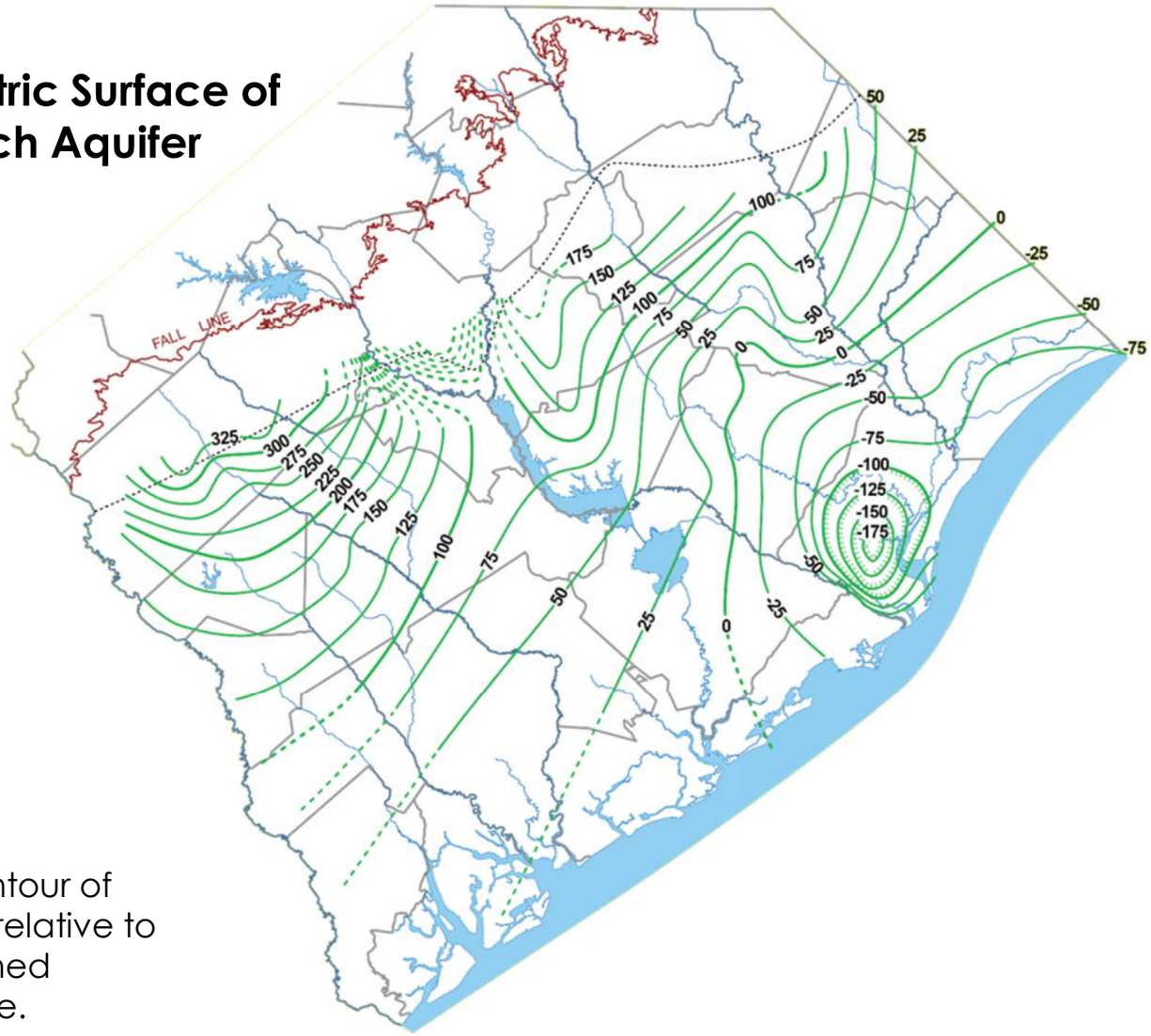
Water-Level Measurements of an Aquifer



https://geology.utah.gov/

Potentiometric Water-Level of an Aquifer

2016 Potentiometric Surface of the Crouch Branch Aquifer



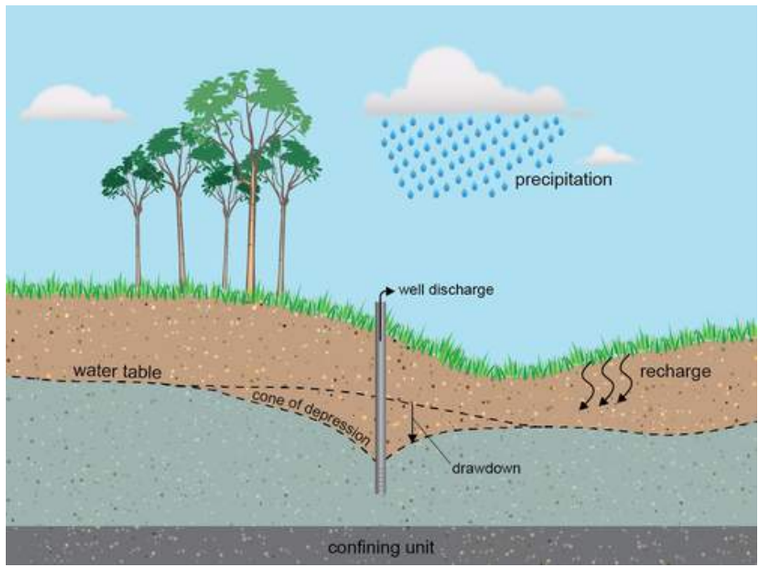
EXPLANATION

100

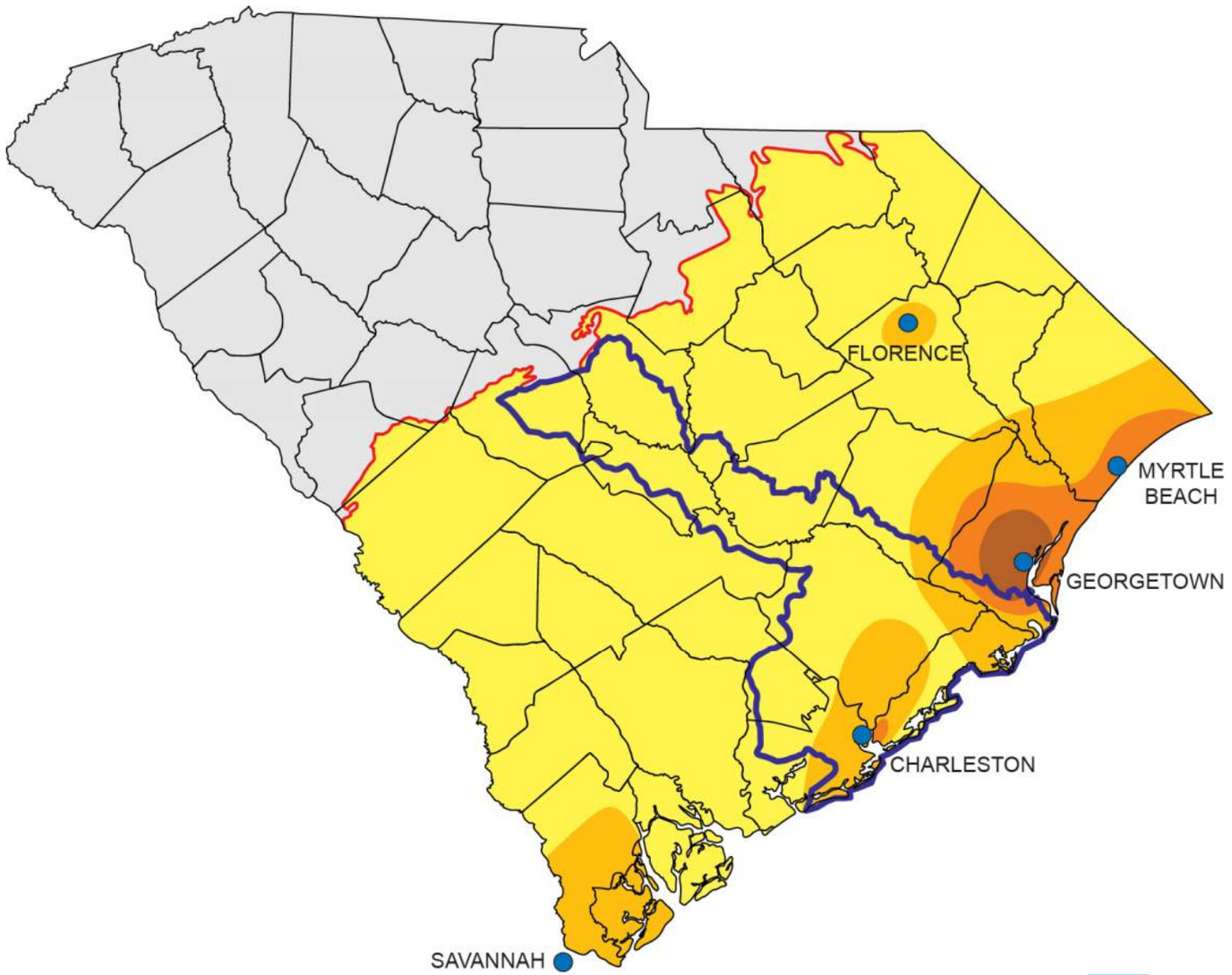
Potentiometric contour of the aquifer in feet relative to feet NAVD88. Dashed where approximate.

- The potentiometric surface is the level, in feet, referenced to a vertical datum to which water rises as measured in tightly cased wells open to specific aquifers.
- Some groundwater model results will be presented as potentiometric contours.

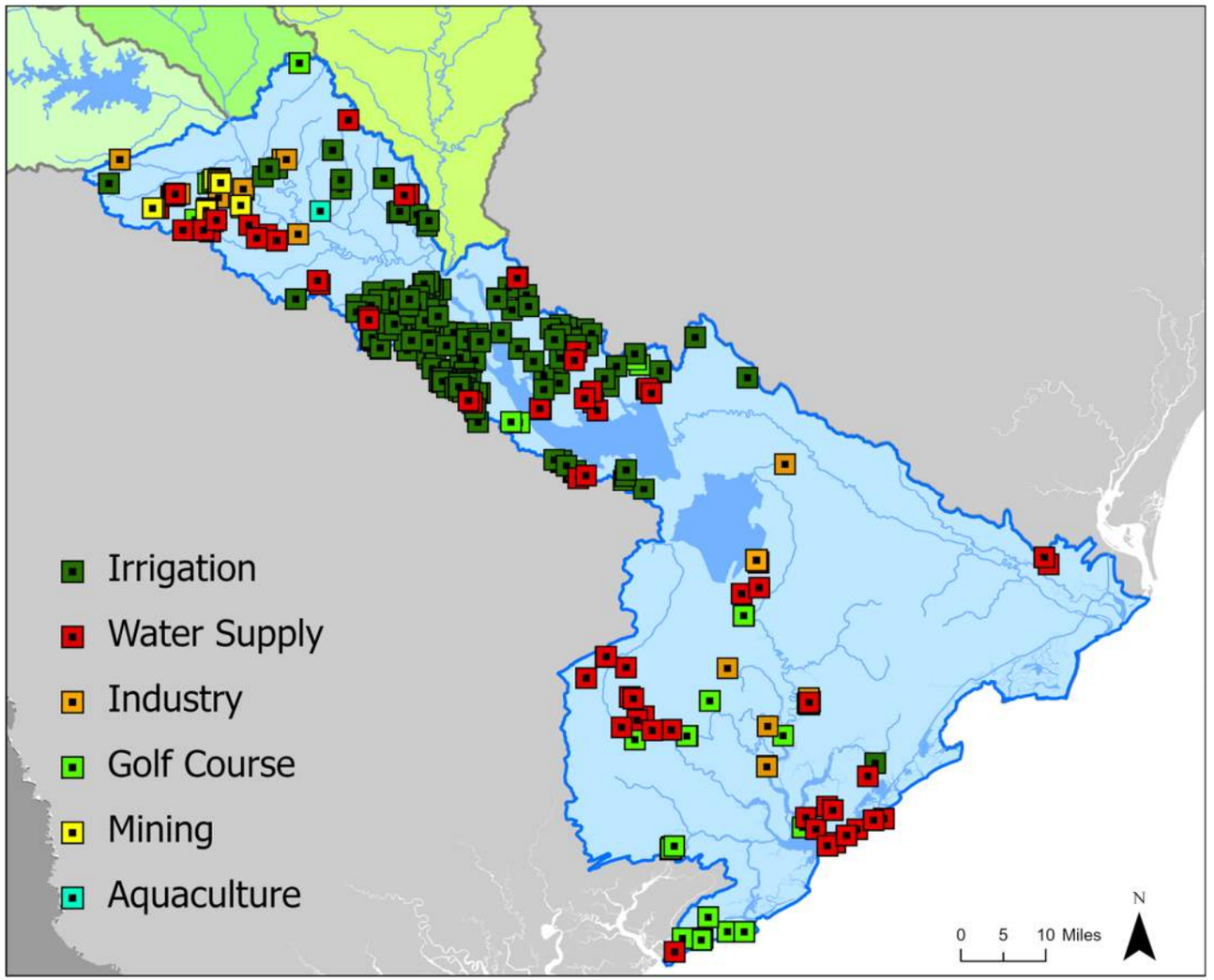
Cones of Depression in SC



Long-term pumping can result in "cones of depression", which are areas where groundwater levels have declined. The greatest declines are centered at the pumping wells, but the zone of influence can spread out for tens of miles.



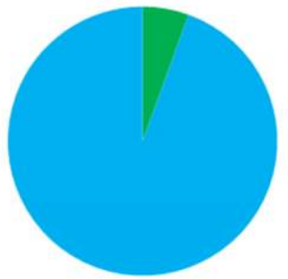
Reported Groundwater Lower Santee Water Use 2023



Including Energy

SW : 94% (438 MGD)

GW: 6% (26 MGD)



Excluding Energy

SW : 84% (133 MGD)

GW: 16% (26 MGD)

Ag. Irrigation, 41% (11 MGD)

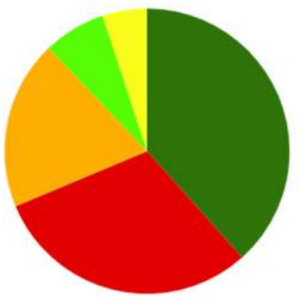
Water Supply, 29% (8 MGD)

Industry, 18% (5 MGD)

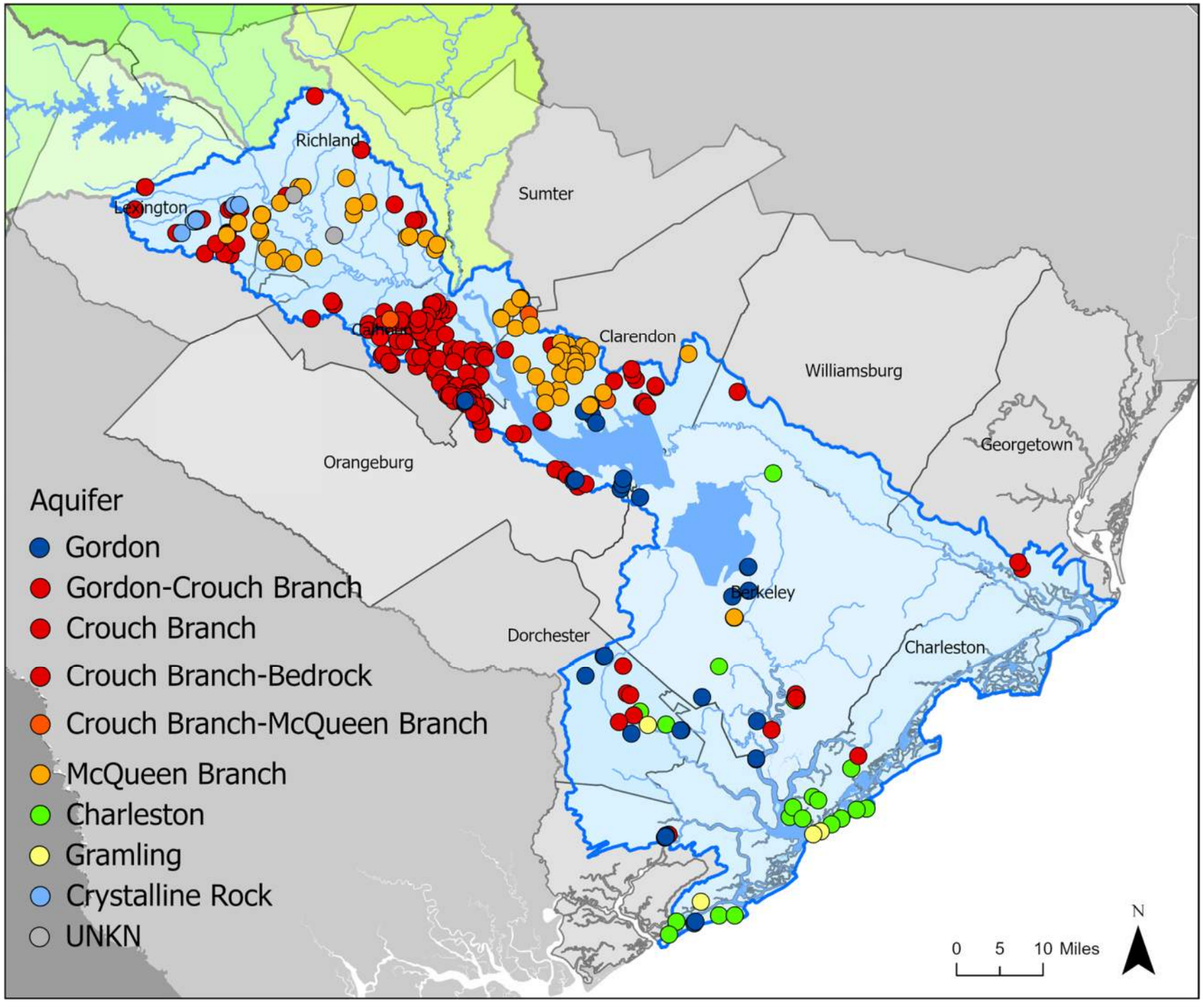
Golf Course, 8% (2 MGD)

Mining, 5% (1.3 MGD)

Aquaculture, < 1% (0.02 MGD)

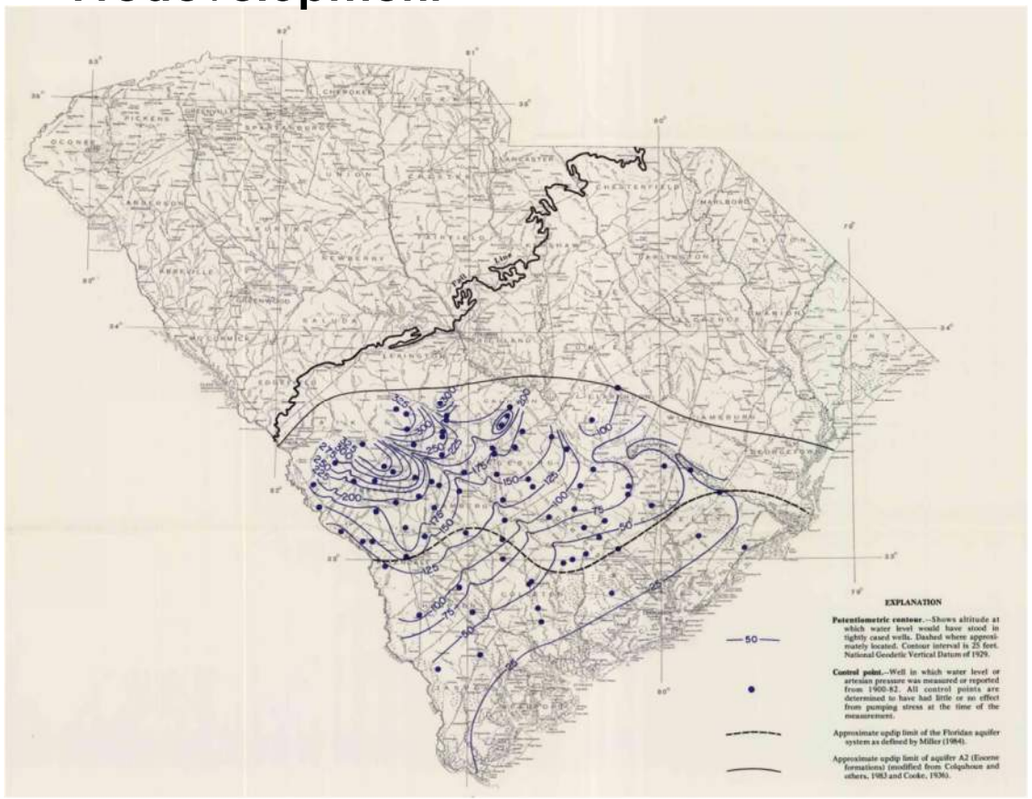


Water Use by Aquifer

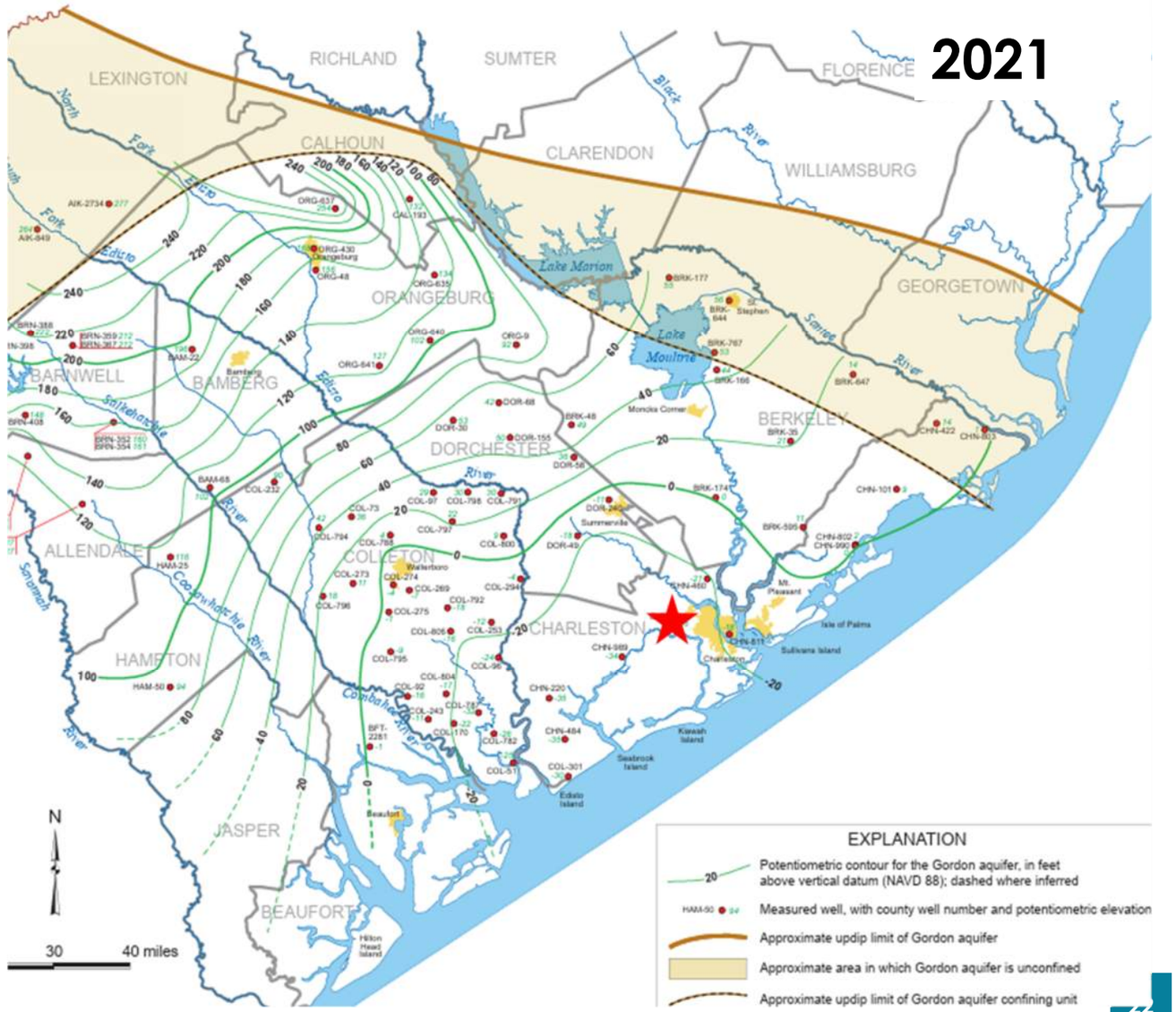


Potentiometric surface of the Gordon Aquifer

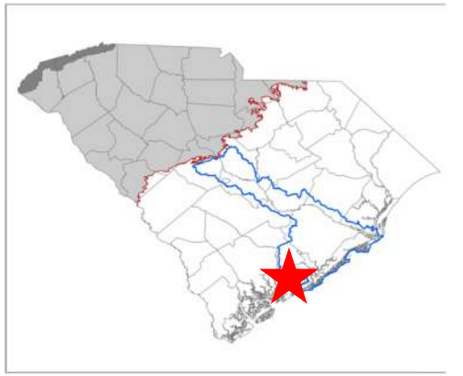
Predevelopment



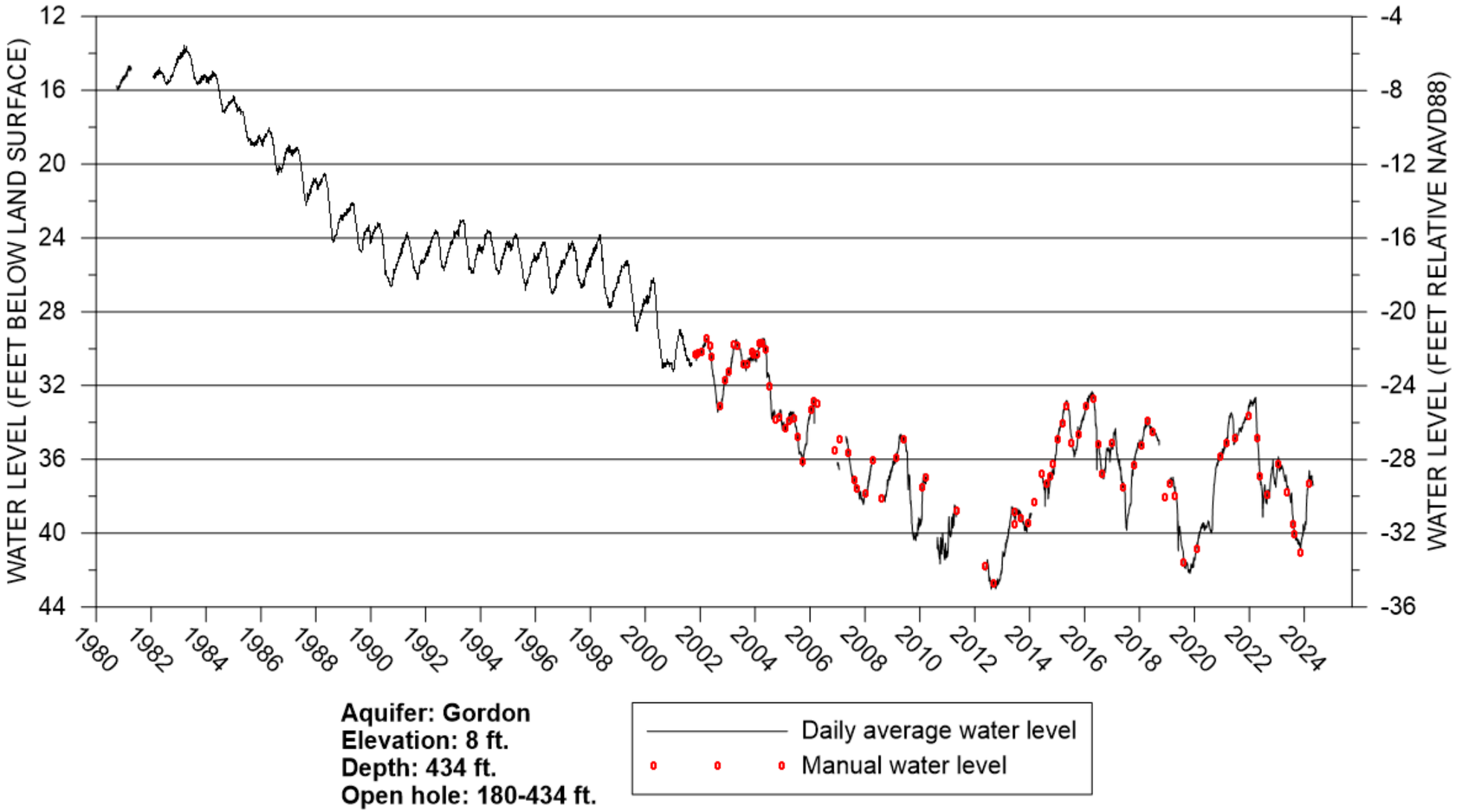
2021



Water-Resources Investigations Report 84-4208
https://doi.org/10.3133/wri844208



CHN-0044 Daily Average and Manual Water Levels

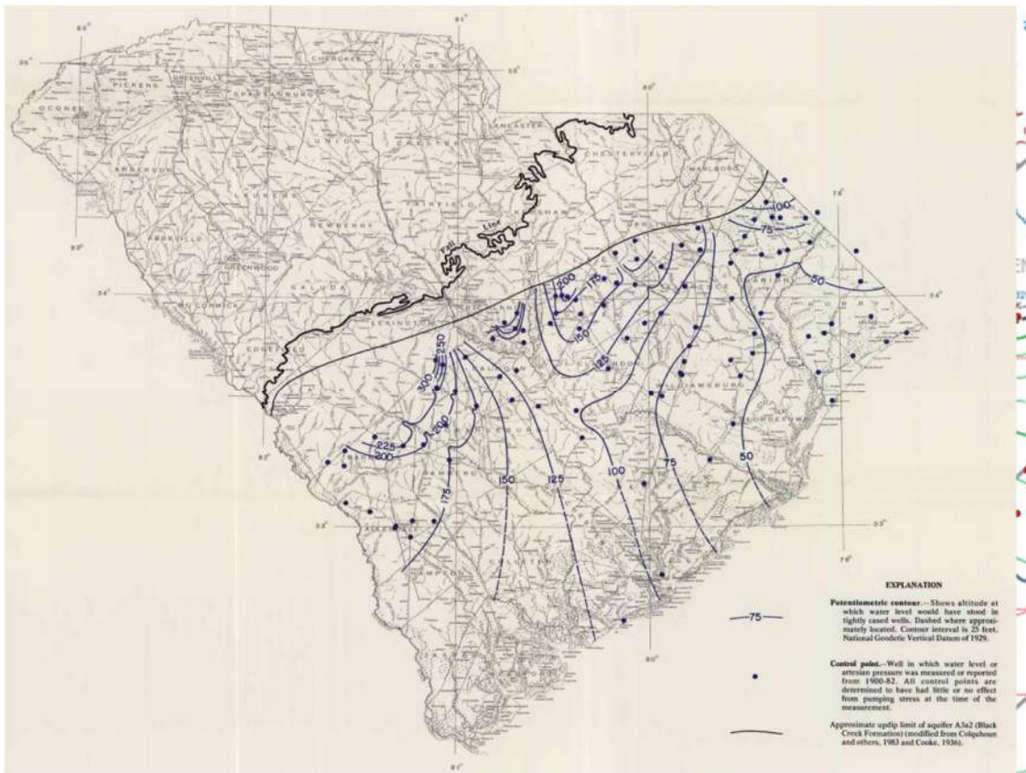


Aquifer: Gordon
Elevation: 8 ft.
Depth: 434 ft.
Open hole: 180-434 ft.

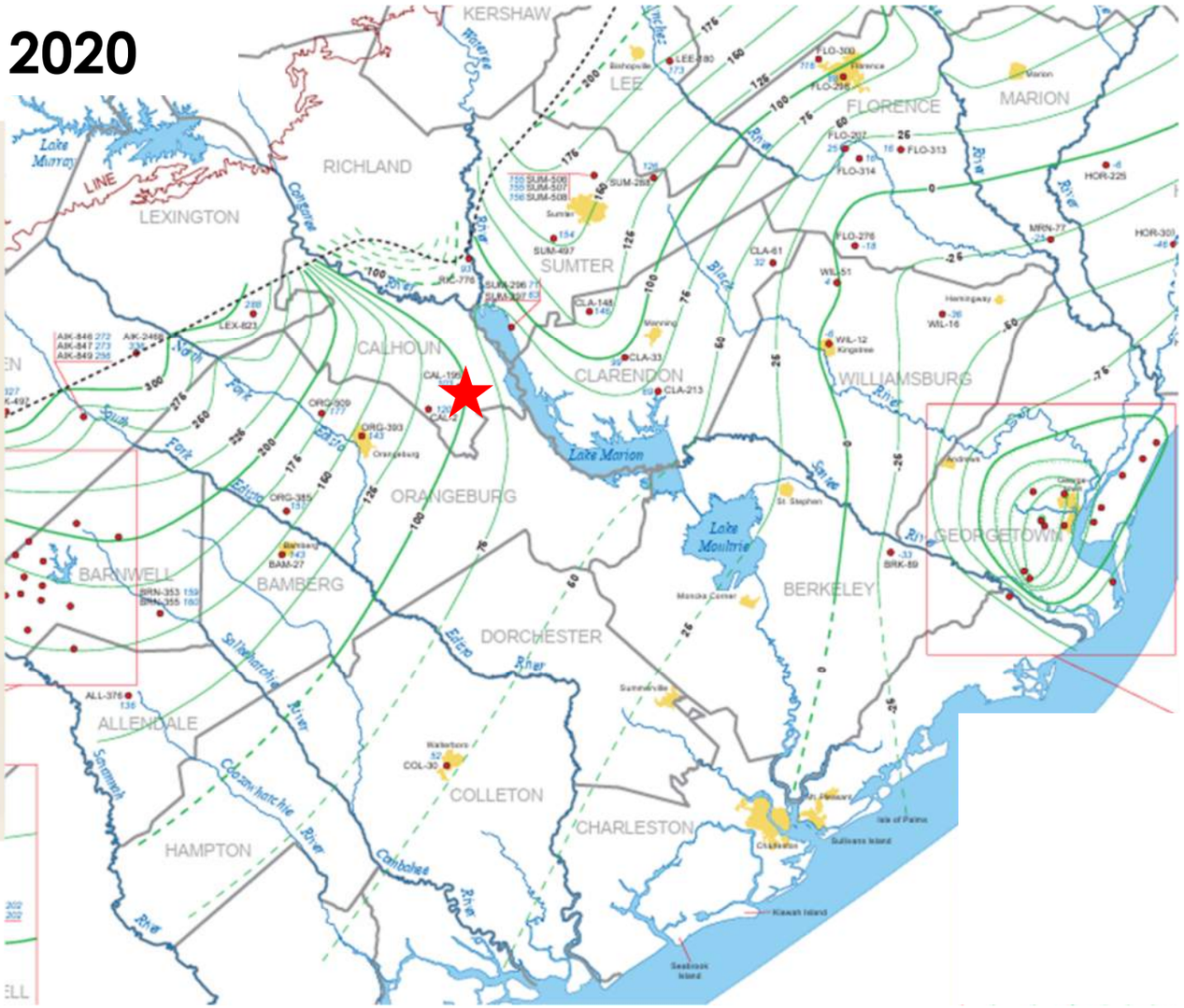
Daily average water level
Manual water level

Potentiometric surface of the Crouch Branch Aquifer

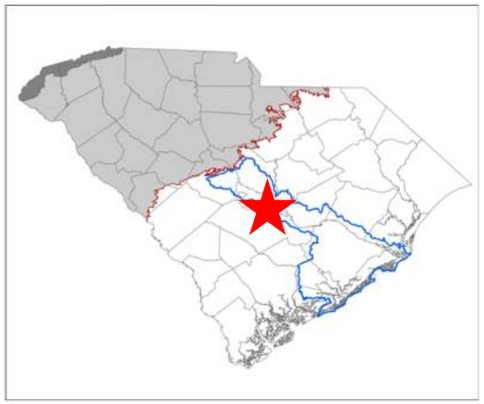
Predevelopment



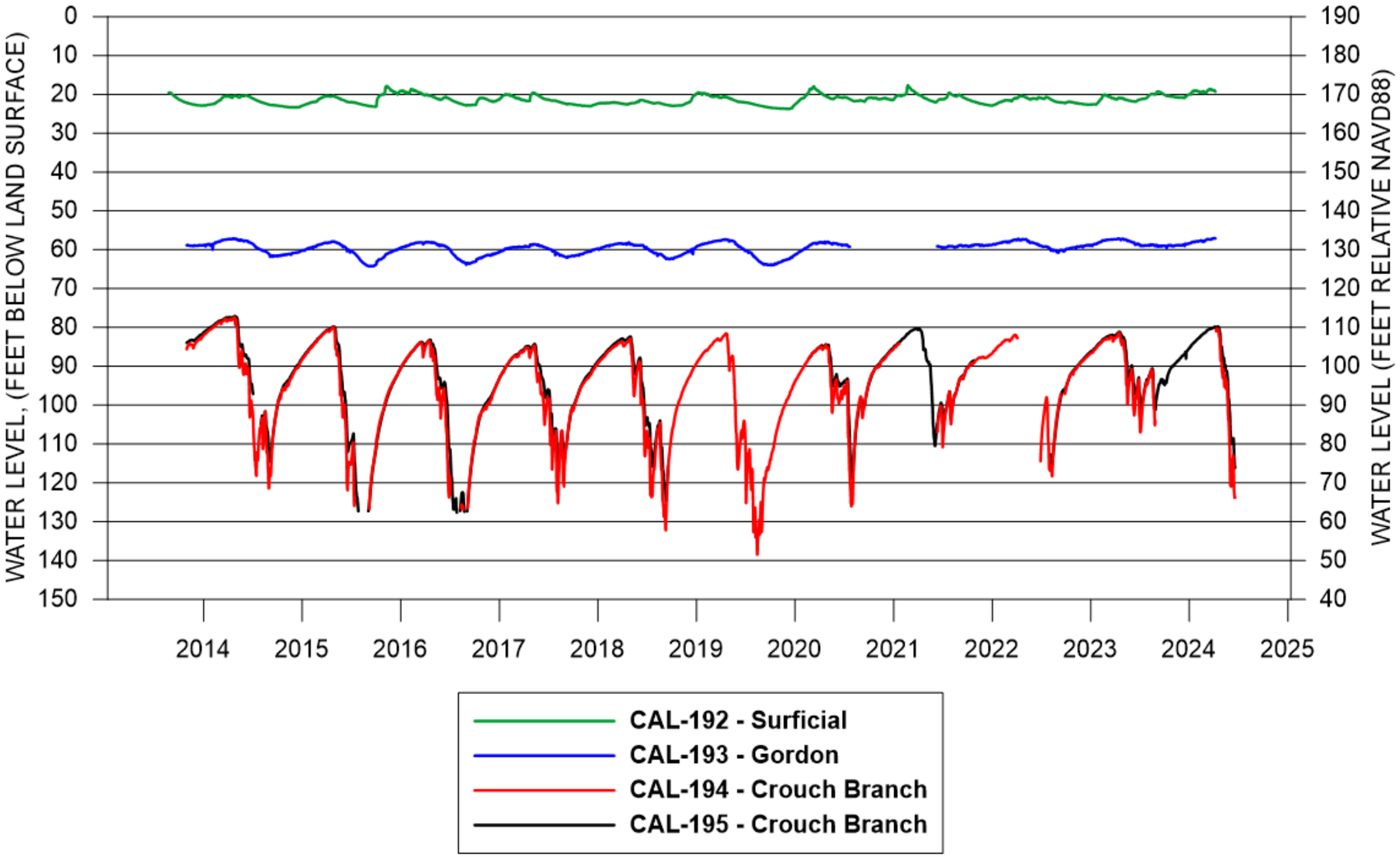
2020



Water-Resources Investigations Report 84-4208
https://doi.org/10.3133/wri844208

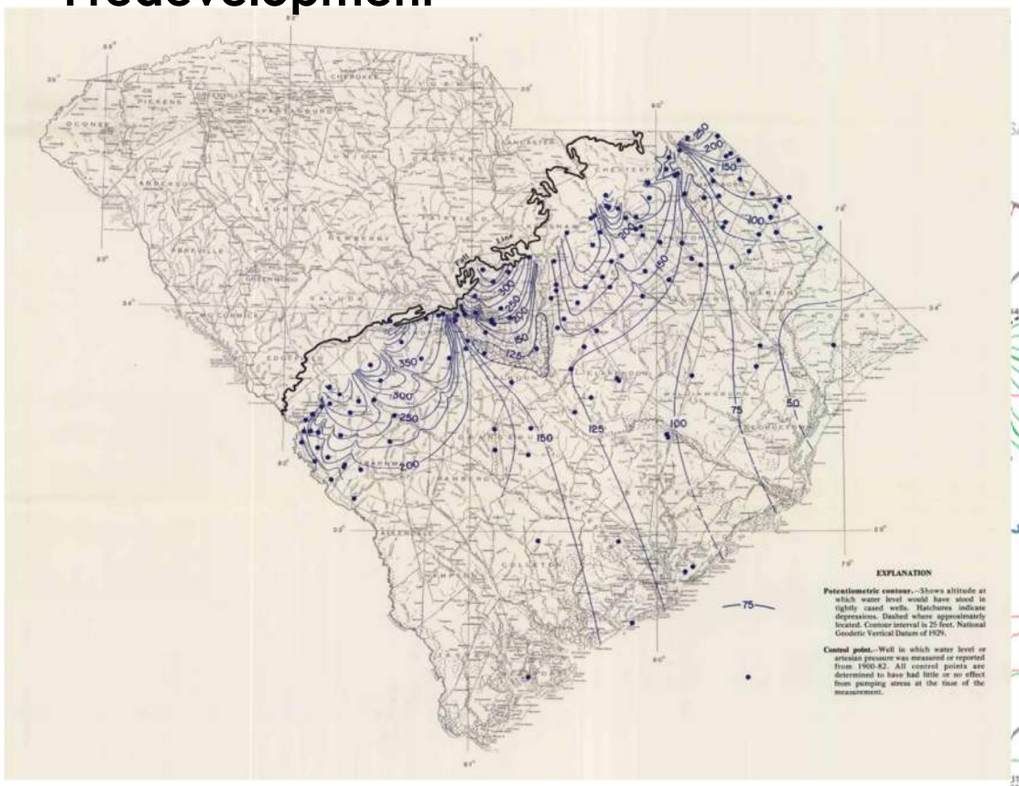


Creston, Calhoun County Daily Average Water Levels

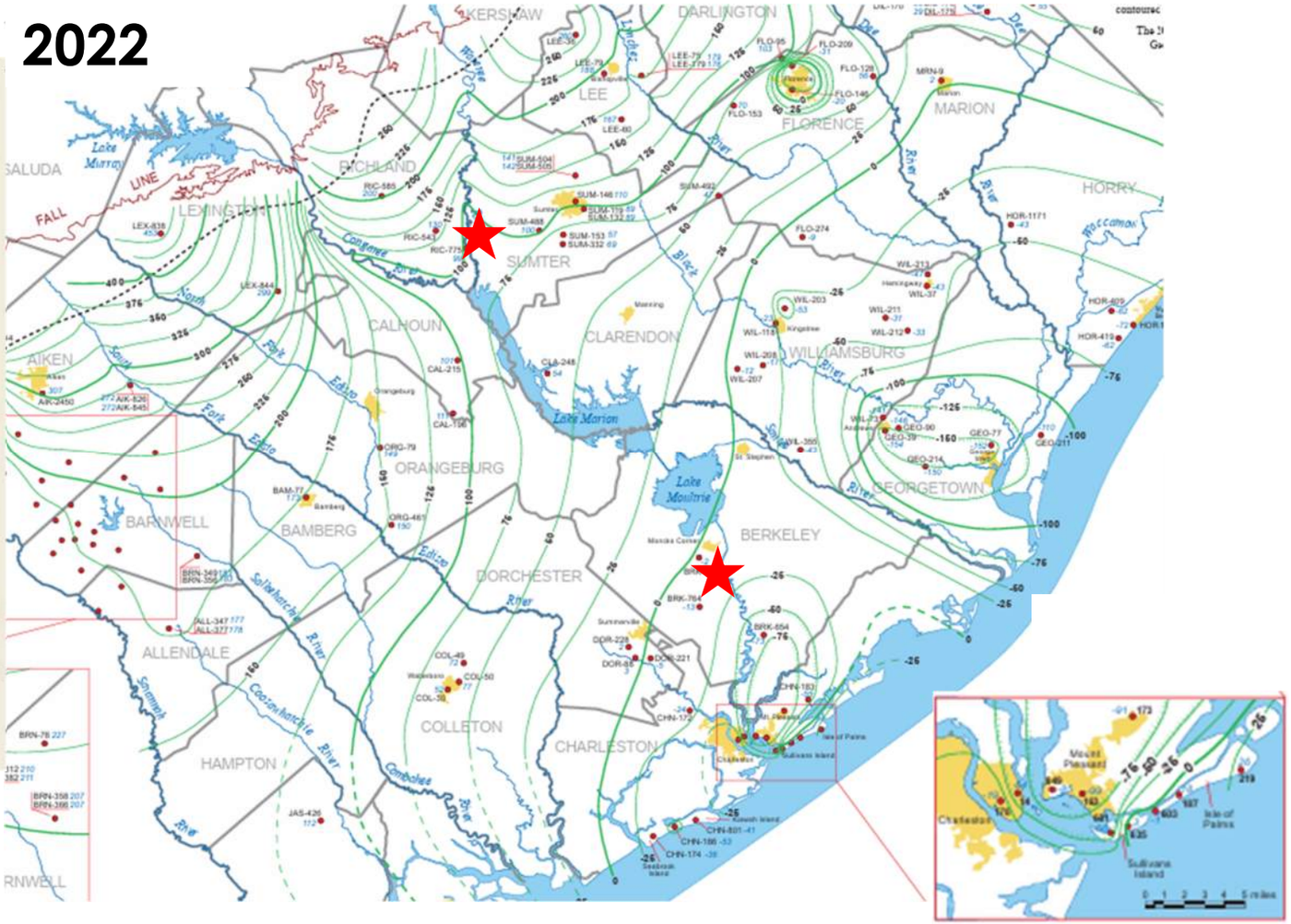


Potentiometric surface of McQueen & Charleston Aquifers

Predevelopment

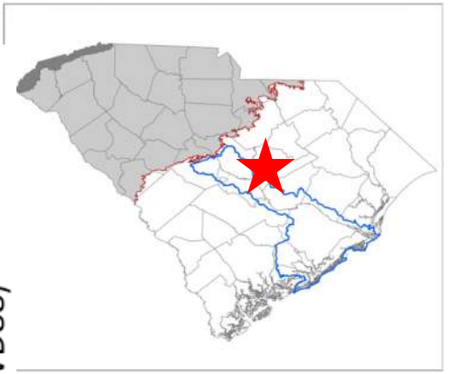


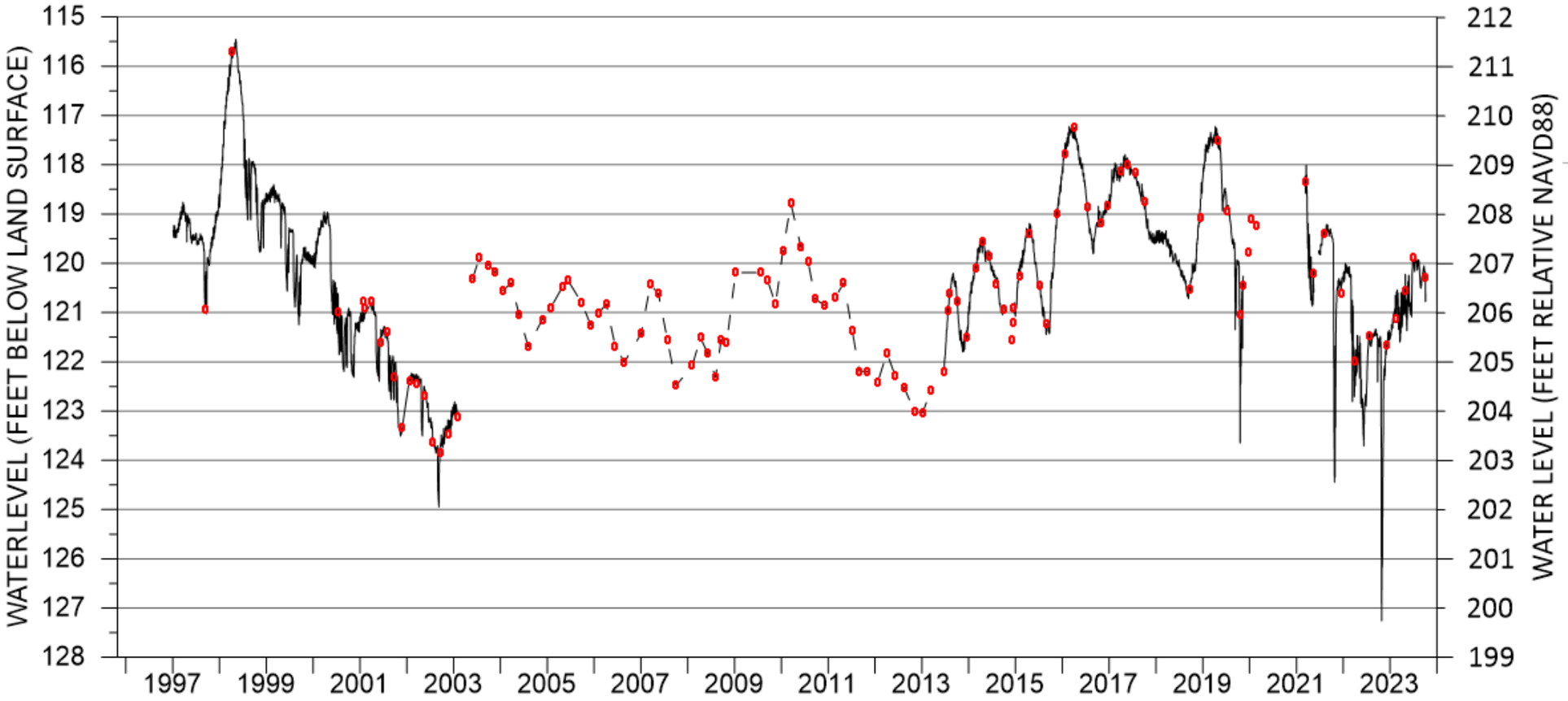
2022



Water-Resources Investigations Report 84-4208
https://doi.org/10.3133/wri844208

RIC-0585 Daily Average and Manual Water Levels

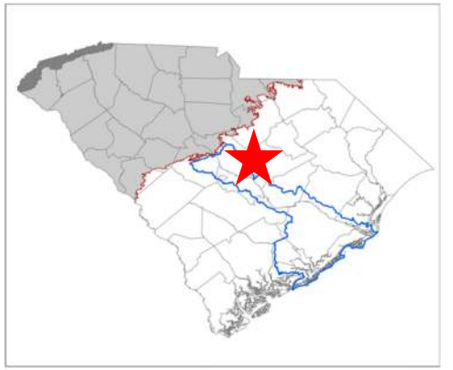


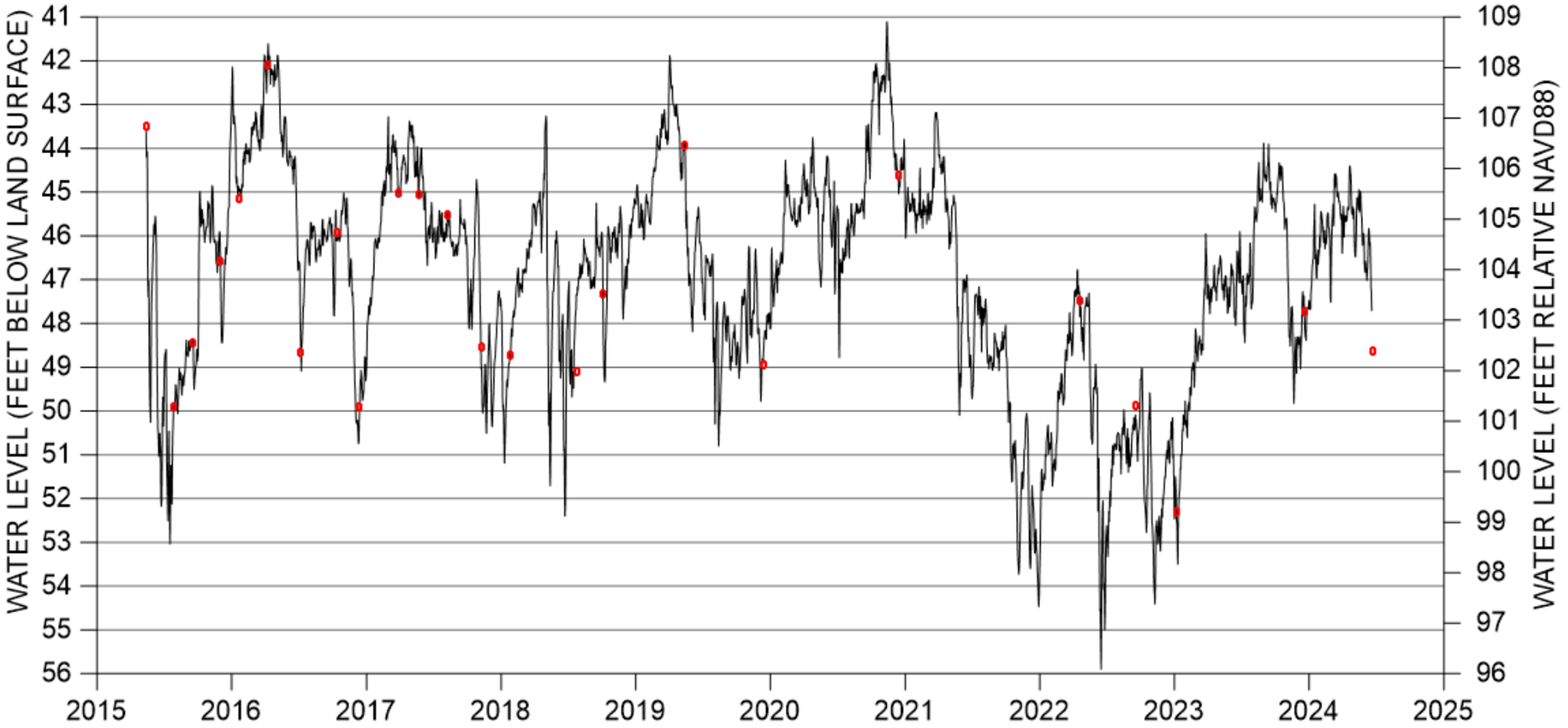


Aquifer: McQueen Branch
Elevation: 327 ft
Depth: 403 ft
Screen: 363-393 ft

Daily Average
Manual

RIC-0775 (OBW-2) Daily Average and Manual Water Levels



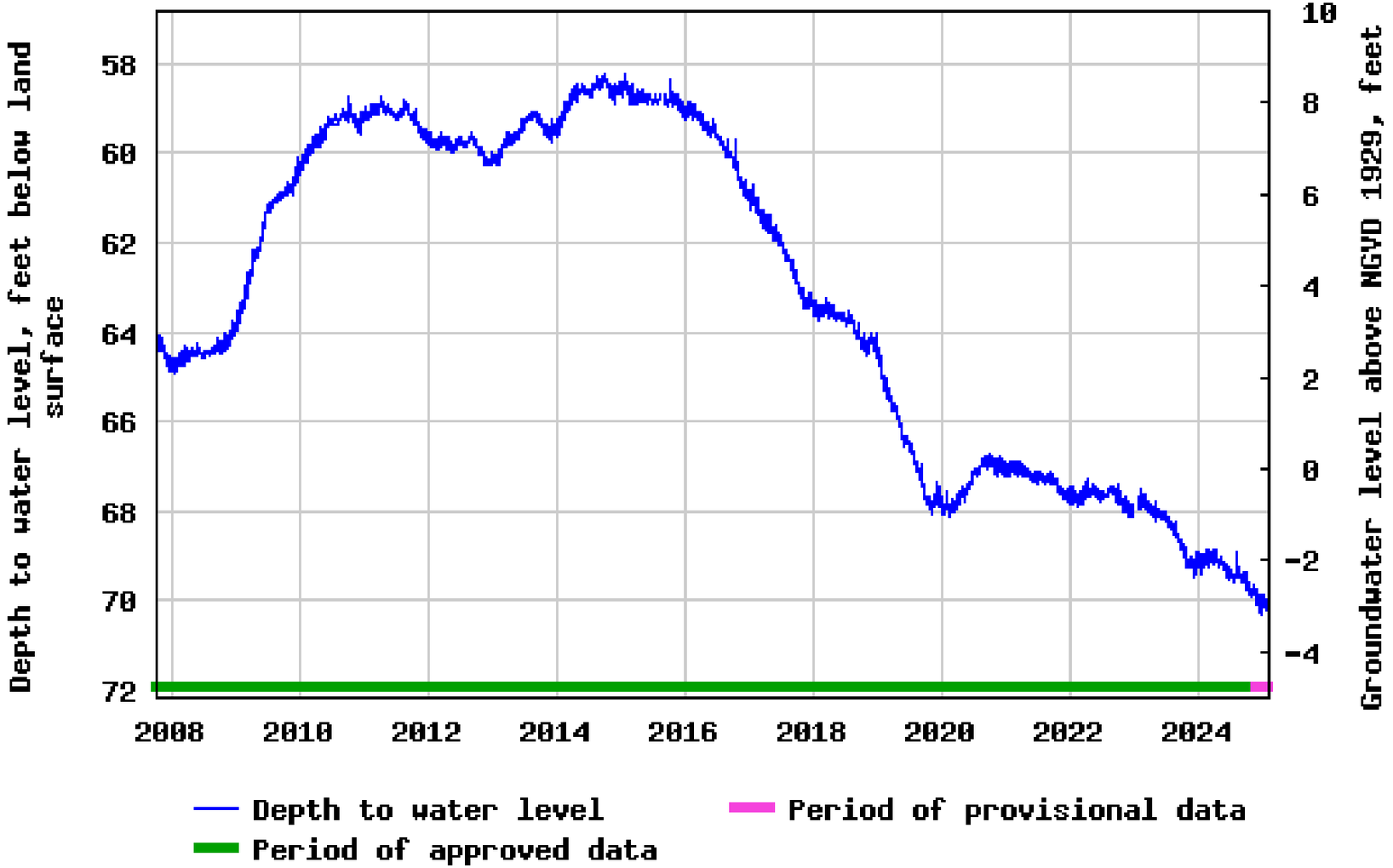


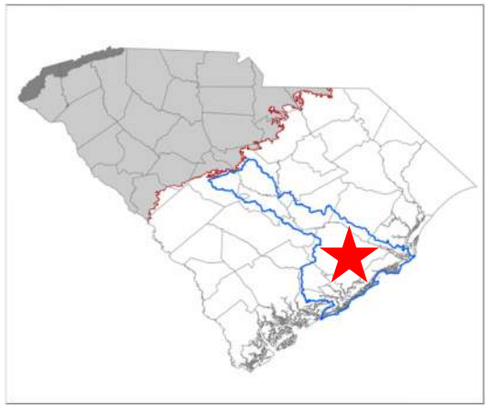
Aquifer: McQueen Branch
Elevation: 150 ft
Depth: 607 ft
Screen: 437-600 ft

Daily Average
0 0 0 Manual

USGS

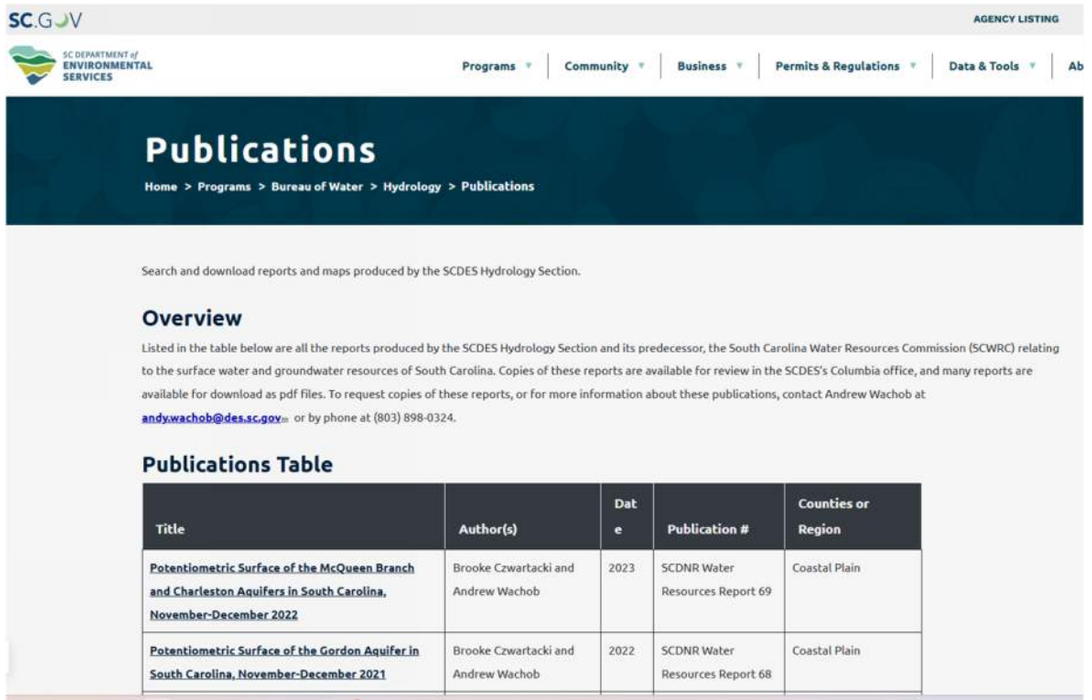
USGS 331022080021801 BRK- 431

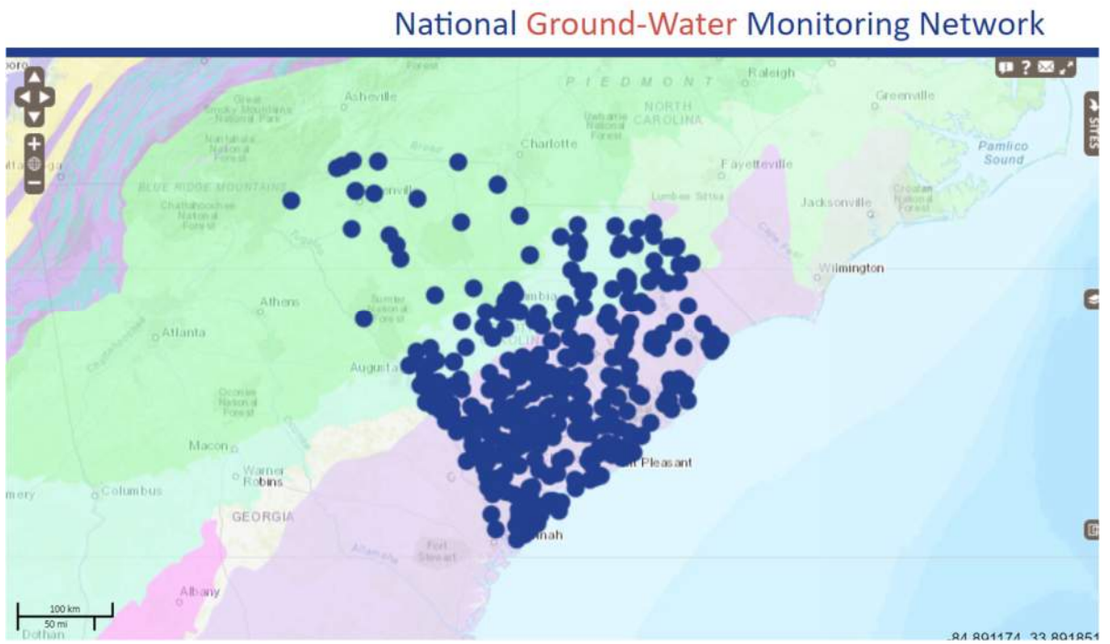




Aquifer: Charleston
Elevation: 67 ft
Well Depth: 1607 ft

Groundwater Data and Publications





https://des.sc.gov/programs/bureau-water/hydrology/publications

https://cida.usgs.gov/ngwmn/index.jsp

Questions?

Brooke Czwartacki

brooke.czwartacki@des.sc.gov

SC DEPARTMENT *of* ENVIRONMENTAL SERVICES