Long Island Groundwater Trends

Presented by Paul Grosser, PhD. PE. PG.

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Outline

- Issues have been raised in regards to sand and gravel mines causing groundwater elevations in surrounding areas to drop.
- Data was collected from independent sources for groundwater elevation and annual precipitation quantities.
  - Elevation data was analyzed for 47 USGS observation wells from 1989 to 2018
  - Monthly precipitation data was collected from 1989 to 2018 from NOAA weather station at MacArthur Airport
- Findings indicate that open lake sand and gravel mining results in aquifer recharge.

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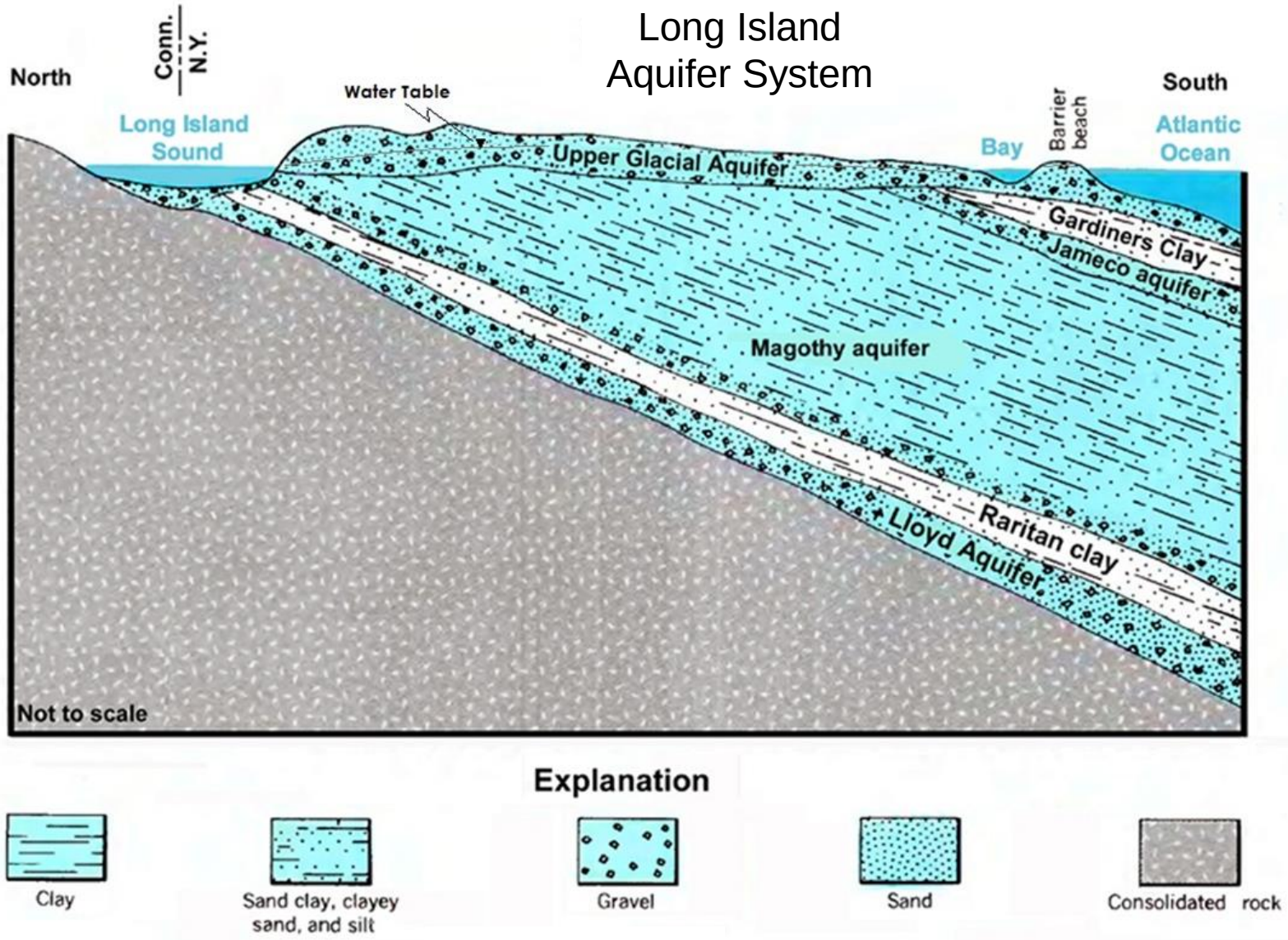
Long Island Aquifer System



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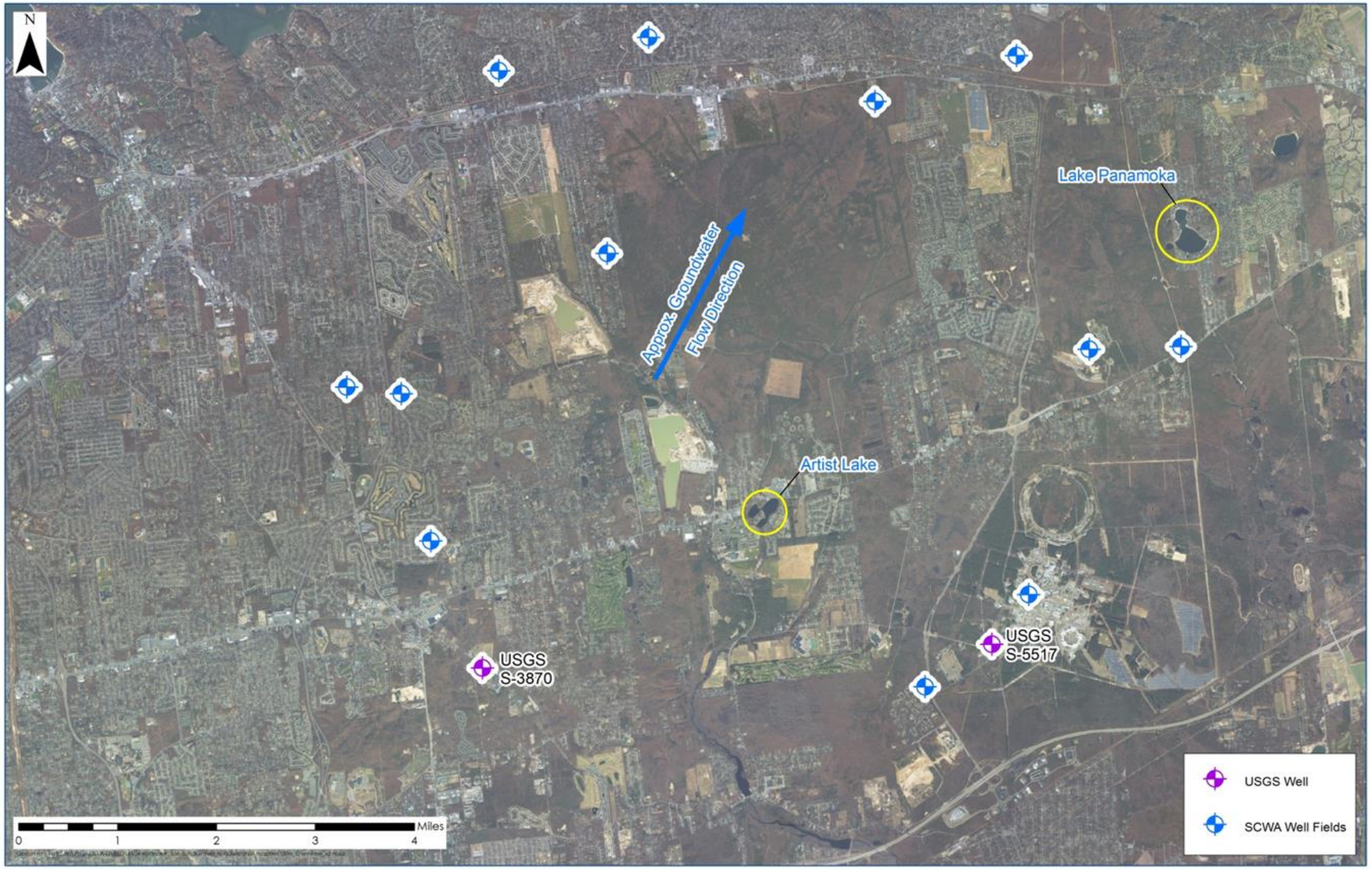

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Regional Analysis of Groundwater Levels

Data Constraints

- Thirty years of precipitation and groundwater elevation data
  - January, 1989 through November, 2018
- Active for the entire time constraint
  - Minimizes impact of well construction variable
- At least one reading per calendar year, missing no more than five years
  - Minimizes data gaps
  - Seasonal variations in groundwater table elevation can impact these yearly elevations
- Wells have been chosen based on distance from the roundabout at Whiskey Road and Yaphank-Middle Island Road
  - 10 mile radius
  - Removed Wells located in Lloyd Aquifer
- Rainfall, snowmelt, etc. (Precipitation) data from NOAA weather station at Islip MacArthur Airport (KISP)

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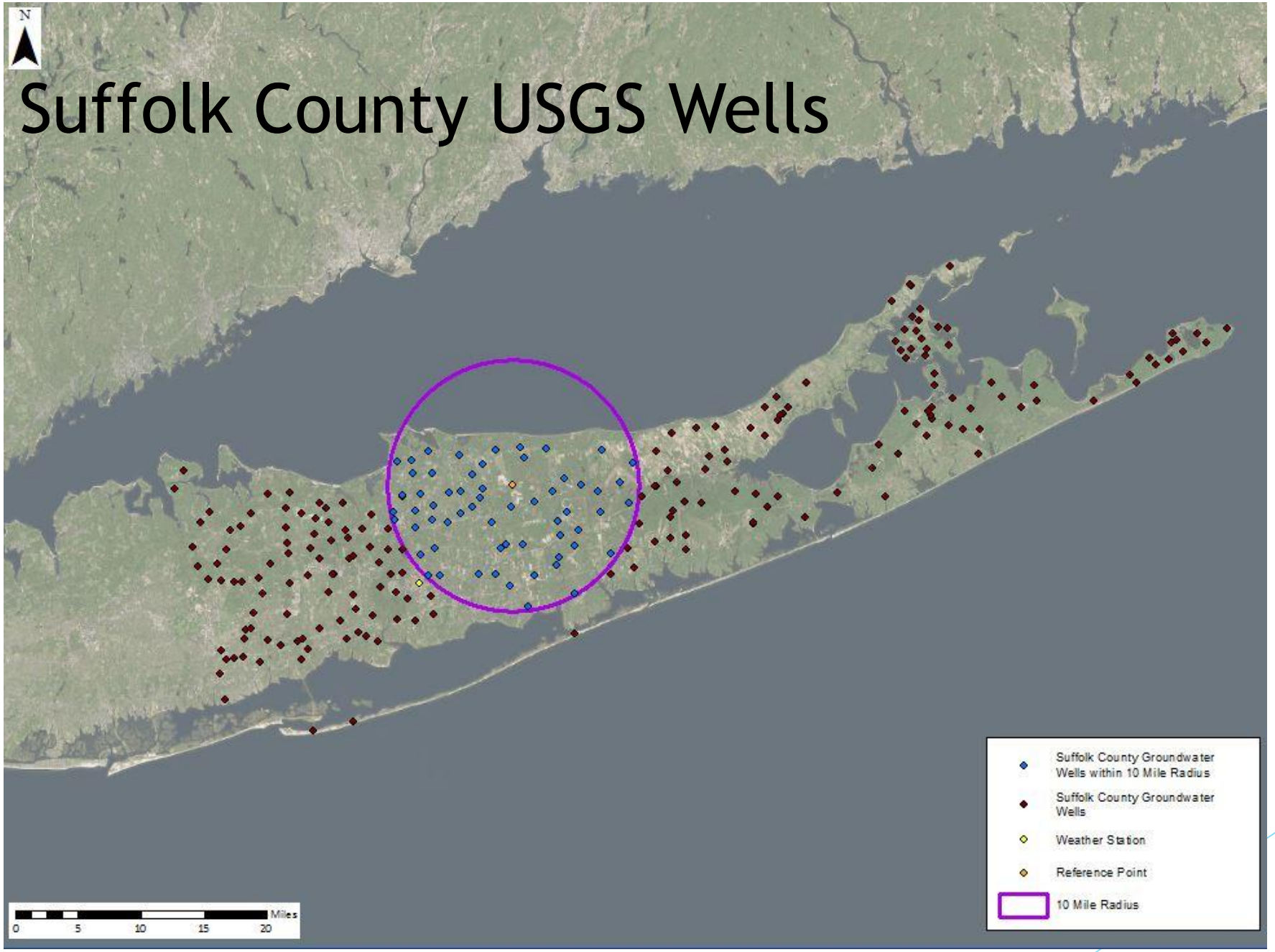
Suffolk County USGS Wells



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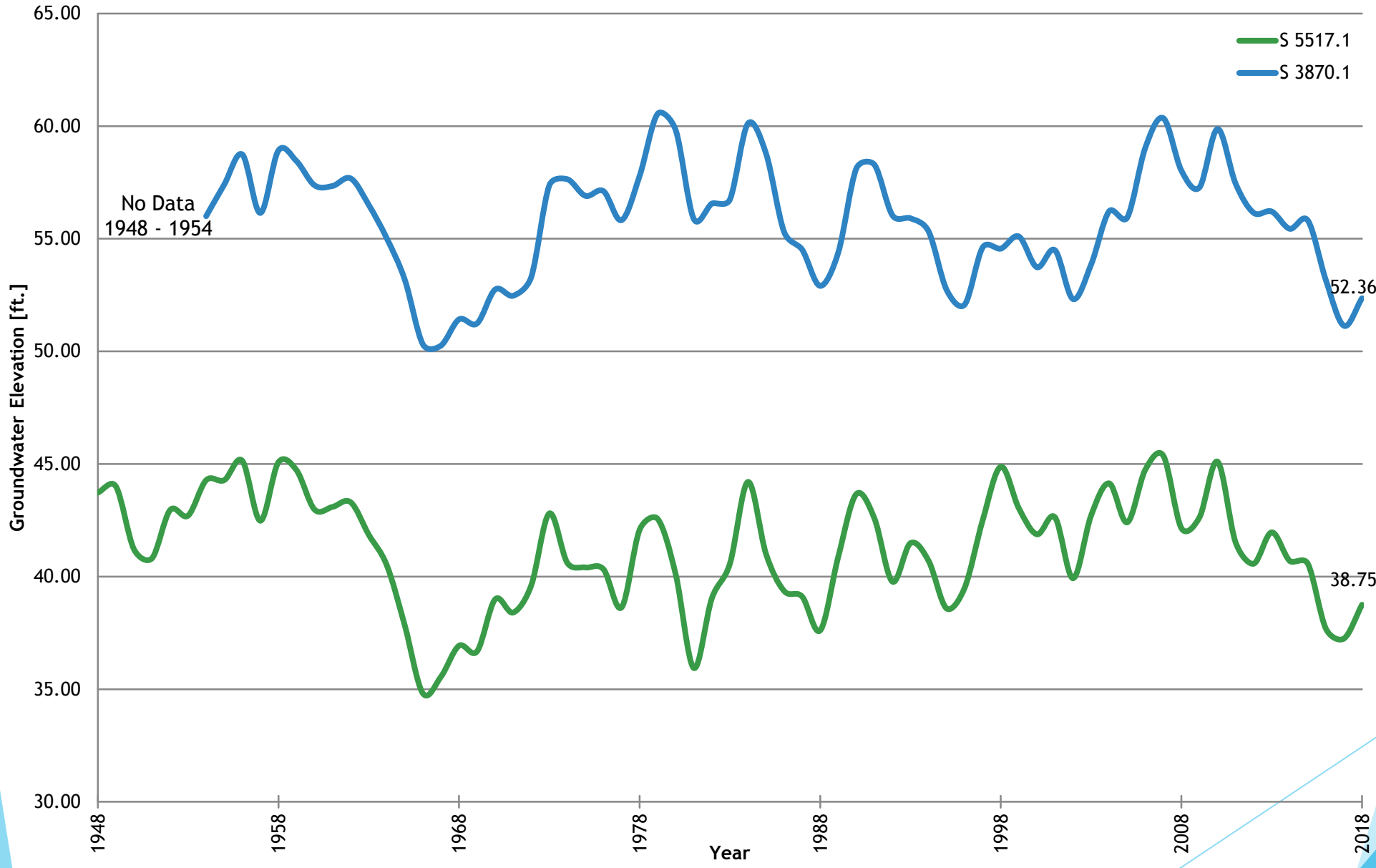
Regional USGS Wells Groundwater Elevation



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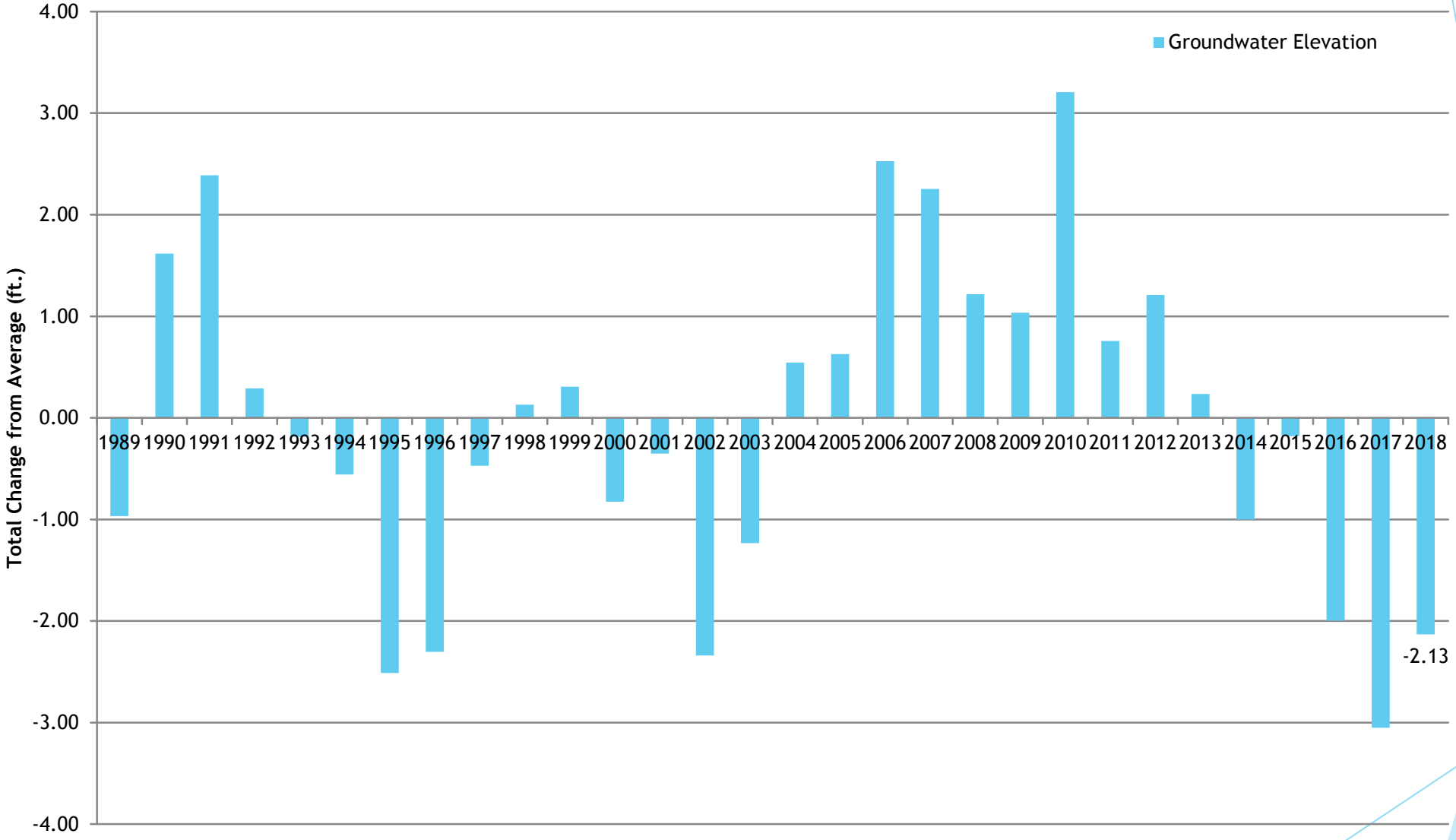
Groundwater Elevation Deviations from Average 1989 - 2018



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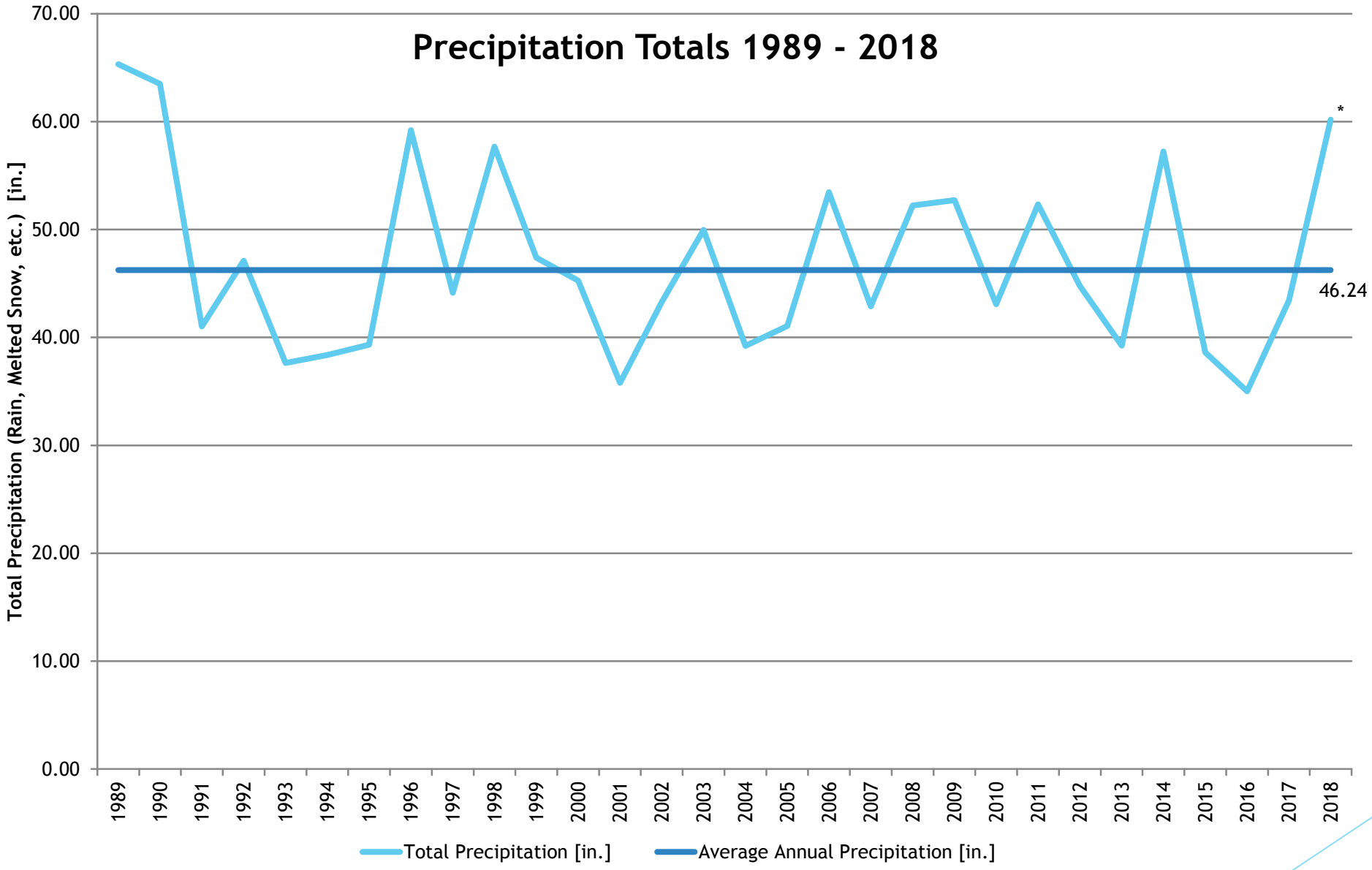

* Value is an estimate based on average precipitation for December

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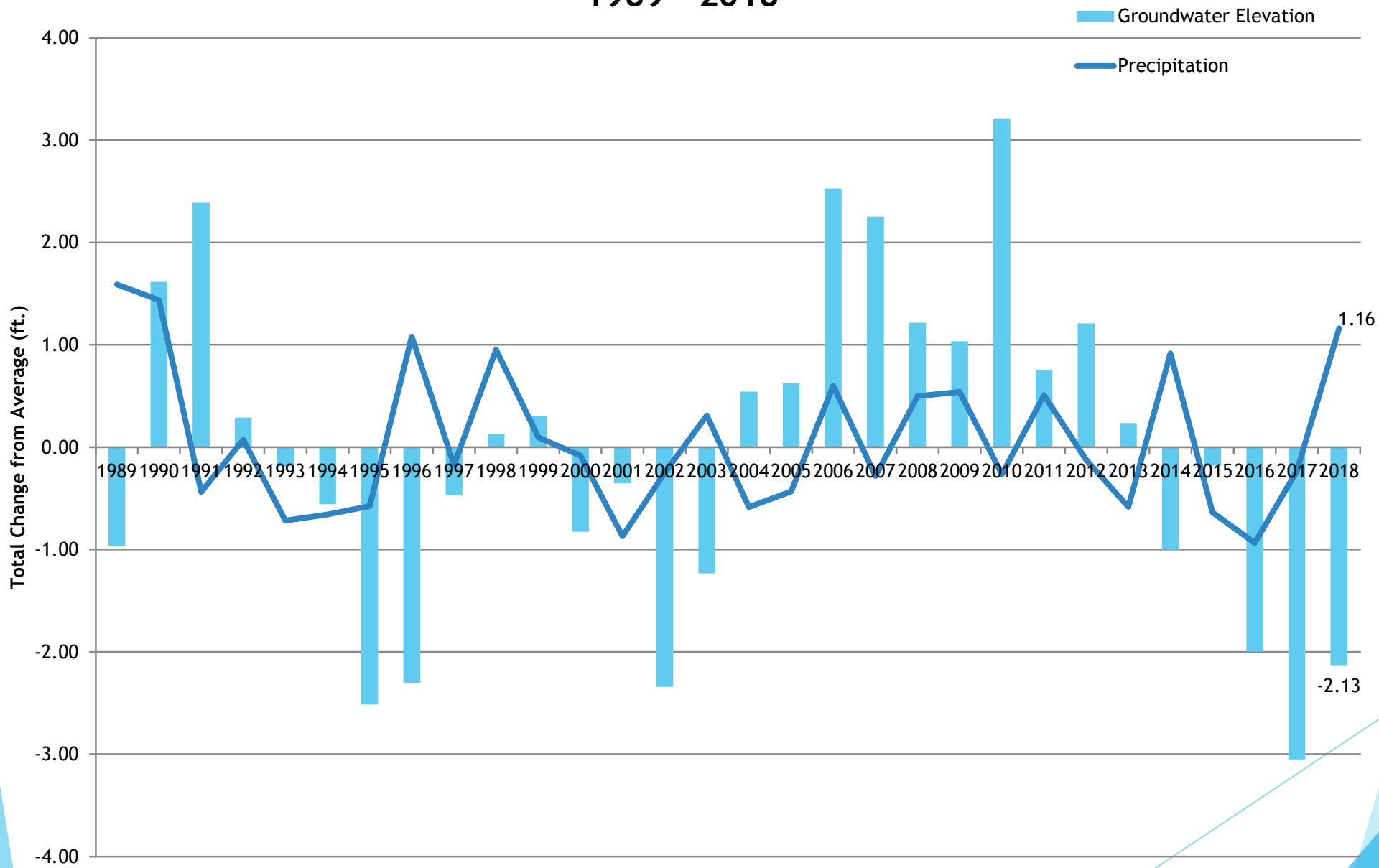
Groundwater and Precipitation Deviations from Average
1989 - 2018



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Precipitation and Recharge

- “Nassau and Suffolk Counties rely totally on ground water as their source of freshwater, and precipitation is the only source of replenishment” (Peterson, 1986)
- “Heavy rains or melting snow may increase recharge and cause the water table to rise. An extended period of dry weather may decrease recharge and cause the water table to fall.” (Clark and Briar, 1993)
- Annual Long Island Precipitation Thirty-year norm: 46.24 inches

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- With the exception of one day (August 13, 2014) Long Island has received below average rainfall for the past 6 years.
  - That one day yielded 13.25 inches in 12 hours.
- 2018 has been prorated to include Dec. totals using the 30 year normal value (4.06 inches).
- 2018 is projected to have 60.19 inches of precipitation, 13.95 inches above average.
- 2018 has the greatest precipitation total since 1990 (63.49 inches).
- The increase in precipitation has already seen groundwater elevation rise by 0.92 feet on average.
- This elevation rise is expected to continue into 2019 assuming precipitation totals remain at or above average.

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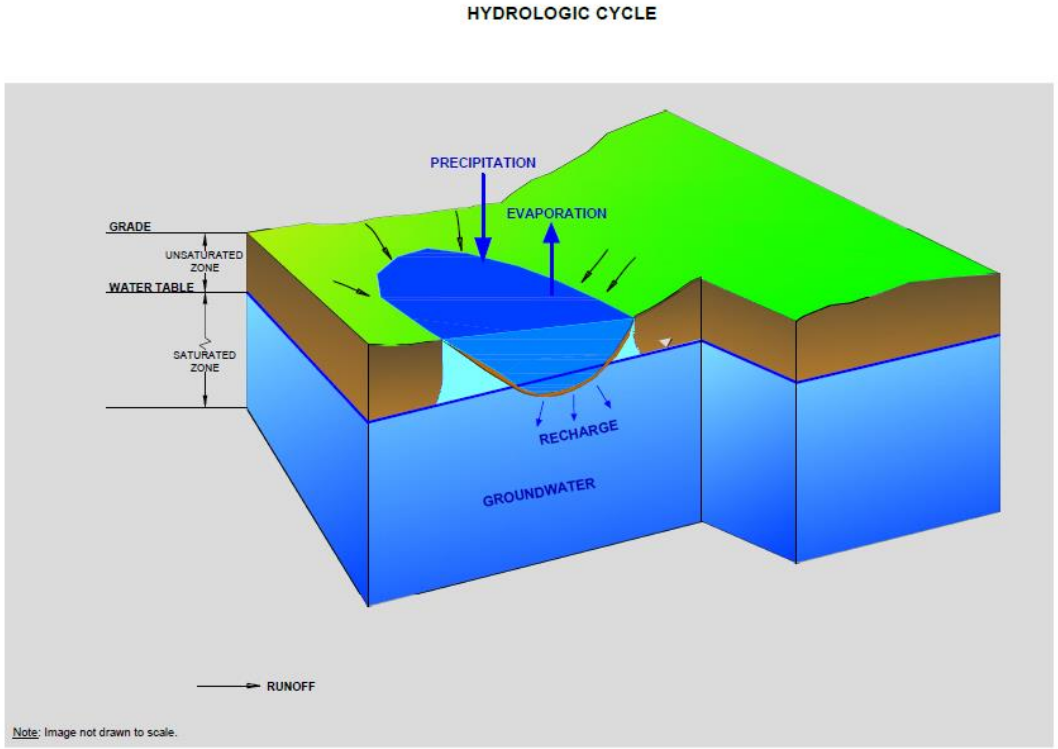
Water Budget

- *R = (P + Q) - E*
  - *R = Recharge*
  - *P = Precipitation*
  - *Q = Runoff to Ponds*
  - *E = Evaporation*



- Surface Area of Ponds = 172.89 acres (7,531,088.4 square feet)
  - P = 217.1 MGY (46.24 inches/year)
  - E = 150.2 MGY (32 inches/year)
- Minimum Recharge = (217.1 + *Q*) – 150.2 = 66.9 + *Q* MGY

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Conclusion

- In summation, groundwater recharge on Long Island is dependent on precipitation.
- Sand and Gravel mining sites act as localized recharge basins and have a positive impact on groundwater elevation
- Climactic fluctuations in temperature, winds, and precipitation occur on a regional scale causing changes in evaporation rates and recharge rates. This results in groundwater elevations to fluctuate.
- Data presented to NYSDEC on a routine basis from the subject sites containing: water table elevation, groundwater flow direction, and groundwater quality.
- Based upon independent data from the USGS, there is no indication that mining operations have caused decreased groundwater elevations.
- Future projections of impacts of climate change are: an increase in rainfall intensities, durations, and annual quantities thus trending to an increase in groundwater levels.

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Questions?

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