

2022 Annual Groundwater Report

Public Hearing
April 27, 2023



FORT BEND
SUBSIDENCE DISTRICT

Provisional - Subject to Revision

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- **Weather**
- Pumpage
- Water Levels
- Subsidence

Location Map

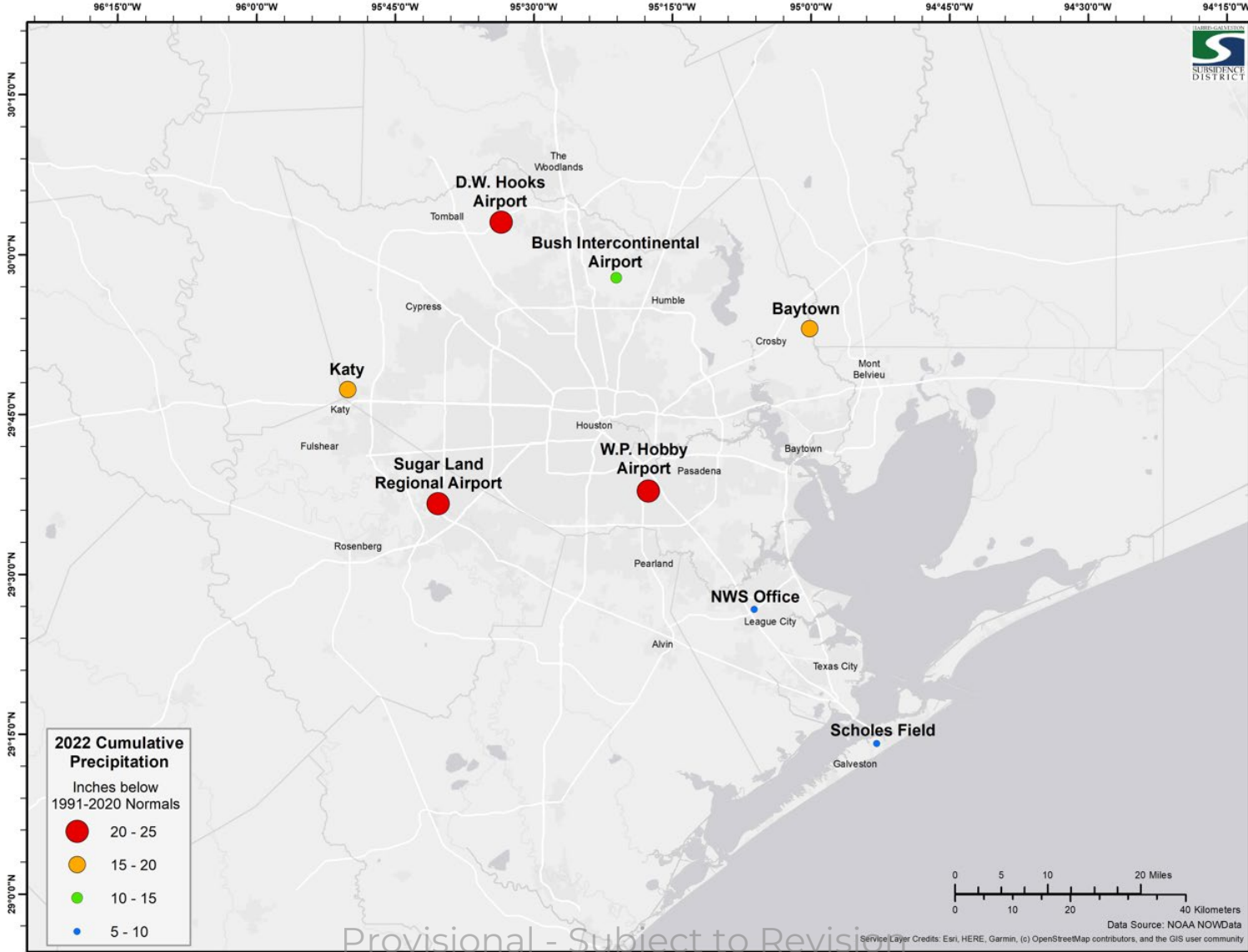


Exhibit 1

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Weather



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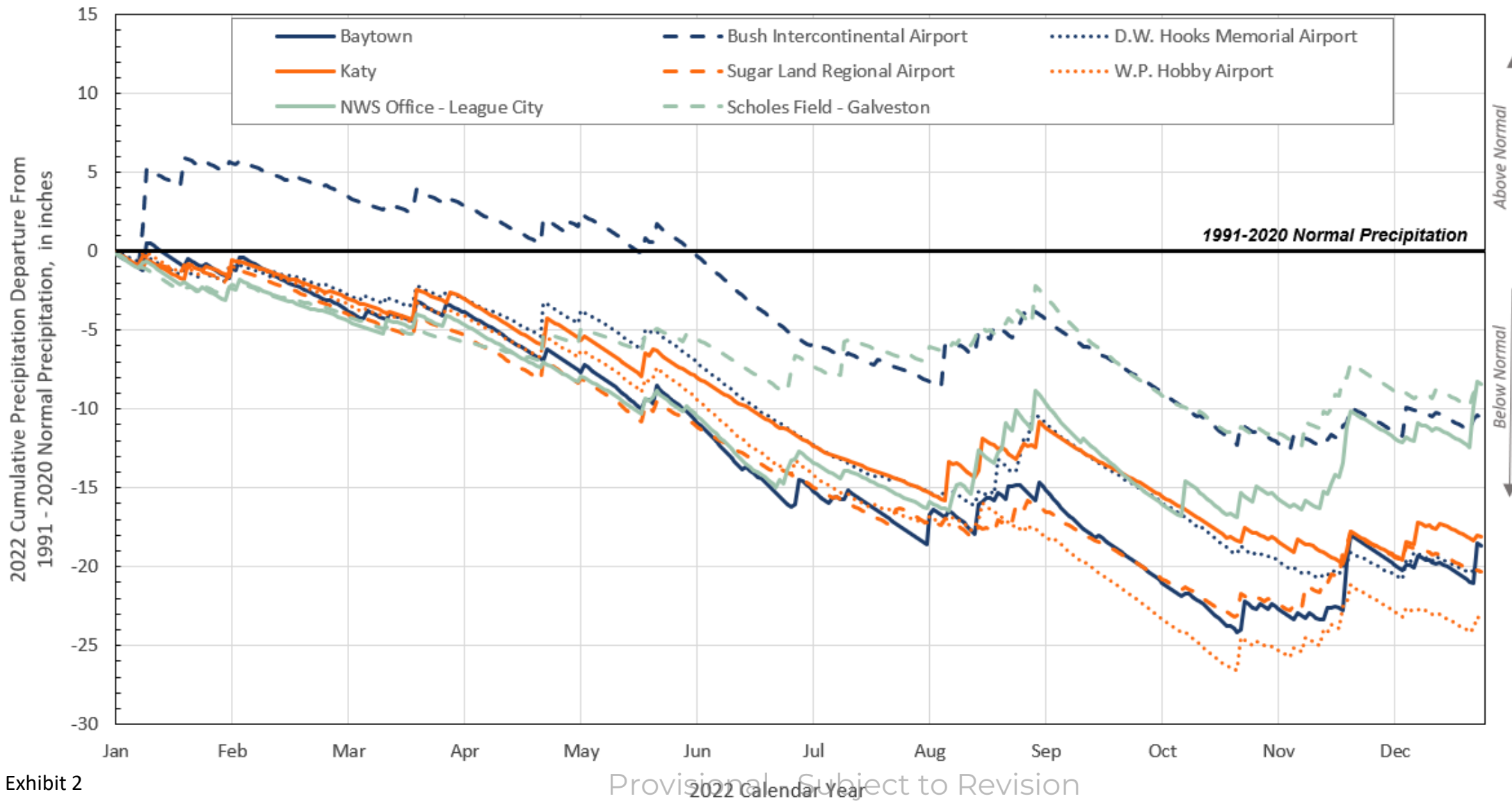


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Groundwater Withdrawals | Regulatory Area A



Groundwater Withdrawals Grouped by Use - Regulatory Area A

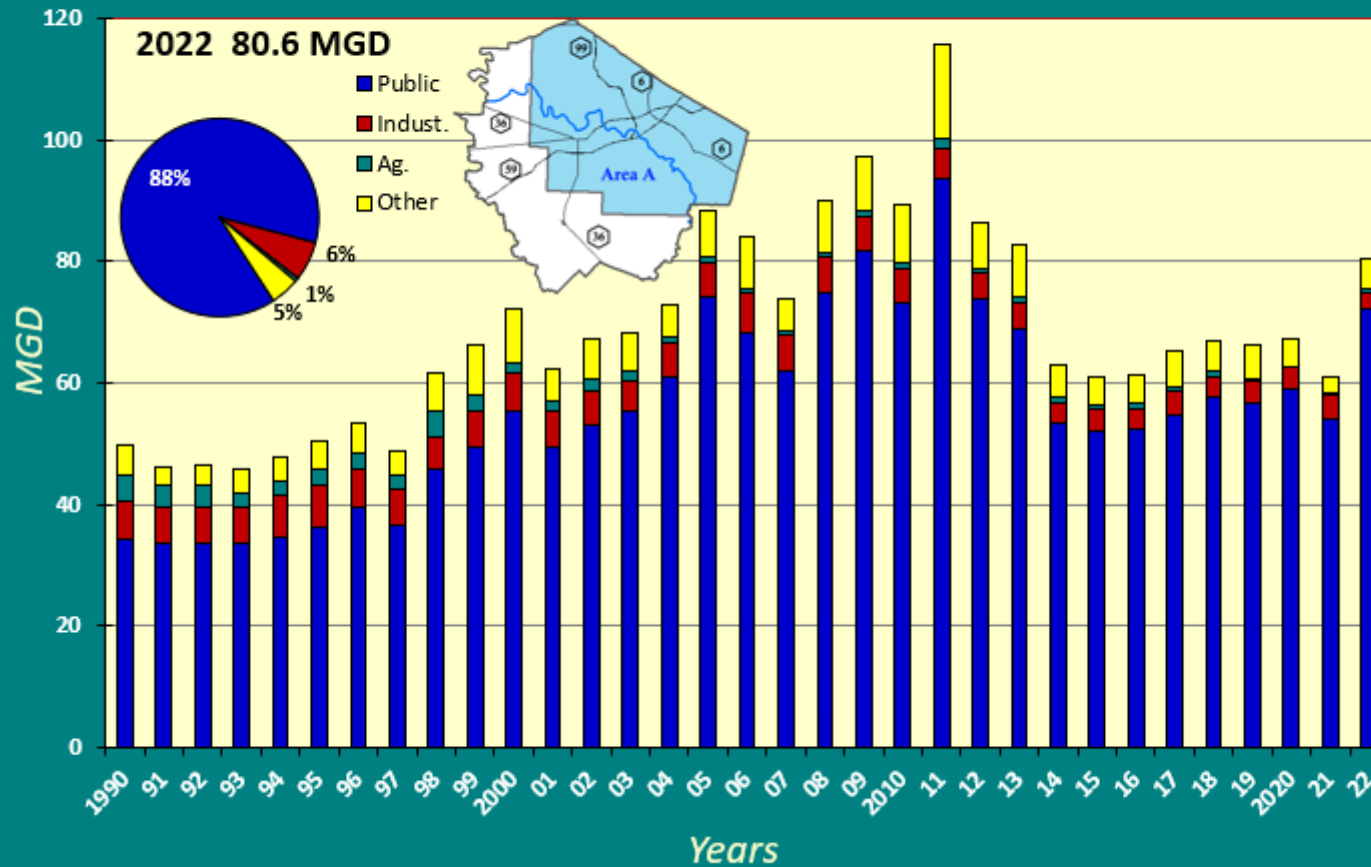


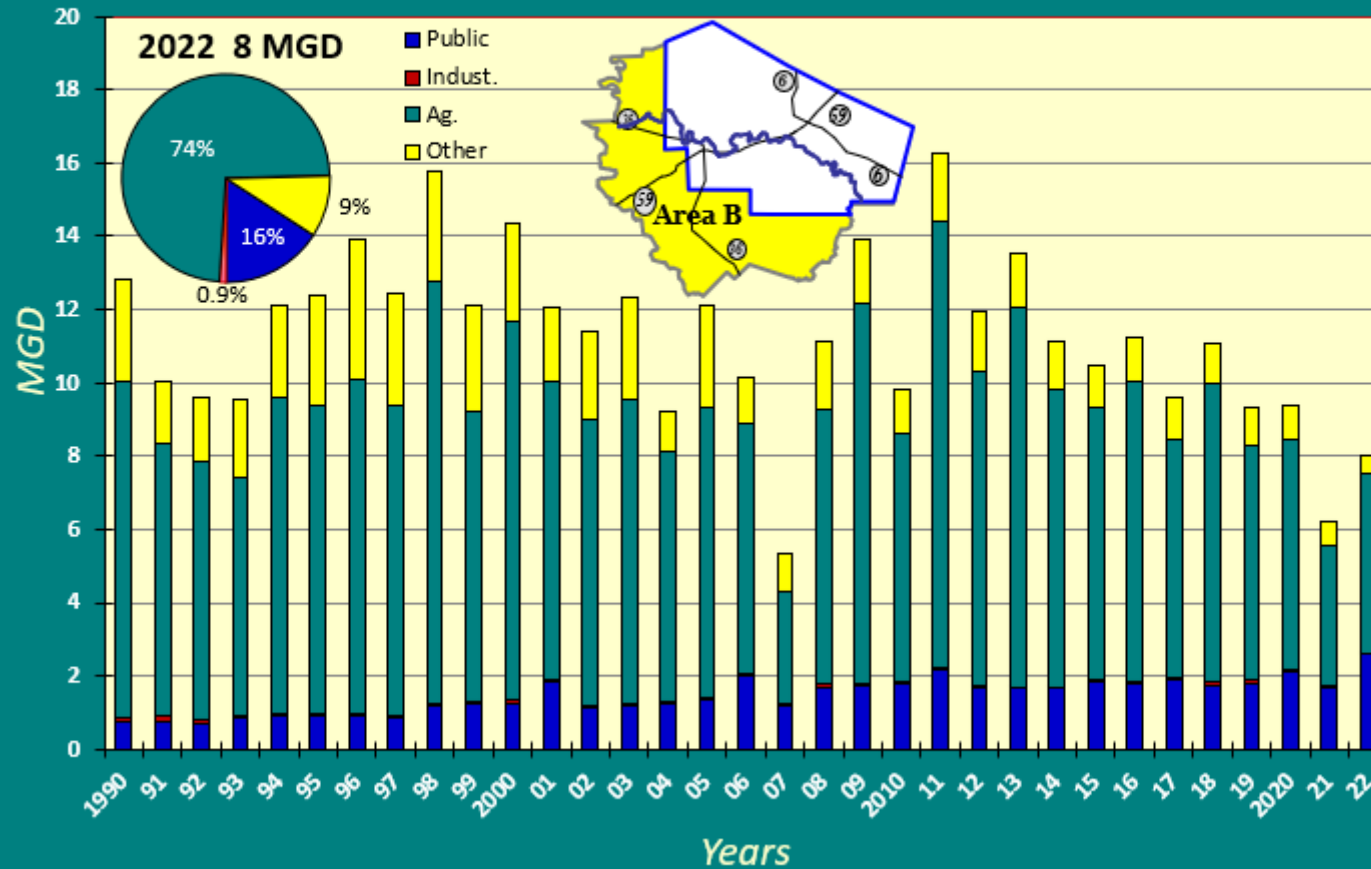
Exhibit 3

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Groundwater Withdrawals | Regulatory Area B



Groundwater Withdrawals Grouped by Use - Regulatory Area B

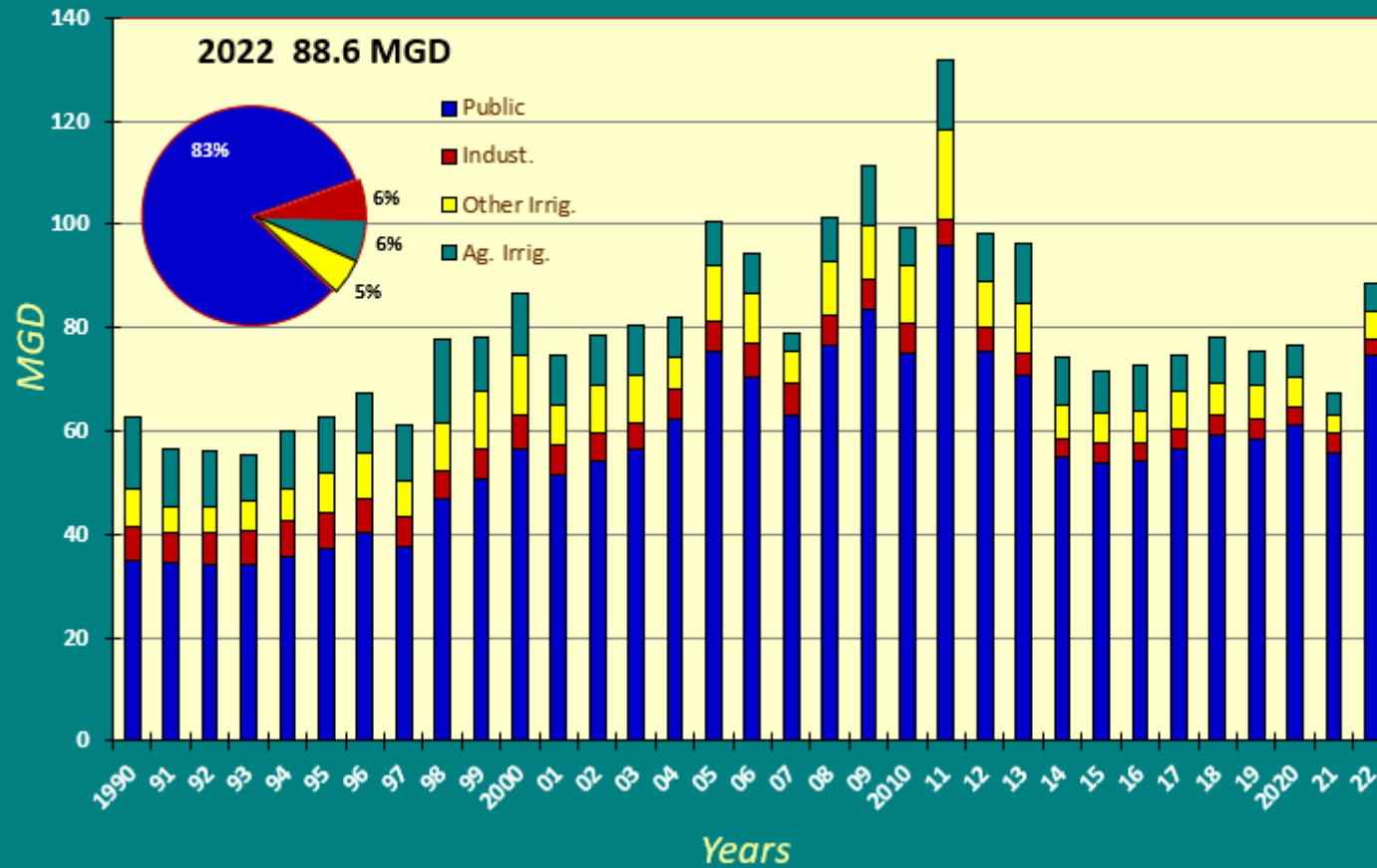


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Groundwater Withdrawals | Entire District



Groundwater Withdrawals Grouped By Use - Entire District



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Surface & Re-Use Water Utilized | Entire District



Surface & Re-Use Water Utilized Grouped By Source - Entire District

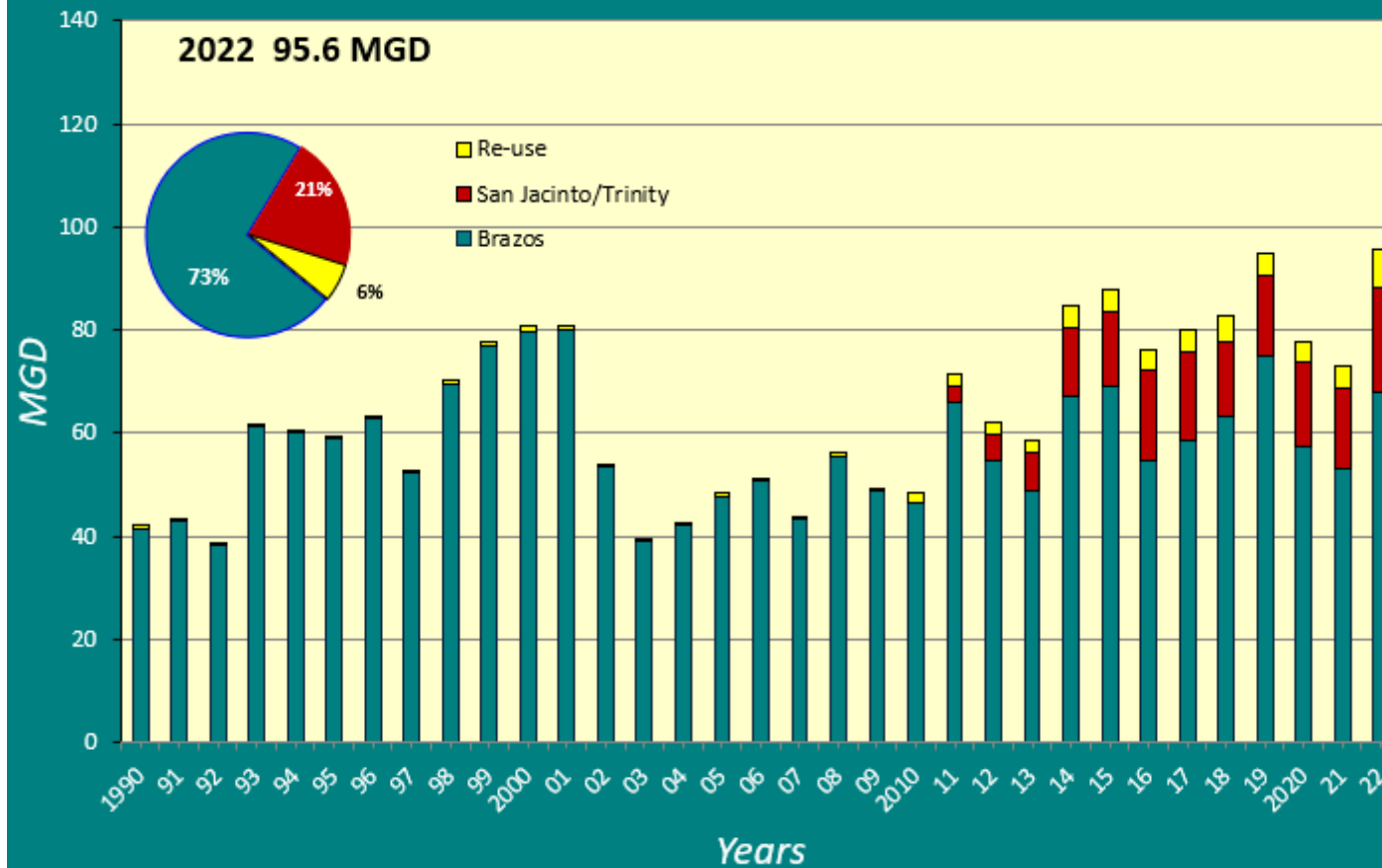


Exhibit 6

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Total Water Demands | Grouped by Source - Entire District

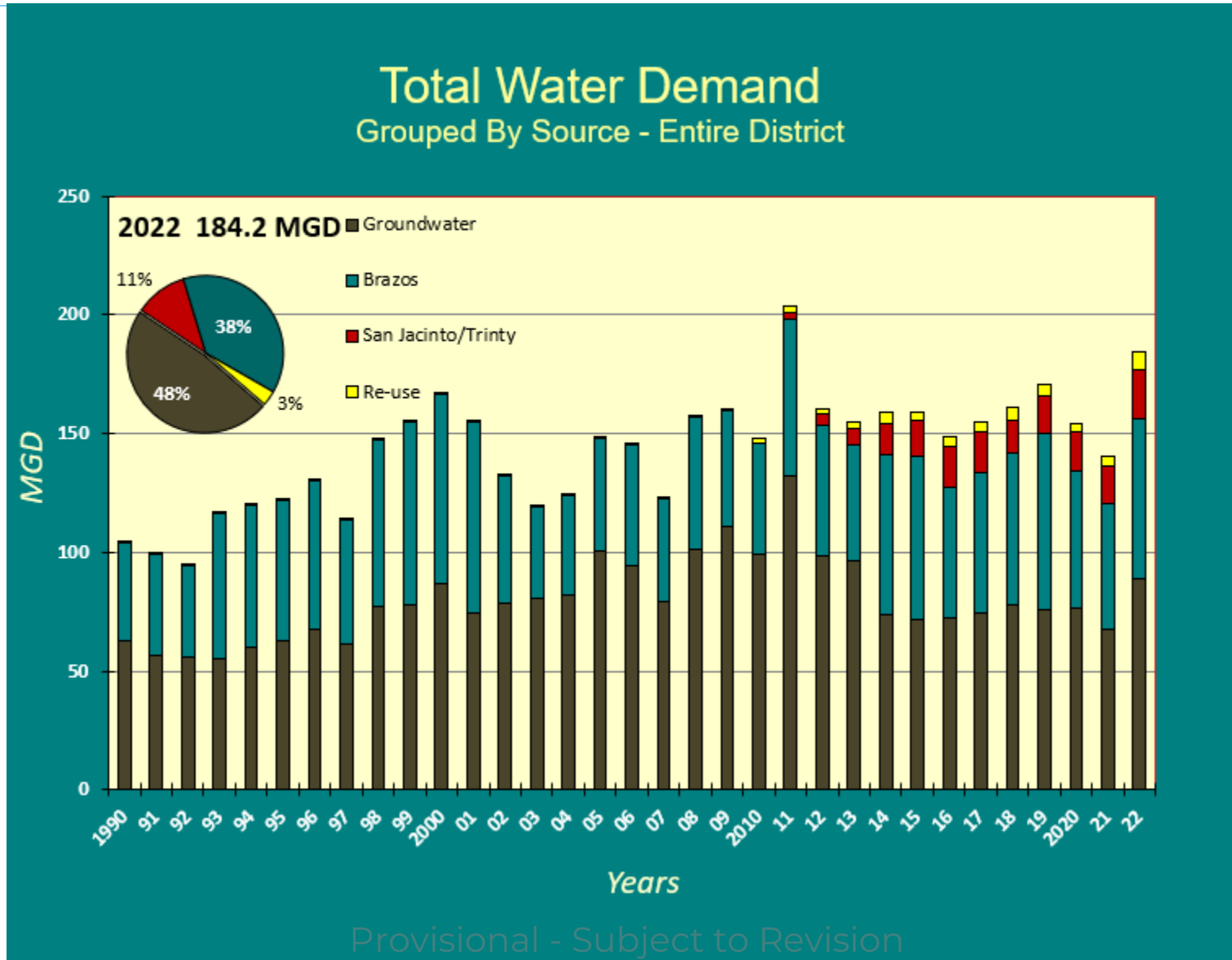


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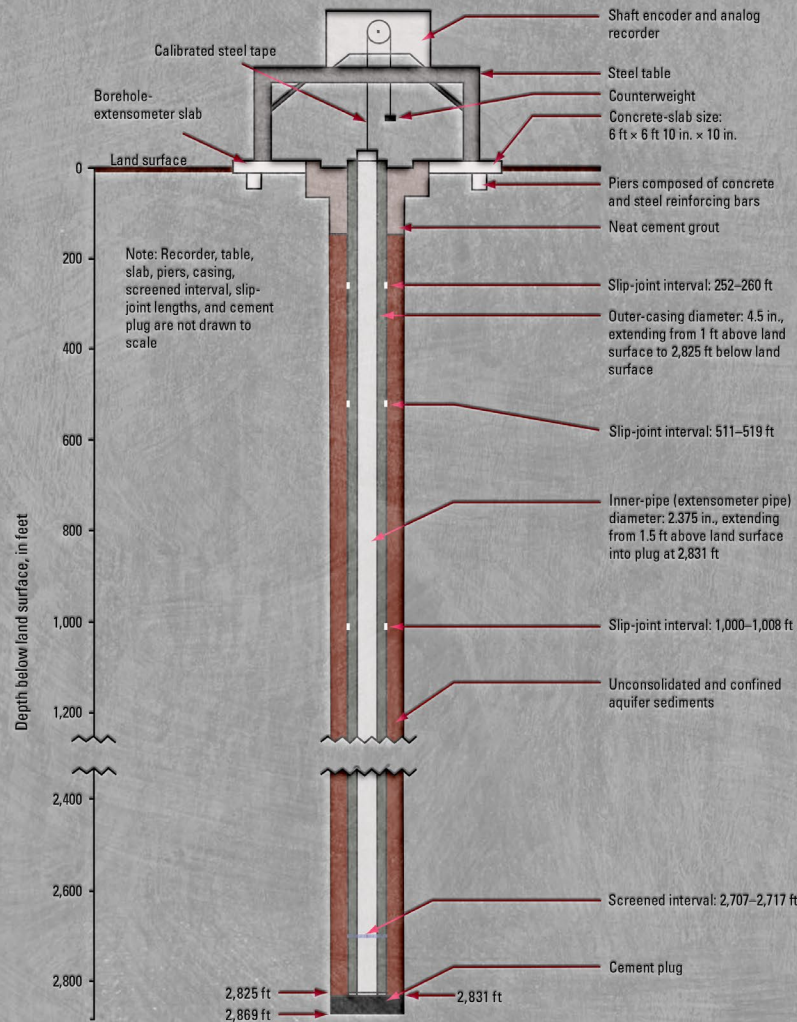


DIAGRAM OF A BOREHOLE EXTENSOMETER

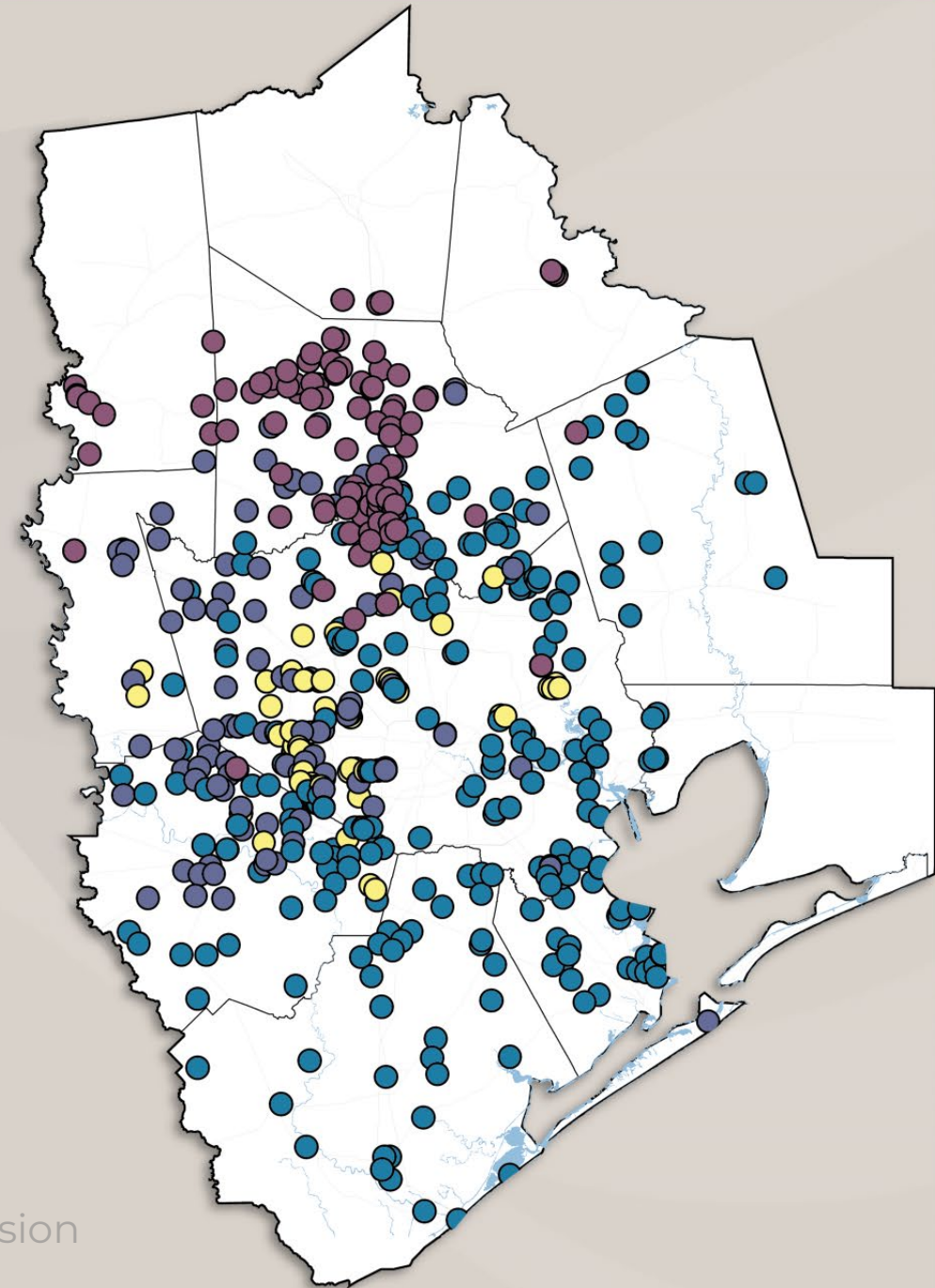
Groundwater-level Altitudes, Long-Term Change & Compaction

CHICOT/ÉVANGELINE AND JASPER AQUIFERS

RESEARCH IN COOPERATION WITH THE HARRIS-GALVESTON & FORT BEND SUBSIDENCE DISTRICTS, BRAZORIA GROUNDWATER CONSERVATION DISTRICT, THE CITY OF HOUSTON AND LONE STAR GROUNDWATER CONSERVATION DISTRICT

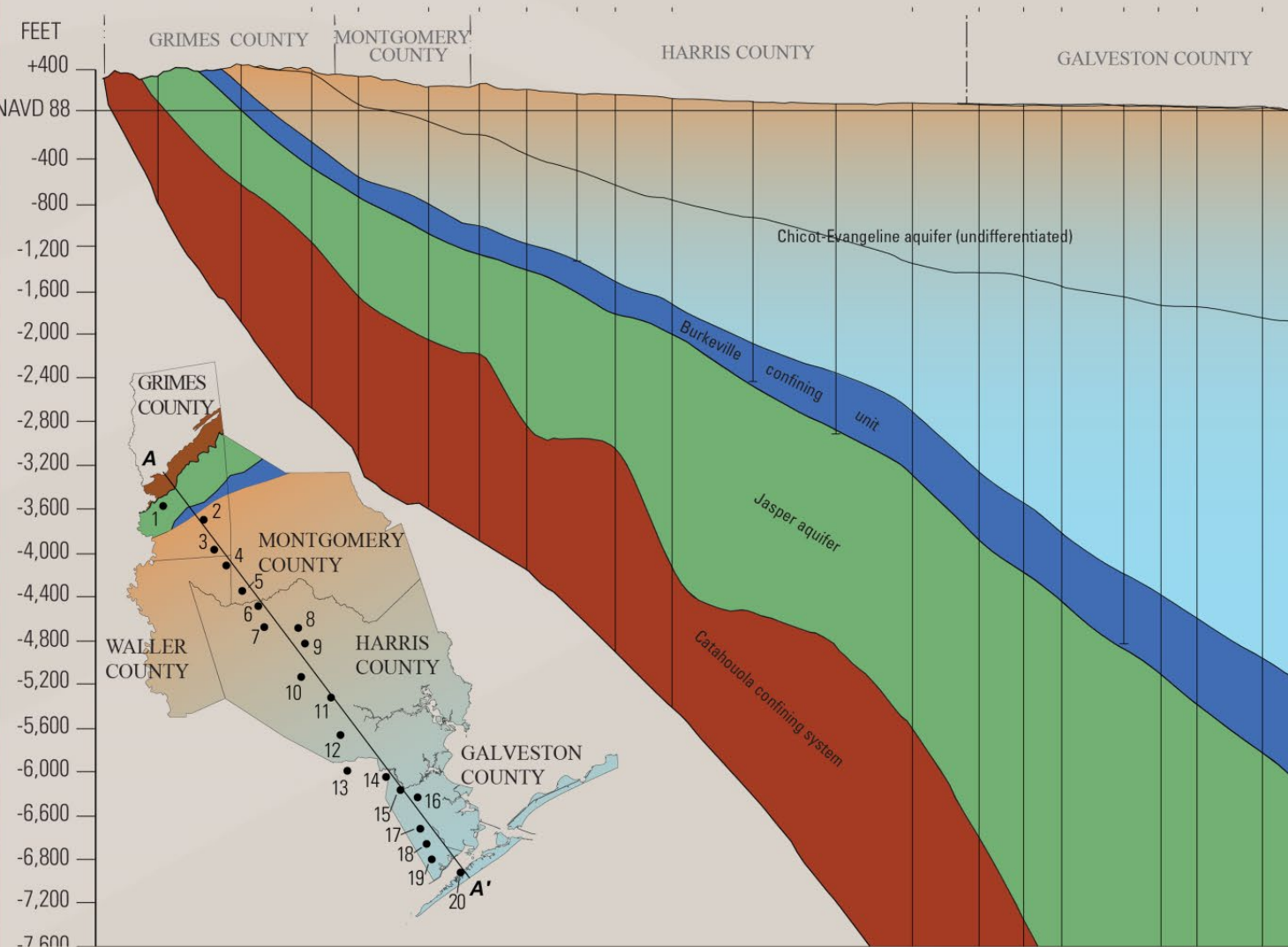
2023 Water-Level Map Series

- Chicot and Evangeline Aquifers (undifferentiated)
 - 2023 Water-Level Altitude
 - 2022 to 2023 Water-Level Change
 - 2018 to 2023 Water-Level Change
 - 1990 to 2023 Water-Level Change
 - 1977 to 2023 Water-Level Change
- Compaction 1973 to 2022
 - Compaction Data from 14 Extensometers



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Geology and Hydrology



In 2021 and Moving Forward			
Geologic units ¹		Hydrogeologic units ¹	
Alluvial, terrace, and dune deposits		Chicot-Evangeline aquifer (undifferentiated)	
Beaumont Formation			
Lissie Formation	Montgomery Formation		
	Bentley Formation		
Willis Sand			
Goliad Sand (upper part)			
Goliad Sand (lower part)			
Lagarto Clay (upper part)			
Lagarto Clay (middle part)			Burkeville confining unit
Lagarto Clay (lower part)			Jasper aquifer
Oakville Sandstone		Catahoula Confining System	
Catahoula Formation	Upper Catahoula Formation		
	Frio Formation		

- Chicot and Evangeline aquifers (undifferentiated)
 - combined for annual regional-scale assessments
 - Updated aquifer tops and bases*
 - Chicot thickened across much of southeast Harris County
 - Distribution of Evangeline wells changed significantly

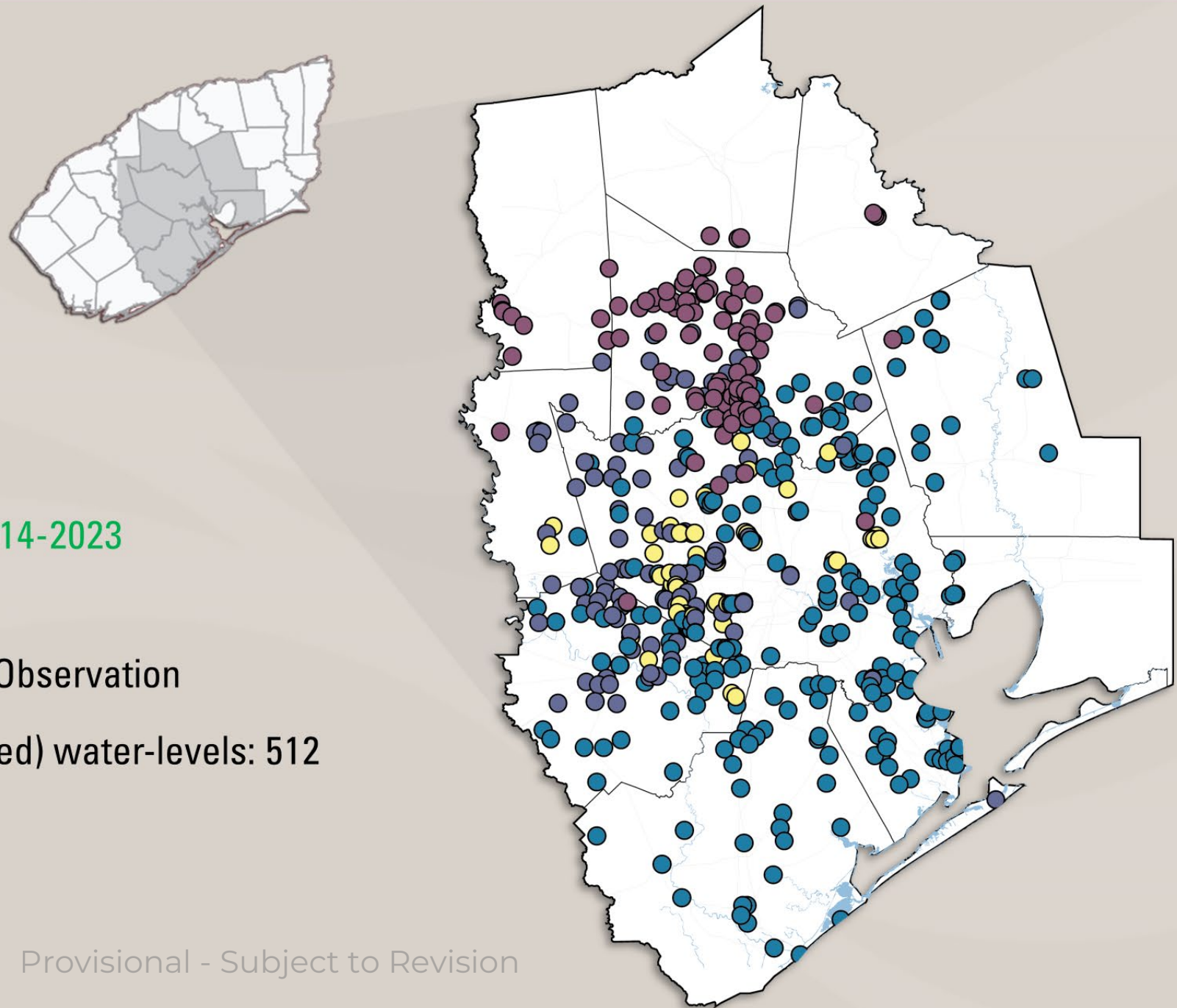
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¹Young, S.C., Kelley, V.A., Deeds, N., Hudson, C., Piemonti, D., Ewing, T.E., Banerji, D., Seifert, J., and Lyman, P., 2017

*Young, S.C., and Draper, C., 2020

Network

- Data collected across 11 counties
- Data collection from 12-09-2022 to 3-14-2023
- Well Types:
 - Public Supply, Irrigation, Industrial, Observation
- Chicot and Evangeline (undifferentiated) water-levels: 512
 - 74 in Fort Bend County



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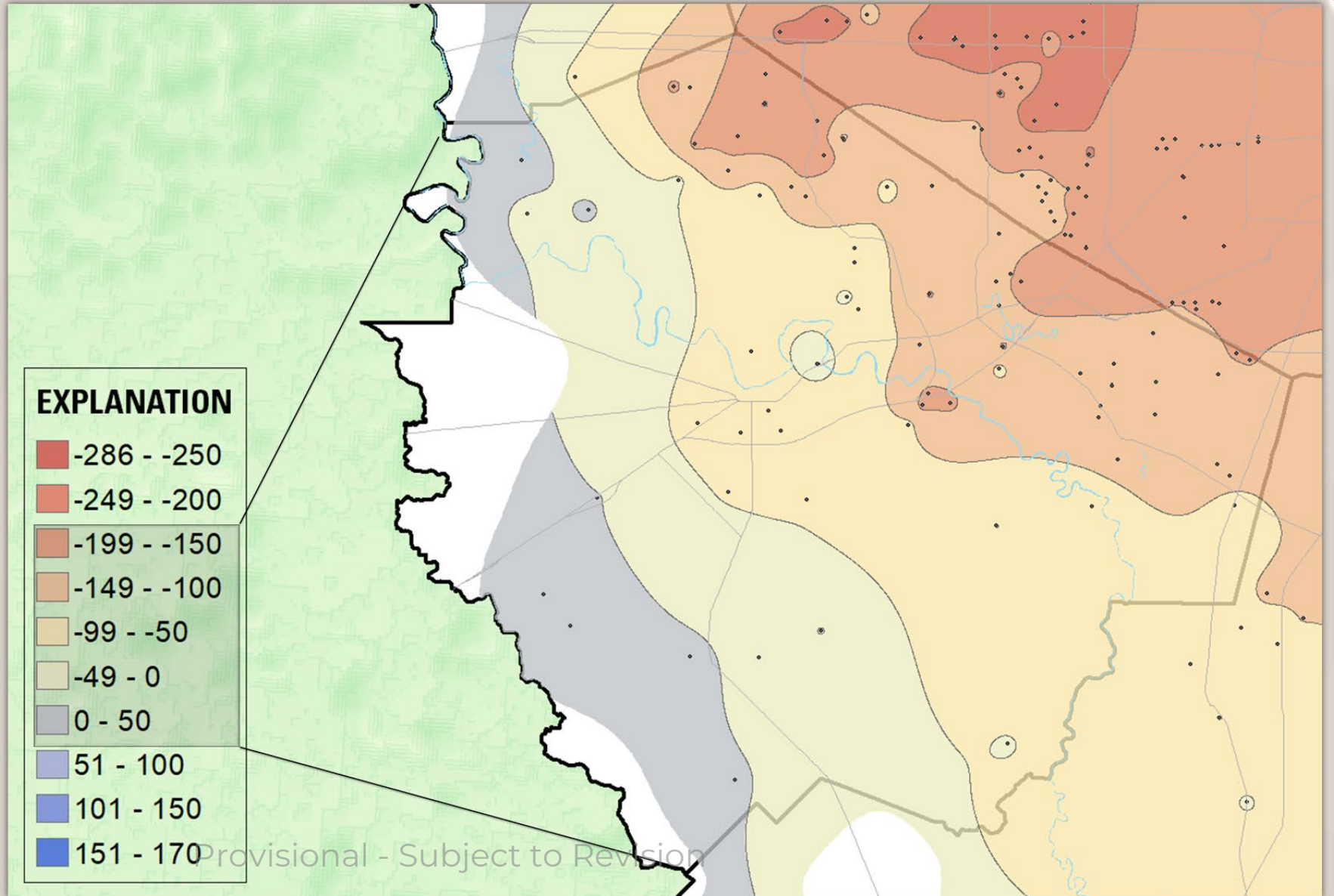
Water-Level Altitude

Chicot and Evangeline (undifferentiated)

Altitudes are referenced from
NAVD 88

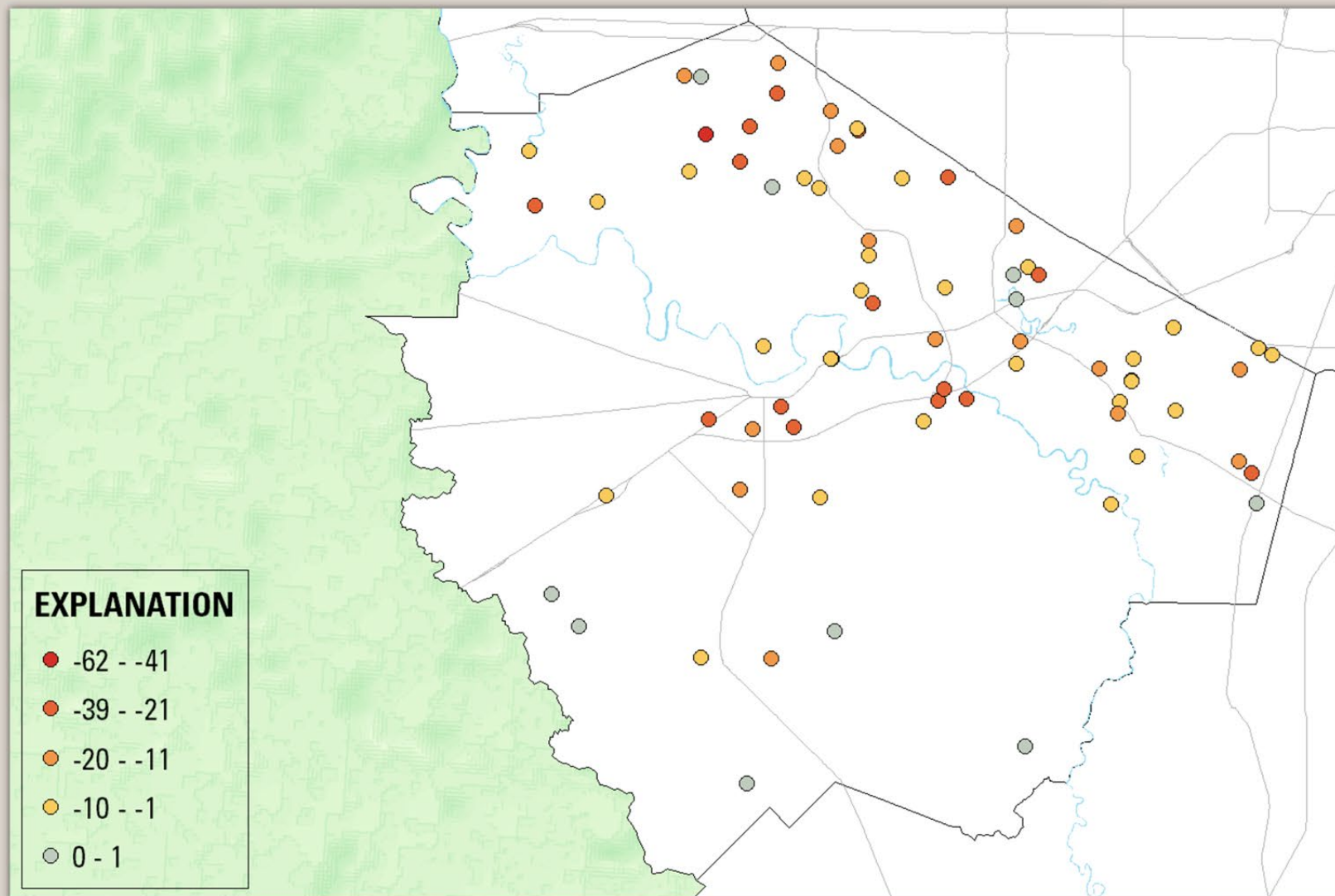
Lowest altitudes in northern and
eastern portions of the county
along the border with Harris
County

Highest altitudes in the western
portions of the county



2022 to 2023 Water-Level Change

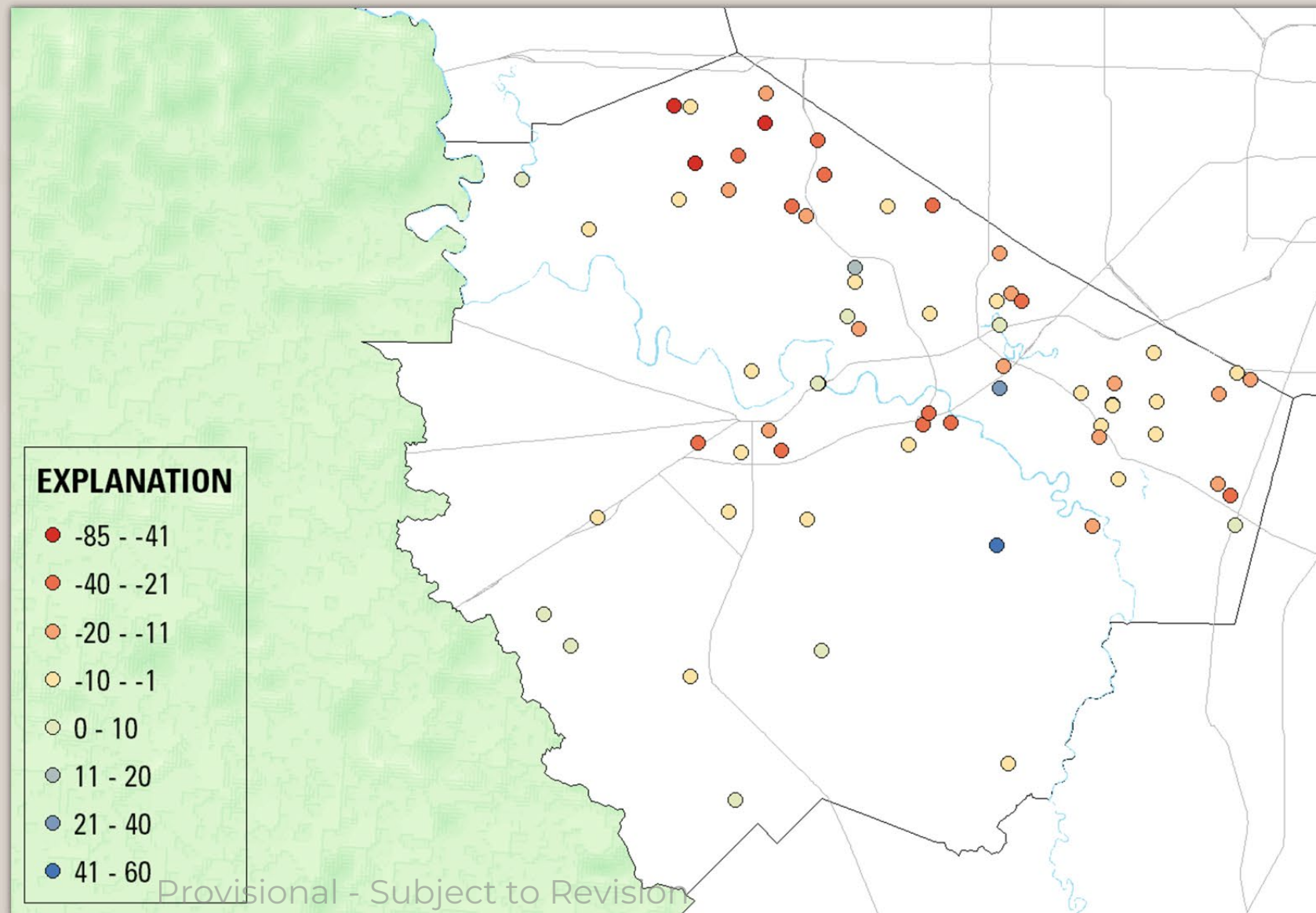
- 72 water-level pairs
 - Mostly declines
 - Largest declines (>30 ft):
 - Central Fort Bend County (1)
 - West-central Fort Bend County (2)
 - Northern Fort Bend County (2)



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2018 to 2023 Water-Level Change

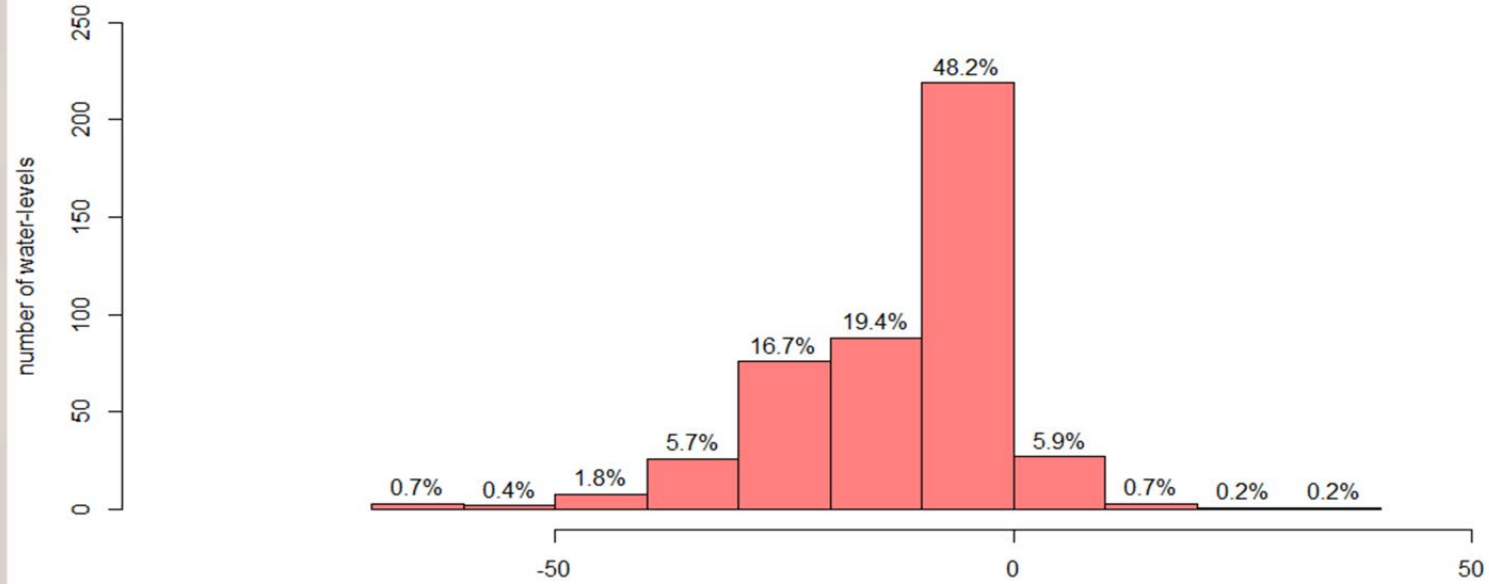
- 68 water-level pairs
 - Mostly declines
 - Largest declines (>40 ft):
 - Northern Fort Bend County
 - Largest rises (> 40 ft):
 - 1 in south-eastern Fort Bend County



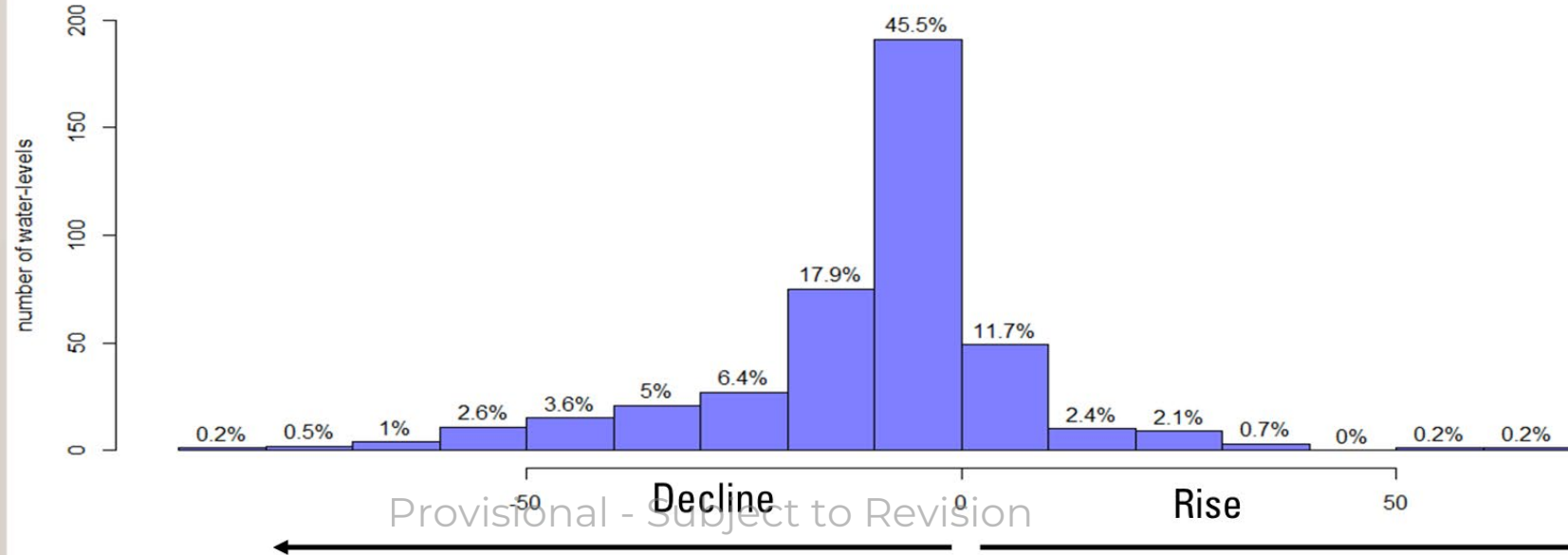
Change Comparison

Chicot and Evangeline (undifferentiated)

1 Year
2022 to 2023



5 Year
2018 to 2023

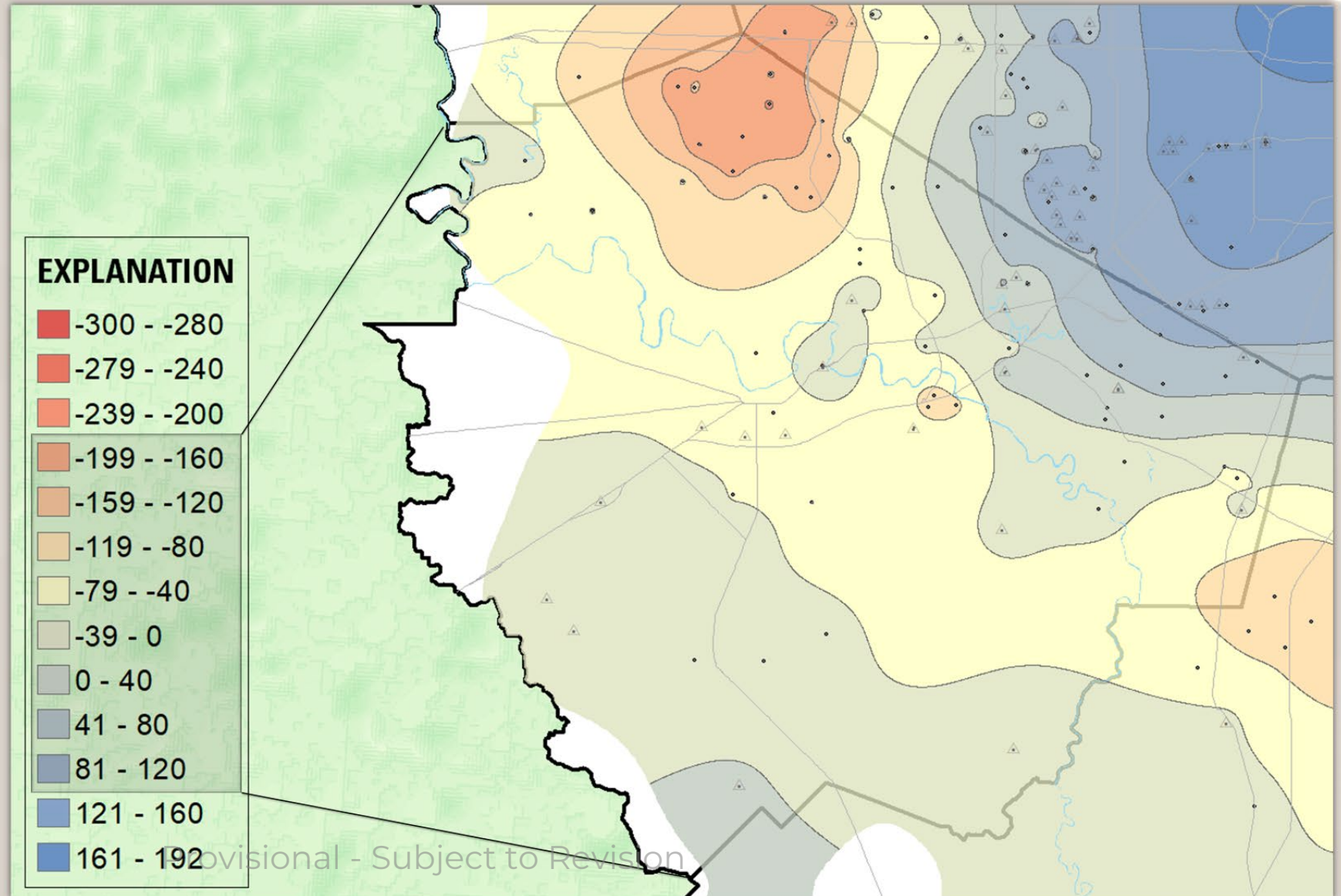


Long term change

Chicot and Evangeline (undifferentiated) Water-Level Change 1990 to 2023

Water level rises along the border with Harris County

Water-level declines across much of the county with larger declines



Compaction 1973 - 2022

Compaction Interval:

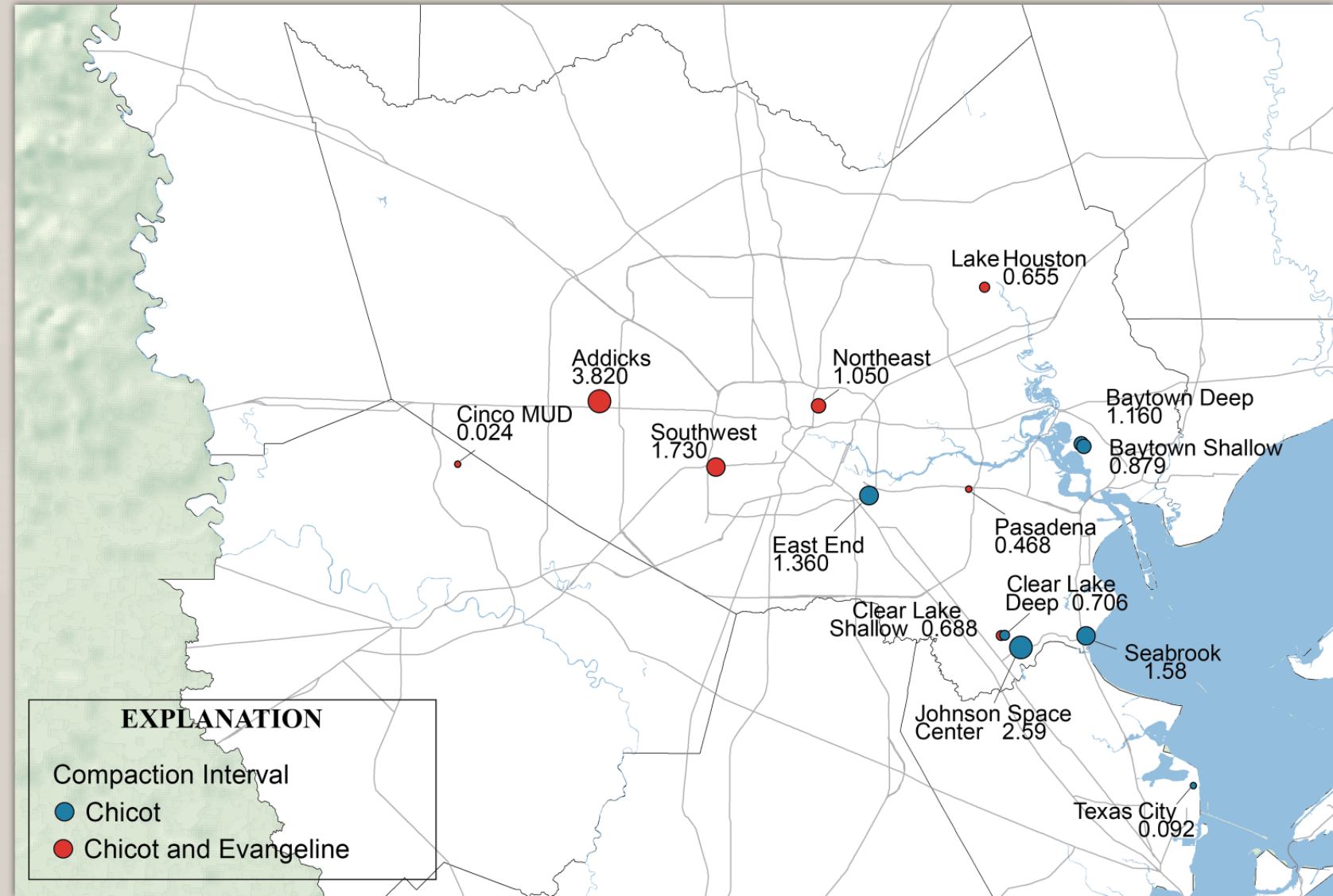
Chicot

1. 1973 | Baytown Shallow 0.879 ft.
2. 1973 | East End 1.360 ft.
3. 1973 | Johnson Space Center 2.590 ft.
4. 1973 | Seabrook 1.580 ft.
5. 1973 | Texas City 0.092 ft.
6. 1976 | Clear Lake Shallow 0.688 ft.

Compaction Interval:

Chicot and Evangeline

7. 1973 | Baytown Deep 1.160 ft.
8. 1974 | Addicks 3.820 ft.
9. 1974 | Pasadena 0.468 ft.
10. 1976 | Clear Lake Deep 0.706 ft.
11. 1980 | Lake Houston 0.655 ft.
12. 1980 | Northeast 1.050 ft.
13. 1980 | Southwest 1.730 ft.
14. 2017 | Cinco MUD 0.024 ft.

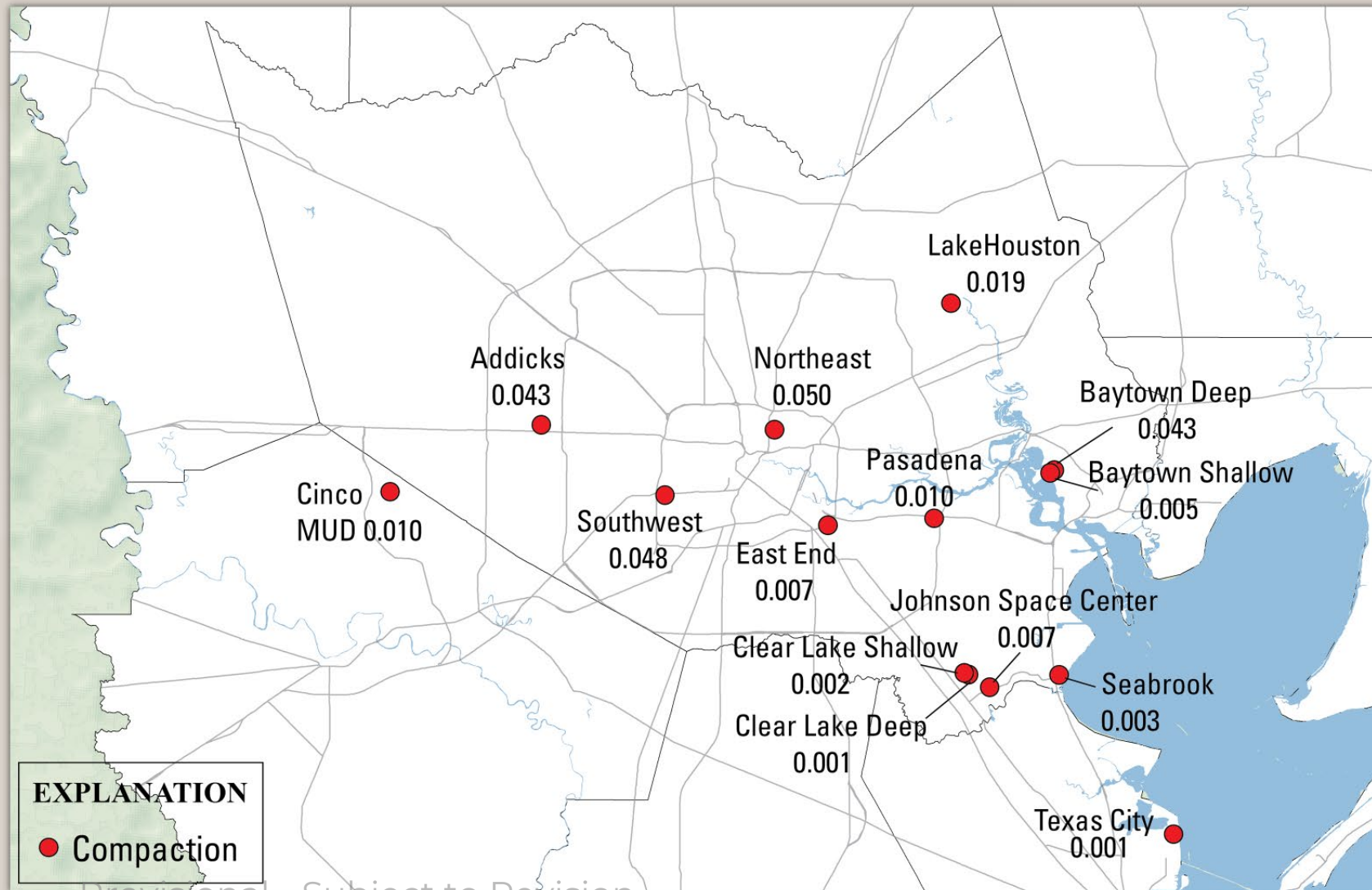


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2022 Compaction Summary

- All sites recorded compaction for the period (no expansion)
- Compaction ranged from 0.001 ft to 0.050 ft

Compaction December 2021 to December 2022



EXPLANATION
● Compaction

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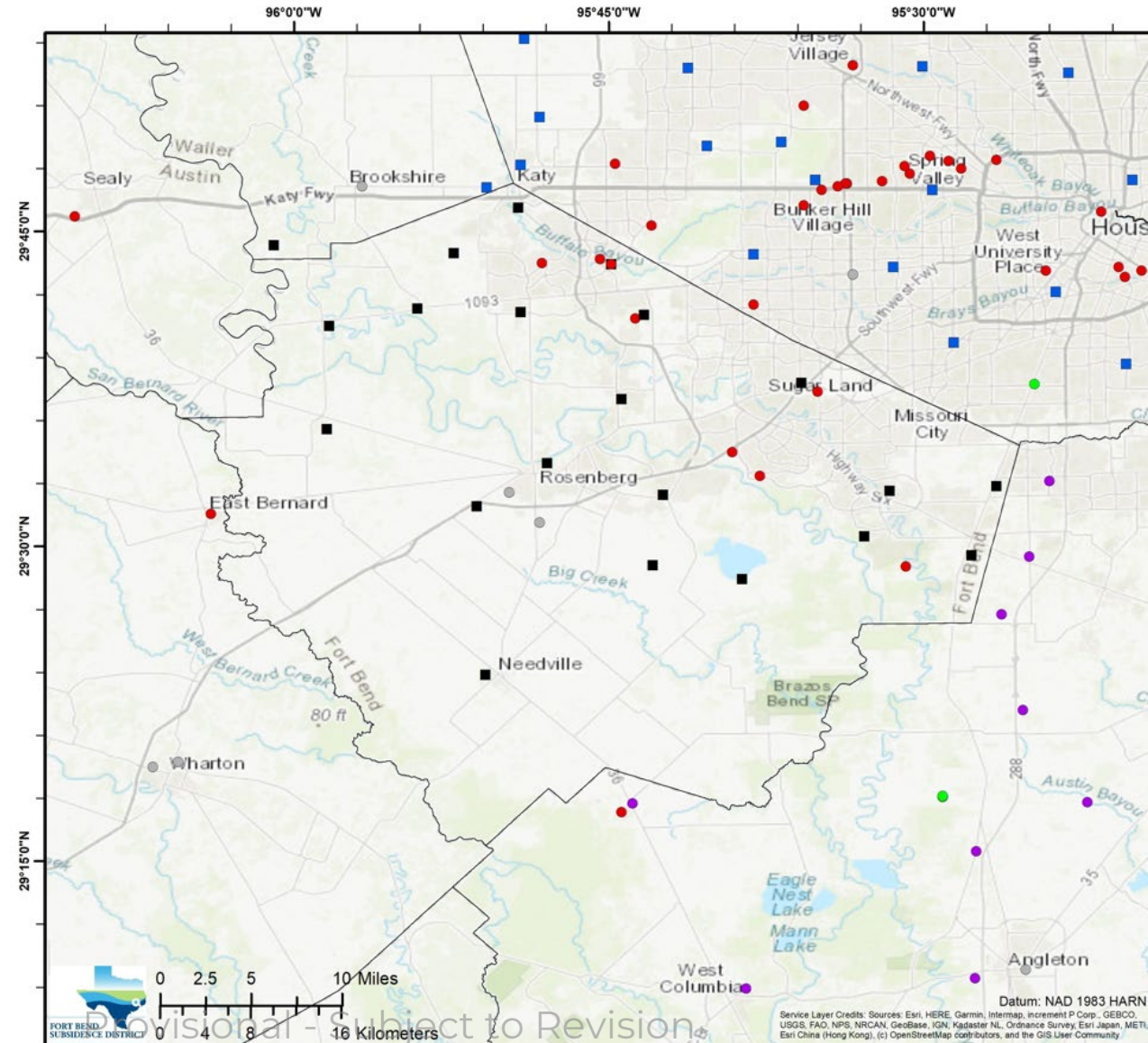
GPS Station Operators



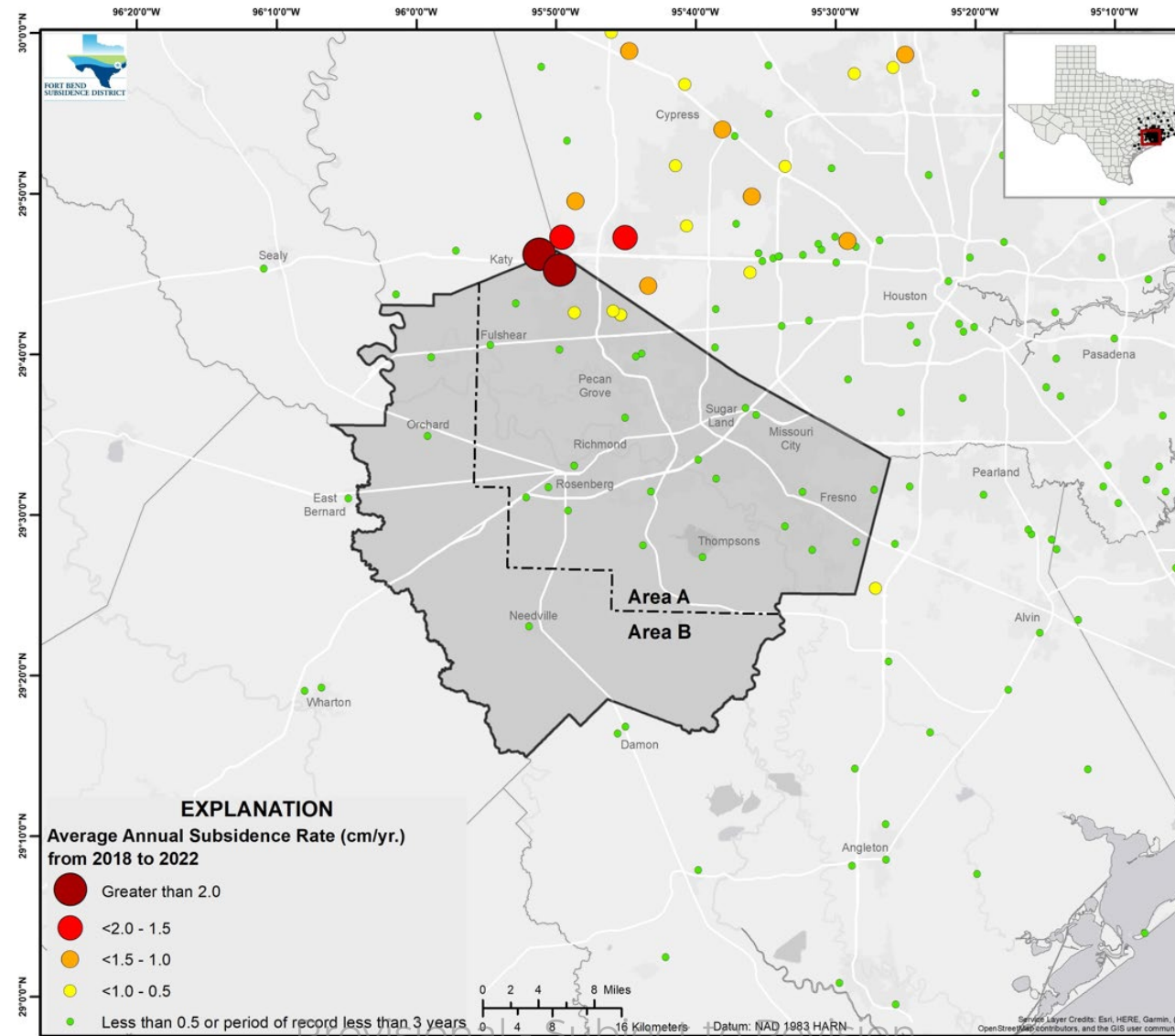
EXPLANATION

GPS Station Operators

- Fort Bend Subsidence District
- Harris-Galveston Subsidence District
- Brazoria County Groundwater Conservation District
- Lone Star Groundwater Conservation District
- Texas Department of Transportation
- University of Houston
- Other Agencies



Subsidence Rates

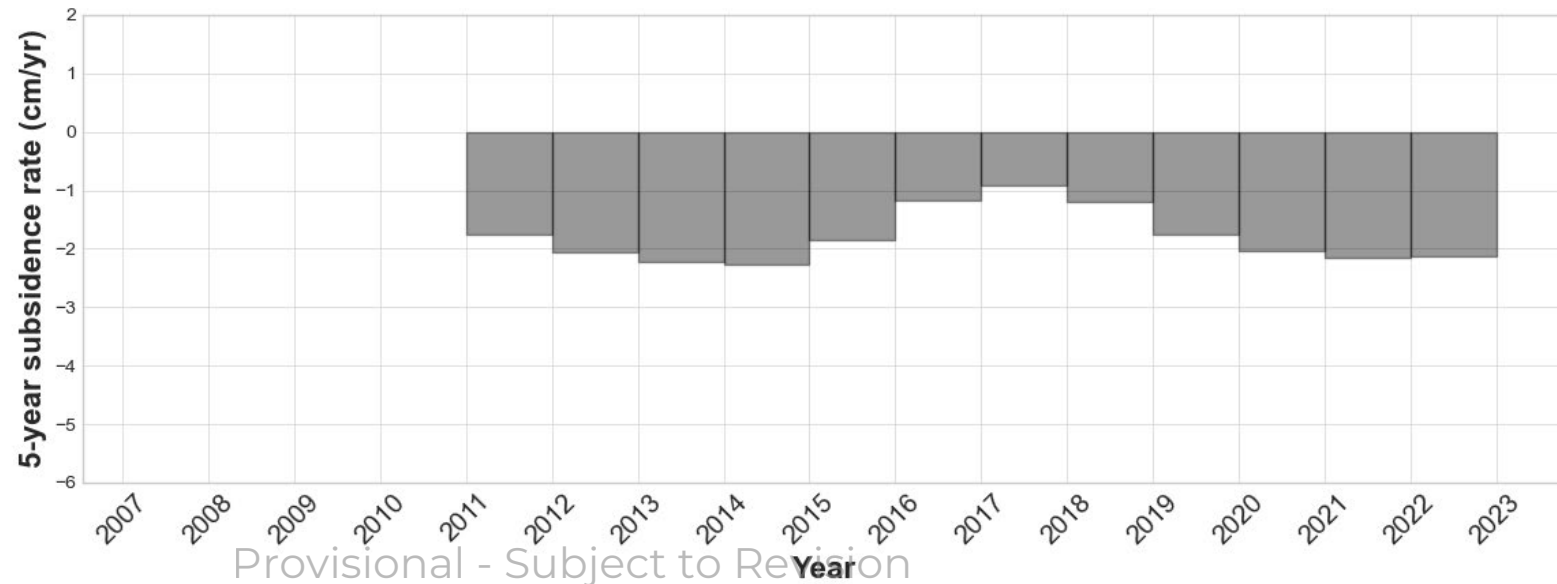
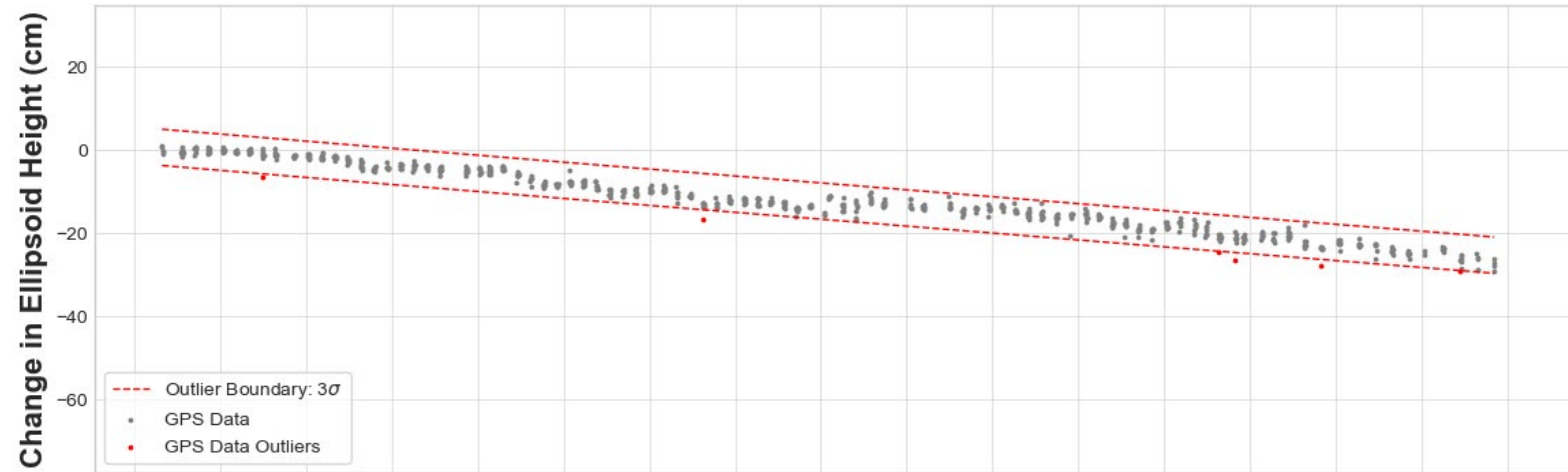


Period of Record Plot for P029 - Katy



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- GPS station P029, located in Katy, has measured a total of approximately 28.5 cm of subsidence since 2007.
- 2018-2022 annual subsidence rate is 2.13 cm/yr. of subsidence.

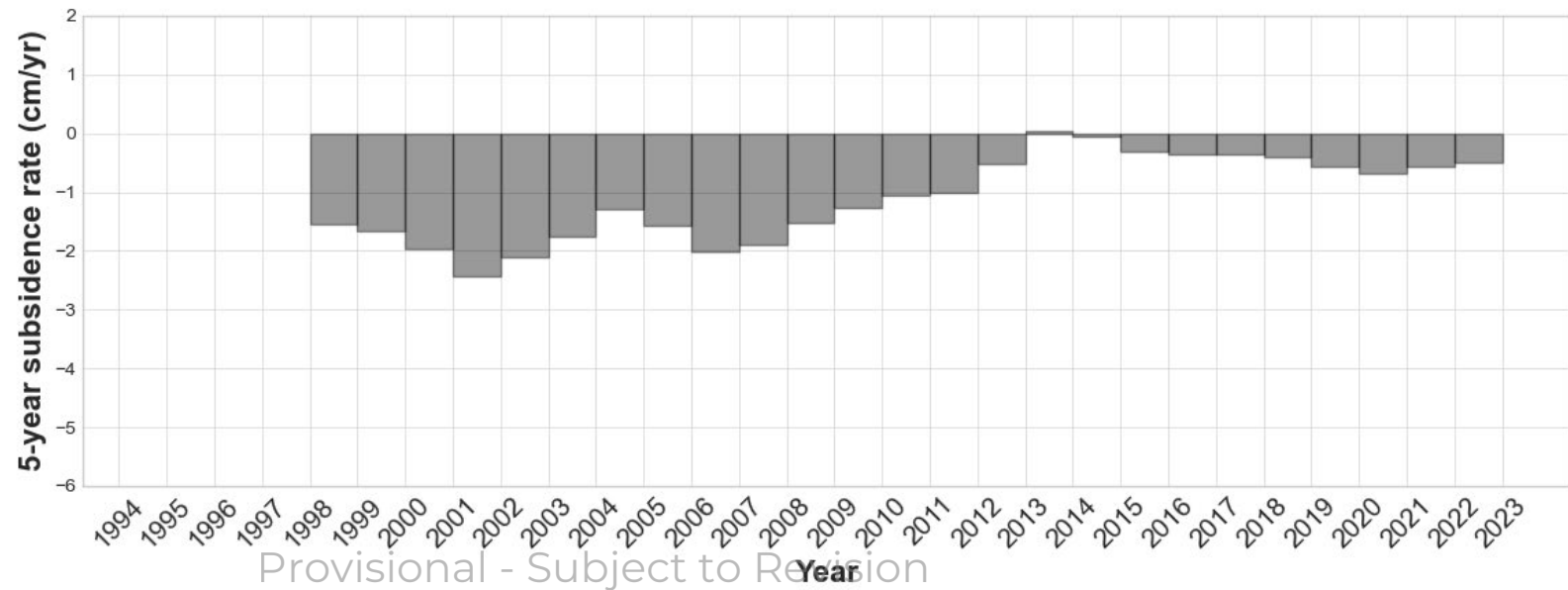
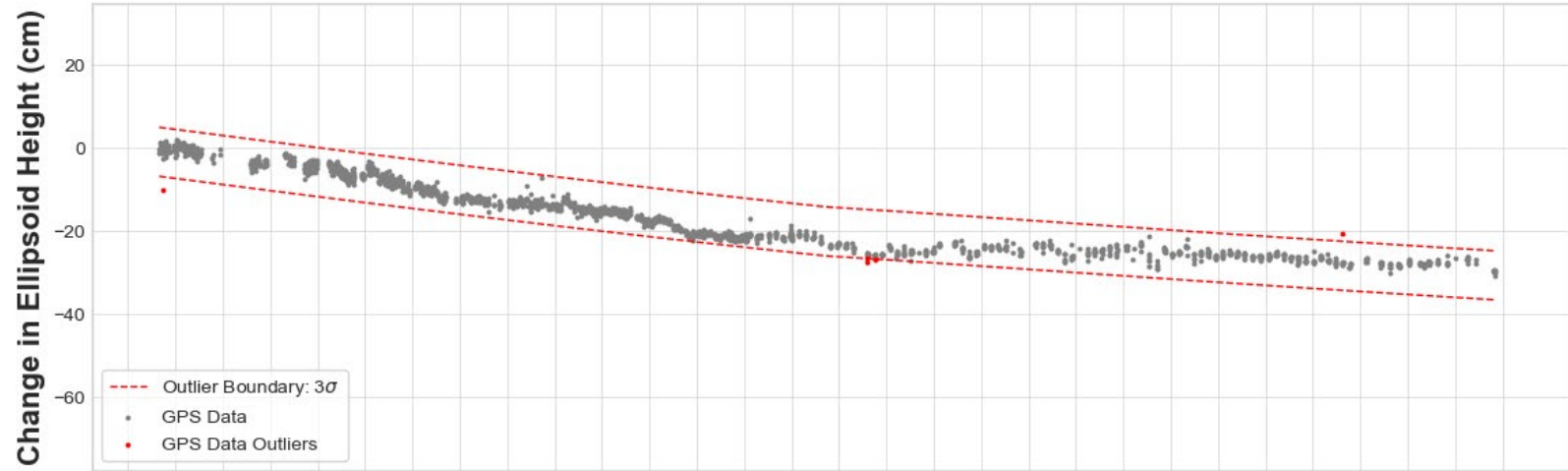


Processed GPS data (source: UH) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by the District when calculating subsidence rates and are shown for informational purposes only.

Period of Record Plot for P004 - Sugar Land



- GPS station P004, located in Sugar Land, has measured a total of approximately 27.6 cm of subsidence since 1994.
- 2018-2022 annual subsidence rate is 0.49 cm/yr. of subsidence.

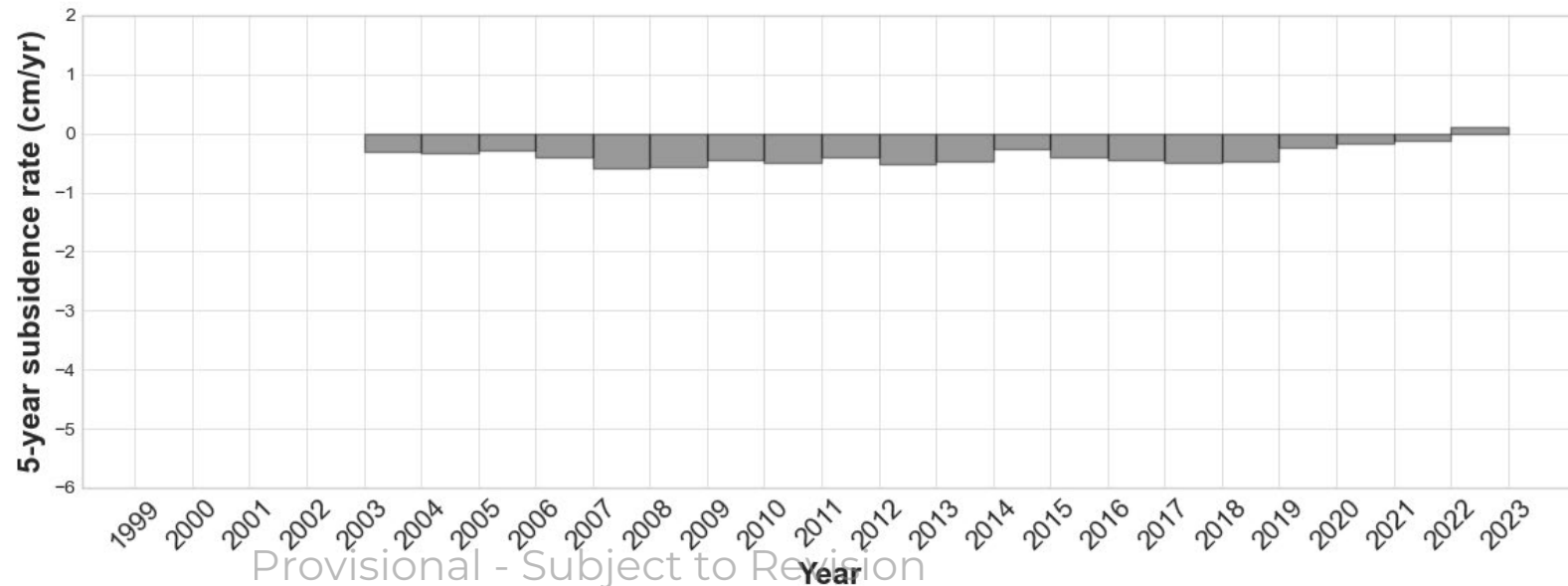
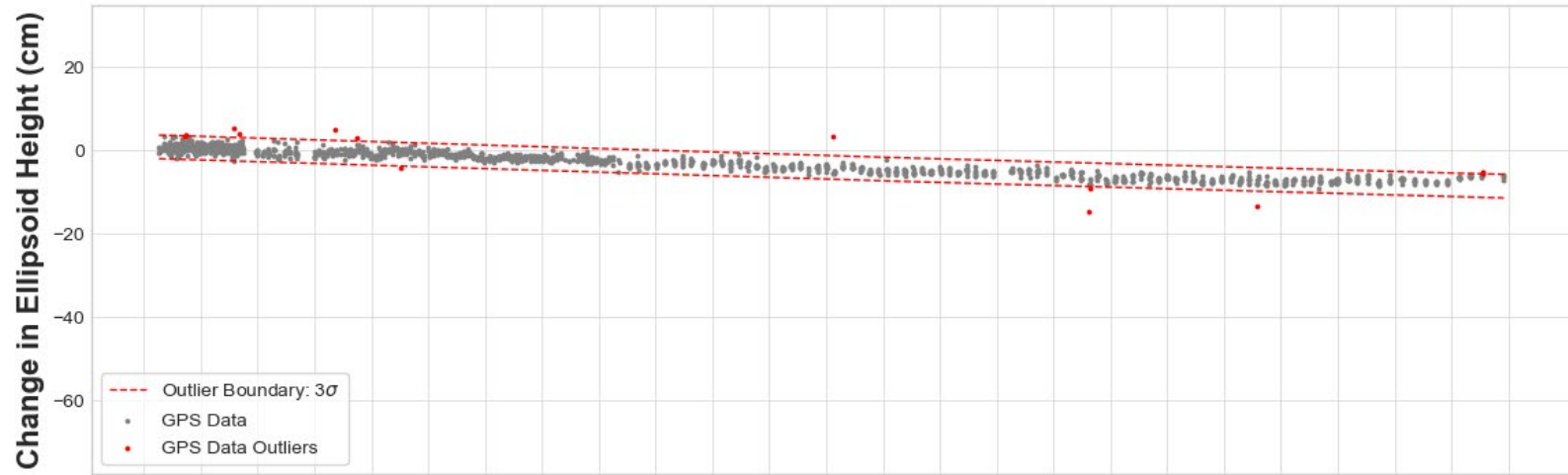


Processed GPS data (source: UH) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by the District when calculating subsidence rates and are shown for informational purposes only.

Period of Record Plot for P010 - Richmond



- GPS station P010, located in Richmond, has measured a total of approximately 6.8 cm of subsidence since 1999.
- 2018-2022 annual rate is 0.11 cm/yr. of uplift.



Processed GPS data (source: UH) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by the District when calculating subsidence rates and are shown for informational purposes only.

Thank you for attending the Public Hearing for FBSD's 2022 Annual Groundwater Report

- A draft copy of this presentation is available on the District's website (www.fbsubsidence.org).
- Record will be open until May 5, 2023. You may provide comments by sending an email to fbinfo@subsidence.org
- The 2022 Annual Groundwater Report will be presented to the Fort Bend Subsidence District Board of Directors on May 24, 2023.
- The 2022 Annual Groundwater Report will be posted on the District's website upon approval of the District's Board of Directors.

Contact Information

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