2023 Annual Groundwater Report

Public Hearing
April 25, 2024

FORT BEND SUBSIDENCE DISTRICT

Fort Bend Subsidence District

The Fort Bend Subsidence District (FBSD) is a special-purpose district created by the Texas Legislature in 1989 to prevent further land subsidence in Fort Bend County.

GROUNDWATER REGULATION

Collaborate with local to state water entities and providers to manage groundwater use through water planning and well permitting.

RESEARCH & MONITORING

Utilize the highest quality data to monitor groundwater usage, aquifer characteristics, and land surface changes.

WATER CONSERVATION

Provide permittees, businesses, and educators with water conservation tools to reduce water use and empower the community to value water.

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Exhibit 1

Location of National Weather Service (NWS) climate stations used for rainfall data for the 2023 calendar year.

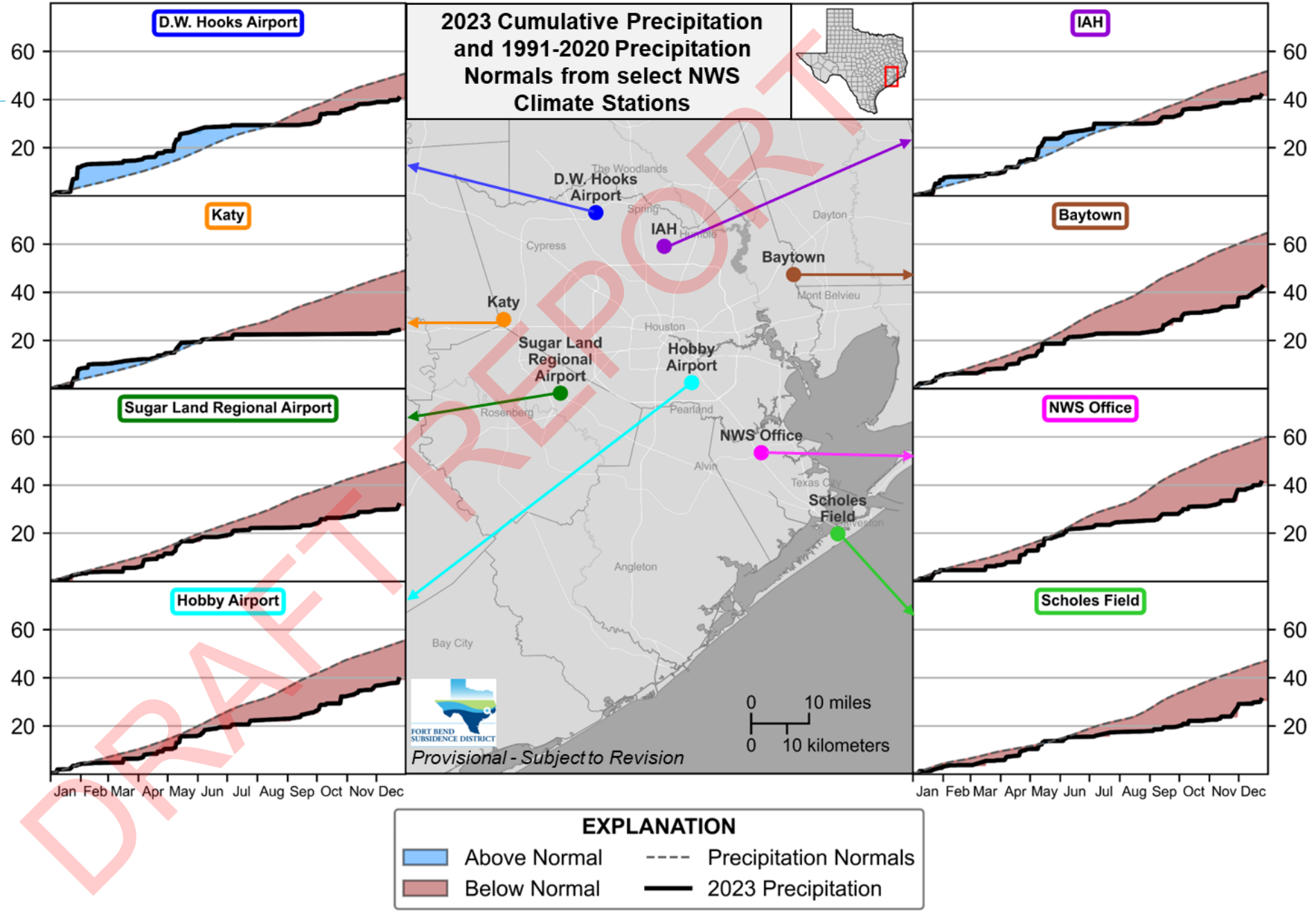
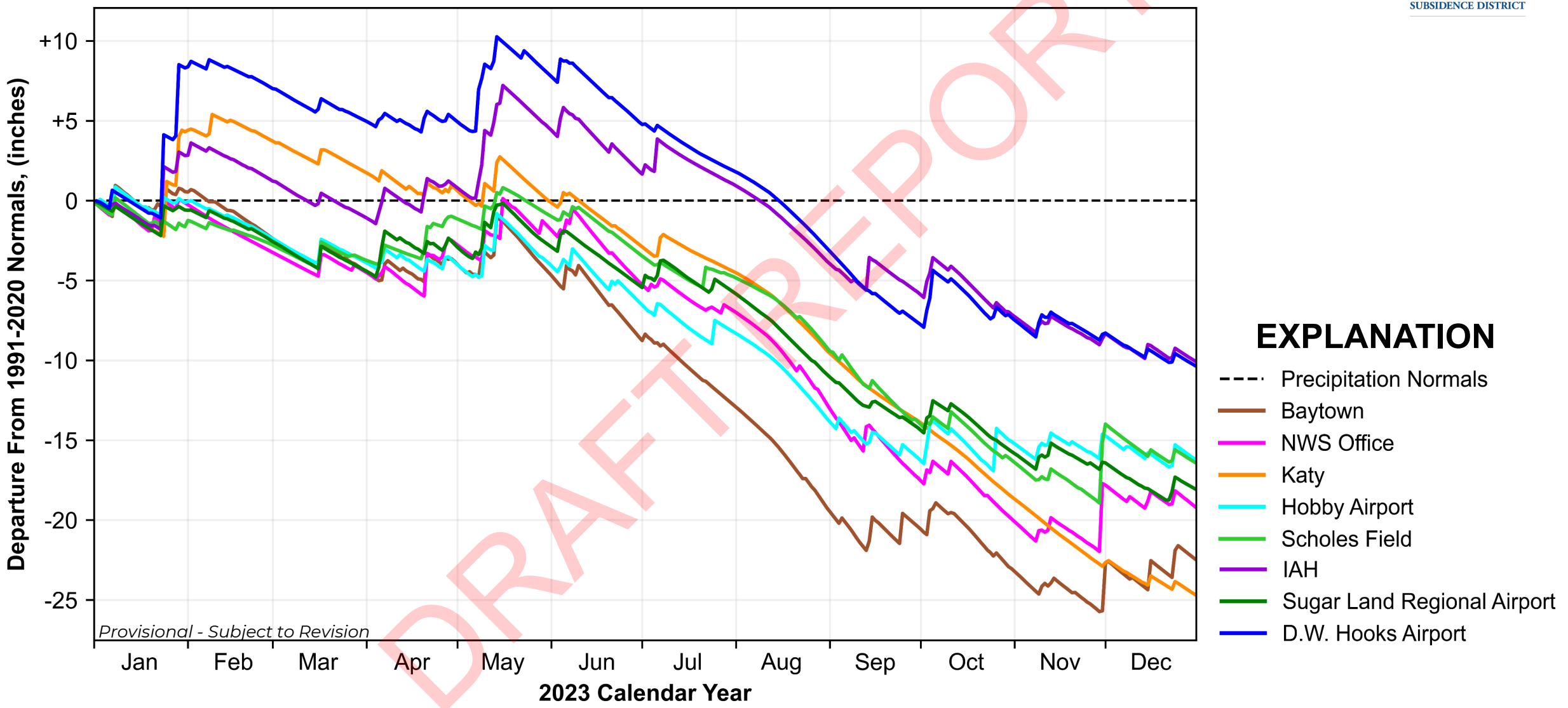


Exhibit 2 2023 Precipitation Data



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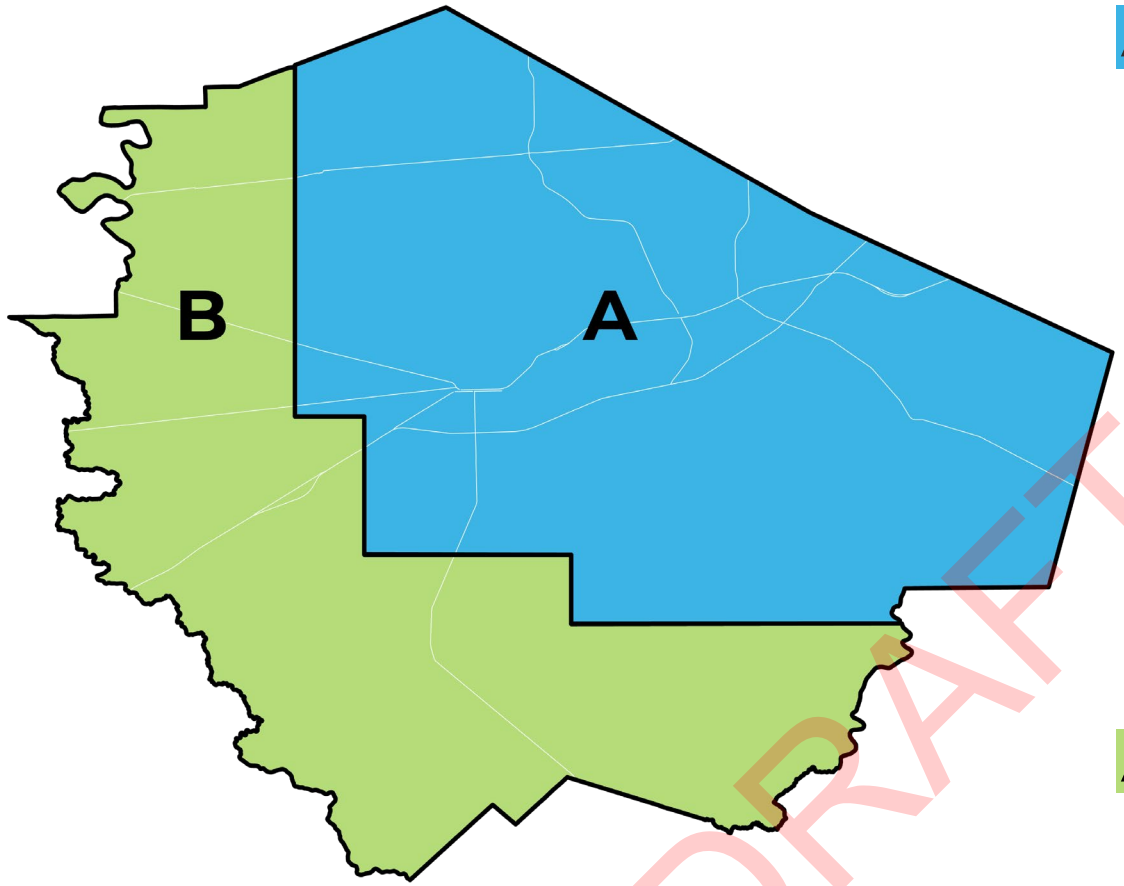
FBSD Regulatory Areas

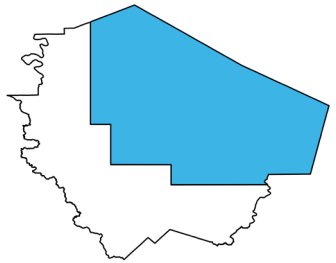


Area A: no more than 40% of Total Water Demand (TWD) may be sourced from groundwater.

- Permittees operating within an approved Groundwater Reduction Plan have the following requirements:
  - 2013 – no more than 70% of TWD from groundwater
  - 2027 – no more than 40% of TWD from groundwater

Area B: not subject to groundwater reduction requirements.

Exhibit 3 Regulatory Area A



2023: 84.8 MGD

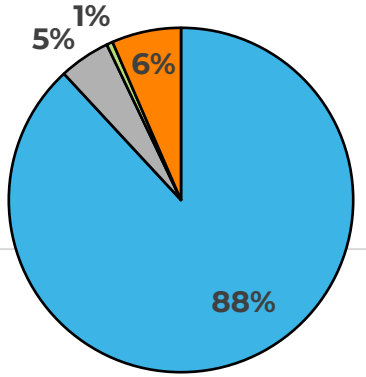
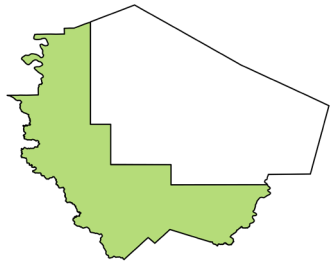


Exhibit 4 Regulatory Area B



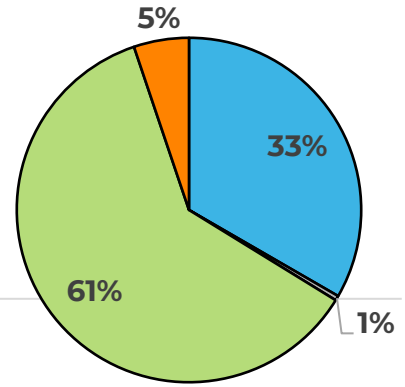
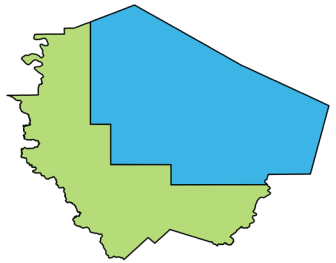


Exhibit 5 Entire District



2023: 95.5 MGD

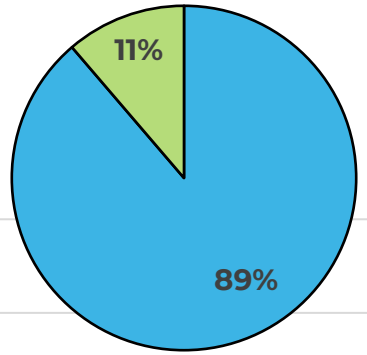


Exhibit 6 Entire District

FORT BEND SUBSIDENCE DISTRICT

2023: 95.5 MGD

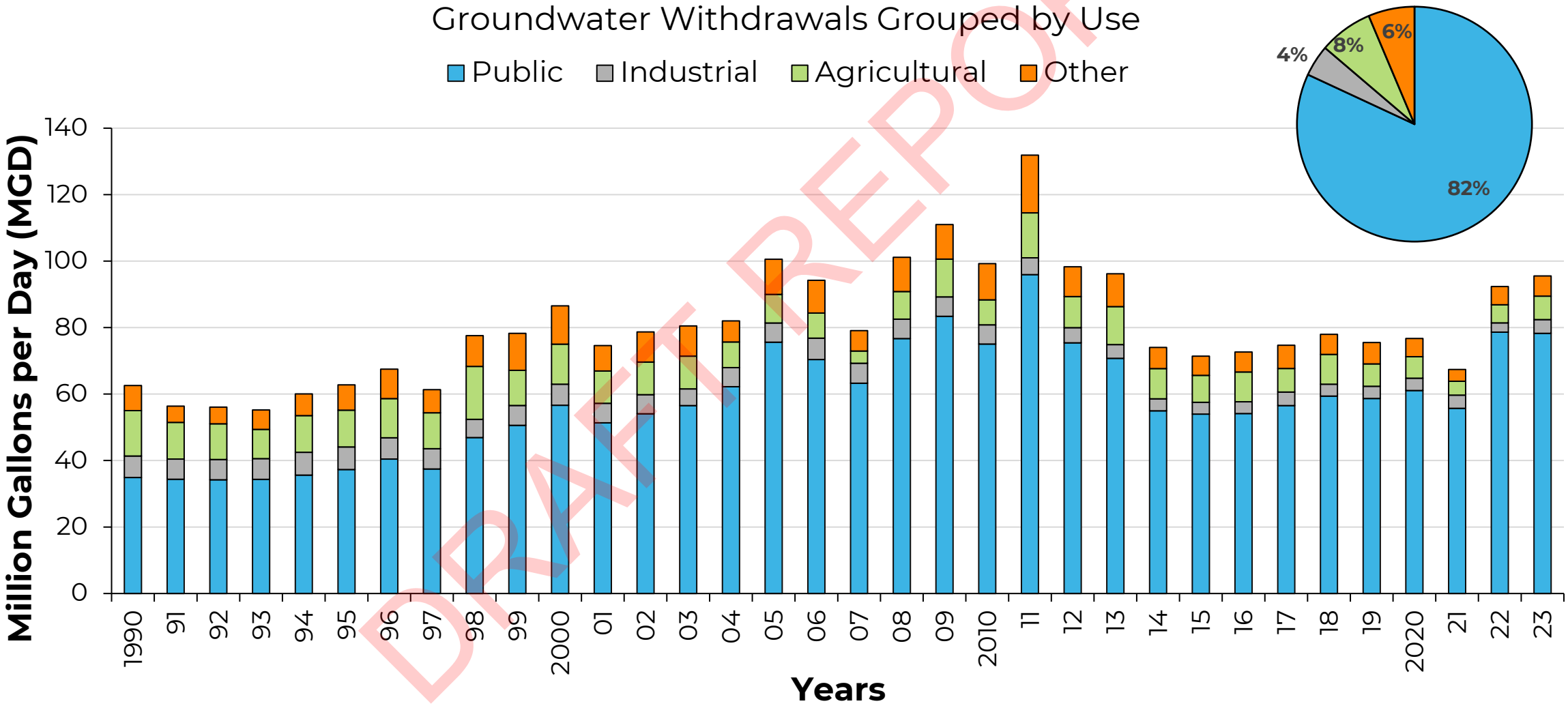


Exhibit 7 Alternative Water Use

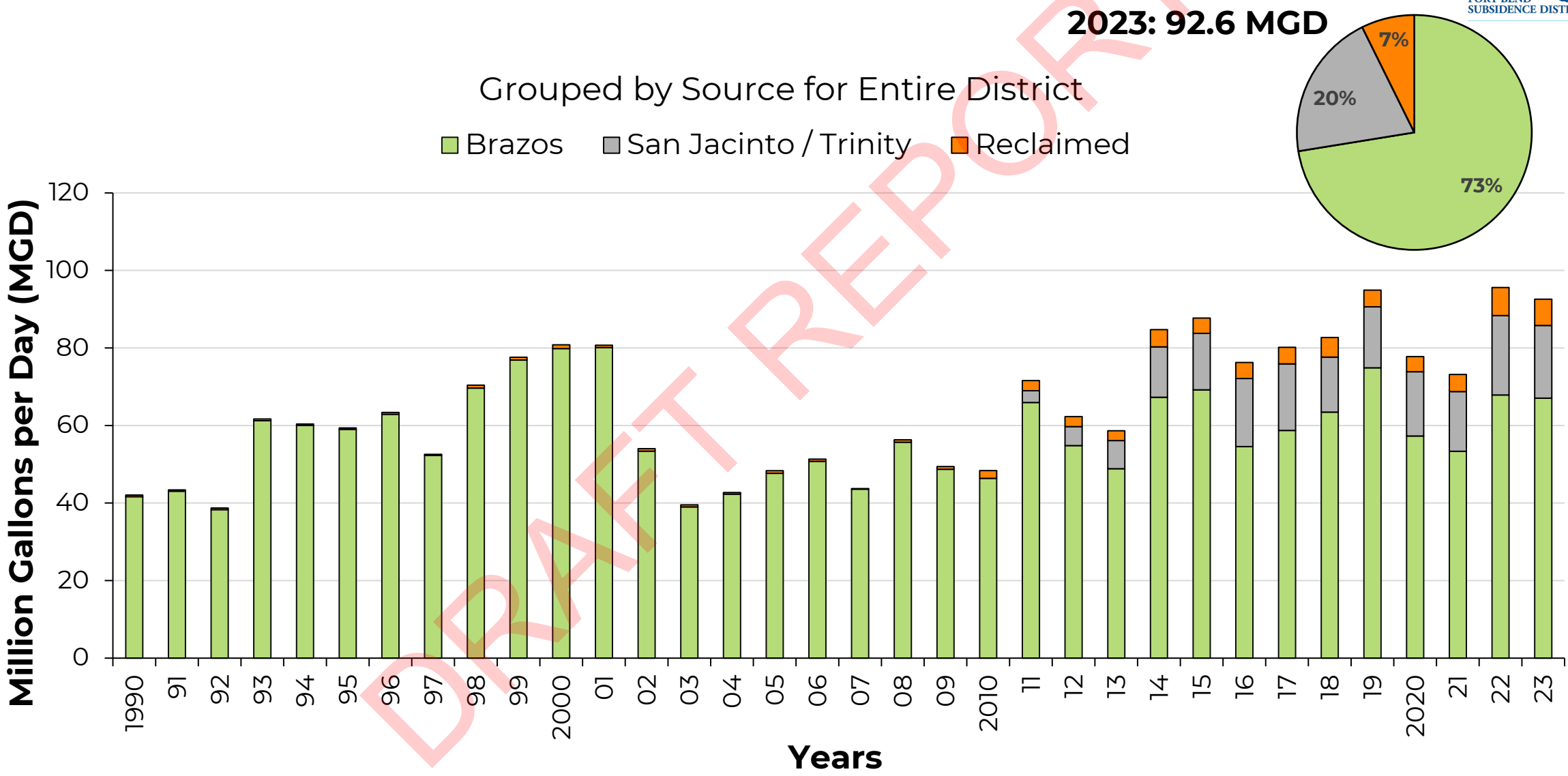
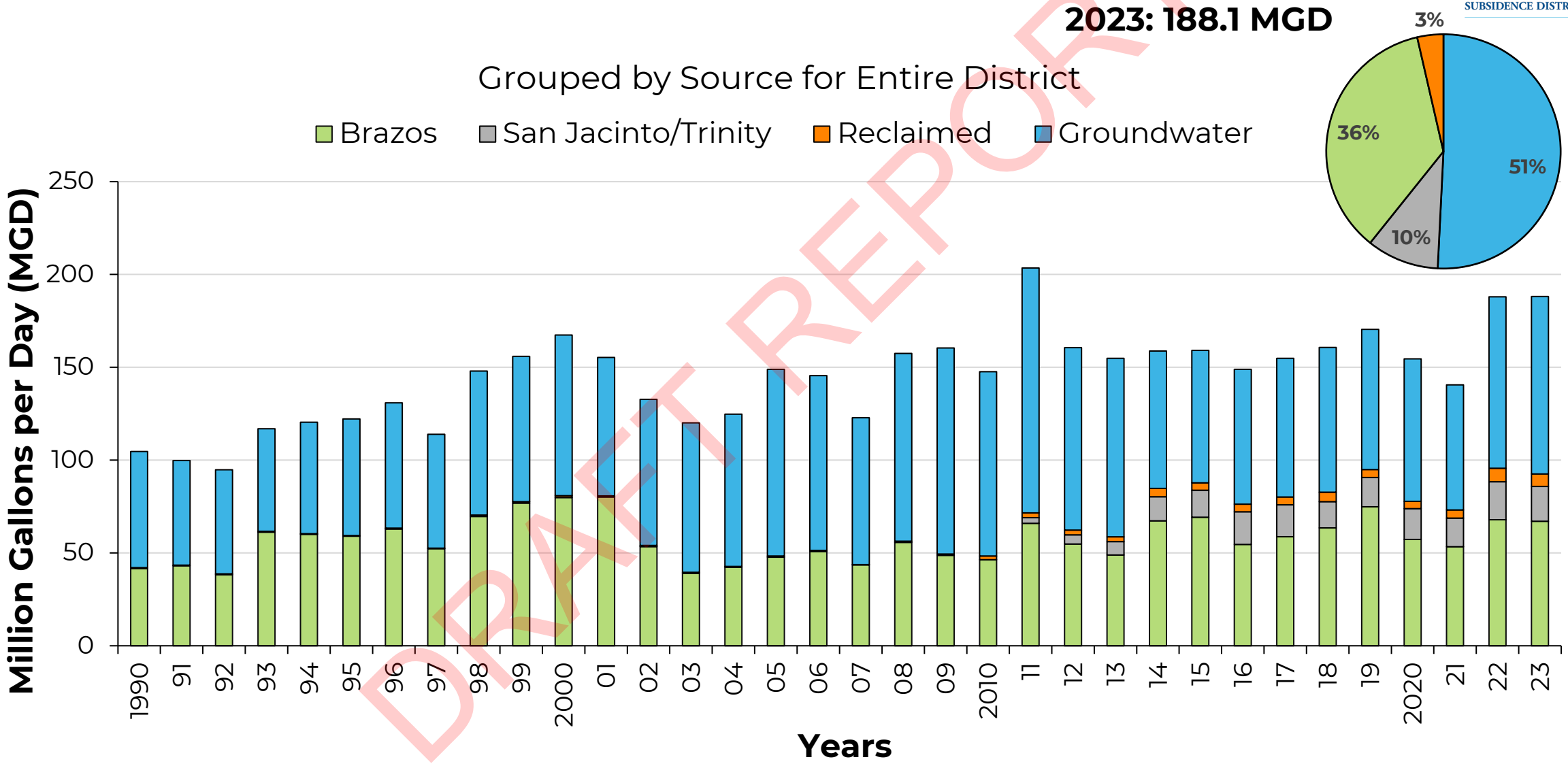


Exhibit 8 Total Water Demand



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USGS
science for a changing world

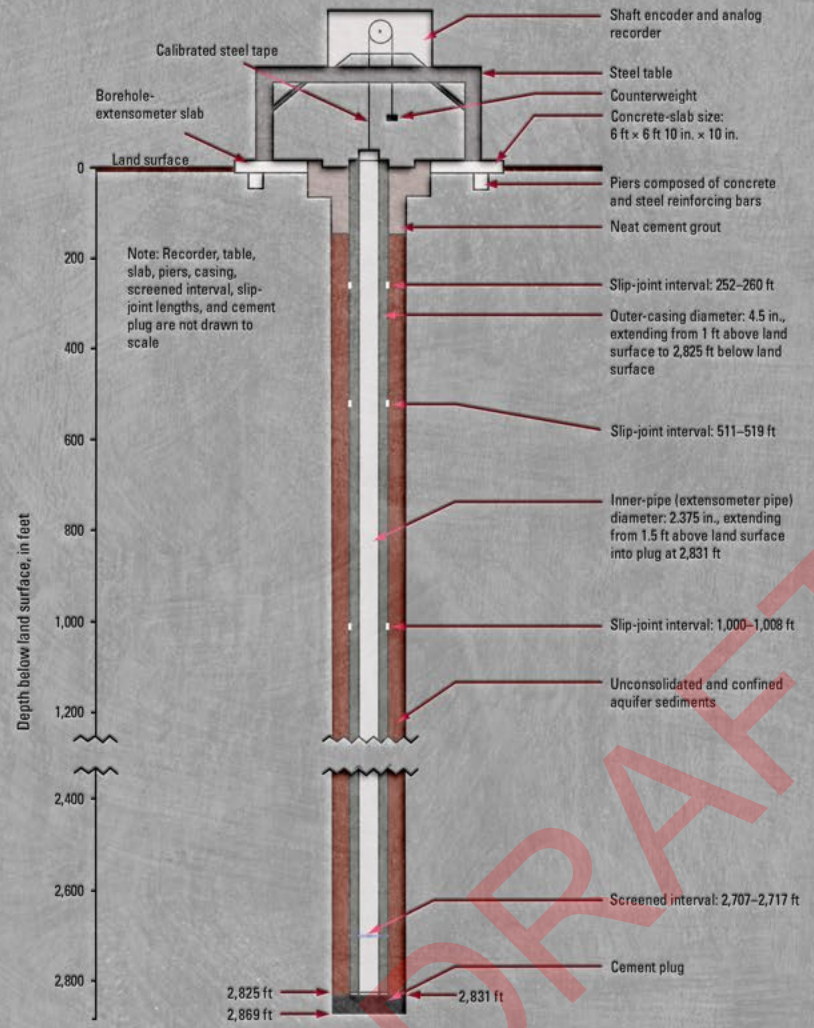


DIAGRAM OF A BOREHOLE EXTENSOMETER

Groundwater-level Altitudes, Long-Term Change & Compaction

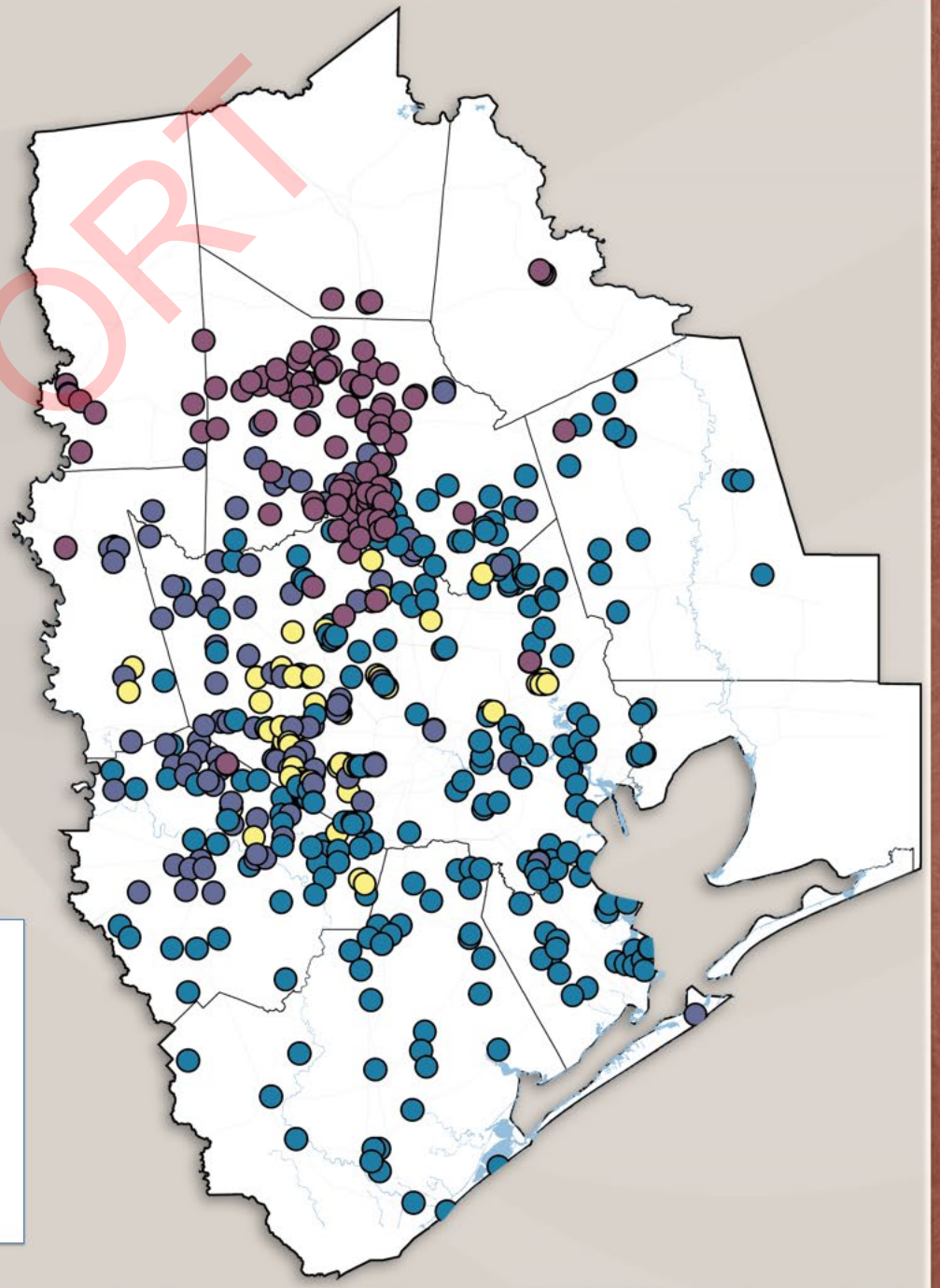
CHICOT/EVANGELINE AND JASPER AQUIFERS

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

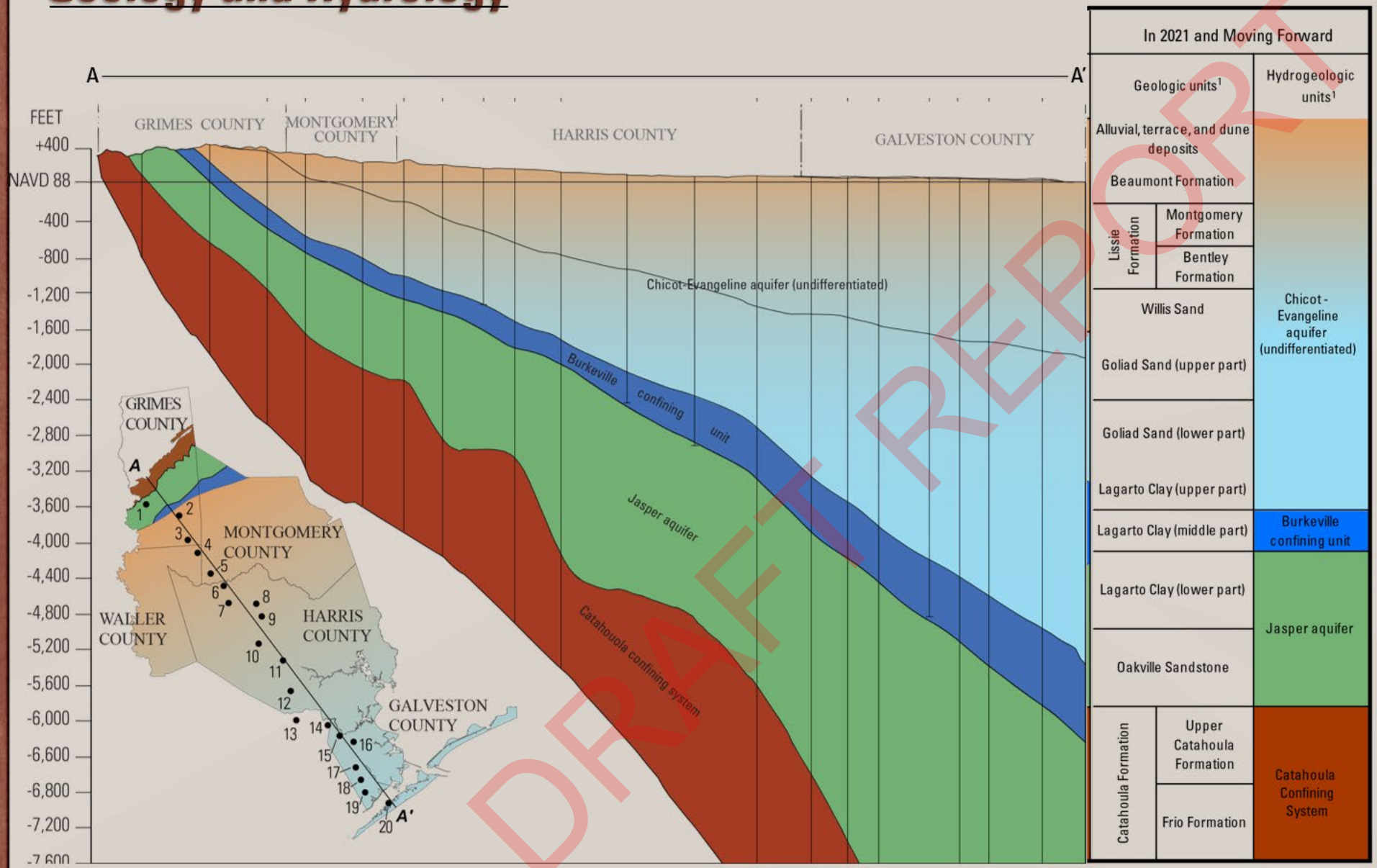
2024 Water-Level Map Series

- Chicot and Evangeline Aquifers (undifferentiated)
  - 2024 Water-Level Altitude
  - 2023 to 2024 Water-Level Change
  - 2019 to 2024 Water-Level Change
  - 1990 to 2024 Water-Level Change

- Compaction 1973 to 2023
  - Compaction Data from 14 Extensometers



Geology and Hydrology



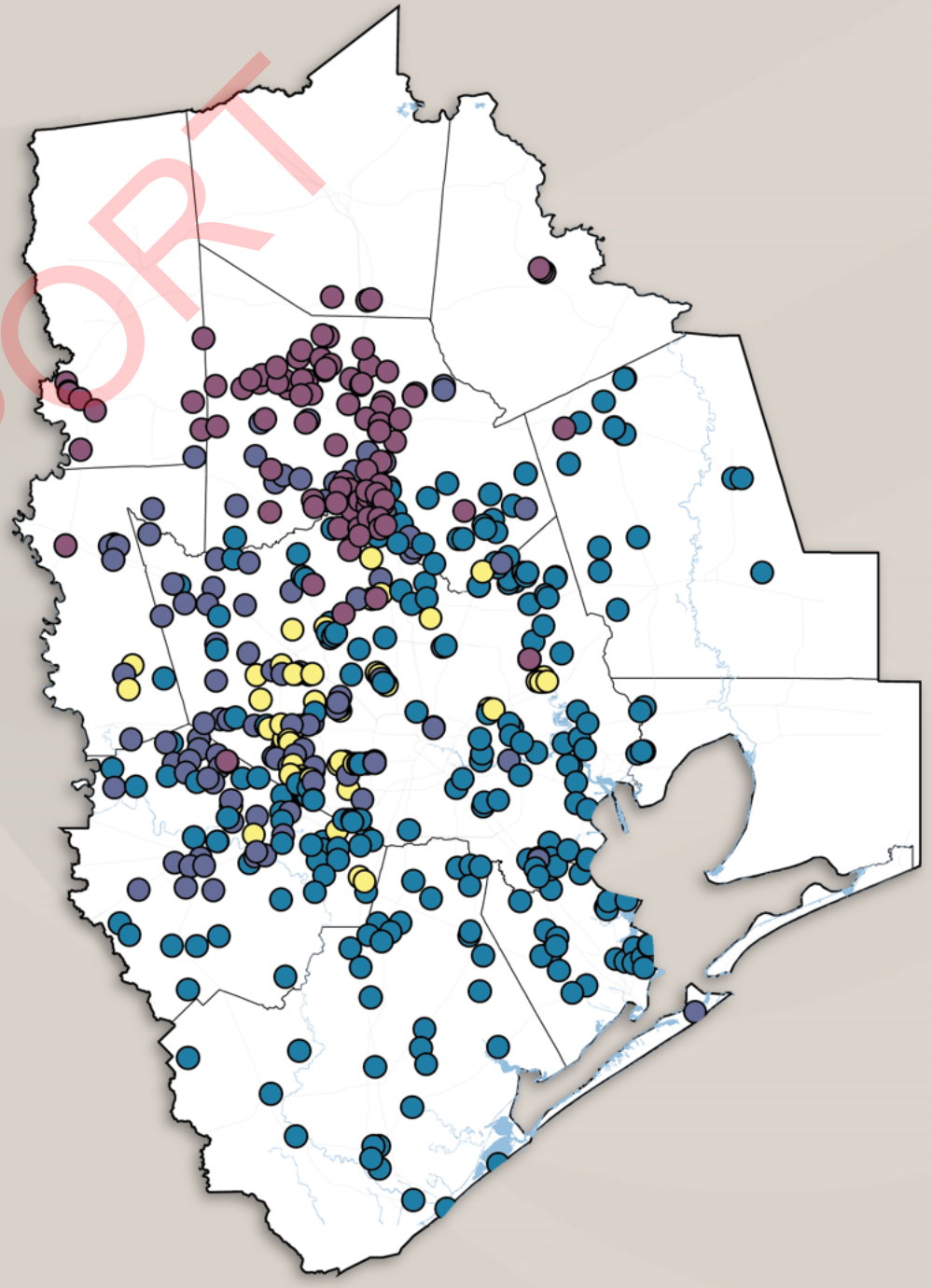
In 2021 and Moving Forward		
Geologic units[1]		Hydrogeologic units[1]
Alluvial, terrace, and dune deposits		Chicot - Evangeline aquifer (undifferentiated)
Beaumont Formation		
Lissie Formation	Montgomery Formation	
	Bentley Formation	
Willis Sand		
Goliad Sand (upper part)		
Goliad Sand (lower part)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

*Young, 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 12-12-2023 to 3-07-2024
- Well Types:
  - Public Supply, Irrigation, Industrial, Observation
- Chicot and Evangeline (undifferentiated) water-levels: **478**
  - **75 in Fort Bend County**
- Number of wells used to create the 2024 altitude maps
  - Chicot and Evangeline (undifferentiated): *444*

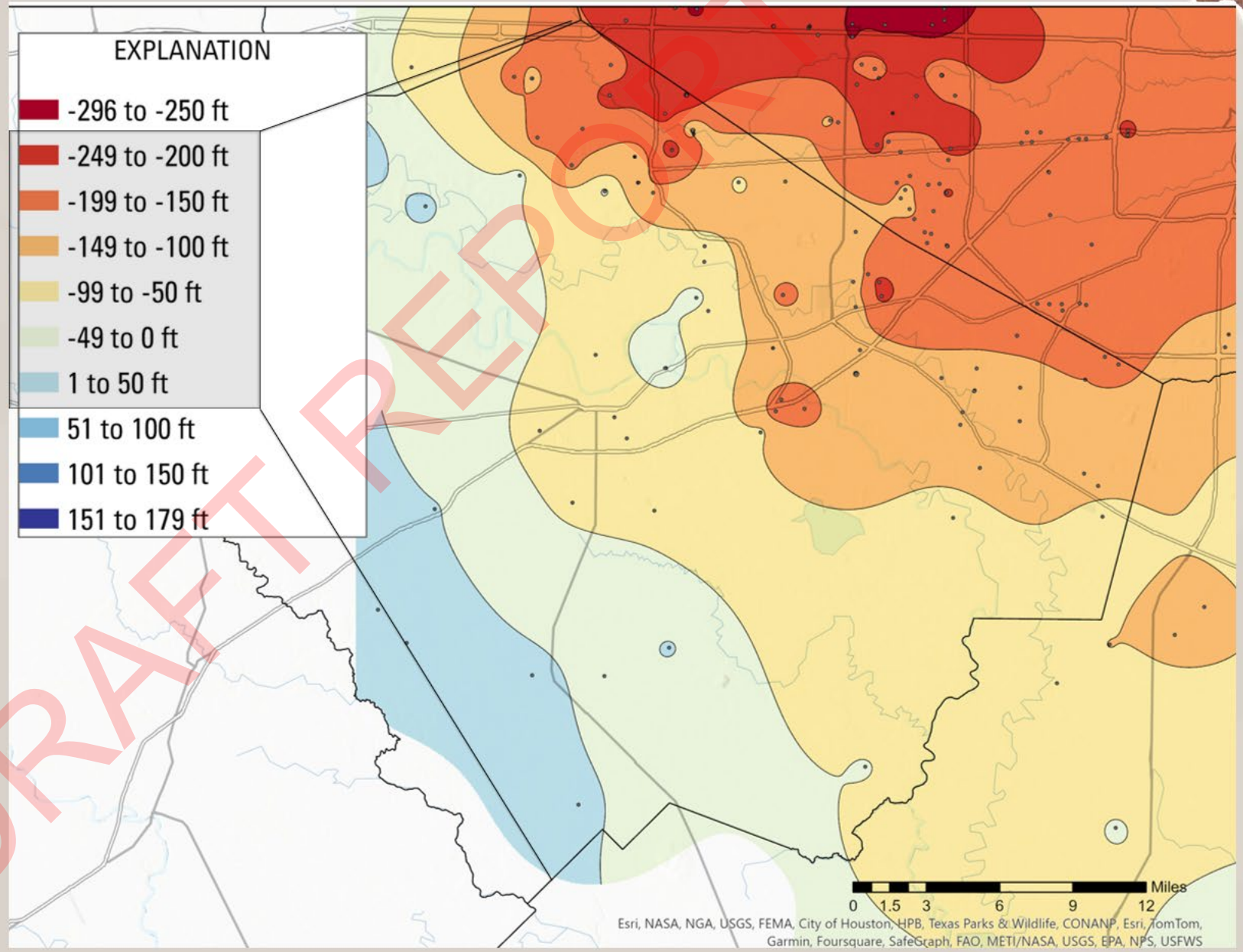
Water-Level Altitude

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

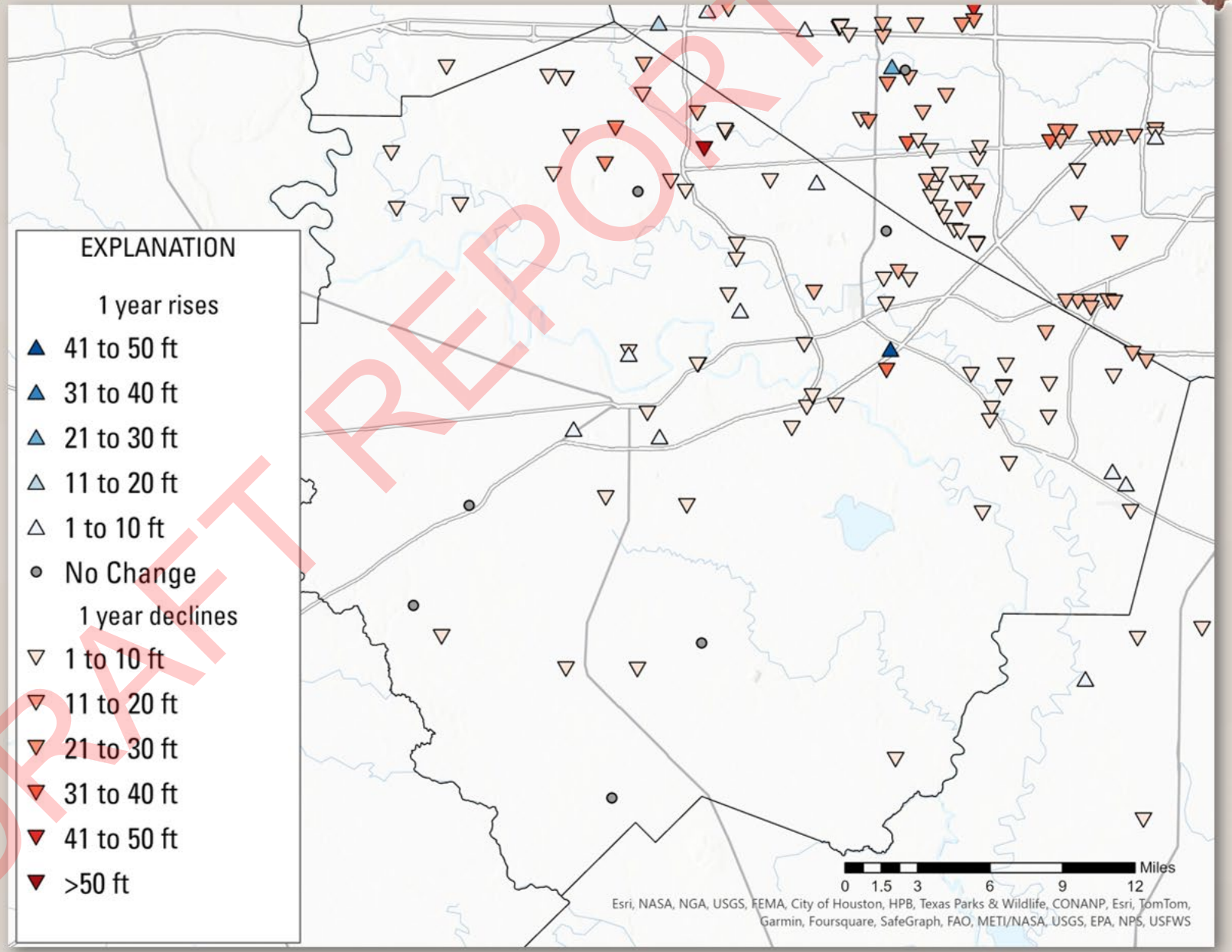
Highest altitudes in the western portions of the county



2023 to 2024 Water-Level Change

Chicot and Evangeline (undifferentiated)

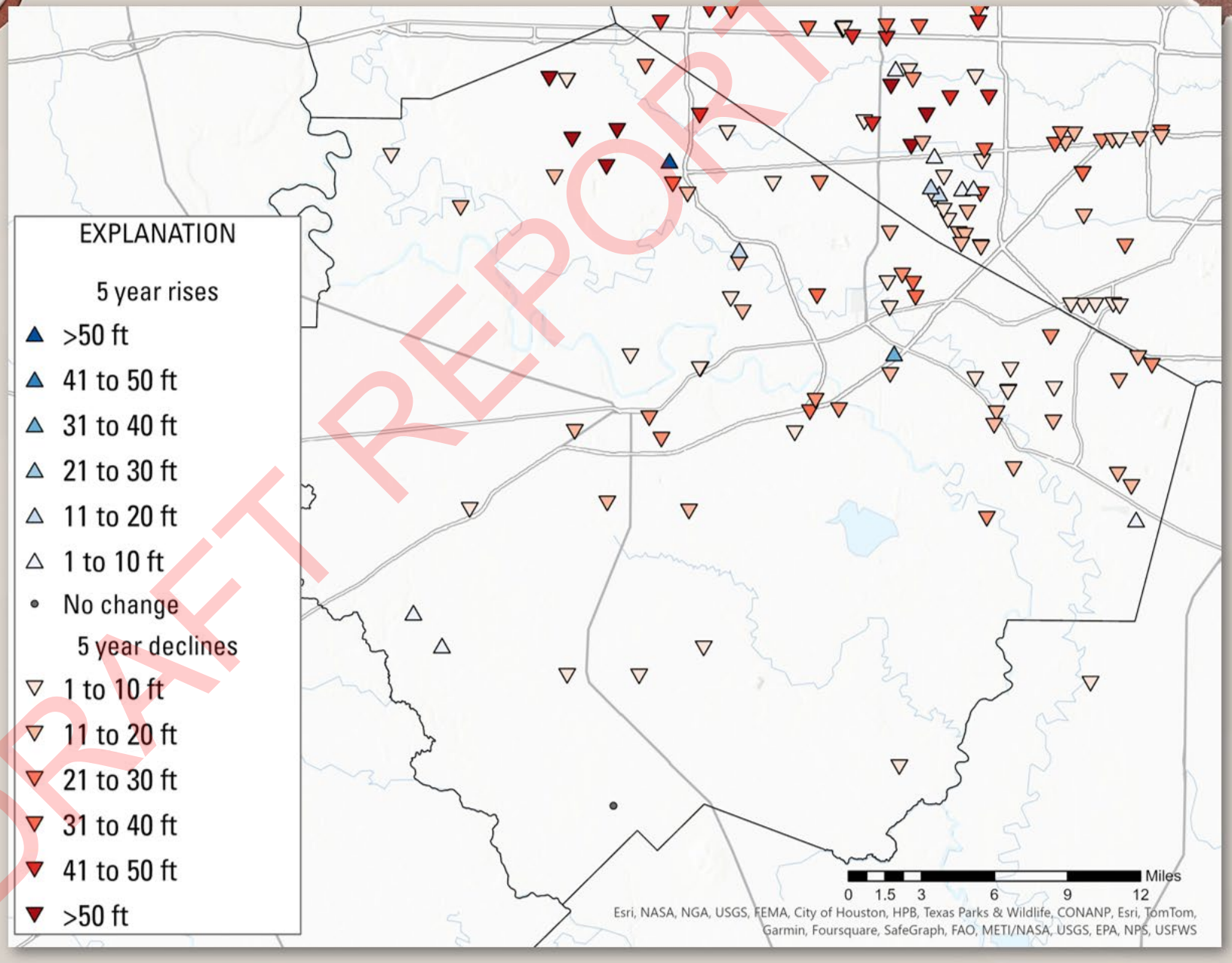
- 72 water-level pairs
  - Mostly declines
    - About 71% are declines of less than 10 feet.
  - Largest decline (>50 ft):
    - Northern Fort Bend County (1)
  - Largest rise (>40 ft):
    - East-central Fort Bend County (1)



2019 to 2024 Water-Level Change

Chicot and Evangeline (undifferentiated)

- 70 water-level pairs
  - Mostly declines
    - More than half (~57%) are declines of less than 20 ft.
  - Largest declines (>50 ft):
    - Northern Fort Bend County
  - Largest rises (> 50 ft):
    - 1 in northern Fort Bend County



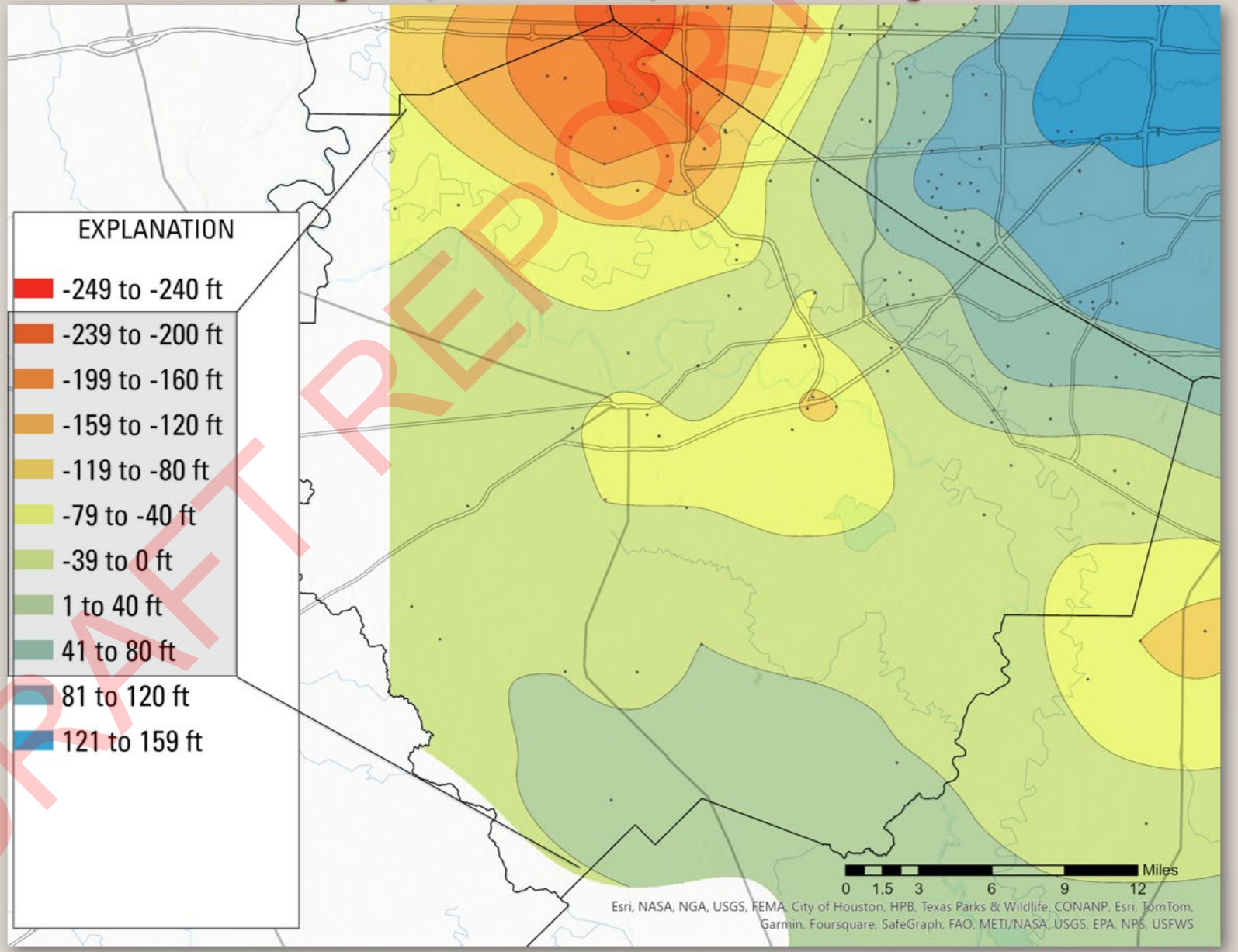
USGS science for a changing world

Long term change

Water level rises along the north-eastern border with Harris County and the southern border of Brazoria County

Water-level declines across much of the county with larger declines in the northern portion of the county

Chicot and Evangeline (undifferentiated) Water-Level Change 1990 to 2024



USGS science for a changing world

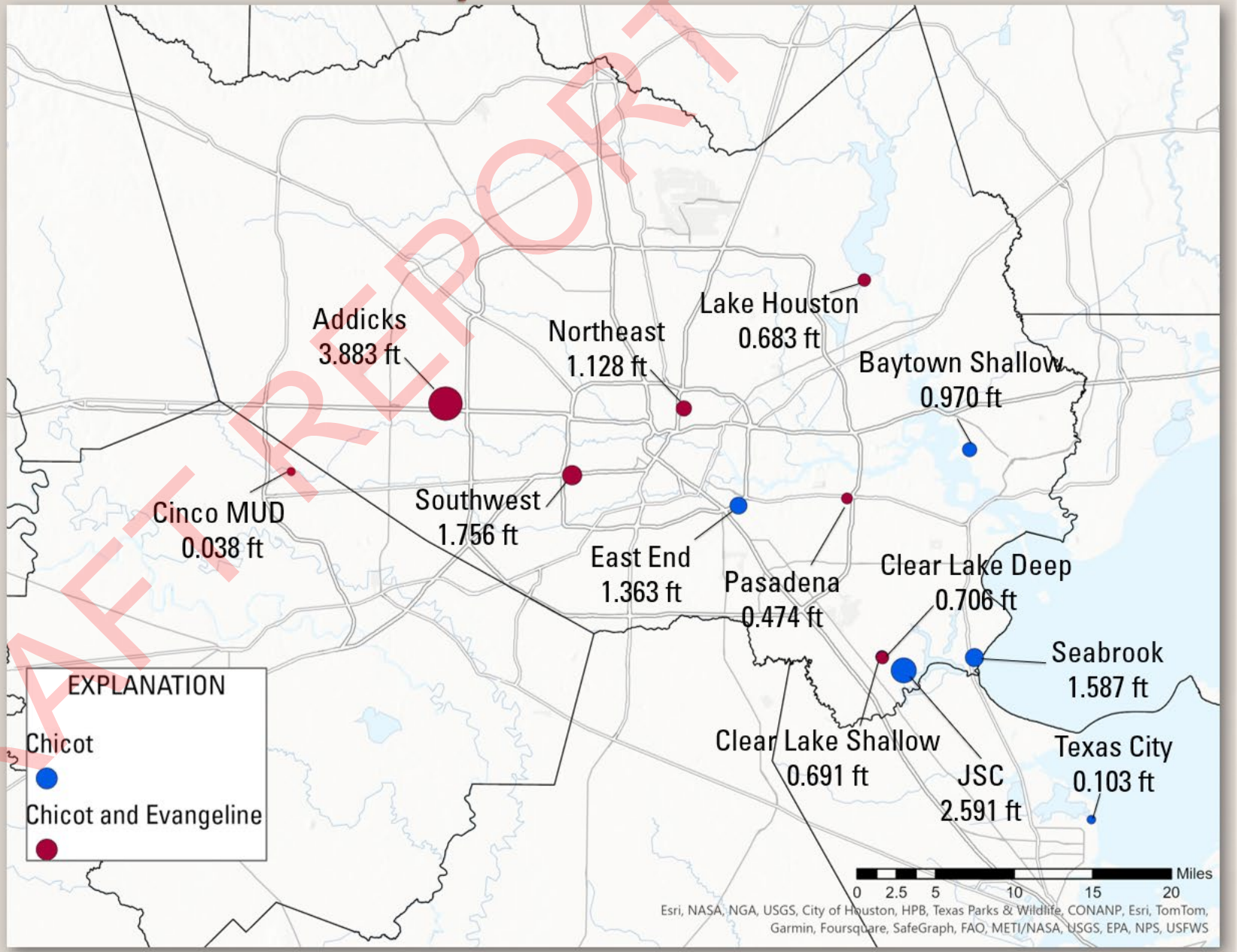
Compaction 1973 - 2023

Compaction Interval:
Chicot

1. 1973 | Baytown Shallow 0.970 ft.
2. 1973 | East End 1.363 ft.
3. 1973 | Johnson Space Center 2.591 ft.
4. 1973 | Seabrook 1.587 ft.
5. 1973 | Texas City 0.103 ft.
6. 1976 | Clear Lake Shallow 0.691 ft.

Compaction Interval:
Chicot and Evangeline

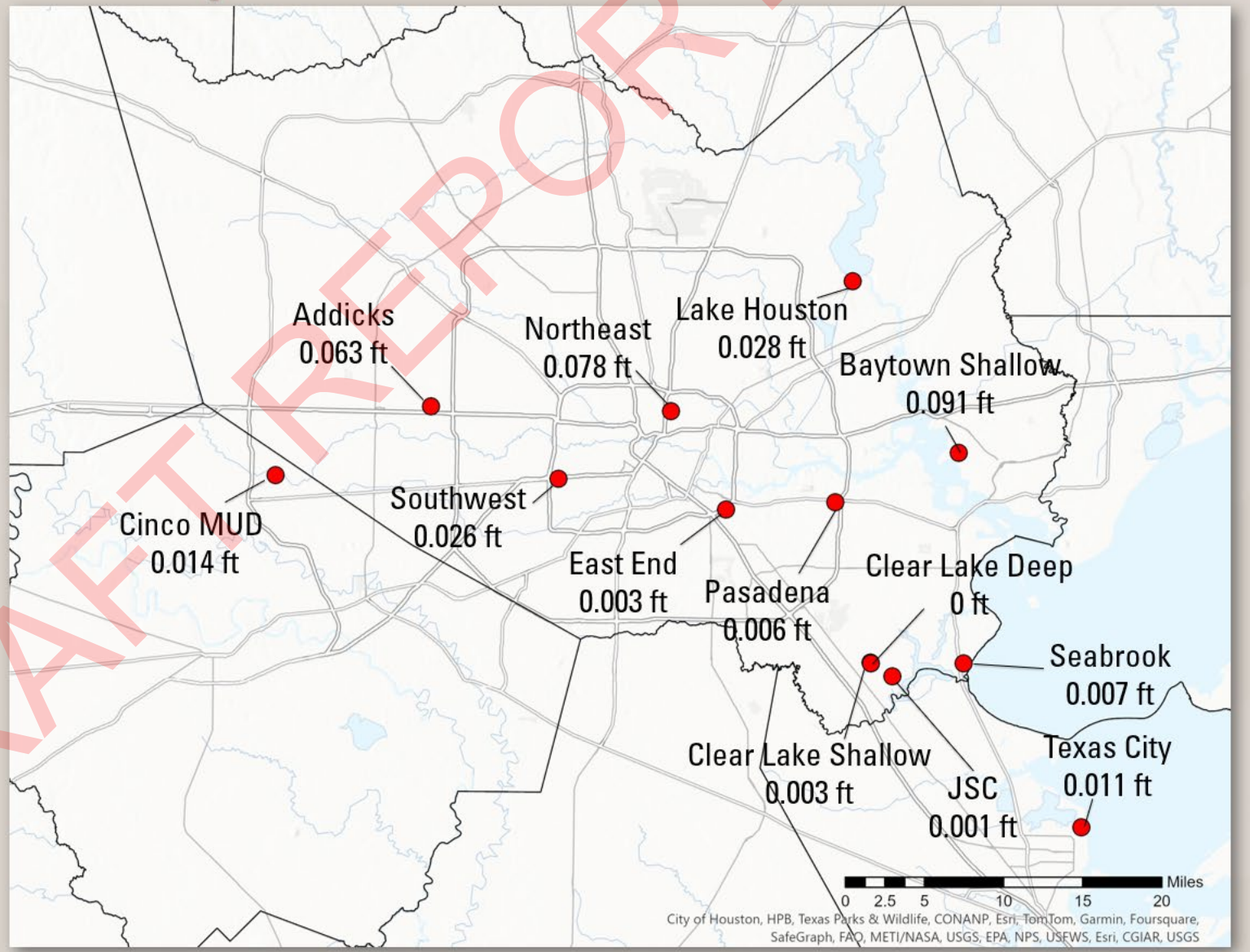
7. 1973 | Baytown Deep --- ft.
8. 1974 | Addicks 3.883 ft.
9. 1974 | Pasadena 0.474 ft.
10. 1976 | Clear Lake Deep 0.706 ft.
11. 1980 | Lake Houston 0.683 ft.
12. 1980 | Northeast 1.128 ft.
13. 1980 | Southwest 1.756 ft.
14. 2017 | Cinco MUD 0.038 ft.



2023 Compaction Summary

- No sites recorded expansion for the period
- Compaction ranged from 0.000 ft to 0.078 ft

Compaction December 2022 to December 2023



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Subsidence Monitoring

All FBSD operated global positioning system (GPS) stations are constructed in a custom design.

GPS data are collected for one week every two months.

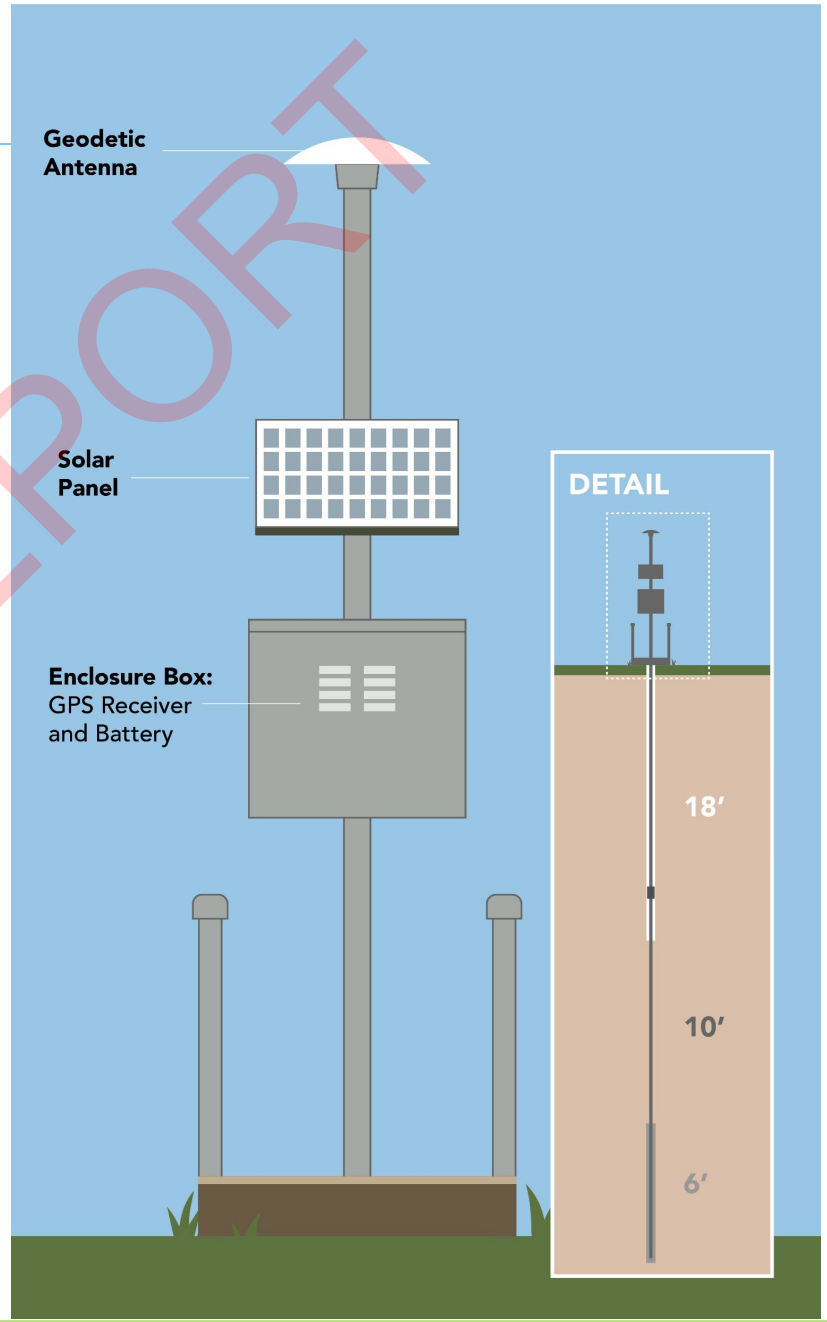
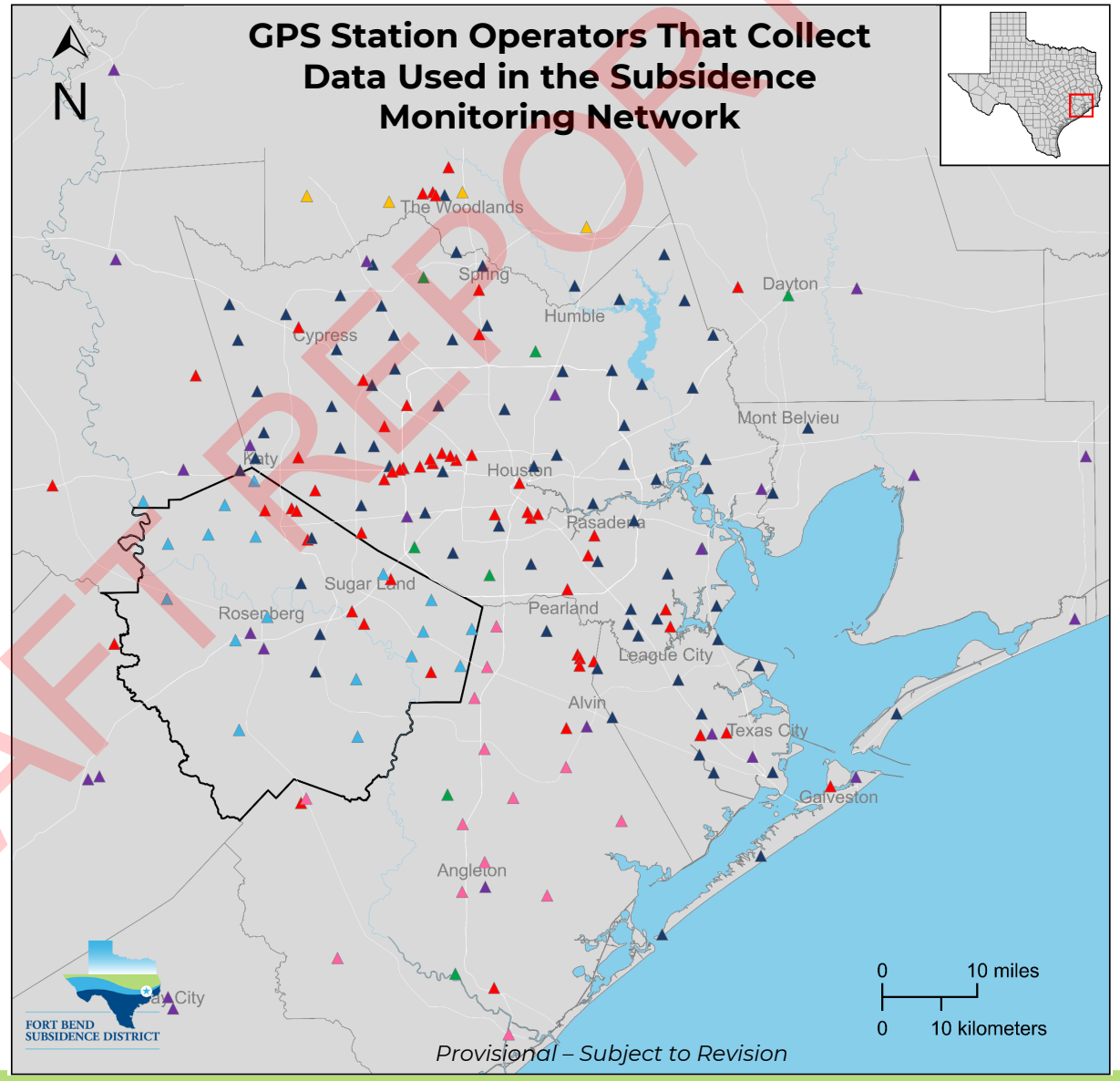


Exhibit 9 Subsidence Monitoring Network

Location and operator of GPS stations that monitor land surface deformation periodically or continuously within southeast Texas in 2023.

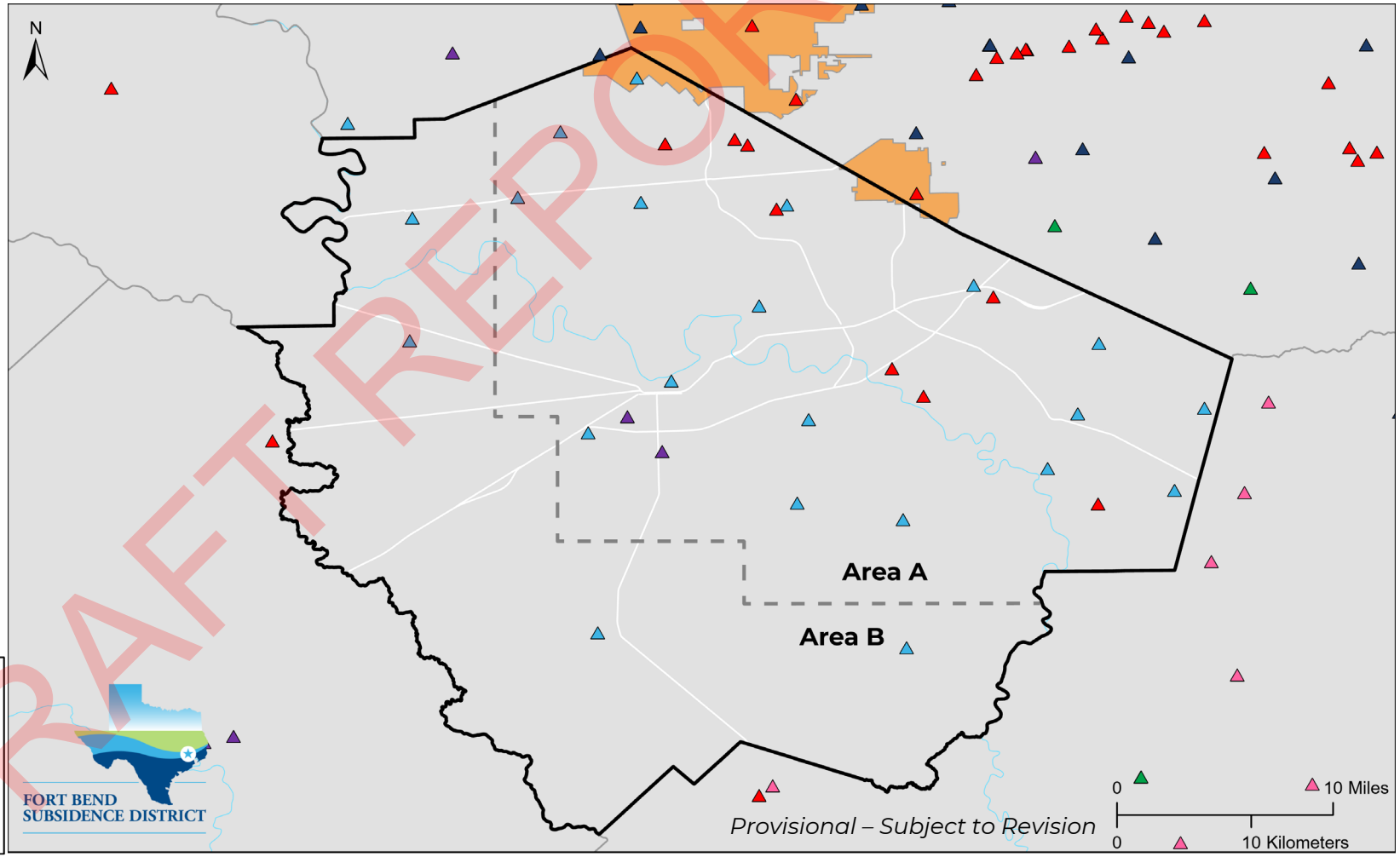


EXPLANATION

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

Exhibit 10 GPS Station Operators

Location of GPS station operators and jurisdiction of FBSD and the West Harris County Regional Water Authority (WHCRWA), who is not permitted by FBSD.



EXPLANATION

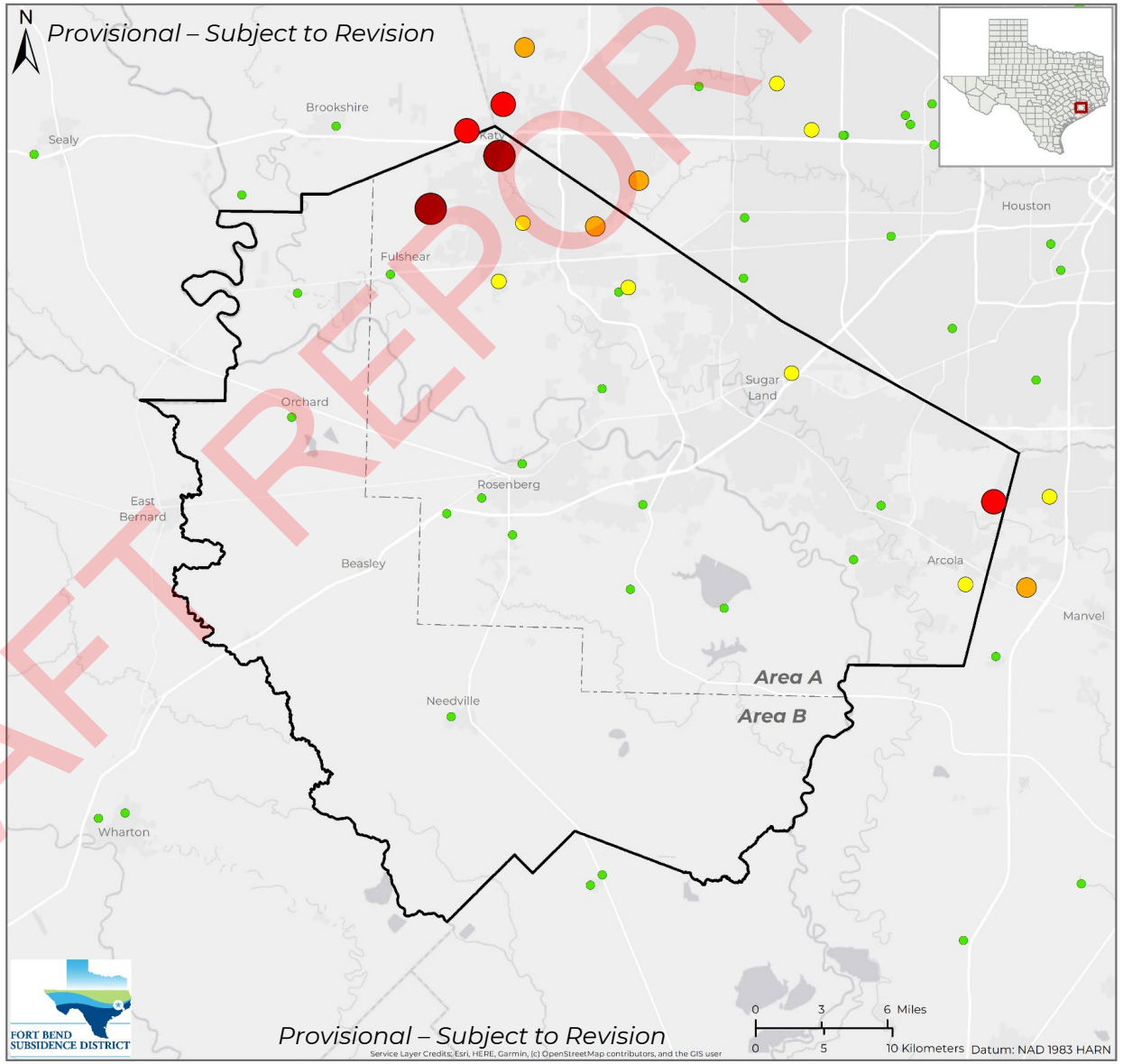
GPS Stations Used in the Subsidence Monitoring Network

- FBSD
- HGSD
- UH
- TxDOT
- BCGCD
- LSGCD
- Other
- WHCRWA

Exhibit 11 Subsidence Rates in Fort Bend

FORT BEND SUBSIDENCE DISTRICT

Annual subsidence rate, in centimeters per year (cm/yr.), estimated from GPS data collected at active stations with three or more years of data averaged from 2019 to 2023.



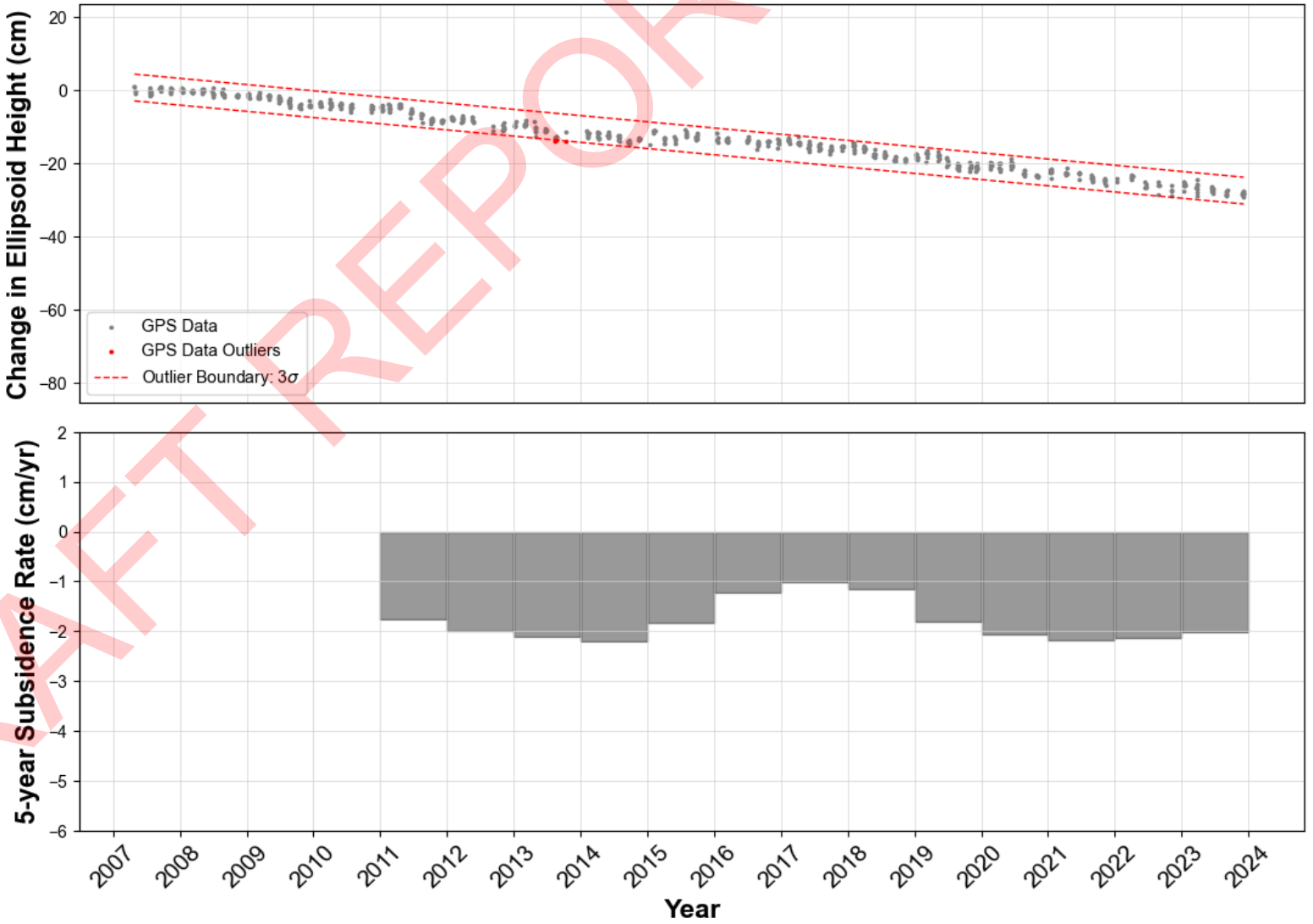
EXPLANATION

Average Annual Subsidence Rate (cm/yr.) Estimated from GPS Data Collected from Active GPS Stations from 2019 to 2023

- Greater than 2.0
- 2.0 - 1.5
- 1.5 - 1.0
- 1.0 - 0.5
- Less than 0.5

Exhibit 12 Subsidence Data in Katy

- GPS station P029, located in Katy, has measured a total of approximately 28.5 cm of subsidence since 2007.
- 2019-2023 average annual subsidence rate is 2.03 cm/yr.

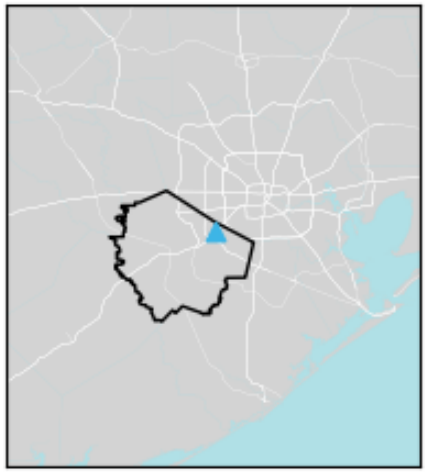


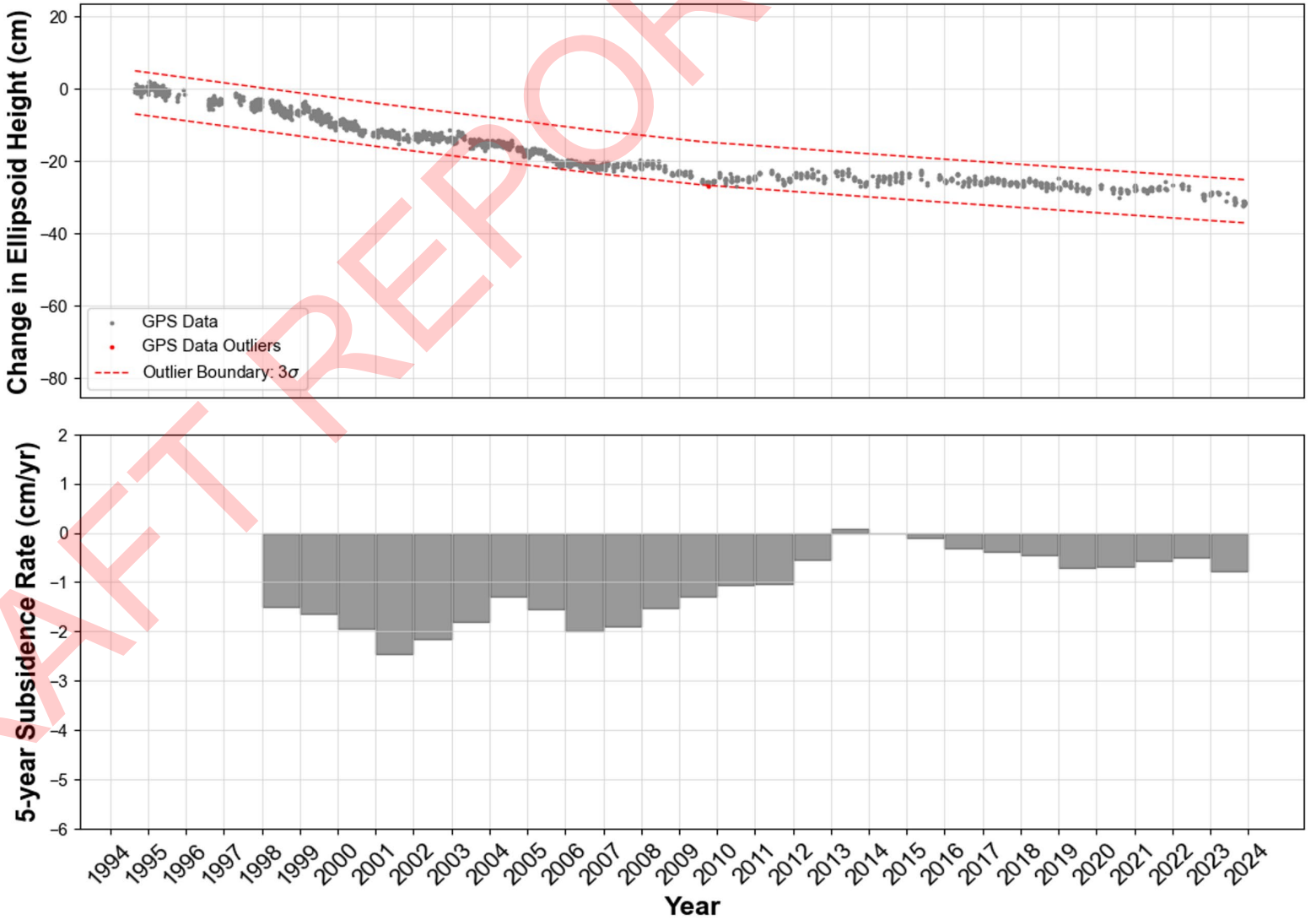
Processed GPS data (source: UH) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by the District when calculating subsidence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

Exhibit 13 Subsidence Data in Sugar Land

FORT BEND SUBSIDENCE DISTRICT

- GPS station P004, located in Sugar Land, has measured a total of approximately 31.3 cm of subsidence since 1994.
- 2019-2023 average annual subsidence rate is 0.77 cm/yr.

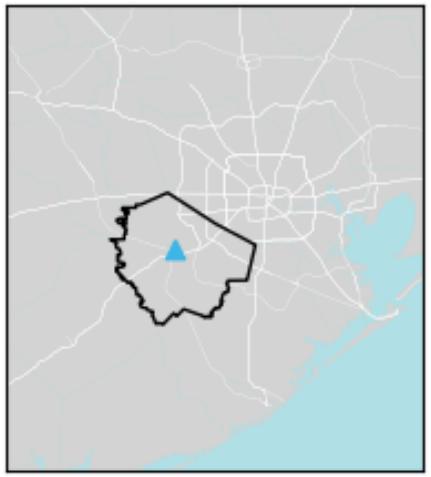


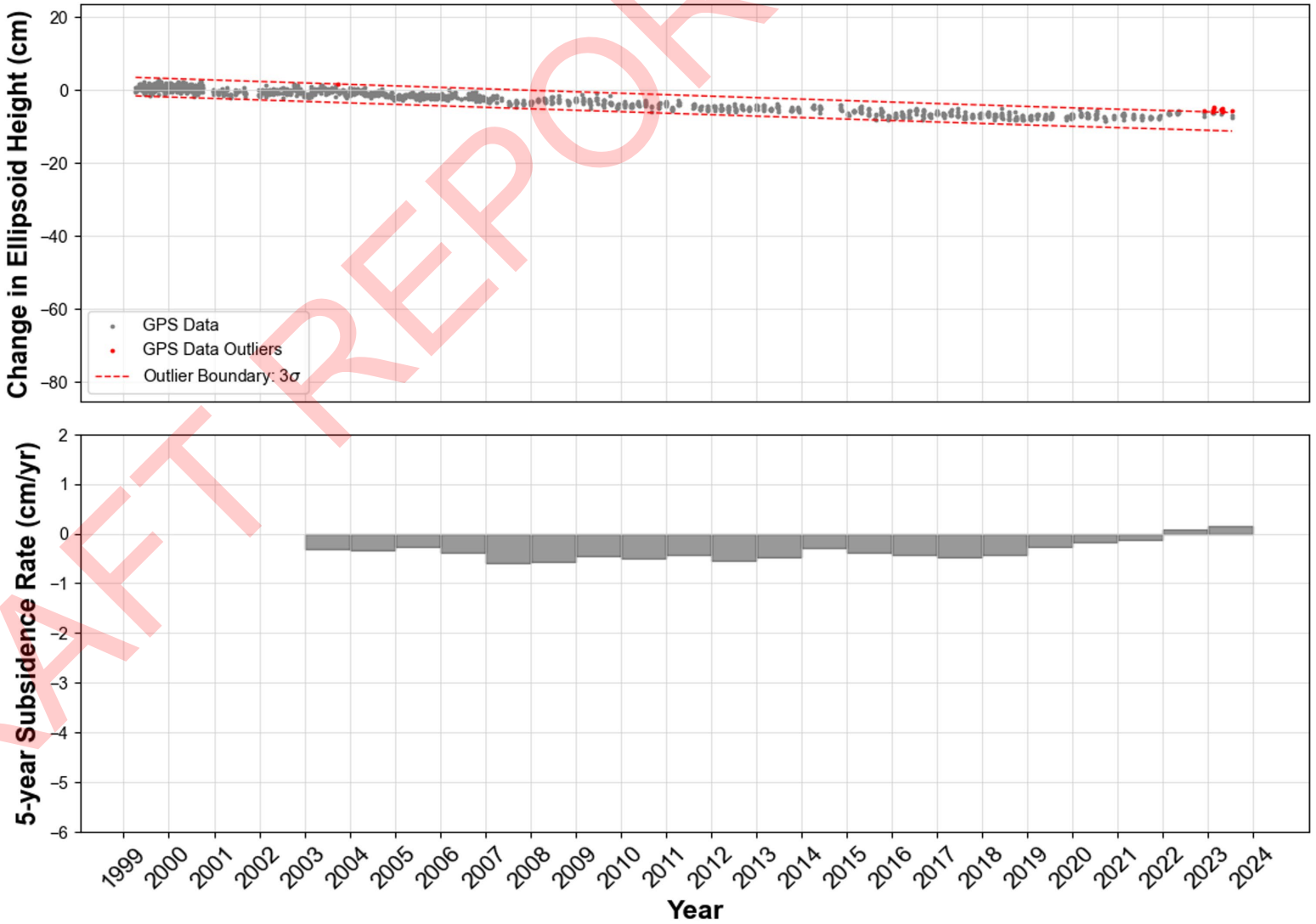


Processed GPS data (source: UH) over period of record. Processed GPS data (gray circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are not considered by the District when calculating subsidence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

Exhibit 14 Subsidence Data in Rosenberg

- GPS station P010, located in Rosenberg, has measured a total of approximately 6.4 cm of subsidence since 1999.
- 2019-2023 average annual subsidence rate is -0.31 cm/yr. (Uplift of 0.31 cm/yr.).





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Testimony and Public Comment

FORT BEND SUBSIDENCE DISTRICT

Any person who wishes to present testimony, evidence, exhibits or other information may do so in person, by counsel, via email to **fbinfo@subsidence.org** or any combination of these options.

Thank You for Attending the Public Hearing for FBSD's 2023 Annual Groundwater Report

- Record will be open until **May 3, 2024**. You may provide comments by sending an email to **fbinfo@subsidence.org**
- The 2023 Annual Groundwater Report will be presented to the Fort Bend Subsidence District Board of Directors on **May 22, 2024**.
- The 2023 Annual Groundwater Report will be posted on FBSD's website upon approval from the Board of Directors.

Contact Information

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www.fbsubsidence.org

FORT BEND
SUBSIDENCE DISTRICT