



**FORT BEND
SUBSIDENCE DISTRICT**

2022 ANNUAL GROUNDWATER REPORT

Determination of Groundwater Withdrawal
and Subsidence in Fort Bend County

EXECUTIVE SUMMARY



Fort Bend Subsidence District Report 2023-01

Fort Bend Subsidence District
Richmond, Texas
www.fbsubsidence.org

2022 Executive Summary

Groundwater was the primary source of water for municipal, agricultural, and industrial users over the last century. The rapid increase in population in the 1950s due to the expansion of the industrial complex in the Houston Ship Channel area led to a dramatic increase in water demand and groundwater withdrawal. The reliance on groundwater and subsequent subsidence that was caused by its regional development resulted in the creation of the Fort Bend Subsidence District (District) in 1989. The District's mission is to regulate the use of groundwater in Fort Bend County, to cease ongoing and prevent future subsidence that can lead to infrastructure damage and contribute to flooding.

This report comprises the 33rd Annual Groundwater Report for the District. Pursuant to District Resolution No. 2023-468 passed on February 22, 2023, the Board of Directors held a public hearing at 2:00 p.m. on April 27, 2023. This report provides an overview of the information presented during the Public Hearing, including climatic conditions, groundwater use, groundwater levels and measured subsidence within the District from January 1, 2022 through December 31, 2022.

Description of Study Area

Fort Bend County uses groundwater from the Gulf Coast Aquifer System, which includes two primary water-bearing units: the shallow, hydrologically connected system of the Chicot and Evangeline (undifferentiated) aquifers and the deeper Jasper aquifer. The regionally confining Burkeville unit separates the shallow and deeper systems. Only one well is completed in the Jasper aquifer and has only been in use on a limited basis. Therefore, most of the subsidence that has occurred in the District can be sourced to clay compaction in the shallow water-bearing units.

The District's [Regulatory Plan](#) was developed to reduce groundwater withdrawal to a level that ceases ongoing subsidence and prevents future subsidence within the District. The District adopted the most recent Regulatory Plan on January 23, 2013 and amended it on June 22, 2022. The District Plan separates Fort Bend County into two regulatory areas (**Figure 1**). Utilizing a novel regulatory approach, the amount of groundwater that may be used by a permittee is dependent upon their total water demand and location within a specific regulatory area. Regulatory Area A permittees can produce groundwater for up to 40% of their total water demand unless they are in a certified groundwater reduction plan; whereas, Regulatory Area B permittees have no groundwater reduction requirements.

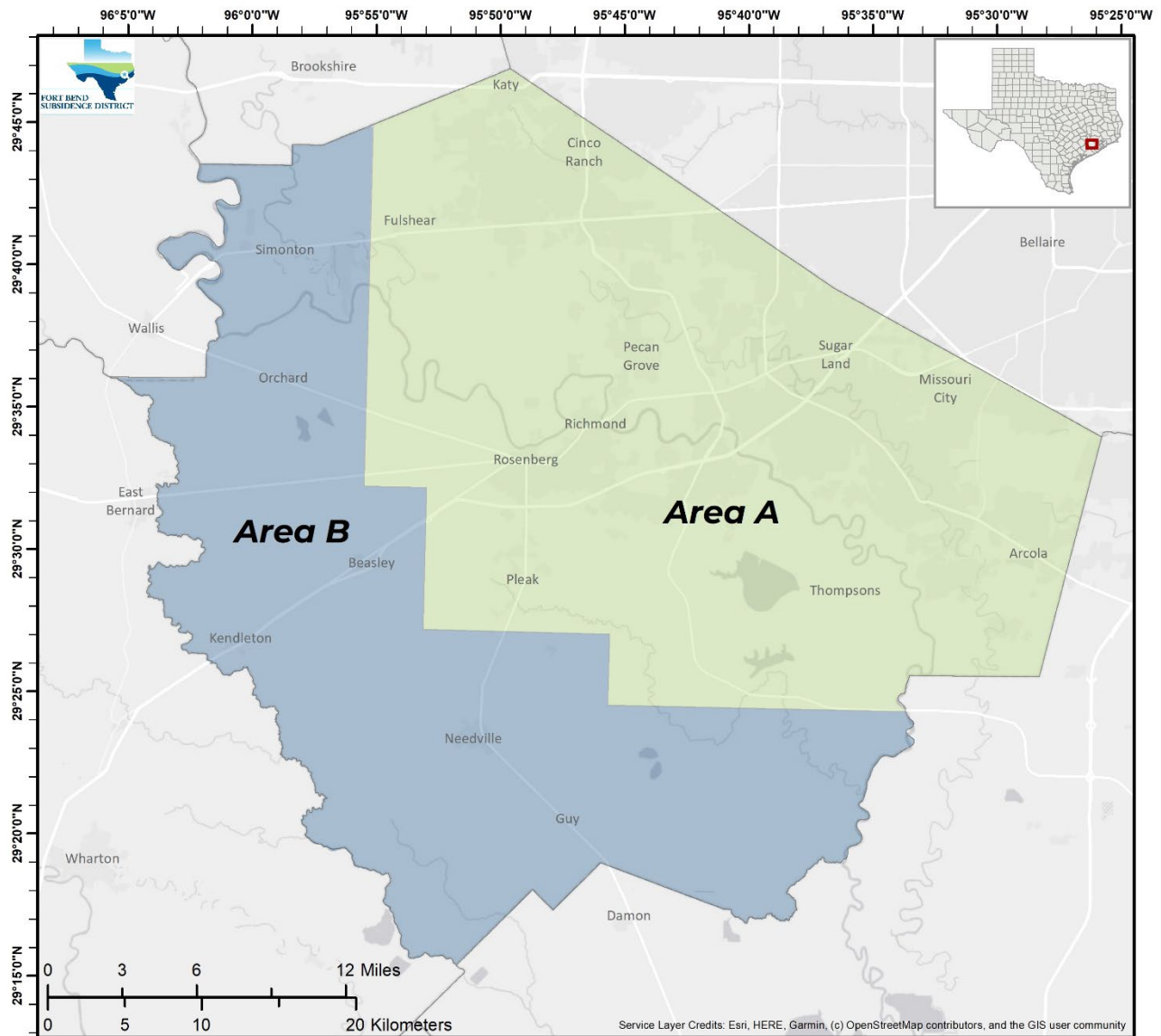


Figure 1. Location of the Fort Bend Subsidence District Regulatory Areas.

The District’s Regulatory Plan requires permittees to convert to alternative water supplies in order to reduce their reliance on groundwater sources. The primary alternative water supply used in this region is surface water sourced from three river basins: the Brazos River Basin, the San Jacinto River Basin and the Trinity River Basin.

In the 1950s, the City of Houston along with other entities in the region began the development of several water supply reservoirs within the San Jacinto and Trinity River Basins to provide water for the rapidly growing area. Today, water treatment plants served by these surface water sources and the Brazos River Basin are operated by the City of Houston, the City of Sugar Land, the City of Richmond, the Gulf Coast Water Authority, the Brazosport Water Authority, and others.

Climate

Annual variations in precipitation can significantly impact the total water demand in the District. Groundwater use patterns fluctuate during periods of climatic variation, which results in changes in aquifer water levels and potentially in subsidence rates. During periods of excessive rainfall, total water demand can decline; conversely, during periods of drought, water use can increase resulting in declining water levels in the aquifer and increased rates of subsidence. The 2022 calendar year started out below normal, and remained below normal for the rest of the year (**Figure 2**). There were periods for some rainfall in the spring, fall and the end of the year. Overall, rainfall totals in 2022 ended 20.3 inches below normal in Fort Bend County.

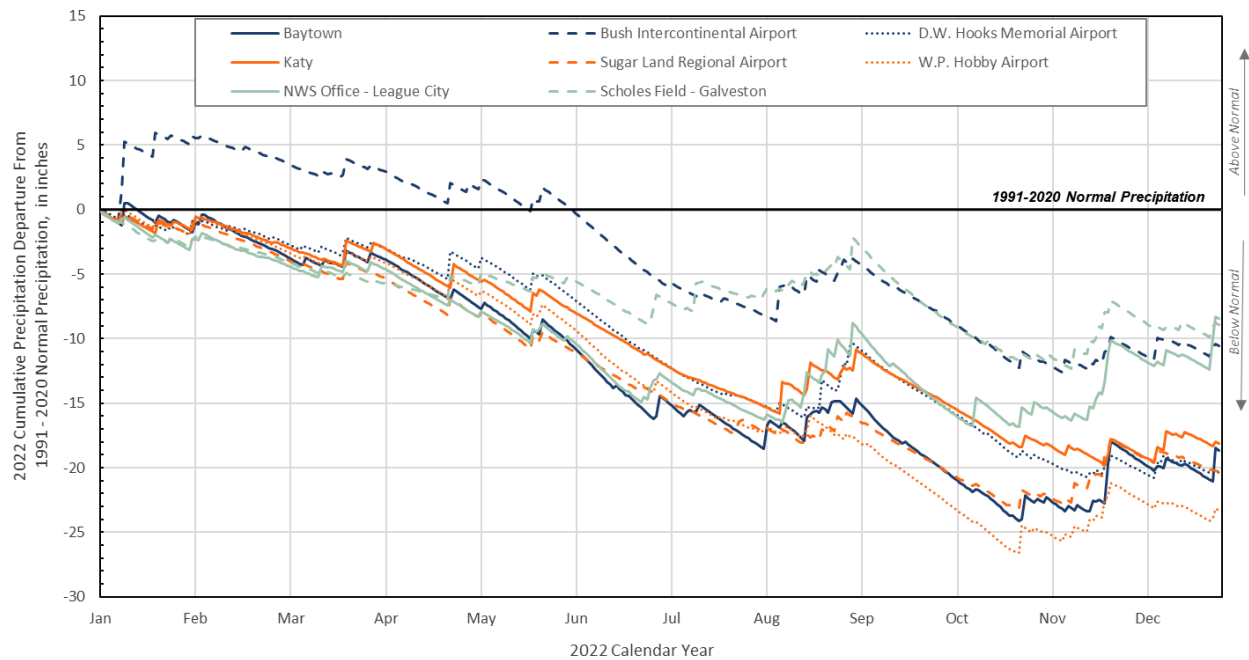


Figure 2. Cumulative precipitation departure, in inches, from 1991-2020 normal precipitation (sourced from <https://www.ncei.noaa.gov/data/normals-daily/1991-2020/access/>) at selected NOAA-NWS Climate Stations in the Houston region. Individual climate station data are sourced from NOWData – NOAA Online Weather Data accessed via <https://www.weather.gov/wrh/Climate?wfo=hgx>

Water Use

Since 1989, water users in the District have been working to change their source water from primarily groundwater to alternative sources of water that will not contribute to subsidence, like treated surface water. The percent of total water demand sourced from groundwater has dropped from about 60 percent in 1990 to about 48 percent in 2022 (**Figure 3**). The three primary water uses in the District are public supply, industrial, and irrigation. Public supply groundwater use remains the largest single-use category at 74.8 million gallons per day (MGD), a 34 percent increase from 2021, and accounts for 83 percent of groundwater used in the District.

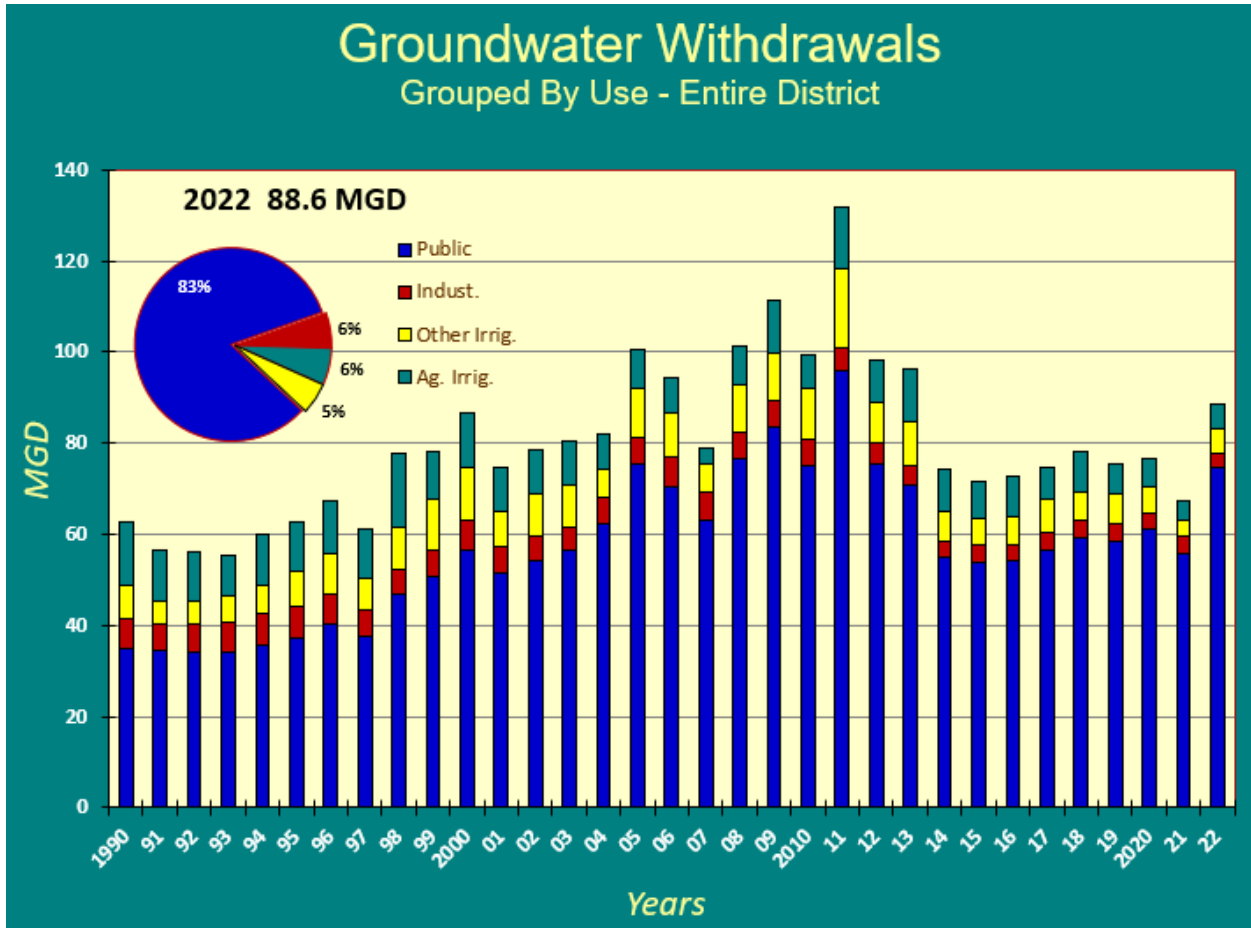


Figure 3. Groundwater withdrawals, in million gallons per day, by water use category from 1990 to 2022. The total groundwater used in the District was 88.6 MGD in 2022, with 83 percent of the use being public supply.

The District’s Regulatory Plan requires permittees to convert to alternative water supplies to reduce their reliance on groundwater sources. The primary alternative water supply used in our region is surface water sourced from three river basins, the Brazos River Basin, the San Jacinto River Basin and the Trinity River Basin. Total alternative water usage for 2022 was 95.6 MGD, with the Brazos River remaining the single largest source of alternative water, providing a total of 67.9 MGD in surface water supply (**Figure 4**). Groundwater remains the largest source of water supply within the District as a whole. The total water use for the District was determined to be 184.2 MGD in 2022, which is 32 percent higher than in 2021.

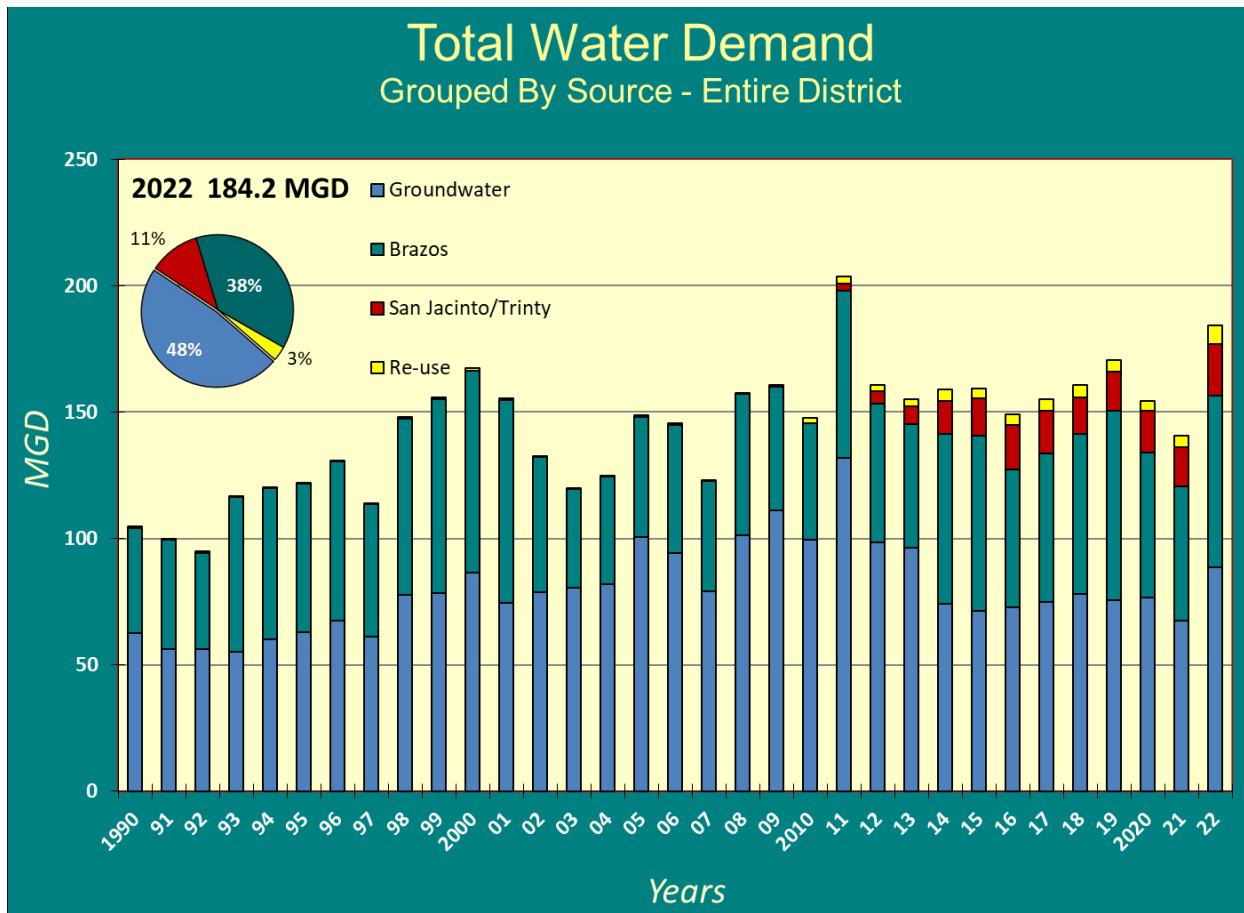


Figure 4. Total water use for the District, in million gallons per day, by source from 1990 to 2022. The total water use for the District in 2022 was 184.2 MGD. The 2022 total water demand is second only to the 2011 drought.

Groundwater Levels

Annually, since 1975, the United States Geological Survey (USGS) has measured the water level in hundreds of wells throughout the Houston region in cooperation with the District through a joint funding agreement along with additional cities, subsidence districts and groundwater conservation districts to monitor and provide reports on groundwater level altitude data for the Chicot/Evangeline and Jasper aquifers. Since aquifer water level is the best measure of the pressure in the aquifer, this information is also of vital importance to understanding the impact of changes in water use on subsidence.

The change in water level in the Chicot and Evangeline aquifers (undifferentiated) since 1990 shows the impact of District regulation on the aquifers. The area of rise with as much as 81 feet in the Chicot and Evangeline aquifers (undifferentiated) is a result of the reduction of groundwater use required by the District’s Regulatory Plan (**Figure 5**). In northeastern Fort Bend County, water levels continue to be significantly lower than the historical benchmark, with declines of at least 160 feet in the Chicot and Evangeline aquifers (undifferentiated). These areas are growing

rapidly and the conversion to alternative sources of water will not be completed in the District until 2027.

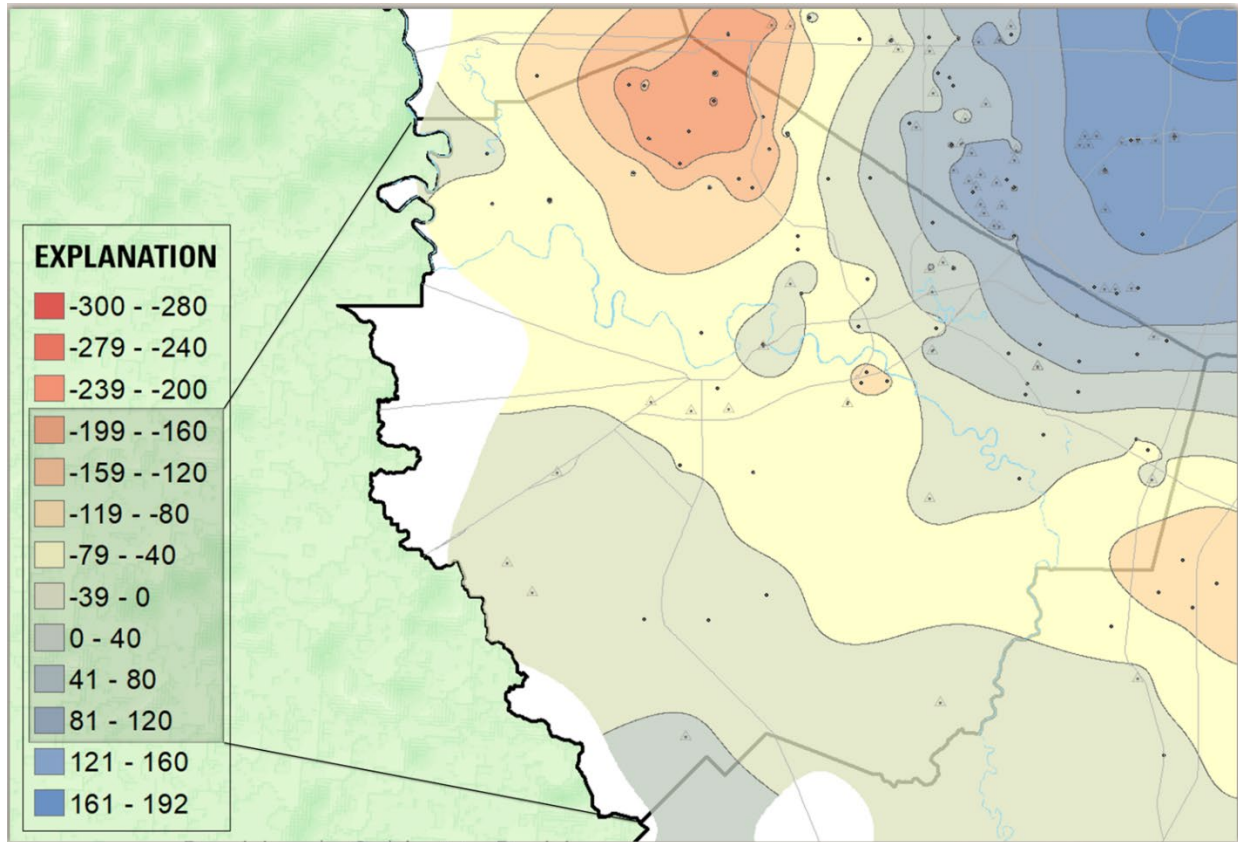


Figure 5. Potentiometric water level change at wells screened in the Chicot/Evangeline (undifferentiated) aquifer, Fort Bend County, Texas, 1990 to 2023 (Source: USGS provisional data – preliminary and subject to change).

Subsidence

Since the 1990s, the District has utilized global positioning system (GPS) technology to monitor the land surface deformation in the area. Working collaboratively with University of Houston researchers, the subsidence monitoring network has grown to 230 GPS stations throughout the region. These stations are operated by the District, the Harris-Galveston Subsidence District (HGSD), the University of Houston (UH), Texas Department of Transportation (TxDOT), and other local entities.

The average annual rate of movement is a useful measure to show the current activity at a GPS station. Subsidence rates greater than 2 centimeters (cm) per year were measured in northern Fort Bend County, near the boundary to the Harris and Waller County line by Interstate 10. The southern portion of Regulatory A and all of Regulatory Area B show very little subsidence at under half a centimeter per year based on the subsidence rate averaged from 2018 to 2022.

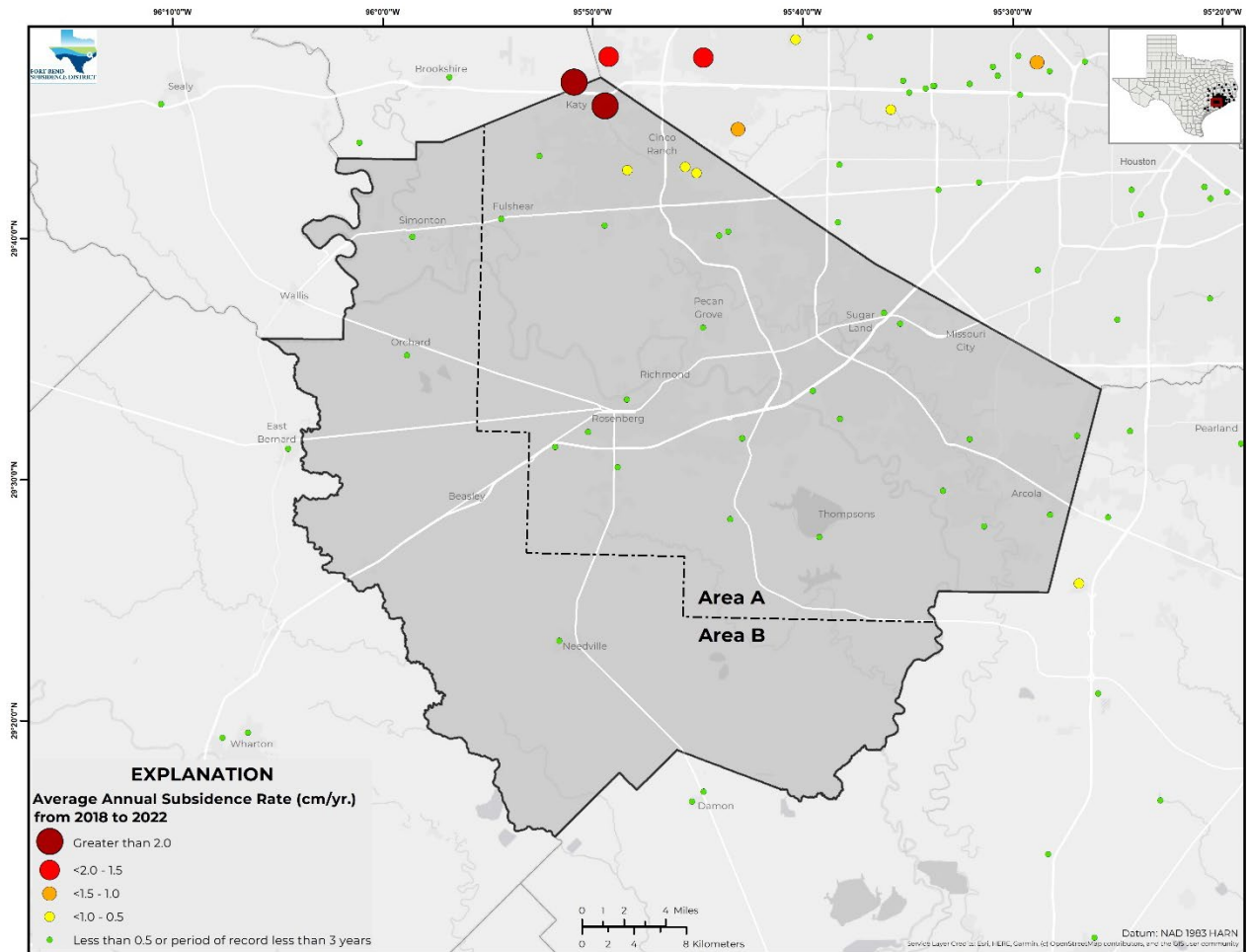


Figure 6. Annual subsidence rate, measured in centimeters per year, from 2018 to 2022, referenced to Houston20 and estimated from three or more years of GPS data collected from GPS stations in Fort Bend and surrounding counties, Texas.




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Download the *Water_{My}Yard*  app for weekly recommendations on how much water your yard needs.



Reducing your shower time to just 5 minutes can save both water and the energy needed to heat the water.



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