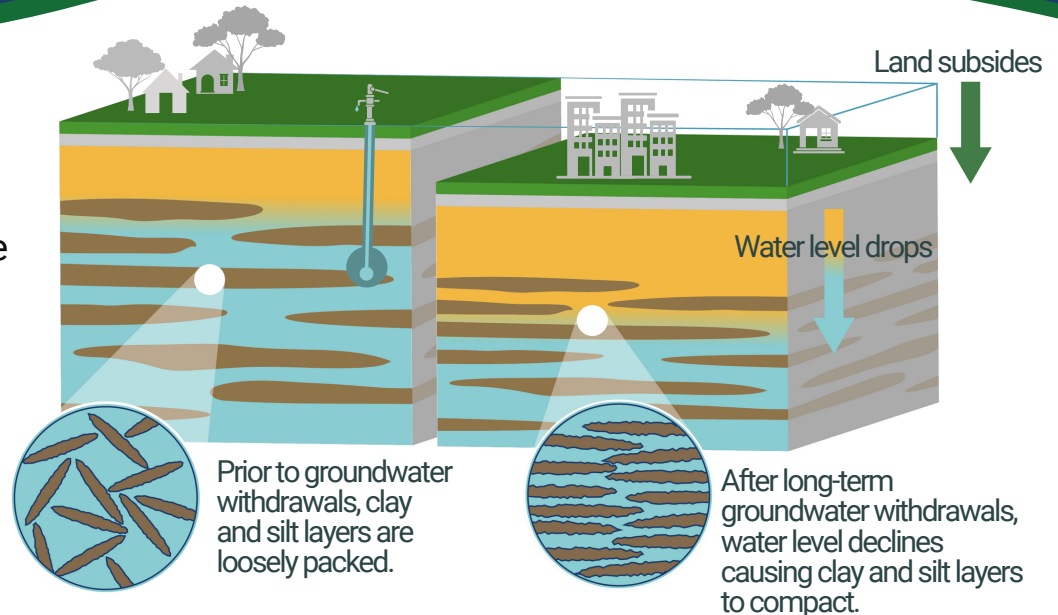


## SUBSIDENCE

[SUHB] + [SY] + [DUHNS]

Subsidence is the gradual sinking of the Earth's surface due to subsurface movement. For the greater Houston-Galveston region, land subsidence is the decrease in land-surface elevation caused by aquifer compaction due to substantial, long-term groundwater withdrawals.

This compaction is seen at the surface as subsidence, and has contributed to increased flooding, damage to roads, and infrastructure issues in our area.



## THE HISTORY OF SUBSIDENCE IN OUR REGION



\*Historical photos of surficial fissures near Baytown, TX.



- Subsidence was first observed in the Houston region around 1918 when the Goose Creek Oil Field near Galveston Bay began to display surficial fissures due to the extraction of oil and water beneath the surface.
- In the 1940s, research conducted by local universities, the State of Texas, and the U.S. Geological Survey continued to identify the correlation between groundwater withdrawal for municipal, industrial, and agricultural supply and subsidence.
- Hurricane Carla hit the Houston area in 1961, causing devastating storm surges and flooding. As a result, local area governments began to analyze the severe and very real impact subsidence could have on the area's potential economic growth and began to determine how best to reduce the region's reliance on groundwater.
- In 1975, the Texas Legislature created the Harris-Galveston Subsidence District (HGSD), the first political subdivision of its kind in the United States. HGSD was authorized as a groundwater regulatory agency to cease ongoing and prevent future subsidence.



# WHAT DOES THE HARRIS-GALVESTON SUBSIDENCE DISTRICT (HGSD) DO?

The Harris-Galveston Subsidence District's mission is to protect the lives and property within Harris and Galveston counties from the impacts of future subsidence. The District achieves this by utilizing a variety of proven strategies, including:

## REGULATION



Regulates the use of groundwater through well permitting, monitoring, and enforcement creating real disincentives to those who rely too heavily on groundwater.

## SCIENCE & RESEARCH



Conducts science and research programs to obtain the most accurate and up-to-date data on subsidence, water demands, aquifer water levels, alternative water sources, and special studies utilizing extensometers, GPS monitoring stations, Interferometric Synthetic Aperture Radar (InSAR) satellite technology, and traditional surveying while collaborating with local, state, federal, and academic partners for the highest quality of reporting.

## COLLABORATION



Works with regional water providers to reduce groundwater withdrawal within the District including the conversion to treated surface water, which has already significantly reduced subsidence rates.

## PLANNING

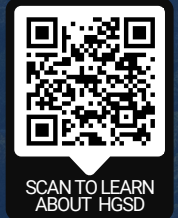


Determine population growth and water demand projections for the Houston region to develop obtainable regulatory framework addressing future water needs and minimizing subsidence risks.

## WATER CONSERVATION



Provides water conservation programs, including a school education program and resources like grants for local projects that implement water efficiency measures.



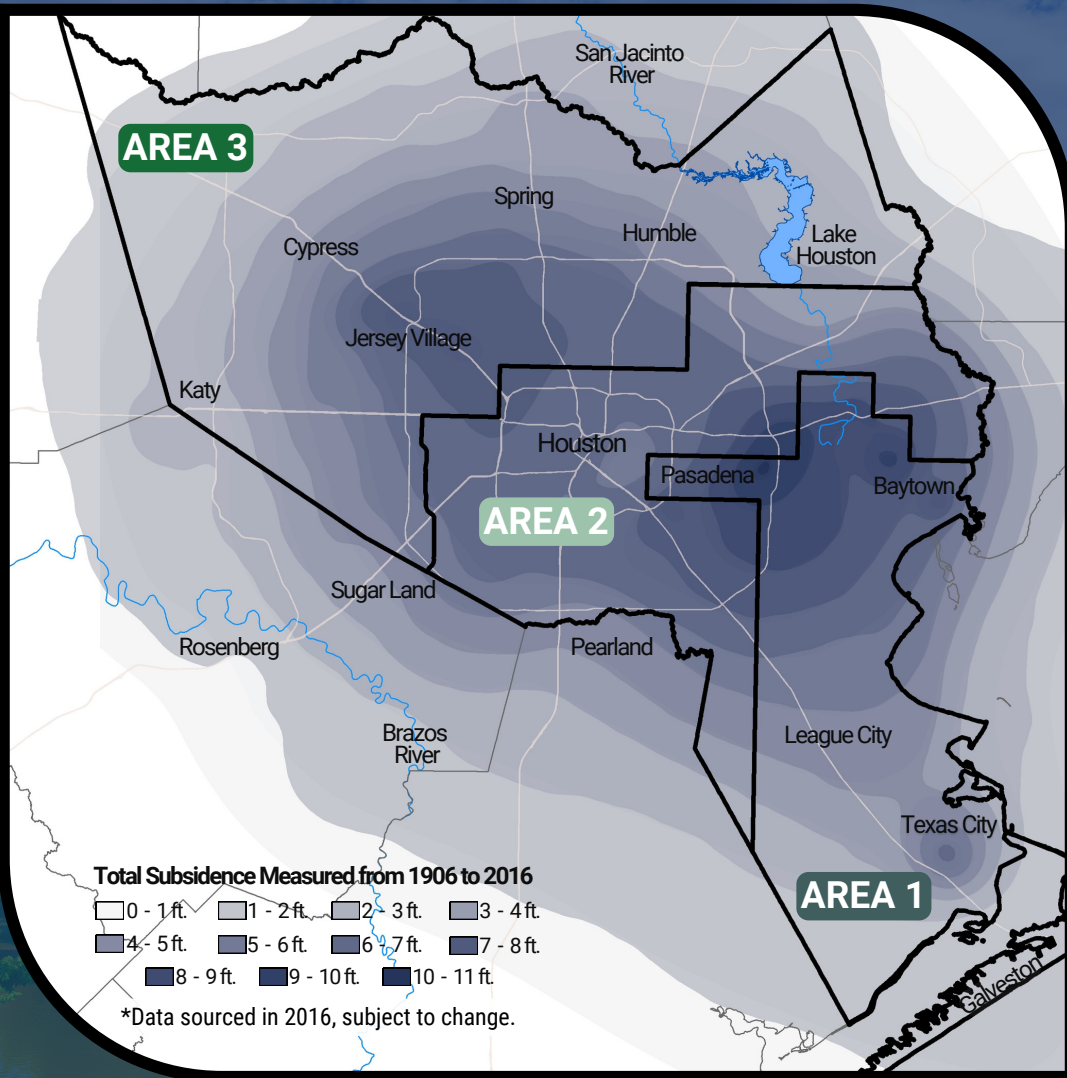
## ALTERNATIVE WATER SOURCES

The best strategy to prevent aquifer water-level decline, decrease in municipal supply well yields, and reduce subsidence is to diminish our reliance on groundwater and utilize alternative water sources (AWS), including:

- 💧 SURFACE WATER DEVELOPMENT
- 💧 SEAWATER DESALINATION
- 💧 RECLAIMED WATER TREATMENT
- 💧 BRACKISH GROUNDWATER DESALINATION



# HOUSTON AREA SUBSIDENCE MAP



## REGULATORY PLAN AND REGULATORY AREAS

The Regulatory Plan was developed with an overall goal to reduce groundwater withdrawal to no more than 20% (10% in Regulatory Area 1) of total water demand. It continues to be reviewed and amended as needed, considering alternative water source availability, geophysical characteristics, and groundwater demand.

**AREA 1** Groundwater withdrawals for each permittee must comprise no more than 10% of the permittee's annual total water demand.

**AREA 2** Groundwater withdrawals for each permittee must comprise no more than 20% of the permittee's annual total water demand.

**AREA 3** Groundwater withdrawals must comprise no more than 20% of the permittee's annual total water demand, unless the permittee is operating under a certified groundwater reduction plan (GRP). A permittee operating under a certified GRP must maintain their groundwater withdrawals to comprise no more than 70% of the permittee's total water demand through 2025. Additional conversions are required to reduce groundwater withdrawal by 2025 and 2035 to no more than 40% and 20% of total water demand respectively.





## THE FUTURE OF SUBSIDENCE IN OUR REGION

As we continue to reduce our reliance on groundwater resources, and further our efforts to educate the community on water efficiency and conservation, we anticipate reduced subsidence rates in the Houston area. An alternative water supply assessment has been completed as part of Harris-Galveston Subsidence District and Fort Bend Subsidence District's ongoing Joint Regulatory Plan Review. It provides an evaluation of alternative water supply strategies, including treated surface water, aquifer storage and recovery strategies, brackish groundwater development, and seawater desalination.

The District will continue its mission to prevent subsidence in our area by enforcing reasonable groundwater regulation, promoting water conservation, and conducting science-based water planning. This approach will continue to assure that future water demands can be fulfilled while minimizing the risk of subsidence.

Visit [hgsubsidence.org](https://hgsubsidence.org) or scan the QR code below for more information regarding subsidence, groundwater regulation, planning, research, and more.

