

# STATUS REPORT GROUNDWATER PRODUCTION AND WATER-LEVEL MONITORING PROGRAM ASSESSMENT

Presented at  
Stakeholder Meeting  
July 29, 2015



By  
LBG-Guyton Associates  
Houston - Austin



# TASK 1 PRIMARY COMPONENTS

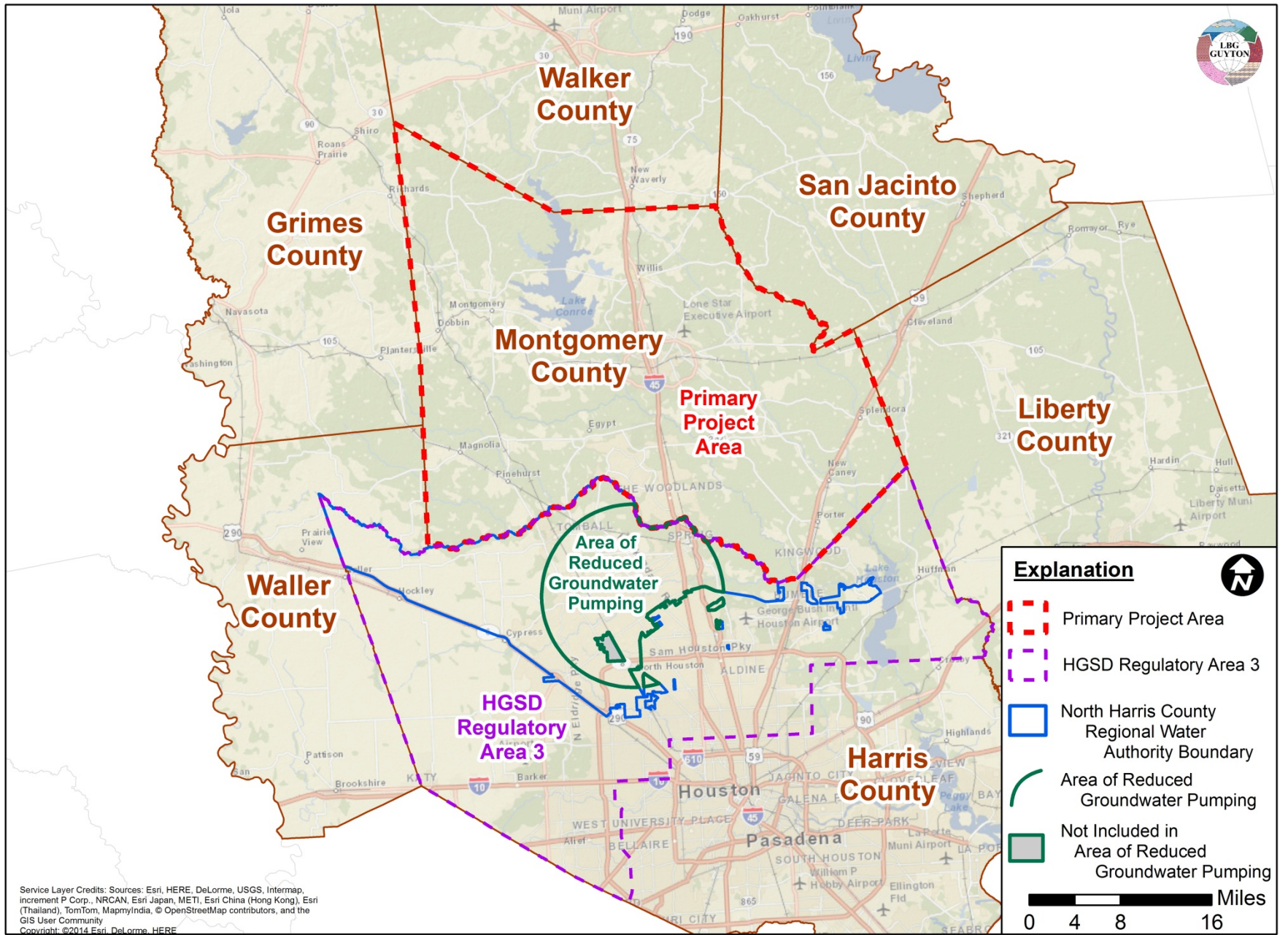
- ▣ Collection and analysis of groundwater production, and water-level data from public and private sources for the Chicot, Evangeline, Jasper and Catahoula aquifers in Montgomery and surrounding counties. Provide recommendations from analysis.
- ▣ Compile and analyze static water level and groundwater production data and surface water use in part of north Harris County. Provide conclusions from analysis.

# TASK 1 PRIMARY COMPONENTS (cont'd)

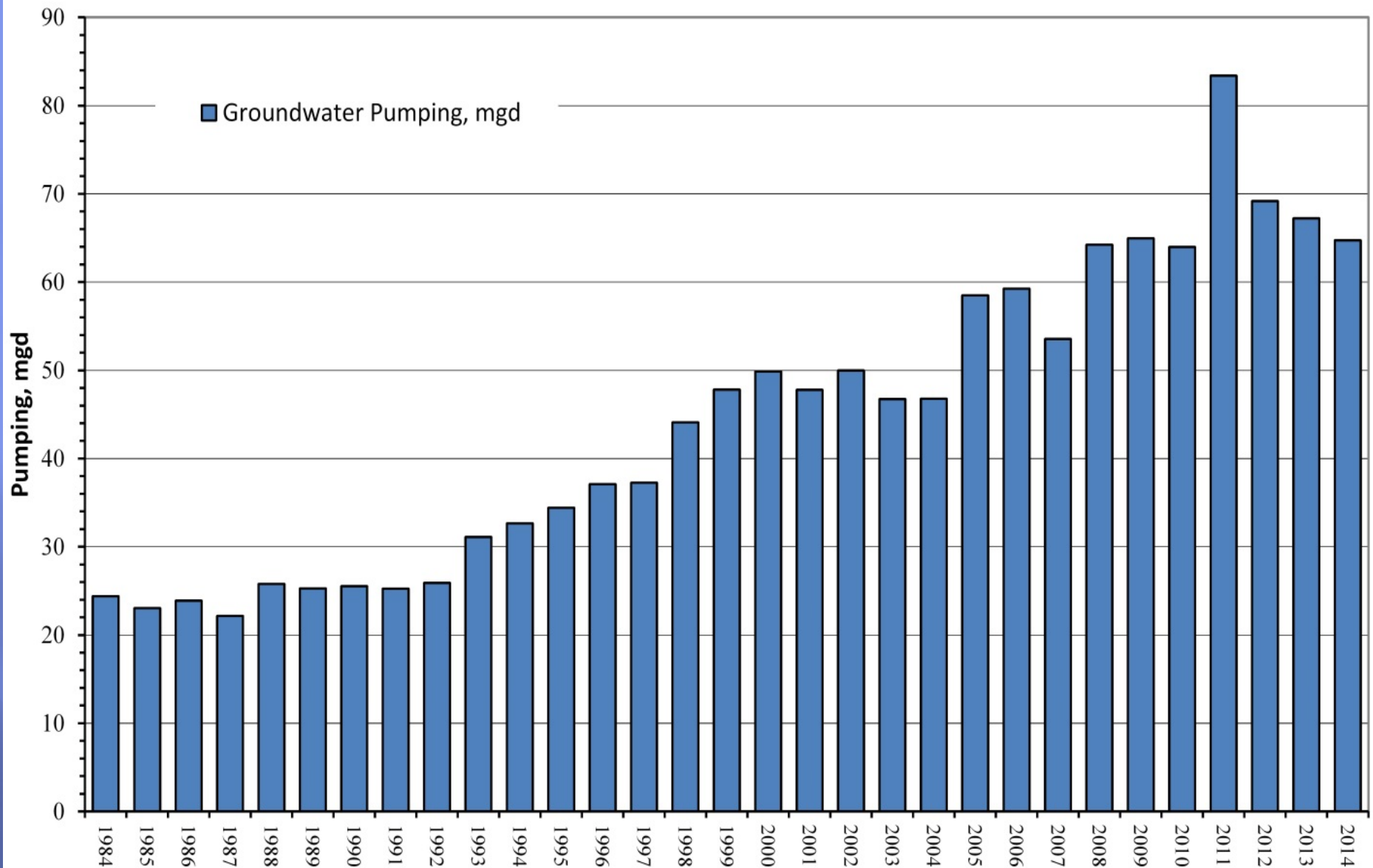
- ▣ Review production and monitoring data after January 1, 2016 scheduled conversion and provide results regarding aquifer response due to conversion. Data for review shall be collected for about a one-year period following conversion.

# TASK 1

- ▣ Draft Technical Memorandum submitted and presented to LSGCD Board of Directors
- ▣ Stakeholder meeting occurring and will receive comments
- ▣ Address stakeholder comments
- ▣ Revise and resubmit technical memorandum

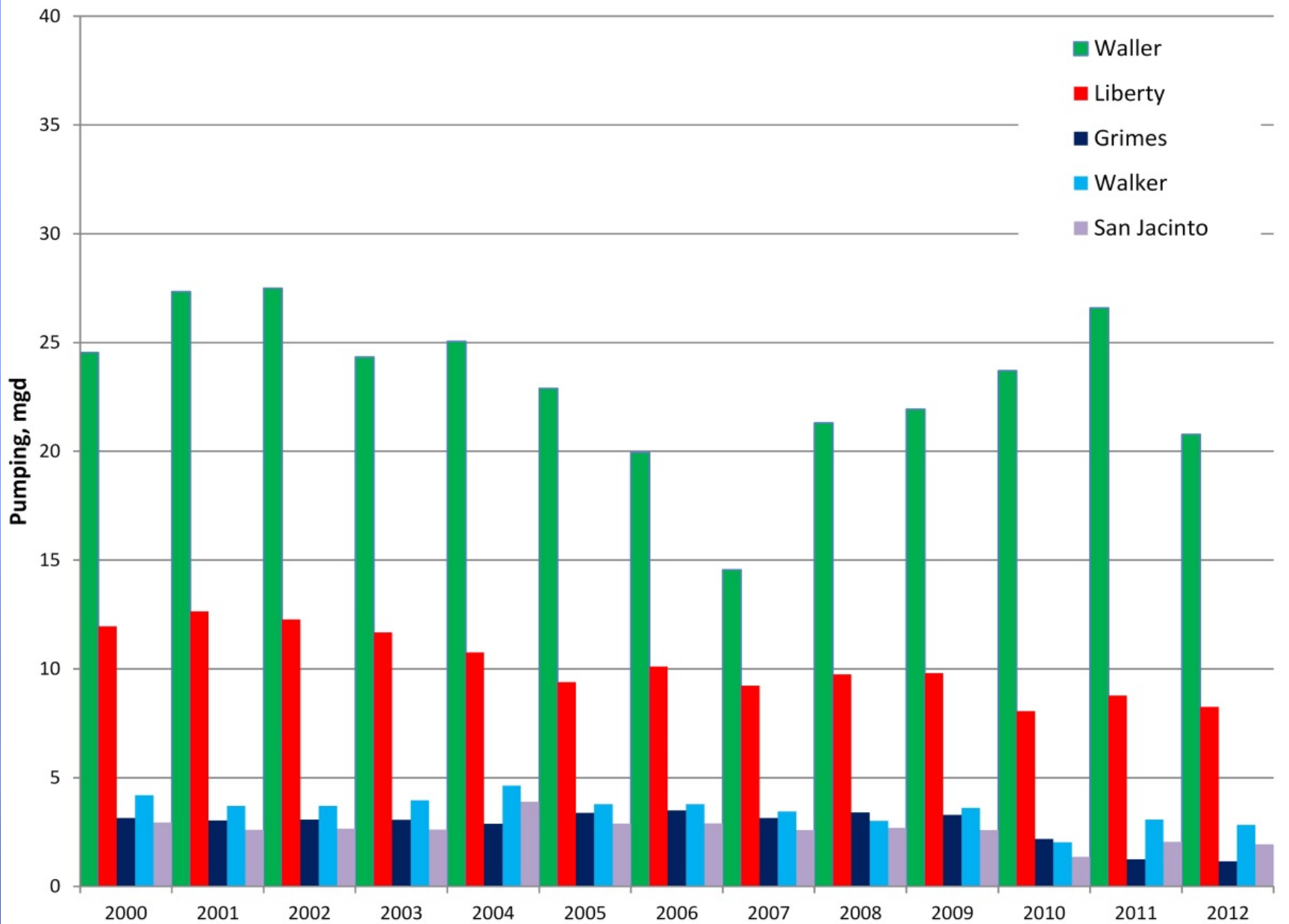


# Montgomery and Surrounding Counties



Data Sources: TWDB and Lone Star Groundwater Conservation District

# Montgomery County Groundwater Pumping



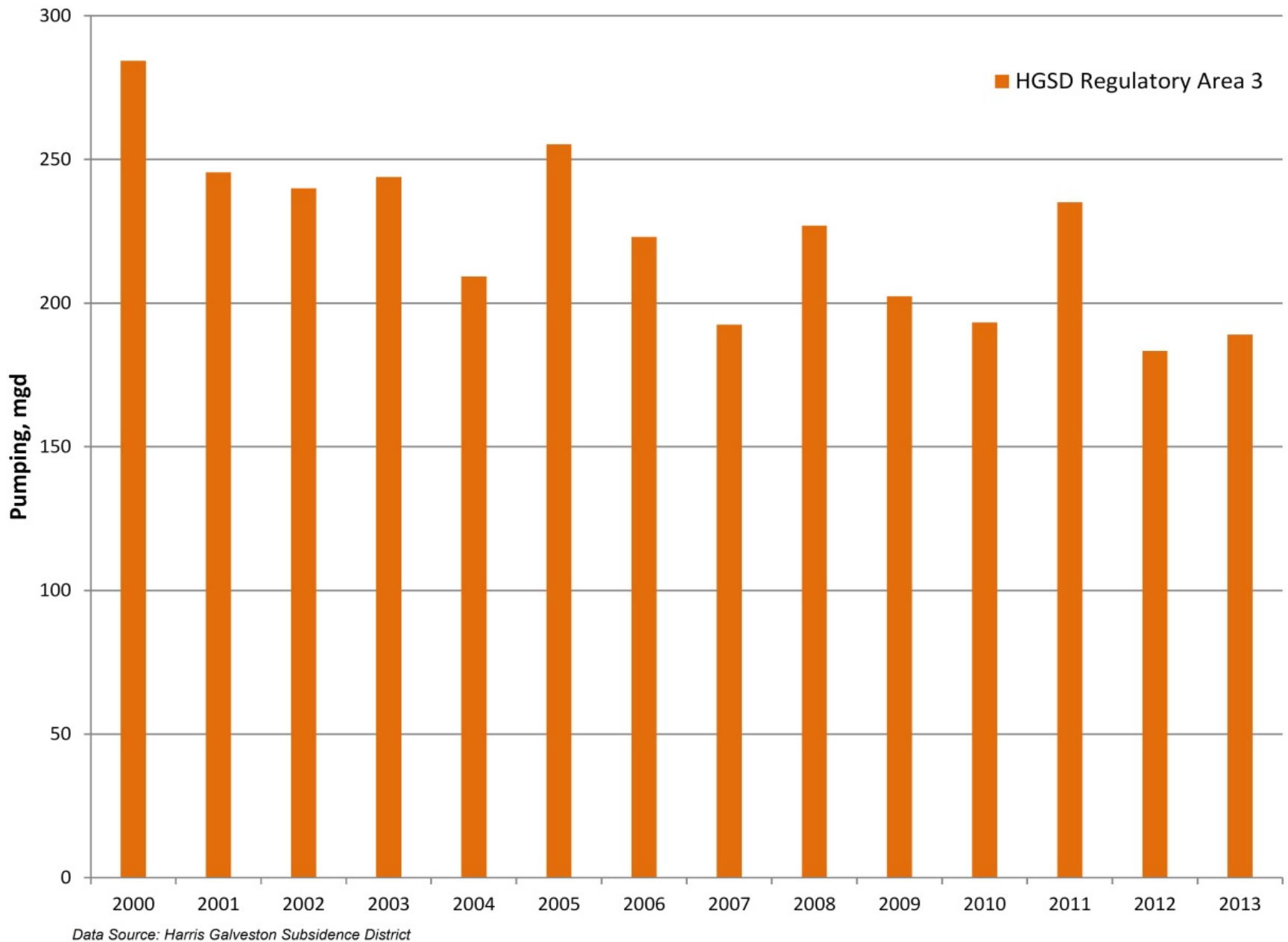
Data Source: Texas Water Development Board

## Groundwater Pumping in Surrounding Counties

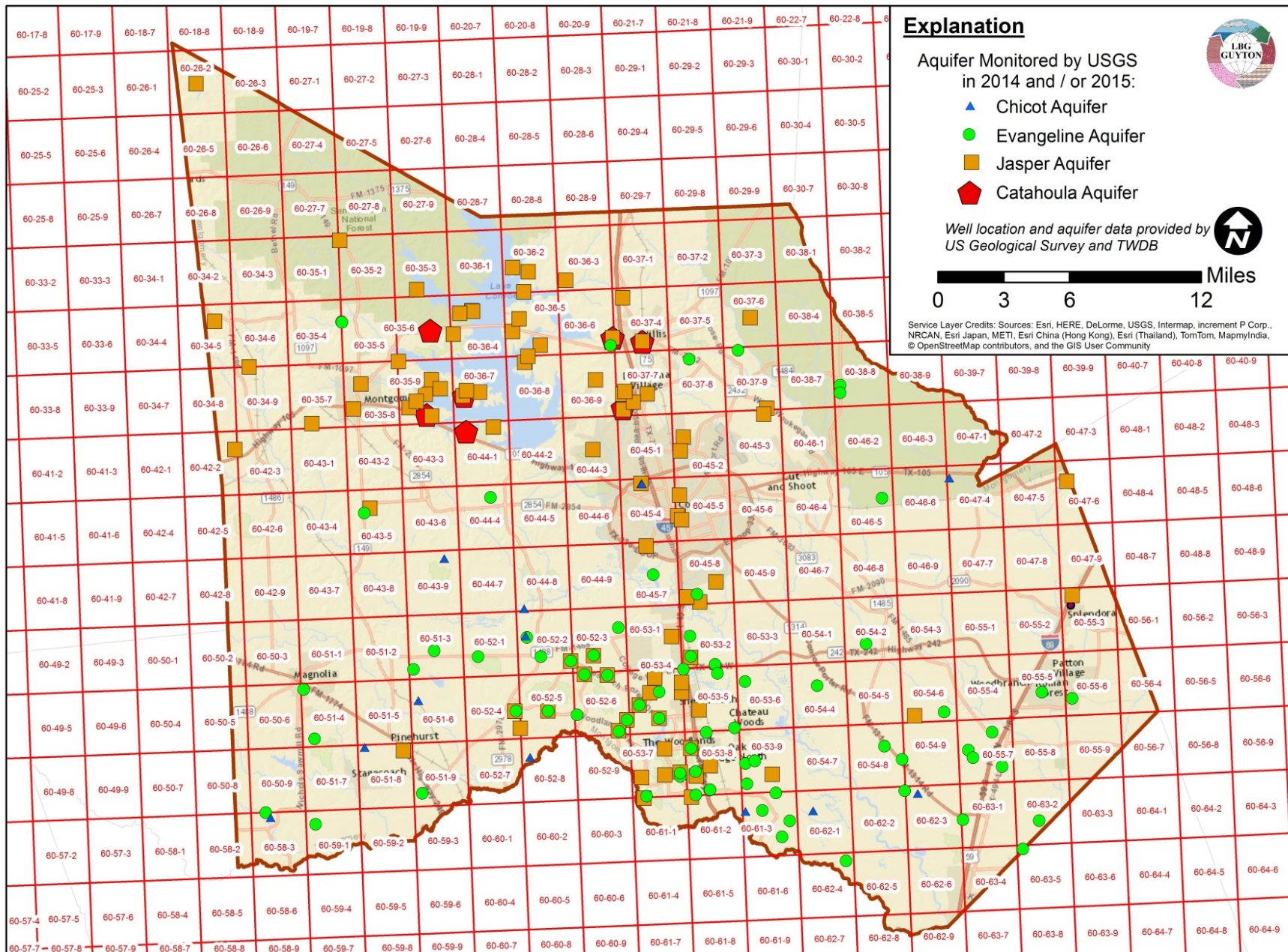
# Five Surrounding Counties Pumping

Year	Gulf Coast Aquifer Pumping in Grimes, San Jacinto, Liberty and Walker Counties, mgd	Waller County, mgd	Total, mgd
2000	22.2	24.4	46.6
2001	22.0	27.2	49.2
2002	21.7	27.3	49.0
2003	21.3	24.2	45.5
2004	22.1	24.9	47.0
2005	19.4	22.7	42.1
2006	20.3	19.7	40.0
2007	18.4	14.4	32.8
2008	18.8	21.1	39.9
2009	19.2	21.8	41.0
2010	9.8	23.5	33.2
2011	13.0	26.3	39.3
2012	12.0	20.6	32.6

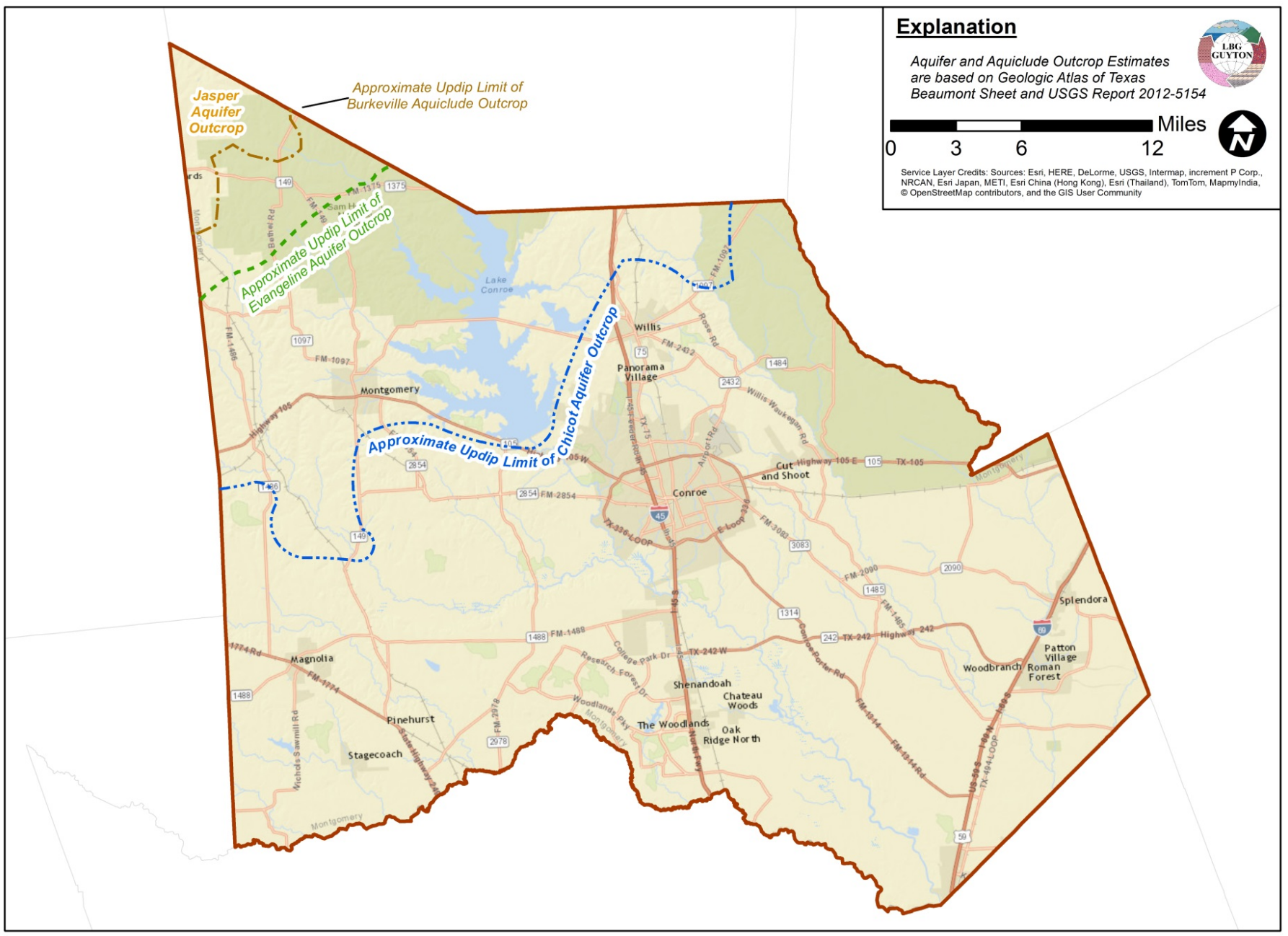




## Groundwater Pumping in HGSD Regulatory Area 3

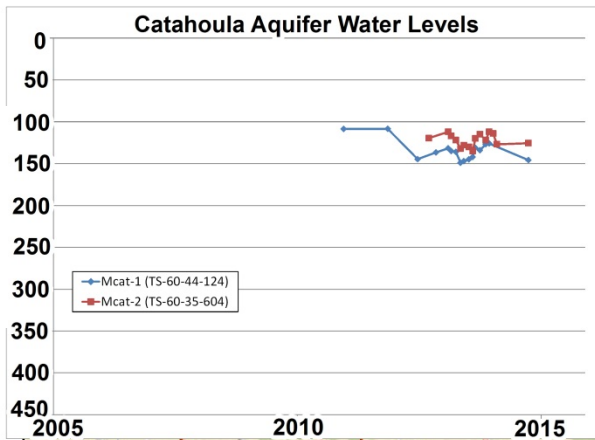


Areal Distribution of Monitoring Wells

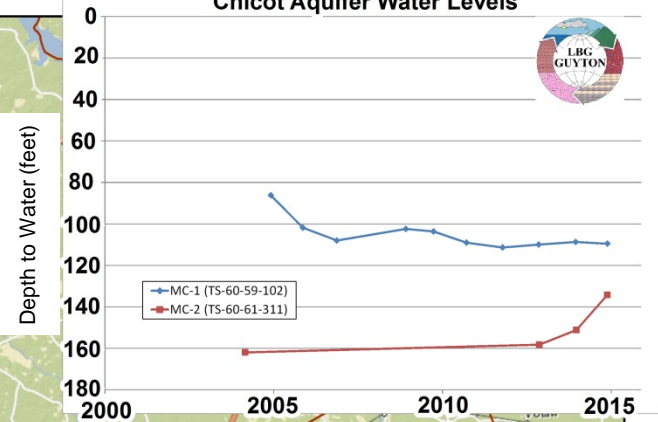


**Aquifer Outcrops**

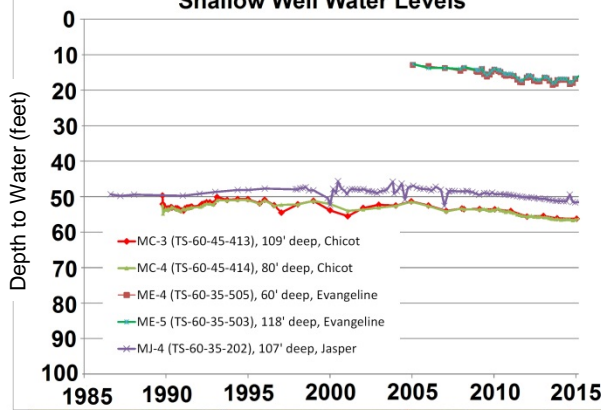
Depth to Water (feet)



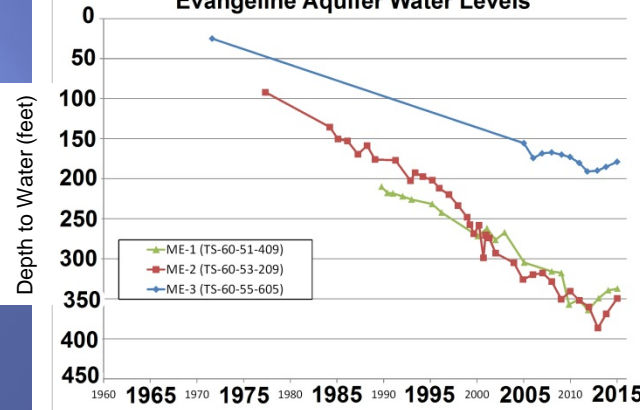
### Chicot Aquifer Water Levels



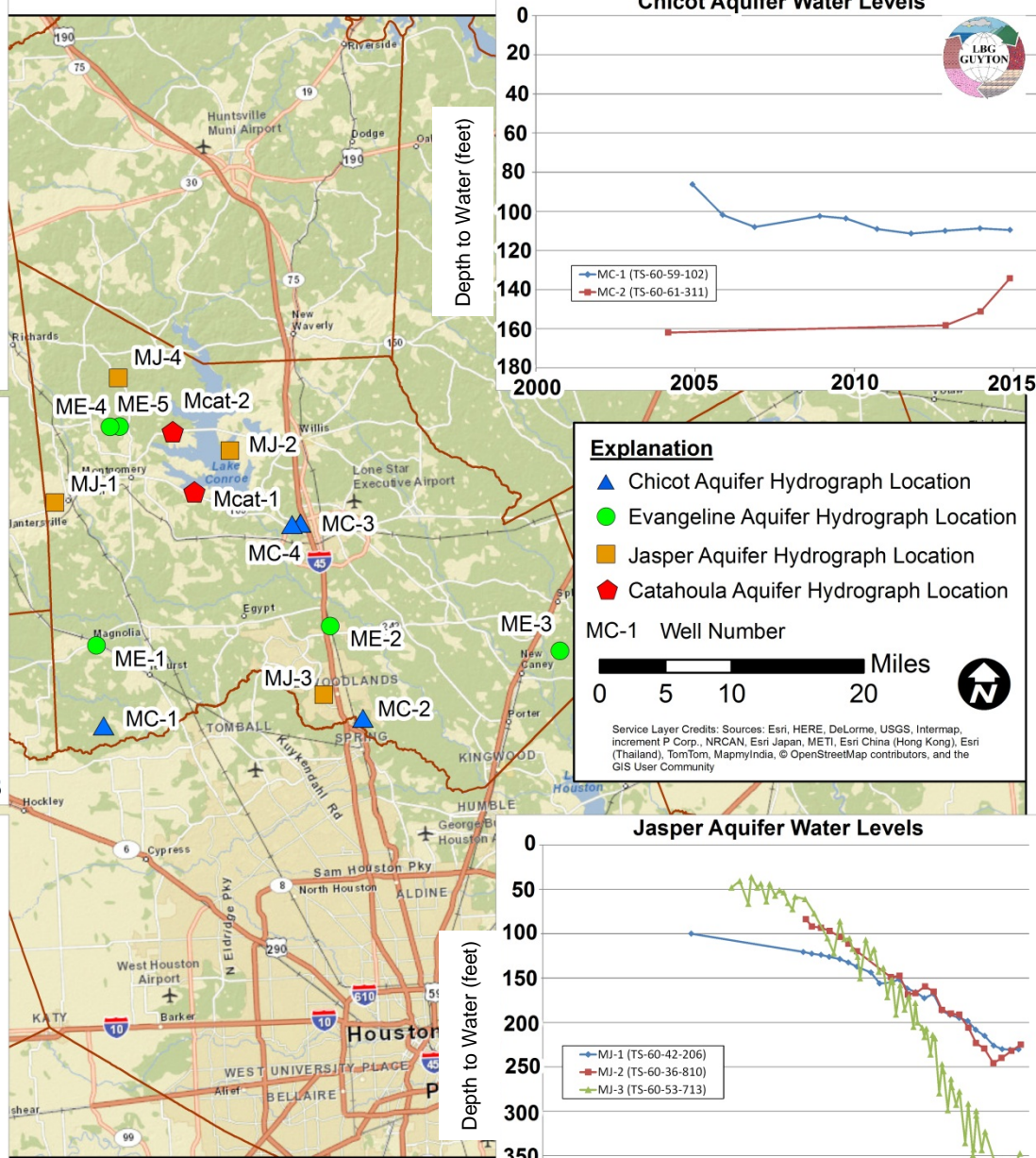
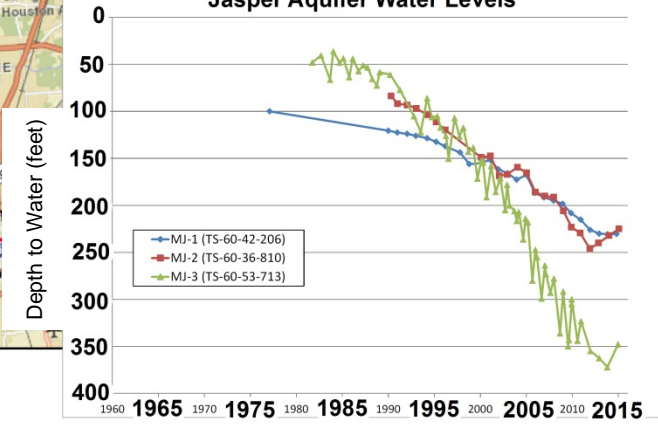
### Shallow Well Water Levels



### Evangeline Aquifer Water Levels



### Jasper Aquifer Water Levels



# Montgomery County Water-Level Hydrographs

# GROUNDWATER PRODUCTION AND WELL WATER-LEVEL SUMMARY

- ▣ Largest increase in pumping since 2000 occurred in Montgomery County.
- ▣ Pumping in surrounding counties has generally decreased since 2000. The largest amount of pumping outside Montgomery County occurs in Harris County.
- ▣ In recent years, groundwater production in surrounding counties has had a limited effect on water levels in at least Chicot and Evangeline aquifer screened wells in Montgomery County.

# GROUNDWATER PRODUCTION AND WELL WATER-LEVEL SUMMARY (cont'd)

- ▣ Potential areas for additional monitoring wells have been identified based on review of locations of existing monitoring wells and estimate of areas of additional urbanization in the county.



### Explanation

Aquifer Monitored by USGS in 2014 and / or 2015:

▲ Chicot Aquifer

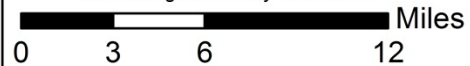
● Evangeline Aquifer

■ Jasper Aquifer

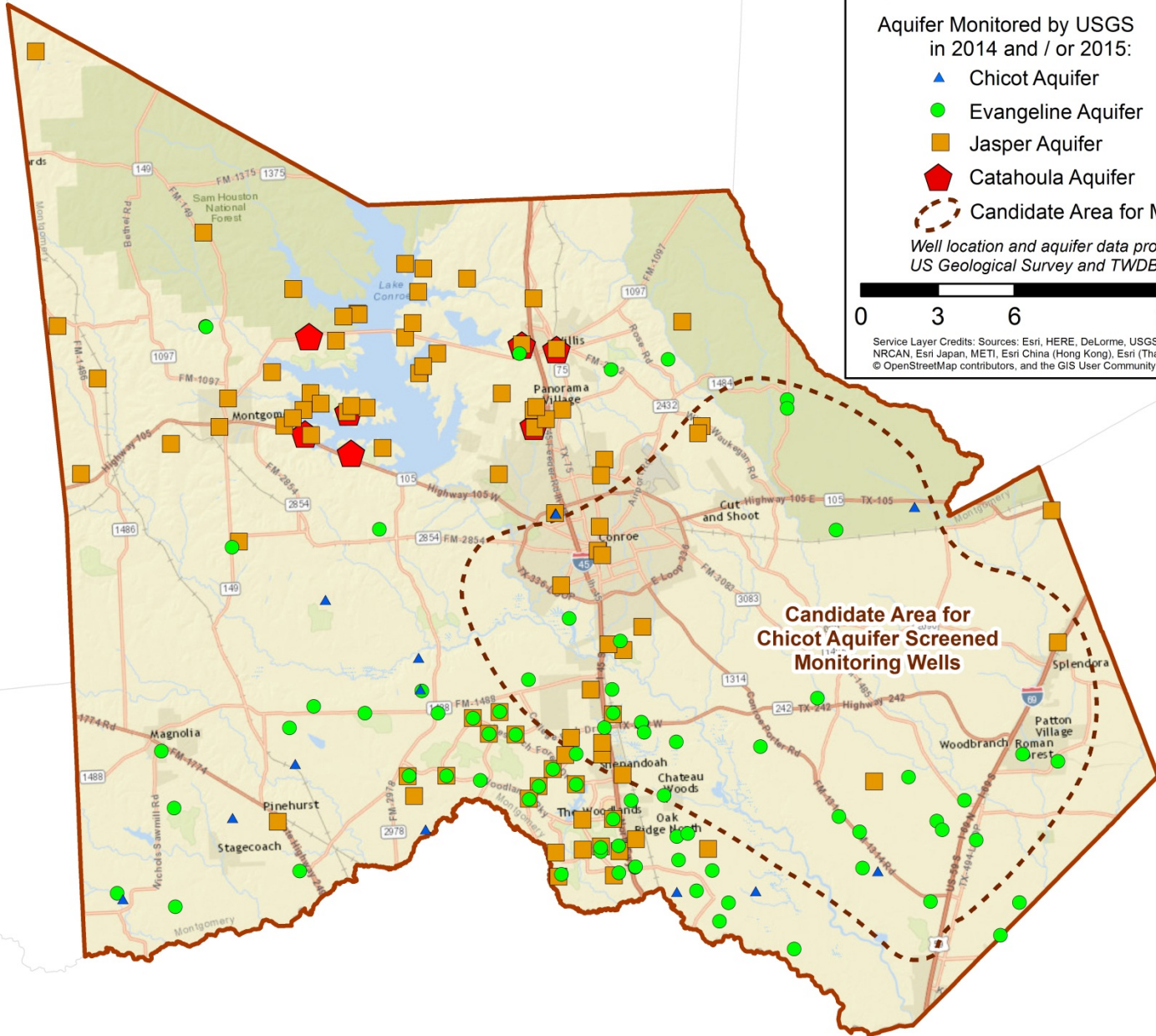
◆ Catahoula Aquifer

○ Candidate Area for Monitoring Wells

Well location and aquifer data provided by US Geological Survey and TWDB



Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Candidate Area for Chicot Aquifer Screened Monitoring Wells

# Area for Additional Monitoring Wells in the Chicot Aquifer



### Explanation

Aquifer Monitored by USGS in 2014 and / or 2015:

▲ Chicot Aquifer

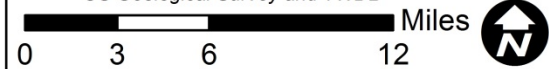
● Evangeline Aquifer

■ Jasper Aquifer

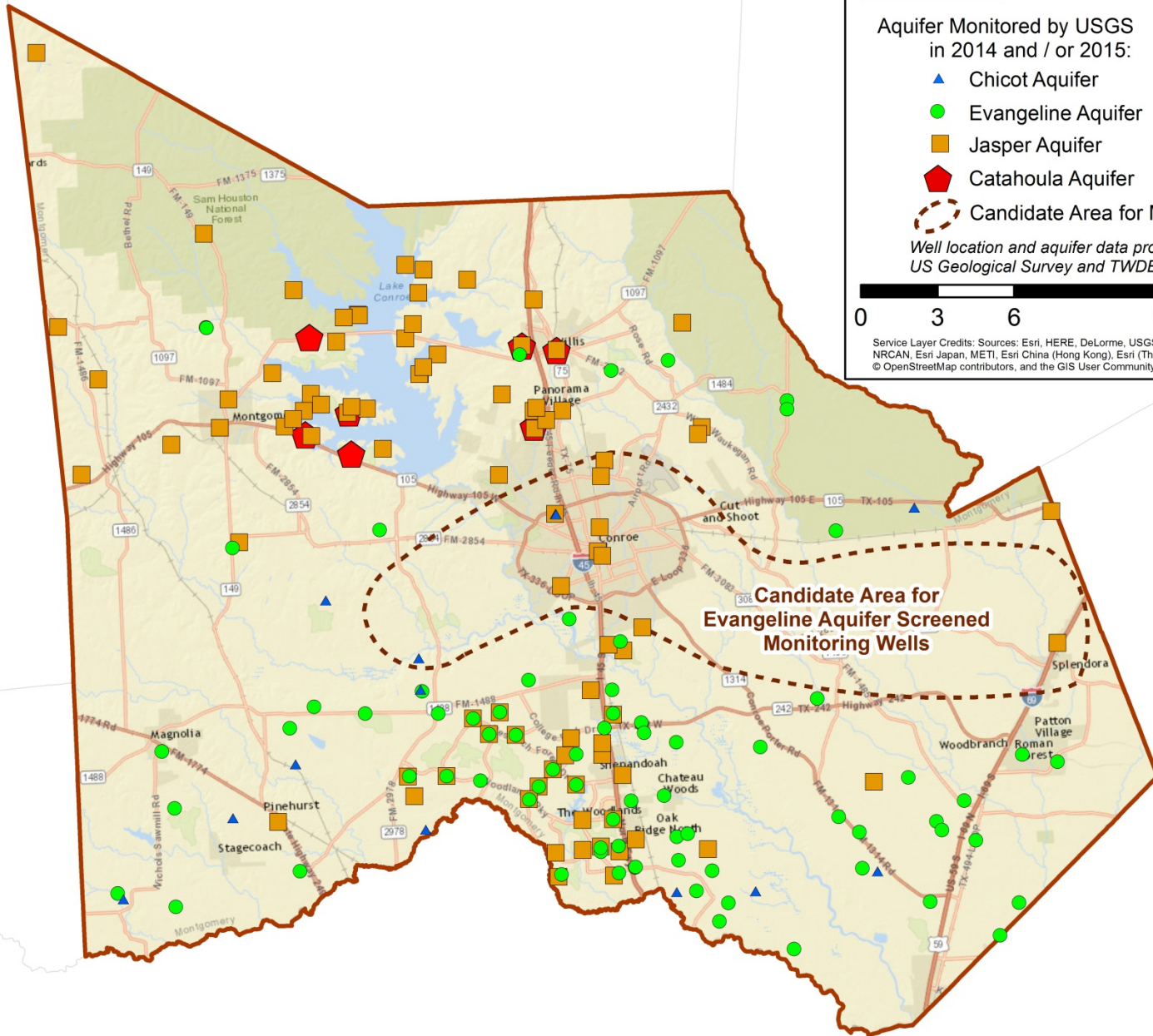
◆ Catahoula Aquifer

○ Candidate Area for Monitoring Wells

Well location and aquifer data provided by US Geological Survey and TWDB

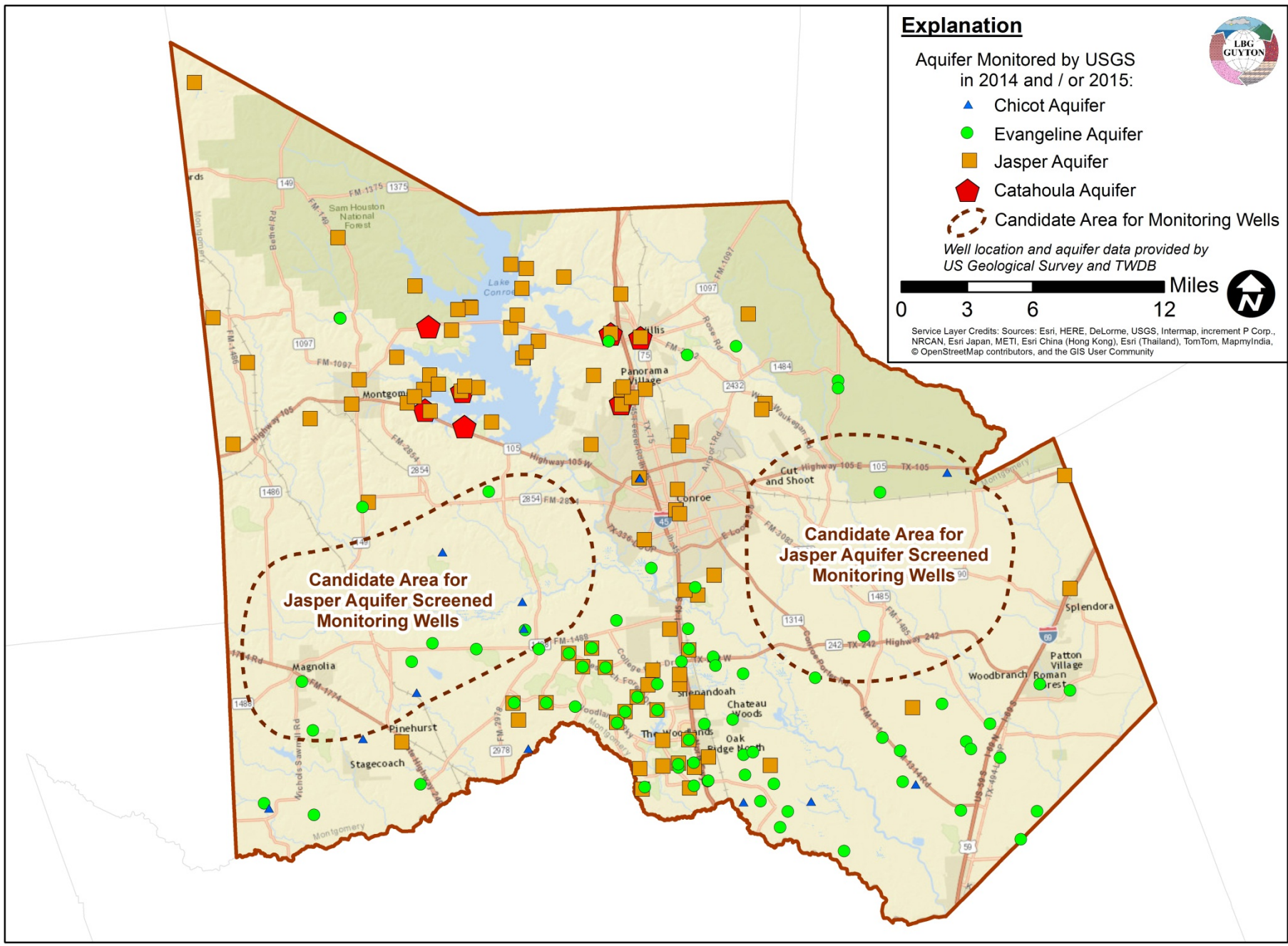


Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



# Area for Additional Monitoring Wells in the Evangeline Aquifer





Area for Additional Monitoring Wells in the Jasper Aquifer



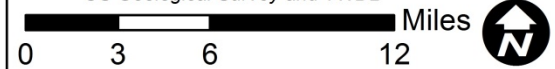
### Explanation

Aquifer Monitored by USGS in 2014 and / or 2015:

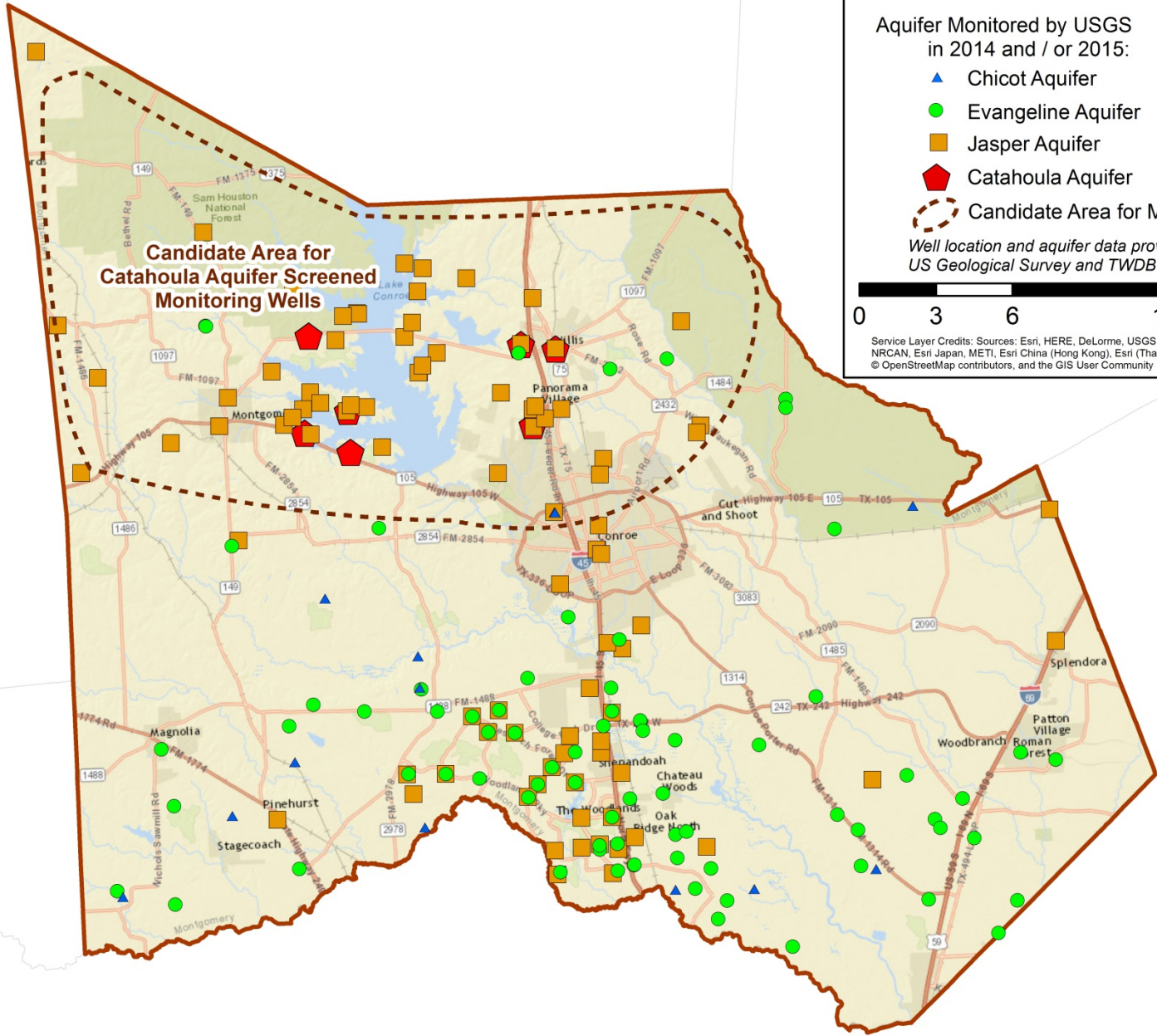
- ▲ Chicot Aquifer
- Evangeline Aquifer
- Jasper Aquifer
- ◆ Catahoula Aquifer

  Candidate Area for Monitoring Wells

Well location and aquifer data provided by US Geological Survey and TWDB



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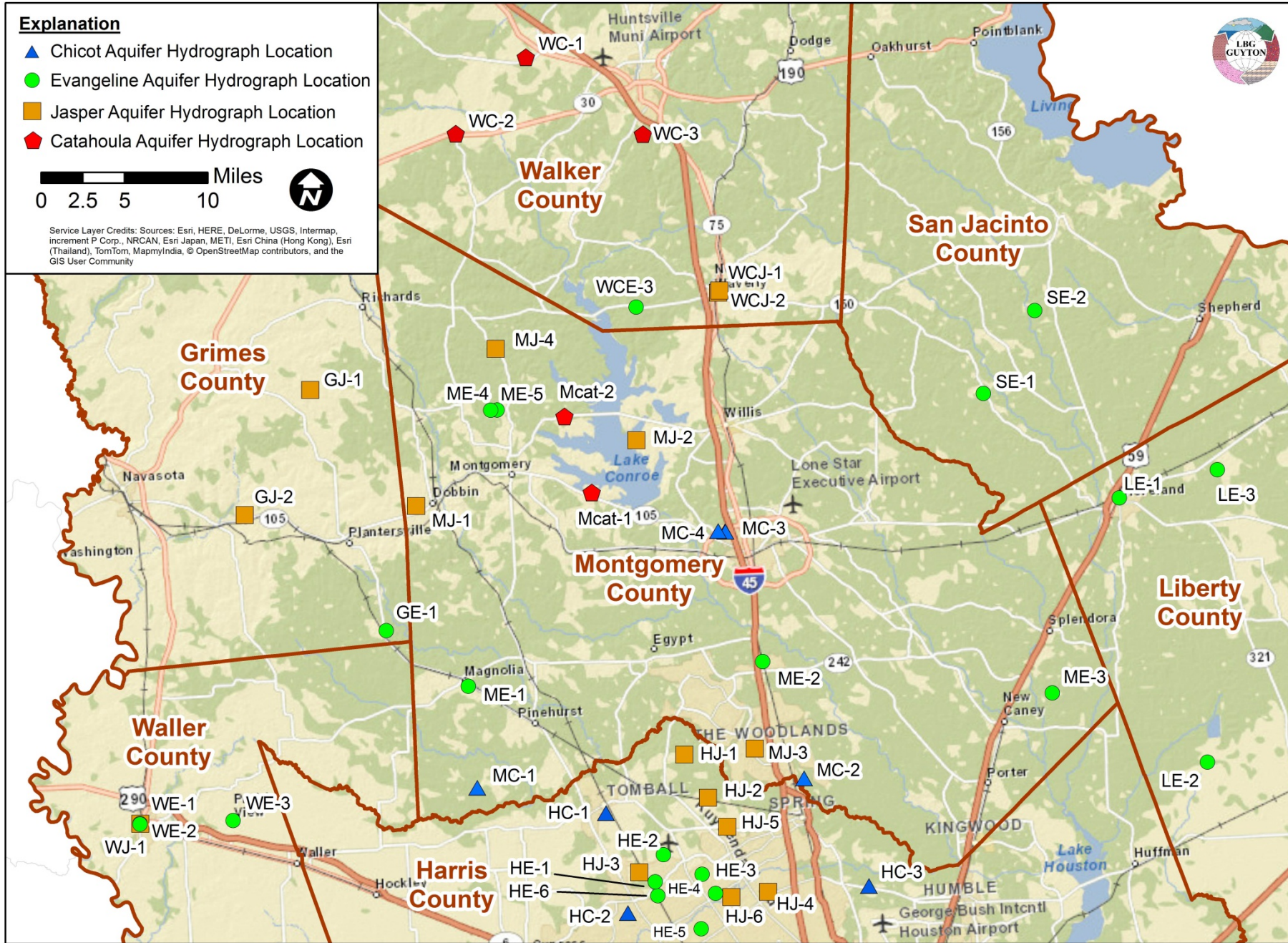
## Area for Additional Monitoring Wells in the Catahoula Aquifer

### Explanation

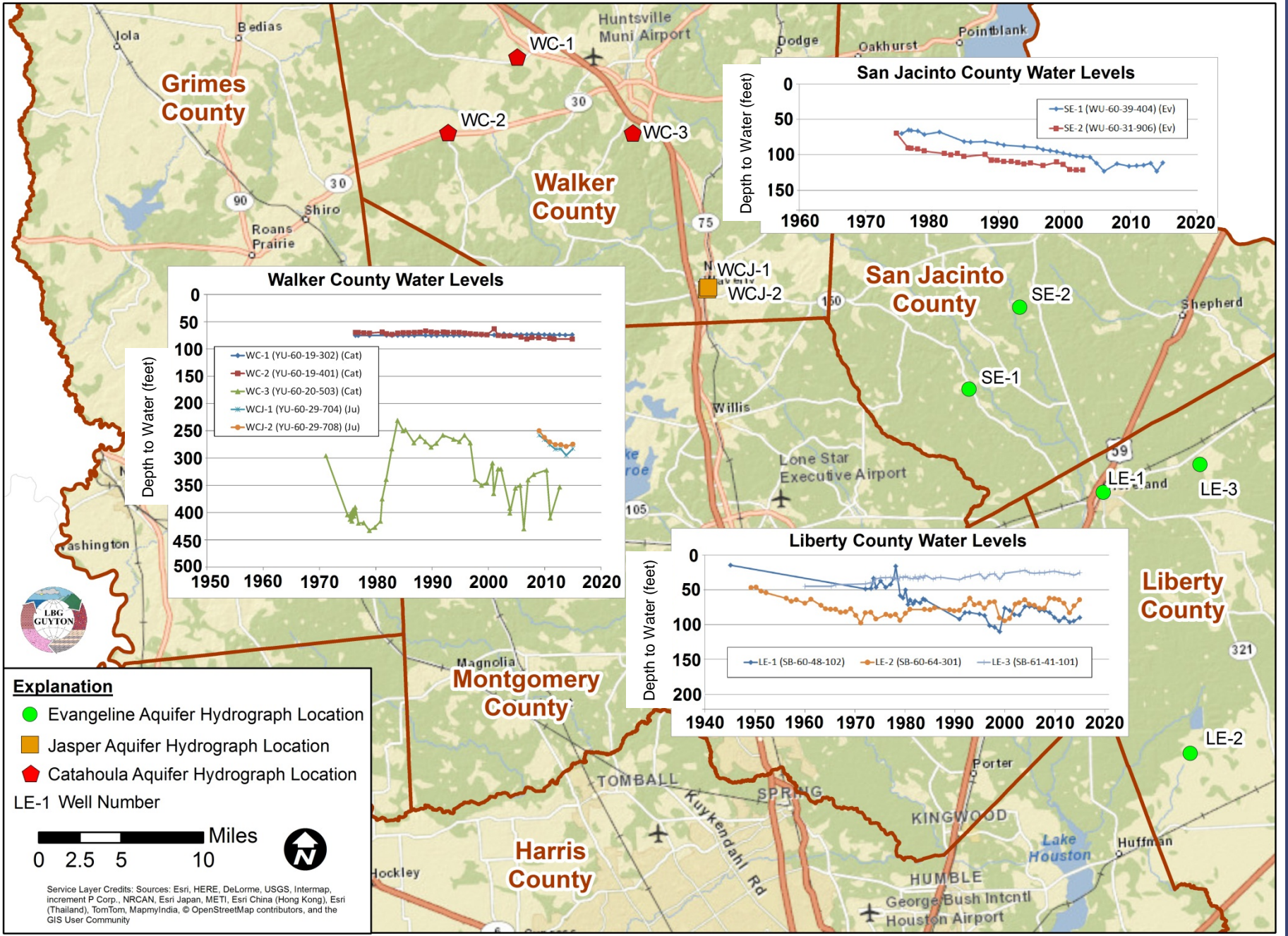
- ▲ Chicot Aquifer Hydrograph Location
- Evangeline Aquifer Hydrograph Location
- Jasper Aquifer Hydrograph Location
- ◆ Catahoula Aquifer Hydrograph Location



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## Static Water-Level Hydrograph Locations



**Explanation**

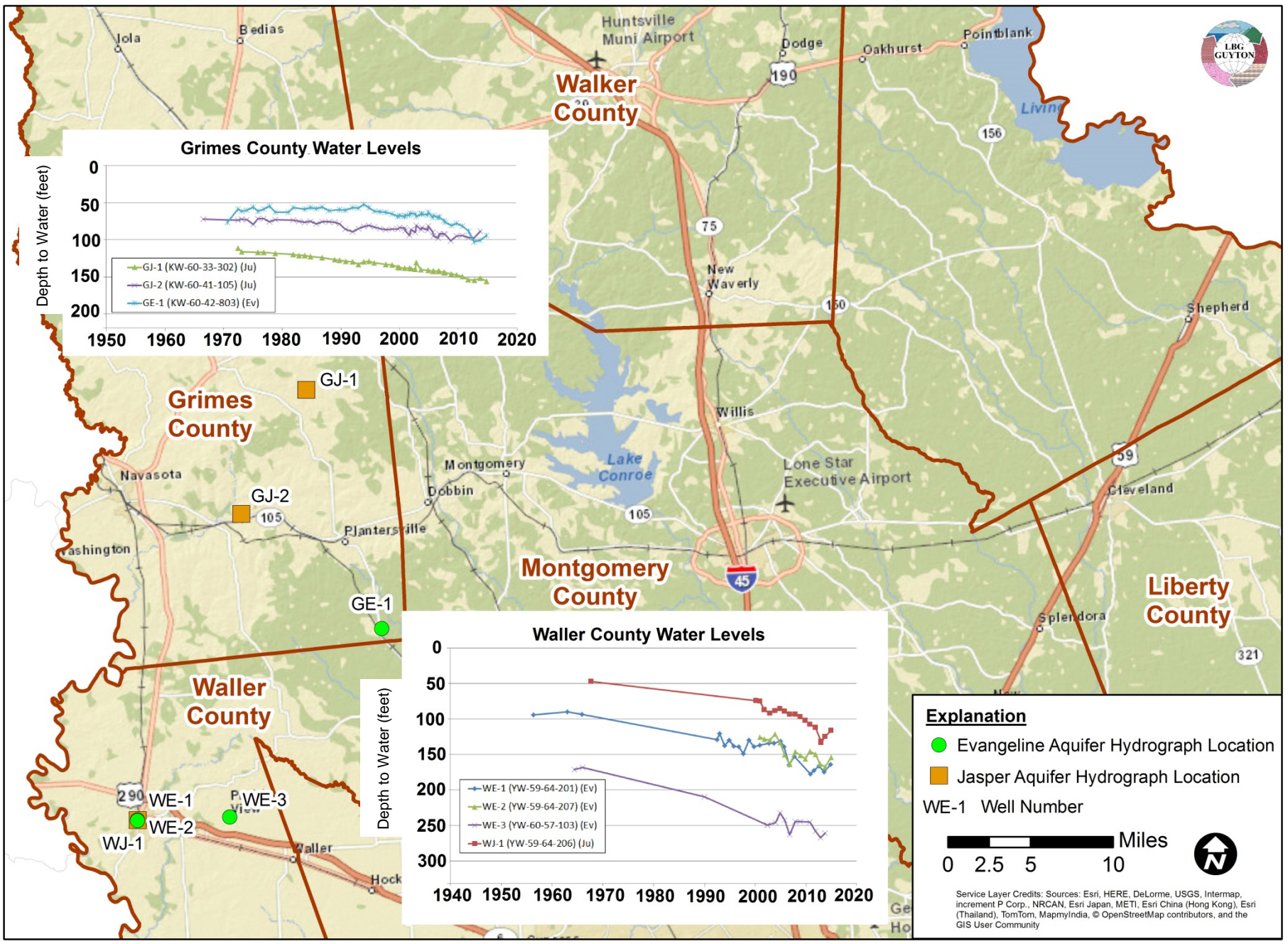
- Evangeline Aquifer Hydrograph Location
- Jasper Aquifer Hydrograph Location
- ◆ Catahoula Aquifer Hydrograph Location

LE-1 Well Number

0 2.5 5 10 Miles

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# Liberty, San Jacinto and Walker County Static Water-Level Hydrographs

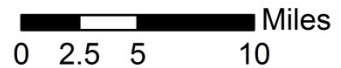


**Explanation**

● Evangeline Aquifer Hydrograph Location

■ Jasper Aquifer Hydrograph Location

WE-1 Well Number

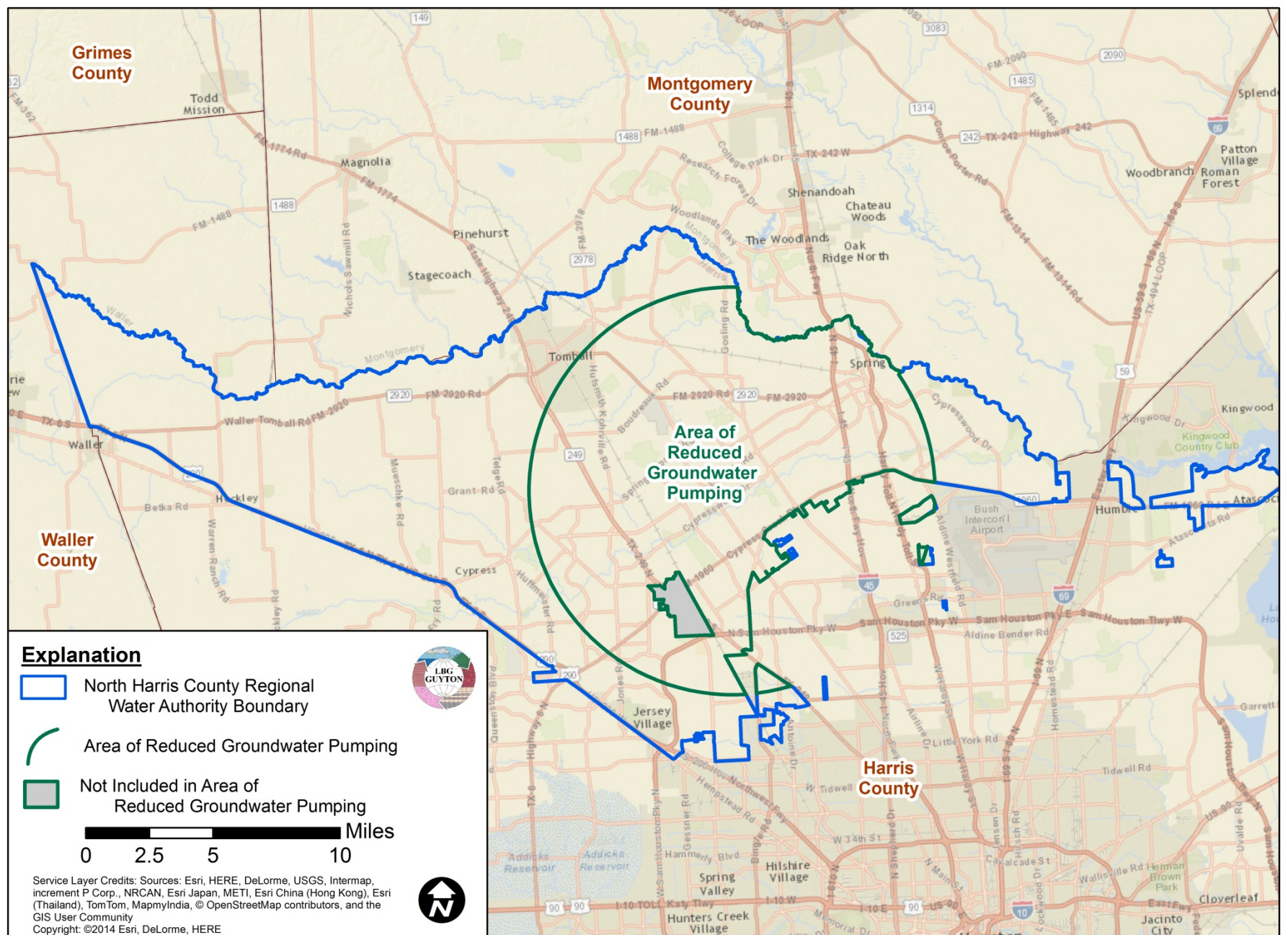


Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

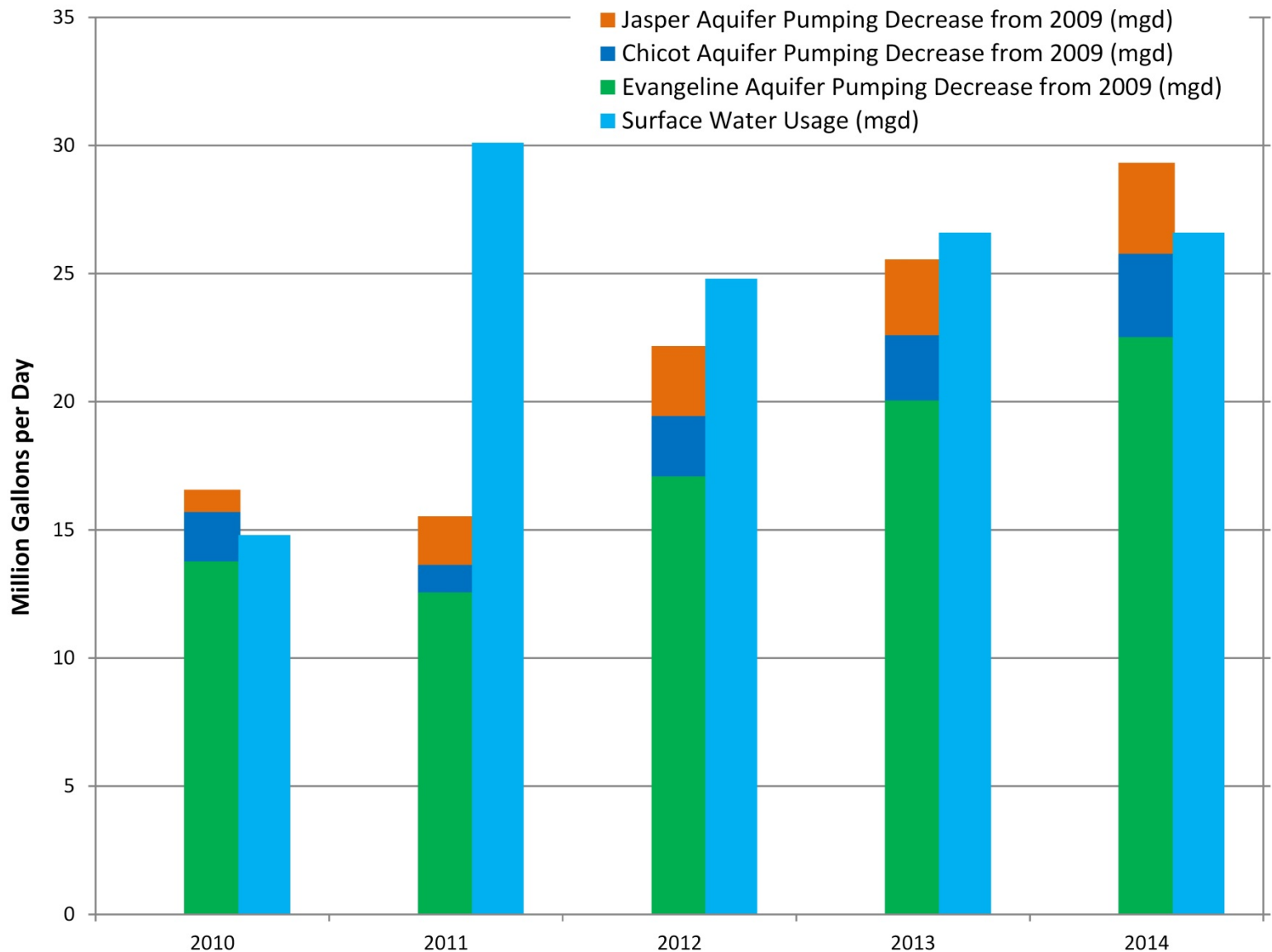
# Waller and Grimes County Static Water-Level Hydrographs

# WATER LEVELS IN SURROUNDING COUNTIES

- ▣ Depths to water are shallower in counties with less groundwater pumping
- ▣ Rates of static water-level change generally are less due to lower amounts of groundwater pumping in counties
- ▣ Continuation of water-level monitoring program provides valuable data for regional evaluation of aquifers response to pumping.



# Area of Reduced Groundwater Pumping

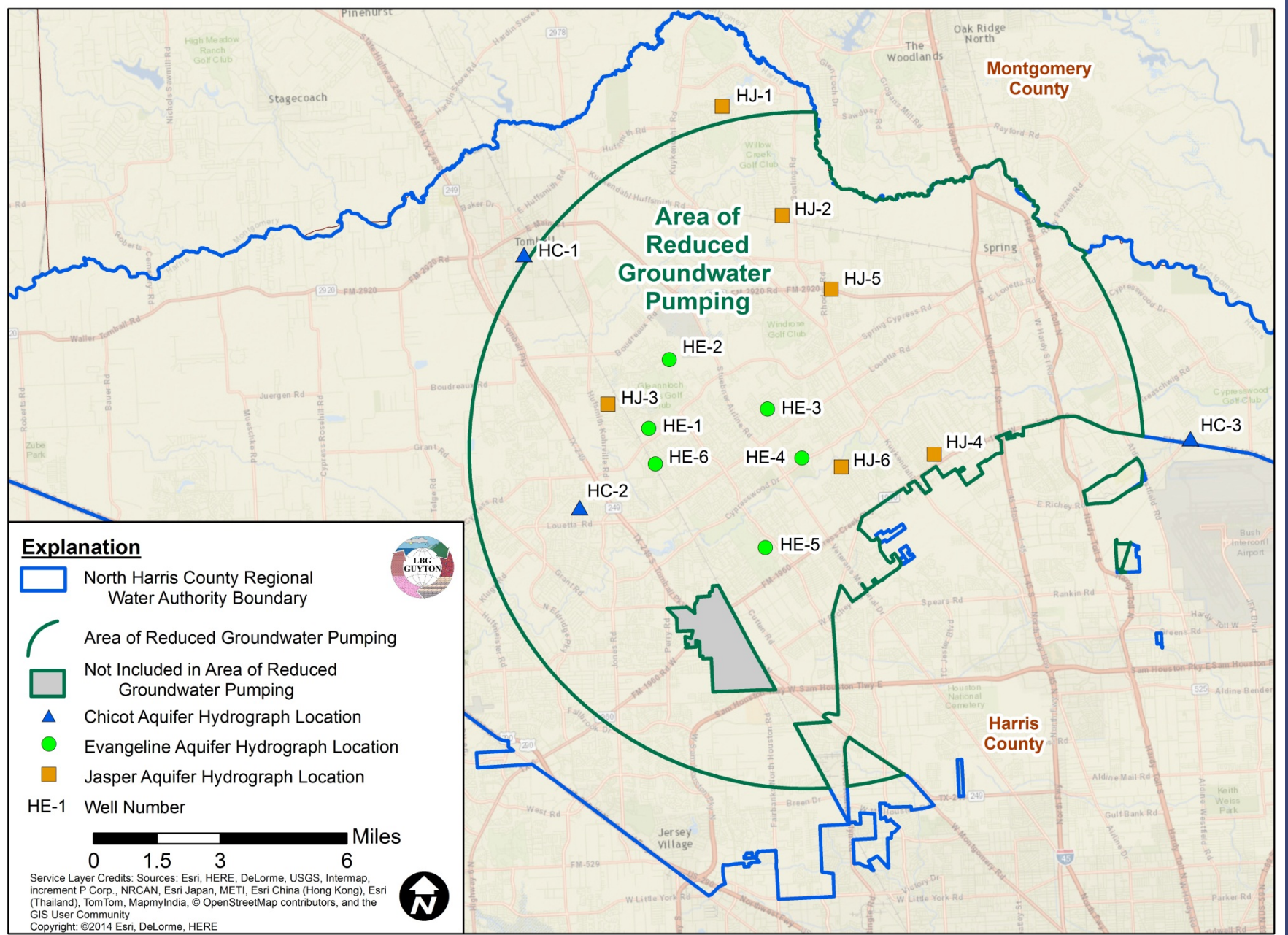


The reduction in groundwater pumping in a year should about equal the surface water usage and that is the case for all years except for 2011. High water demand due to below normal precipitation lead to higher surface water usage and less groundwater pumping reduction.

Data Sources: North Harris County Regional Water Authority and LBG-Guyton Associates

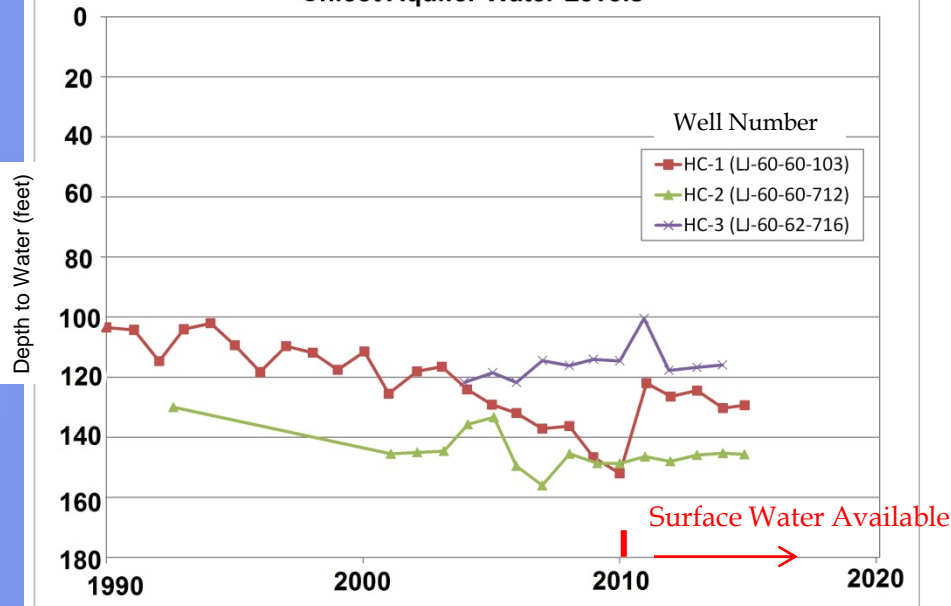
## Decrease in Groundwater Pumping Since 2009 and Surface Water Usage in Area of Reduced Groundwater Pumping



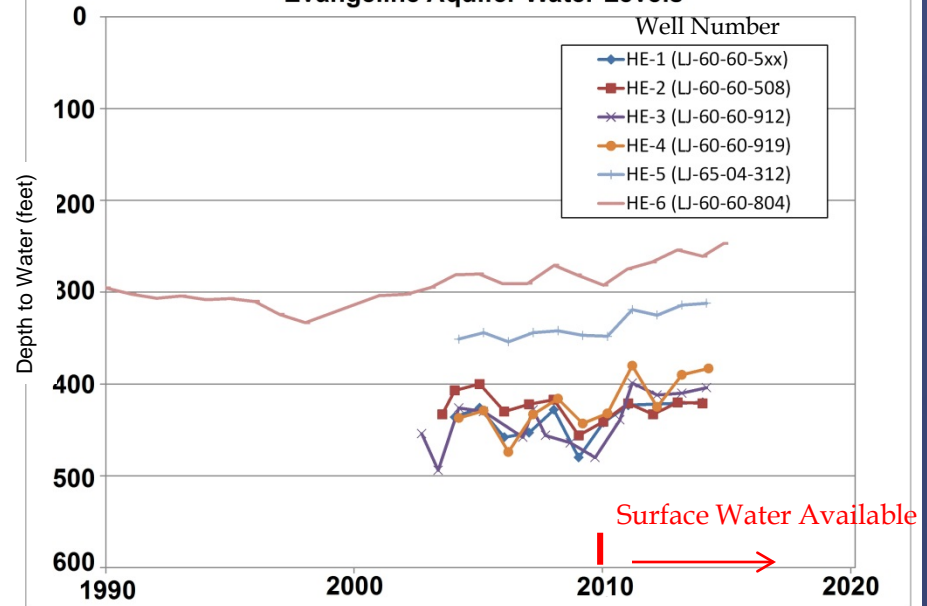


North Harris County Static Water-Level Hydrograph Locations

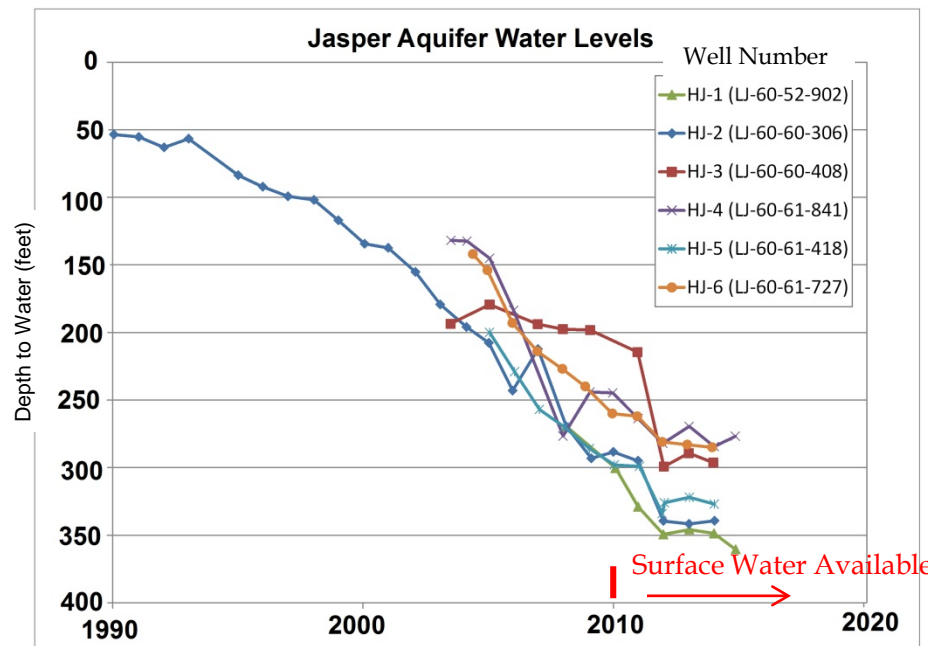
### Chicot Aquifer Water Levels



### Evangeline Aquifer Water Levels



### Jasper Aquifer Water Levels



# RESULTS OF REDUCTION IN GROUNDWATER PUMPING

- ▣ By 2014 reductions averaged 3.3, 22.5 and 3.6 mgd from the Chicot, Evangeline and Jasper aquifers, respectively
- ▣ Influence of reductions in pumping evident in water-level hydrographs for three aquifers
- ▣ The effects of the reductions in groundwater pumping were most evident in the middle of the areas of the reductions and decreased toward the edges of the areas

# RESULTS OF REDUCTION IN GROUNDWATER PUMPING (cont'd)

- ▣ Chicot Aquifer water levels stabilized to showing a small amount of recovery
- ▣ Evangeline Aquifer water levels recovered 20 to 60 feet
- ▣ Jasper Aquifer water level decline reduced from 15 feet per year to 5 or less feet per year

# STUDY RECOMMENDATIONS

- ▣ Additional effort is recommended in Montgomery County to correlate groundwater production by well with the source of the withdrawal, whether Chicot, Evangeline or Jasper aquifer.
- ▣ The static water-level monitoring program is instrumental in assessing the effects of pumping on the aquifers, has provided valuable data in the evaluation and should be expanded to increase the density of monitoring wells in certain areas and in anticipation of groundwater pumping occurring in additional areas.

# STUDY RECOMMENDATIONS (cont'd)

Aquifer	Additional Monitor Wells In Artesian Areas of the Aquifers	Additional Shallow Monitor Wells in Outcrop Area
Chicot	10 -15	20
Evangeline	10 <sup>1</sup>	5 - 10
Jasper	10 - 15 <sup>1</sup>	3

<sup>1</sup> Potentially relinquish some monitor wells in areas with numerous, closely spaced wells and replace them with monitor wells in recommended areas

Shallow monitor wells should be added to the current number available and would provide additional data regarding water-level changes in the outcrop areas.



**Thank you!**

**Questions?**