



**Board of Directors Meeting**  
**Agenda Item 11**  
**Receive Briefing from Staff on the Status of the 2022 GNSS**  
**Survey**  
**12/8/2023**

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## **SUMMARY**

The purpose of this agenda item is to provide the Board with an update on the 2022 global navigation satellite system (GNSS) survey. The past several months involved the submission of a final survey report, approval of monuments in the National Geodetic Survey database, the completion of the HGSD datasheets, and the reconnaissance and installation of new monuments. The Project is planned to be completed within budget by 12/31/2023.

## **INTRODUCTION**

The District initiated the 2022 GNSS Survey in August 2022 to obtain orthometric heights from historically surveyed benchmarks that will be validated by the National Geodetic Survey (NGS) and published. The project team includes the Texas A&M University Corpus Christi Conrad Blucher Institute (CBI), MBCO Engineering, LLC (MBCO) and their team of subconsultants, Dave Zilkoski, and regional advisors from the NGS. CBI will lead the data processing and quality control as well as the NGS coordination efforts. MBCO is the prime firm that will manage the fieldwork and final work products. Dave Zilkoski will act as the subject matter expert and Owner's Representative for the District throughout this project. The project deliverables include a final report, GIS file geodatabase, and validated NGS benchmarks for public use.

## **DISCUSSION**

The NGS approved the results of the 2022 GNSS survey and updated their database with the new heights in September of 2023. The HGSD datasheets have been finalized for over 140 benchmarks in the greater Houston-Galveston region. Geographic information systems (GIS) datasets were submitted to District staff and will be uploaded to the District website for community use by the end of 2023. Additional datasets that will be available for the public to download include a compressed folder containing all HGSD datasheets as well as a Google Earth file containing the location and basic information on all benchmarks observed in this project.

Staff identified and discussed with the Science and Research Committee the reconnaissance, installation, and observation of up to five (5) new benchmarks in areas of interest. This work was included within the original scope of work pending any budget constraints. With sufficient budgeted funds available, reconnaissance and landowner confirmation has been completed and one benchmark, a GPS station in Porter, was installed in October. MBCO anticipates the installation of the remaining four benchmarks before the end of 2023. Observations are scheduled for January 2024 and CBI will perform the processing in OPUS Projects with technical review from Dave Zilkoski.

These final approved survey datasets will be used in other research projects such as the Joint Regulatory Plan Review as well as serve as a comparison in historical subsidence monitoring. For example, Dave Zilkoski estimated the difference in the vertical height at each observed benchmark from the 2000 and 2022 surveys. This comparison was used to create a contour map that illustrates change in the land surface in that 22-year time interval (**Figure 1**).

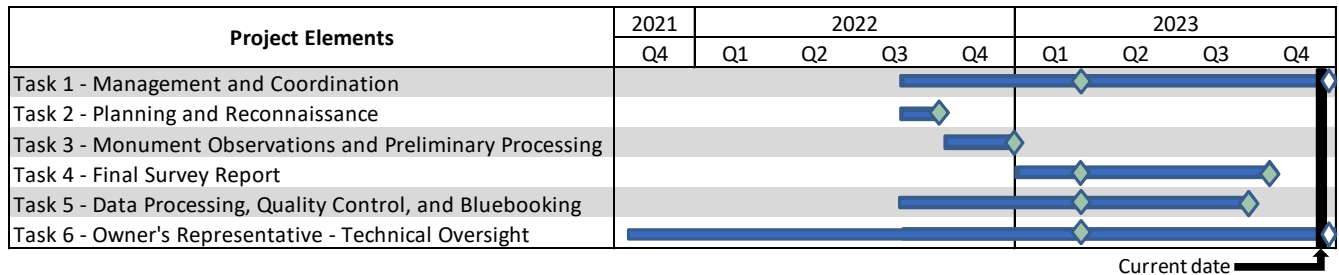
## Budget and Schedule Status

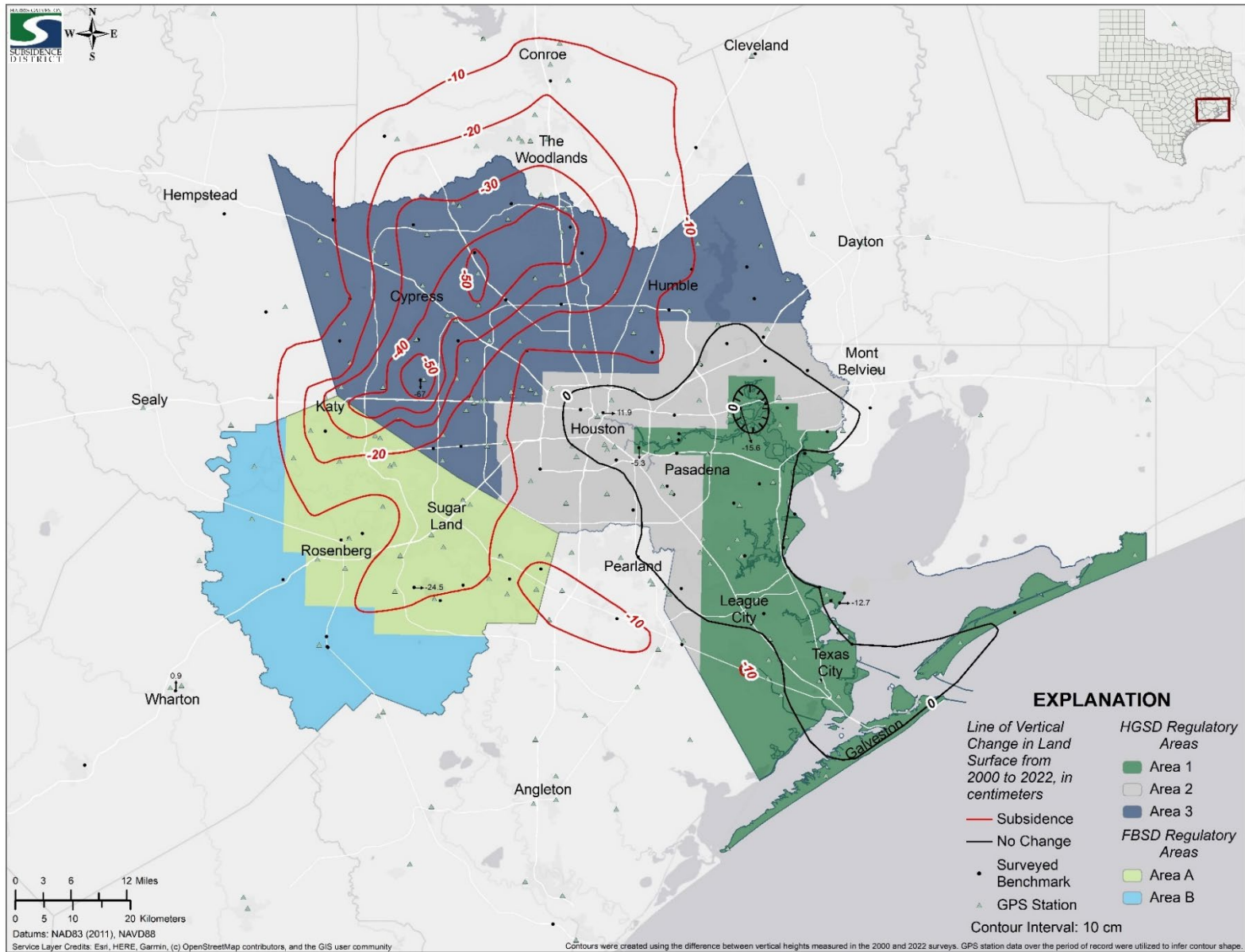
**Table 1** provides a current breakdown of the amount invoiced by contributor and task. Currently, all tasks underway are within budget. Remaining deliverables include the installation of the final four new benchmarks with planned completion by 12/31/2023. An overview of the project schedule is shown in **Table 2**.

**Table 1. Contributor Breakdown**

Task	Description	Contributor	Estimated Budget	Work Orders Issued	Invoiced to Date	Percent Complete
1	Management and Coordination	MBCO	\$65,841	\$65,841	\$58,984	90%
2	Planning and Reconnaissance	MBCO	\$131,034	\$131,034	\$39,287	30%
3	Monument Observations and Preliminary Processing	MBCO	\$869,831	\$869,831	\$624,195	72%
4	Final Survey Report	MBCO	\$153,416	\$153,416	\$84,760	55%
5	Data Processing, Quality Control, and Bluebooking	CBI	\$75,000	\$75,000	\$75,000	100%
6	Owner's Representative - Technical Oversight	Dave Zilkoski	\$30,000	\$30,000	\$26,229	87%
<b>Total</b>			<b>\$1,325,122</b>	<b>\$1,325,122</b>	<b>\$908,454</b>	<b>69%</b>

**Table 2. 2022 GNSS Survey Schedule**





**Figure 1.** Line of vertical change in the land surface from 2000 to 2022. Contours represent the difference between the vertical heights measured at benchmarks during surveys completed in 2000 and 2022. GPS subsidence monitoring station data collected over the 2000-2022 period were used to inform contour location in areas of limited benchmark data.