

**TCEQ Grant Agreement 582-10-90451**

**Water Quality: Watershed Characterization Report for the Highland Bayou Coastal Basin**

**Executive Summary**

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*TEXAS COASTAL  
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A PROGRAM OF THE TCEQ



*PREPARED IN COOPERATION WITH THE  
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# Executive Summary

## Highland Bayou Characterization Report

Prepared by the Texas Coastal Watershed Program  
in cooperation with the Galveston Bay Estuary Program

Grant No. 582-10-90451

The Highland Bayou Characterization Report identifies the current conditions and trends for water quality in Highland Bayou, Galveston, Texas. All segments of Highland Bayou are listed on the Texas Commission on Environmental Quality's 303(d) list of impaired waters for elevated levels of bacteria and depressed levels of dissolved oxygen. Historical observations, analyses of trends, and recent sampling confirm this listing and indicate that the coordinated and sustained action from communities and stakeholders will be needed to delist the bayou. The effort for this project was funded through the US Environmental Protection Agency under the American Recovery and Reinvestment Act.

Nonpoint sources are believed to be the primary source of 303(d) pollutants in the bayou. Clayey soil conditions, shallow water tables, a high concentration of aging on-site septic systems (estimated to number into the thousands), and wastewater facilities are key factors that contribute to the elevated levels of bacteria. Low dissolved oxygen levels result from a mix of factors related to nonpoint source runoff of nitrogen and phosphorous, and are likely compounded by ambient environmental conditions such as the slow movement of water through the bayou and the extended heat of Texas' summers. Anecdotal observations together with analyses of spatial and temporal trends support this understanding of conditions in the bayou and the causes for the impairment.

In summary, the water quality impairments to Highland Bayou are significant and will require long-term attention and commitment from local stakeholders to see improvements and the eventual delisting of the waterway. The general public's understanding of water quality issues is murky at best and only slightly behind the level of understanding by most stakeholders. The watershed planning effort will have to emphasize outreach and education on the benefits of improved water quality. In this era of lean budgets and limited resources for implementation of water-quality recommendations, stakeholders and the WPP program coordinators will be challenged to find effective and feasible approaches to reduce pollutant loads in the bayou.

### *Major Deliverables and Milestones*

The following tasks were completed as part of the Characterization Phase and are included or referenced in the Characterization Report:

1. A QAPP-compliant water quality sampling program consisting of six sampling events over a nine-month period at nine locations throughout the watershed;
2. Creation and approval of two QAPP's for water quality sampling (an amendment) and for the characterization report;

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3. The delineation of sub-watersheds within the Highland Bayou Coastal Basin using ArcInfo GIS tools and high resolution LIDAR elevation data, and subsequent field validation at critical boundaries;
4. A summary of environmental conditions and shoreline processes, plant and animal species of concern, and local conservation and restoration efforts;
5. The creation of a comprehensive GIS database of environmental, facilities, land-use, and socio-economic data;
6. The development of reference maps illustrating key environmental conditions, land use patterns, boundaries, and facilities
7. A tabular summarization of water quality parameters by sampling station, including number of observations, high value, low value, median, average, and standard deviation.
8. Non-parametric, descriptive statistics (box plots) of seasonal conditions by parameter for each station;
9. The creation of a framework GIS model and workshop tool (CHARM and WeTable) for assessing how pollutant loading values may respond to land use changes and BMP implementation;
10. The design and purchase of public outreach materials, brochures, and pet-waste pickup materials including links for online information;
11. The purchase of equipment to facilitate subsequent workshops and stakeholder planning events, such as projectors, laptops, and audience polling devices;
12. The purchase of water quality sampling equipment kits for ongoing monitoring by local water quality volunteers;
13. The creation of a comprehensive list of stakeholder information including contact information and dates of contact;
14. Preliminary interviews with over 25 stakeholders representing a range of interests and entities in the basin;
15. A public open house to share the results of the Characterization phase and to gather input from the public;
16. Initiation of a project-based organization, the Moses-Karankawa Bayous Alliance, named for the bounding subwatersheds of the Highland Bayou Coastal Basin;
17. Establishing an online presence for the project with both a Facebook page (Moses-Karankawa Bayous Alliance) and a social networking page with NING ([www.MoKaBayousAlliance.org](http://www.MoKaBayousAlliance.org)); online sites are updated with event information, news, images, and postings;

### *Stakeholders and Public Outreach*

The public Open House was held on August 30, 2011 in the City of LaMarque, a community at the heart of the watershed. The event was attended by approximately 20 participants and stakeholders. Outcomes from the characterization phase and the next steps in the planning process were shared with the public. A brief voting exercise to assess attendees' attitudes towards potential approaches to watershed management was conducted. In addition, direct stakeholder engagement via preliminary interviews will continue into the early months of the

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watershed protection planning effort, culminating in the creation of a stakeholder committee. Nearly 50 individuals have been interviewed or identified for interviews, and who represent a range of interests, including businesses, local government, not-for-profits, residents, advocates, and individuals from county, state, and federal agencies.

### *Next Steps*

The outcomes of the Characterization phase will be used in direct support of the ensuing watershed protection planning effort, which is underway with a year of project funding in the amount of \$100,000 from the Galveston Bay Estuary Program. Analyses of water quality trends and loads will inform the development of the first five elements of a Nine Element Watershed Protection Plan, including the identification of likely NPS sources, estimated load amounts, estimated load reductions, and potential BMPs and their pollutant removal efficiencies. Stakeholder engagement will continue and grow in importance as the project matures. A working group will be convened early in the process to address preferred directions and potential responsibilities for implementation of WPP recommendations.

### *Current Status of Characterization Report*

The characterization report is a partial draft of the complete report and is the last significant deliverable in the contract to be completed. Several factors contributed to this outcome, among them was a delayed start to the project schedule. After a short time into the project a determination was made that the QAPP for water quality sampling needed to be amended, creating a delay in the start of the sampling program. The sampling program was successfully completed; however results from the effort could not be incorporated into the report by the scheduled time. Effort on the project was also postponed for the preparation of a QAPP for the Characterization Report itself and data management practices.

The Characterization Report is scheduled for completion in the first quarter of 2012, and it will be worked on concurrently with the development of the Highland Bayou Watershed Protection Plan. Sections requiring completion are identified in the report. Completed sections include bayou geography, physical conditions, climate conditions, key ecosystems, species of concern, existing conservation practices, population trends, and summaries of spill reports and water quality enforcement actions. Appendices include completed tables of summary statistics for water quality, plots and charts for water quality trends, and maps illustrating environmental and built characteristics of the study area. Remaining work includes the completion of several sections, among them a description of land use characteristics and existing land management practices, as well as a summary and review of water quality conditions in the watershed. Updated water quality statistics which incorporates results of the sampling program will be included into the final report.

