

October 12, 2018

Ms. Jing Chen, P.E., CFM
Feasibility Studies Project Manager
Harris County Flood Control District
9900 Northwest Freeway
Houston, Texas 77092

Re: Scope of Services for HCFCD Project No. Z100-00-00-P026
HCFCD Bond Program Project F-110
EHRA Project No. 181-059-00

Dear Ms. Chen:

Edminster, Hinshaw, Russ & Associates, Inc. d/b/a EHRA Engineering is pleased to submit this Scope of Services to provide professional surveying and engineering services for the Harris County Flood Control District (HCFCD) Bond Program, Project No. Z100-00-00-P026. The project will include an engineering investigation into the sources of flooding and offer options for reducing flood damages. The following sections of this letter provide background information on the project, a scope of work for the proposed engineering investigation, period of service, deliverables, and a budget breakdown.

BACKGROUND INFORMATION

The area for investigation generally coincides with the Huffman Independent School District boundary in northeast Harris County. The boundaries can be defined as the East Fork of the San Jacinto River being the western boundary; the Harris County line as the northern and eastern boundary; and just south of Old Atascocita Road as the southern boundary. The project area overlays portions of three (3) watersheds: San Jacinto River, Cedar Bayou, Luce Bayou, and their various tributaries. The Cedar Bayou Watershed is currently being studied by Half Associates through a partnership with the Texas Water Development Board. The study titled "Cedar Bayou Flood Risk Reduction Study" examined the main stem of Cedar Bayou and tributaries HCFCD Unit No. Q101-00-00 to Q136-00-00. The project area is located in Precinct 2 and is shown on Key Map pages 258, 259, 298, 299, 338, and 339.

Thirty-one (31) public comments were submitted during the Bond Community Engagement process which provided areas and flood damage reduction projects to examine more closely. Multiple comments request that dredging take place along the East Fork of the San Jacinto River. The project area did experience widespread flooding during Hurricane Harvey, but historical flood records indicate portions of the project area were affected by other recent storms including the Memorial Day 2015 and Tax Day 2016 floods.

This investigation will focus on the following areas in Luce Bayou: along HCFCD Unit Nos. S110-00-00 (Shook Bayou), S114-00-00 (Mexican Gully), S115-00-00, S102-00-00, and S100-00-00 from the Harris County boundary to the confluence with the East Fork of the San Jacinto River.

This investigation will also focus on the following areas in the East Fork of the San Jacinto River: along HCFCD Unit No. G103-80-00 (East Fork) from the confluence with S100-00-00 to the area east of G103-80-04 and near the Harris County border and G205-00-00.

The purpose of this engineering investigation is to: 1) identify sources of flooding for Luce Bayou and the East Fork of the San Jacinto River, focusing on the defined areas with groupings of flood complaints or flood claims; 2) estimate level of service and existing capacity of channels; 3) formulate recommendations on how flood damages could be reduced; and 4) identify right-of-way that would be needed for flood damage reduction recommendations.

KEY ASSUMPTIONS

The following list provides some key assumptions made while developing the scope of work:

- HCFCD provided subdivision plans, repetitive loss data, preliminary engineering reports for roadways associated with the project area. HCFCD will provide some general environmental data including WEB-DST GIS data.
- The Halff Associates study on Cedar Bayou titled “Cedar Bayou Flood Risk Reduction Study” will be reviewed and summarized in our resulting report, but will not be further investigated with these efforts.
- Recommendations for channel modifications and detention basin locations will be provided in a conceptual nature that indicates the general reach or region where these projects are recommended.
- The investigation will identify and list possible sources of flooding, and explain how the source was identified to the public. However, only general recommendations for possible solutions will be included on sources of flooding outside of HCFCD’s responsibilities. No detailed examination or analysis will be completed on flooding sources outside of HCFCD’s responsibilities, i.e. storm sewer calculations, road re-design.
- No hydrologic analysis will be completed for the East Fork of the San Jacinto River. Another study will examine the hydrologic conditions of the East Fork in detailed analysis.
- This analysis will not include geotechnical testing or environmental investigations. General environmental considerations will be documented.
- HCFCD will provide data developed to estimate the fluvial geomorphologic bankfull channel and bench dimensions for estimating right-of-way needs.
- When estimating the amount of storage volume, 20% of the storage volume will be assumed to be lost during final design in order to integrate aesthetically pleasing design and/or recreational features.

SCOPE OF SERVICES

Our scope of work is based on an engineering investigation of the study area and submittal of information to HCFCD. EHRA shall provide the following services to HCFCD:

1. Project Management

This task includes coordinating with HCFCD during the course of the project. EHRA will perform the following Project Management Services for Z100-00-00-P026.

- a) Weekly coordination calls for project updates. Twenty-six (26) calls are anticipated for this task.
- b) Attendance at monthly coordination meetings for project updates. Eight (8) meetings are anticipated for this task. Two (2) individuals will be in attendance at each meeting.
- c) Prepare for and schedule monthly coordination meetings including preparation of meeting minutes. Eight (8) meetings are anticipated for this task.
- d) Attendance at HCFCD preparation meeting prior to first Stakeholder meeting taking place. Two (2) individuals will be in attendance at the meeting.
- e) Attendance at three (3) to five (5) Stakeholder meetings. Two (2) individuals will be in attendance at each meeting. Three (3) to five (5) Stakeholder meetings will be held to solicit input from major stakeholders on the project. The Stakeholder meetings will occur as HCFCD deems necessary. The anticipated purpose of the meetings would be to inform others of the purpose of the investigation and the timeline; and present information gathered and produced during the study, and to collect information from the stakeholders.
- f) Attendance at HCFCD preparation meeting before and close-out meeting after Public Engagement meetings. Three (3) individuals will be in attendance at each meeting. The preparation meeting will be with Public Relations consultant and HCFCD to develop community meeting logistics and implementation. The close-out meeting will be with Public Relations consultant and HCFCD.
- g) Attendance at two (2) Public Engagement Meetings. Four (4) individuals will be in attendance at each meeting. Two (2) Public Engagement meetings will be held to solicit public input on the project. The first Public Engagement meeting would take place at the beginning of the investigation in which the public would be informed of the purpose of the investigation and the timeline and present their information on flooding and possible sources. The second Public Engagement meeting would allow the public the opportunity to review the results of the investigation, solicit questions, and supply input.
- h) Preparation for and attendance at two (2) Executive Briefings. Two (2) individuals will be in attendance at each meeting.
- i) Preparation of invoices, coordination with Public Relations subconsultant, and completion of Project Performance Certifications. Prepare and maintain a study schedule. Anticipated for eight (8) months.
- j) Additional Project Management tasks, as authorized in writing by the Director.

2. Engineering Investigation

This task involves collecting and evaluating the data necessary to complete the engineering investigation of the project area, including:

- a) Limited research and coordination effort for locating additional reference materials beyond what is mentioned in item b.
- b) Reviewing and utilizing available data for the project area, including:
 - 1. As-built drawings, Preliminary Engineering Reports (PERs), past and current studies.
 - 2. Available topographic data, including: Light Detection and Ranging (LiDAR) data and available field survey.
 - 3. Aerial photographs.
 - 4. Harris County FIRMs and Flood Insurance Studies.
 - 5. Current Harris County rainfall data and HCFCD criteria manuals.
 - 6. Recently published NOAA Atlas 14 rainfall data.
 - 7. Hydrologic and hydraulic models available through HCFCD's M3
 - 8. Relevant structural inventory tool data
 - 9. WEB-DST GIS data (HCFCD's in-house watershed environmental baseline data)
 - 10. A high-level assessment of the stream function conditions along Luce Bayou and the tributaries of interest developed and provided by HCFCD.
 - 11. Up to three (3) site visits for field inspection of drainage issues to observe the topographic, hydrologic and hydraulic characteristics of the areas impacted by flooding. Documentation of the site visits will include digital photographs and field notes.
- c) Conduct an Existing Conditions analysis to evaluate areas and potential sources of flooding within those portions of the Luce Bayou and the East Fork of the San Jacinto River watersheds located within the study limits. Investigating the locations of flooding and identifying possible causes, which may include:
 - 1. Preparing a rain-on-grid exercise in which the current Harris County rainfall data would be utilized to identify areas of ponding in the 10-, 1-, and 0.2-percent annual exceedance probability (AEP) rainfall events. The current effective 0.2% AEP storm event will be utilized as an approximation for the future effective 1-percent AEP storm. HCFCD is working to update hydrologic modeling data based on Atlas 14. If that information becomes available at an appropriate time during the investigation, the updated hydrologic modeling data would be utilized for the 1- and 0.2-percent AEP storm events.
 - 2. Performing a limited 2-dimensional analysis to evaluate how the rainfall interacts with the topography for the 10- and 1-percent AEP rainfall events and identify overflow limits.
 - 3. Verify the current capacity and level of service for the existing channels and tributaries.
 - 4. For Luce Bayou and the East Fork of San Jacinto, establish baseline condition metrics along the streams evaluated during this study. Estimate the number of structures, parcels, acres of land, and miles of roadway anticipated to be inundated. This information will be estimated for the 10-, 1- and 0.2-percent AEP storm events.

5. Using the HCFCD's structural inventory tool to estimate the number of homes anticipated to flood during the 10-, 1- and 0.2-percent AEP storm events.
- d) Evaluate recommendations for the area of investigation by:
1. Assessing whether the current channels could be expanded or modified within the existing right-of-way. Estimate the right-of-way needs that would be required for a traditional trapezoidal channel section, as well as a channel section that incorporates natural channel design features.
 2. Estimating how much right-of-way would be needed for channel modifications to reach a 10-, 1-, and 0.2-percent AEP level of service based on current criteria. HCFCD is working to update hydrologic modeling data based on Atlas 14. If that information becomes available at an appropriate time during the investigation, the updated hydrologic modeling data would be utilized for the 1- and 0.2-percent AEP storm events.
 3. Calculating the amount of storage volume needed for a regional detention basin, if the channel is unable to be modified. If channel conveyance improvements are possible, calculate the amount of storage volume needed to mitigate the improvements.
 4. Composing general recommendations on where to locate channel modifications and detention basins based on existing constraints.
 5. For Luce Bayou and the East Fork of San Jacinto, establish metrics established per c) 4 & 5 above for the alternatives that are evaluated during tasks d)1-3.
- e) For areas adjacent to the East Fork and along the main stem of Luce Bayou from the confluence to S110-00-00 (Shook Bayou), examine dredging as a possible recommendation:
1. Describe in detail the causes of flooding along the East Fork including the size of the drainage area and magnitude of flooding.
 2. Perform a limited hydraulic evaluation to approximate the reduced capacity within the East Fork of San Jacinto River and the main stem of Luce Bayou from the confluence to S110-00-00 (Shook Bayou).
 3. Review 2001, 2008, and 2018 LiDAR data and aerial photographs to estimate reduced capacity within channel due to sedimentation over time.
 4. Describe the agency participation necessary and environmental concerns and impacts from discussions with HCFCD Environmental staff for dredging activities including a sectional assessment.

- f) Drafting a report of findings containing text, exhibits, supporting data, assumptions, cost estimates for the alternatives, and methods used. Report will provide recommendations to consider for reducing flood damages within the project area, a description of the right-of-way needs, and a summary of the benefits. Recommendations will require further analysis to be performed under separate contract. The draft report will be delivered for review and comment to HCFCD. Comments will be incorporated into a draft presentable to the public.
- g) Two (2) Public Engagement meetings will be held to solicit public input on the project. The first Public Engagement meeting would take place at the beginning of the investigation in which the public would be informed of the purpose of the investigation and the timeline and present their information on flooding and possible sources. The second Public Engagement meeting would allow the public the opportunity to review the results of the investigation, solicit questions, and supply input. This task involves the preparation of exhibits and presentations for the Public Engagement meetings. Coordination between EHRA and Crouch Environmental will be necessary to develop content for HCFCD's website.
- h) Three (3) to five (5) Stakeholder meetings will be held to solicit public input from major stakeholders on the project. The Stakeholder meetings would occur when HCFCD deems necessary. The anticipated purpose of the meetings would be to inform others of the purpose of the investigation and the timeline and present their information on flooding and possible sources. This task involves the preparation of exhibits and handouts for the Stakeholder meetings.
- i) Review the comments gathered during the public meetings. Group, sort, and summarize the comments for discussion of feedback provided during public engagement meetings. Investigate the key concerns reported by the community, and investigate ways to address the concerns, and establish feasibility in pursuing them. Feasibility will be based as a minimum, on: general cost, constructability, effectiveness, environmental impacts, and permitting requirements. Develop information to answer questions and respond to comments to provide the public with relevant information.
- j) Prepare documentation for submittal to HCFCD at each milestone. The expectations for the milestones will be draft relevant sections of the report that include: 1)baseline conditions analysis; 2) environmental work; and 3) dredging investigation.
- k) Updating the report of findings based on feedback provided at the public engagement meeting. The draft report will be delivered for review and comment to HCFCD. Comments will be incorporated into the final report and submitted electronically to HCFCD.
- l) Performing internal review for any model(s) or calculations developed for this project and the results obtained. If necessary, the model(s) or calculations will be revised based on the review. This task also includes reviewing the report for this project.

3. Limited Surveying

EHRA is budgeting for limited topographic surveying, if needed. The limited survey collection would be in areas where the root reason for flooding cannot be determined from LiDAR or field inspection. This task will not be performed without the prior approval of HCFCD.

4. Community Engagement

In compliance with the 2018 Harris County Bond Program, comprehensive community engagement is required for each bond program project. The purpose of these community engagement efforts is to provide transparent and accessible public information about each bond program project and solicit meaningful public comments. It was discussed that one (1) community engagement meeting would be held at the beginning of the project prior to completing any investigative work and one (1) community engagement meeting would be held near the completion of the engineering investigation to present the findings.

Crouch Environmental Services, Inc. (CESI) will assist EHRA by performing the following services:

- a) Community meeting noticing;
- b) Community meeting logistics and implementation;
- c) Public comment and community meeting documentation; and
- d) Community engagement completion activities.

More specific information regarding each of these tasks is described in the CESI proposal dated October 2, 2018 which is included as Attachment A.

BUDGET BREAKDOWN

The budget itemized below reflects the requested funds outlined in this proposal.

Task	Description	Total Project Amount Requested
1	Project Management	\$ 65,710.00
2	Engineering Investigation	\$ 234,180.00
3	Limited Surveying	\$ 10,000.00
4	Public Engagement Consultant	\$ 39,935.00
	Total of Additional Services	\$ 349,825.00
	Total Proposed Fee	\$ 349,825.00

Requested Authorization: \$ 349,825.00

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PERIOD OF SERVICE

Our scope of work is based on the project extending for a period of six (6) months.

DELIVERABLES

EHRA Engineering will provide the following deliverables:

- Electronic copy of the report directly to HCFCD's office.
- Flash drive of Adobe Acrobat (.pdf) files of exhibits prepared by EHRA and computer model(s), if any, developed for this project.
- Any shapefiles that are created for use on exhibits in the report or created for the Stakeholder or Public Engagement meetings.

Enclosed with this letter are Attachment A: CESI Proposal dated October 2, 2018; Attachment B: General Scope of Additional Services; and Attachment C: EHRA Public Works 2017 Hourly Rate and Reimbursement Schedule. **EHRA proposes to provide the scope of services on an hourly basis estimated not to exceed \$349,825.00, for a total contract amount of \$349,825.00.**

If you have any questions, please contact either of us at (713)784-4500 or via email at apalermo@ehrainc.com or jhundl@ehrainc.com.

Sincerely,

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Associate Principal | Department Manager
Hydrology and Hydraulics

Jennifer R. Hundl, P.E., CFM
Project Manager
Hydrology and Hydraulics

AVP/JRH

Attachments: Attachment A – CESI Proposal dated October 2, 2018
Attachment B - Level of Effort Worksheet
Attachment C - Public Works Hourly Rate and Reimbursement Schedule

cc: Truman C. Edminster, P.E. – Firm
A. Hasan Syed, P.E. – Firm
Vally Swann, C.P.A. – Firm