Fort Bend County - Big Creek 2017 CDBG-DR Infrastructure Application

Attachments

SF-424
Public Participation Summary
Resolution
Maps
Additional Information for the Infrastructure Application
  Texas Division of Emergency Management (TDEM) DR 4332- HMGP Applicant Briefing slides
  Tetra Tech HMGP Benefit Cost Analysis Memo for Big Creek
Beneficiary Information
  2019 Low and Moderate Income Summary Data (LMISD)
  Race/Ethnicity/Gender Calculator Form
  American Fact Finder DP05 Table
Documentation of Hurricane Harvey related damage
  Local Disaster Declaration
  USGS Graphs – Big Creek Gauge at Hwy 36
Environmental Exception Form
Recent Audit
Key Staff Listing
Fort Bend County Purchasing Manual (local procurement policies and procedures)
Application for Federal Assistance SF-424

**1. Type of Submission:**
- [ ] Preapplication
- [X] Application
- [ ] Changed/Corrected Application

**2. Type of Application:**
- [X] New
- [ ] Continuation
- [ ] Revision

**3. Date Received:**

**4. Applicant Identifier:**
TX489157

**5a. Federal Entity Identifier:**

**5b. Federal Award Identifier:**

**State Use Only:**

**6. Date Received by State:**

**7. State Application Identifier:**

**8. APPLICANT INFORMATION:**

**a. Legal Name:** Fort Bend County Texas

**b. Employer/Taxpayer Identification Number (EIN/TIN):** 74-6001969

**c. Organizational DUNS:** 0000081457075

**d. Address:**
- **Street1:** 301 Jackson Street
- **Street2:** Suite 502
- **City:** Richmond
- **County/Parish:** Fort Bend County
- **State:** TX, Texas
- **Province:**
- **Country:** USA, UNITED STATES
- **Zip/Postal Code:** 77469

**e. Organizational Unit:**
- **Department Name:** Community Development
- **Division Name:**

**f. Name and contact information of person to be contacted on matters involving this application:**
- **Prefix:** Ms.
- **First Name:** Marilynn
- **Middle Name:**
- **Last Name:** Kindell
- **Suffix:**
- **Title:** Community Development Department Director

**Organizational Affiliation:**

**Telephone Number:** 281-341-6410
**Fax Number:** 281-341-3762

**Email:** marilynn.kindell@fortbendcountytx.gov
**Application for Federal Assistance SF-424**

*9. Types of Applicant 1: Select Applicant Type:
8: County Government

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*10. Name of Federal Agency:
U.S. Department of Housing and Urban Development (HUD)

*11. Catalog of Federal Domestic Assistance Number:
14.328

CFDA Title:
Community Development Block Grant (CDBG) Program Disaster Recovery

*12. Funding Opportunity Number:

* Title:
Hurricane Harvey Infrastructure Application Guide

*13. Competition Identification Number:

Title:

*14. Areas Affected by Project (Cities, Counties, States, etc.):

*15. Descriptive Title of Applicant's Project:
Community Development Block Grant - Disaster Recovery (CDBG-DR) Infrastructure Program - Big Creek Expansion Project

Attach supporting documents as specified in agency instructions.
Application for Federal Assistance SF-424

16. Congressional Districts Of:
   * a. Applicant: TX-022
   * b. Program/Project: TX-022

Attach an additional list of Program/Project Congressional Districts if needed.

17. Proposed Project:
   * a. Start Date: 10/01/2019
   * b. End Date: 09/30/2022

18. Estimated Funding ($):

| * a. Federal | 13,060,895.00 |
| * b. Applicant | 0.00 |
| * c. State | 0.00 |
| * d. Local | 0.00 |
| * e. Other | 0.00 |
| * f. Program Income | 0.00 |
| * g. TOTAL |  |

19. Is Application Subject to Review By State Under Executive Order 12372 Process?
   □ a. This application was made available to the State under the Executive Order 12372 Process for review on
   □ b. Program is subject to E.O. 12372 but has not been selected by the State for review.
   ✗ c. Program is not covered by E.O. 12372.

20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)
   □ Yes  ✗ No
   If "Yes", provide explanation and attach

21. "By signing this application, I certify (1) to the statements contained in the list of certifications** and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)
   ✗ ** I AGREE

   ** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix:  
* First Name: KP
Middle Name:  
* Last Name: George
Suffix:  

* Title: County Judge

* Telephone Number: 281-341-8608  Fax Number:  
* Email: county.judge@fortbendcountytx.gov

* Signature of Authorized Representative:  
* Date Signed:  


Public Participation Summary

Fort Bend County's Hurricane Harvey Infrastructure Project: Big Creek Expansion Project process involved one public notice and one public meeting. The dates of the public notice, meeting and other participation opportunities are listed below.

Public Meeting Notice in Newspaper  
January 31, 2019

Emails to Mailing List  
February 5, 2019

Beginning of thirty day comment period  
February 4, 2019

Fort Bend Connect Meeting/Announcement  
February 8, 2019

Public Meeting  
February 21, 2019

End of thirty day comment period  
March 5, 2019

Commissioners Court approval  
May 14, 2019

The thirty day public comment period for the draft of the Hurricane Harvey Infrastructure Project: Big Creek Expansion Project Application started on February 4, 2019 and ended on March 5, 2019.

A public notice was published on January 31, 2019 in the local newspaper. In addition, over eighty emails were sent to persons, organizations, and local governments on the FBC Community Development mailing list.

A FBC Community Development Department (FBCCDD) Staff member attended the February 8, 2019 Fort Bend Connect Meeting. Fort Bend Connect is networking group of individuals, groups, agencies, or organizations that strive to address the multiple needs in Fort Bend County. The monthly meetings are planned to provide valuable information regarding resources available to benefit the Fort Bend community. A copy of the public notice was posted on the announcement board; FBCCDD staff made an announcement during the meeting and handed out over twenty copies of the public notice to interested persons. Staff answered questions from persons wanting more information.

No written comments nor telephone inquiries were received during the public commenting period related to this project. No one attended the February 21, 2019 meeting.

The Hurricane Harvey Infrastructure Project: Big Creek Expansion Project Application is scheduled to be approved by Fort Bend County Commissioners Court on Tuesday, May 28, 2019. Any comments received during the public comment regarding agenda and announcement portion of the Commissioners meeting will be included in this section.
PUBLISHER'S AFFIDAVIT

THE STATE OF TEXAS §
COUNTY OF FORT BEND §

Before me, the undersigned authority, on this day personally appeared Lee Hartman who being by me duly sworn, deposes and says that he is the Publisher of Fort Bend Herald and that said newspaper meets the requirements of Section 2051.044 of the Texas Government Code, to wit:

1. it devotes not less than twenty-five percent (25%) of its total column lineage to general interest items;

2. it is published at least once each week;

3. it is entered as second-class postal matter in the county where it is published; and

4. it has been published regularly and continuously since 1959.

5. it is generally circulated within Fort Bend County.

Publisher further deposes and says that the attached notice was published in said newspaper on the following date(s) to wit:

1-31

__________________________________________

______________________________, A.D. 2019

Lee Hartman
Publisher

SUBSCRIBED AND SWORN BEFORE ME by Lee Hartman, who

____X____a) is personally known to me, or

_______b) provided the following evidence to establish his/her identity, ____________________________

on this the 1__ day of February, A.D. 2019

to certify which witness my hand and seal of office.

__________________________

Notary Public, State of Texas

[Notary Public Seal]
REQUEST FOR
COMPETITIVE SEALED
PROPOSAL
Key ISD Maintenance and
Operations is accepting Competitive Sealed Proposals for the 2019 Campus Life Safety
and Specialty System upgrades by the "Proposal Due
Date" of Thursday, February 28, 2019 at 2:00 p.m. Proposi-
tions will be reviewed at Katy ISD's facility at 20400 Frantz
Road, Katy, TX 77496. A Pre-
Proposal Conference will be
held February 1, 2019, 9:30
a.m. at the above location. Pre-
qualification requirements and
proposal documents may be
secured at Salas-O'Brien
Engineers, Inc. 10390 W. Sam
Houston Pkwy. N., Suite 500
Houston, TX 77064 (281) 654-
1800 Proposal Evaluation Cr-
tera are published in the "IN-
STRUCTION TO PRO-
POSALS" section of the pro-
posal documents. Katy ISD re-
serves the right to postpone, to
modify or reject any or all re-
quests for proposals as it deems
fit to do in its best interest and to
waive formalities and reason-
able irregularities in this pro-
posal.

There is more $$ in
that old furniture,
clothes or knick-knack
than you thought. Sell
them in a garage sale,
by listing it in the Fort
Bend Herald Classifieds at 281-232-
3737.

NEED A classified? Call
281-232-3737.

705 Unfurnished
Apartment

BAYQUÉ BEND
APARTMENTS
Rosenberg's Best Kept Secret
REDUCED RATES
2x1 $945-$955 & 1/2 OFF 1st Months Rent
Water & Sani Included; Reserved Parking included
Unit Credit Approval. With this ad
2861 AIRPORT AVE, ROSENBERG
281-342-5990

930 Legal Notices

FORT BEND ISD, in accordance
Texas Education Code
44.031, Texas Government Code
2254, and Texas Gover-
ment Code 2256, is soliciting
prospective bids RFP
Supplemental Professional
Lending Consulting Ser-
vice RFP 18-064MC. Sub-
misions will be due
02/28/2019 @ 2:00 P.M. CST.
NO LATE BIDS WILL BE AC-
CEPTED. Contact: Maria Cas-
tellanos via email at marta.
castellanos@fortbendisd.co
mcmail.com; marta.castellanos@
fortbendisd.com. Bid may be
downloaded from:
http://purchasing.fortbend
isd.com/CurrentBids.aspx.
Mail response in a SEALED
envelope with RFP on outside
to: FBISD, 555 Juile
Rivera Drive, Sugar Land, TX
77478, ATTN: Maria Cast-
tellanos- RFP 18-064MC

930 Legal Notices

FORT BEND ISD, in accordance
Texas Education Code
44.031, Texas Government Code
2254, and Texas Gover-
ment Code 2256, is soliciting
prospective bids RFP
Supplemental Instructional
Resources for K-12: ELA, Math,
Science, Social Studies,
World Languages, Health, Physical Education,
STEM, Coding, Robotics RFP
18-065MC. Submissions will
be due 02/28/2019 @ 3:00
P.M. CST. NO LATE BIDS WILL BE ACCEPTED. Con-
act: Maria Castellanos via
e-mail at marta.castellanos@
fortbendisd.com; maria.castellanos@
fortbendisd.com. Bid may be
downloaded from:
http://purchasing.fortbend
isd.com/CurrentBids.aspx.
Mail proposal in a SEALED
envelope with RFP on outside
to: FBISD, 555 Juile
Rivera Drive, Sugar Land, TX
77478, ATTN: Maria Cast-
tellanos- RFP 18-065MC

PUBLIC NOTICE
FORT BEND COUNTY, TEXAS
FY 2017 COMMUNITY DEVELOPMENT BLOCK GRANT DISASTER
RECOVERY (CDBG-DR 4332)

Hurricane Harvey Infrastructure Application and
Hurricane Harvey Local Buyout and Acquisition Program
Application

In February of 2018, the federal government allocated Community Devel-
oping Block Grant disaster recovery (CDBG-DR) funds for the purpose of
assisting in long-term recovery from 2017 disasters. The U.S. Depart-
ment of Housing and Urban Development (HUD) was authorized under
this Act to distribute the funds to state grantees. The State of Texas
was required to submit a plan detailing the proposed use of all funds, includ-
ing the criteria for eligiblity and how the use of these funds will address
long-term recovery and restoration of infrastructure, housing, and eco-
nomic revitalization in the most impacted and distressed areas. Within the
State of Texas, these funds were distributed based on Methods of Distribu-
tion (MOD) developed by the Regional Councils of Government. The
Houston-Galveston Area Council (H-GAC) is responsible for administering
the hurricane recovery programs and guiding long-term and short-
term resilience efforts in the 13-county Gulf Coast Planning Region that
includes Fort Bend County. H-GAC developed a state-approved MOD for
approximately $241 million in CDBG-DR funds. Under this MOD, Fort
Bend County was allocated $21,153,575 for Local Buyout and Acquisi-
tion Program and $17,417,192 for a Local Infrastructure Program.

The Fort Bend County's draft Local Buyout Program and Infrastructure

applications include the proposed projects to be funded using CDBG-DR
Program funds and will be available for public review and comment from
Monday, February 4, 2019 to Tuesday, March 5, 2019. A public meeting
will be held on Thursday, February 21, 2019 at 10:00 a.m. at the William
B. Travis Building, 301 Jackson St., 7th Floor Meeting Room, Rich-
mond, Texas to receive comments from the public regarding the Hurri-
 cane Harvey Infrastructure Application and Hurricane Harvey Local Buy-
out and Acquisition Program Applications. Anyone interested is encour-
aged to attend and to submit comments to Maryann Kindell, Community
Development Director, at the Fort Bend County Community Development
Department, 301 Jackson St., Suite 602, Richmond, Texas, 77469. Comments
will be incorporated into the draft application documents, as appropriate.

Persons with vision or hearing impairments or other individuals with dis,
abilities requiring auxiliary aids and services may contact the department at
(281) 341-4410 regarding reasonable accommodations for the meeting.
Spanish language translators are available at the meeting for persons
with Limited English Proficiency. Persons requiring other language translators
must contact the department at least 48 hours prior to the meeting at
(281) 341-4410 to request translation services for the meeting.

1-31
RESOLUTION

Fort Bend County Community Development

Application to the Texas General Land Office for
Community Development Block Grant – Disaster Recovery Assistance

WHEREAS, the County Court of Commissioners finds it in the best interest of the citizens of Fort Bend County to participate in the infrastructure program through the Texas General Land Office for Community Development Block Grant – Disaster Recovery assistance regarding infrastructure affected by flooding in 2017; and

WHEREAS, an application must be submitted to the Texas General Land Office to participate in such program, and

WHEREAS, the County Court of Commissioners designates KP George, Fort Bend County Judge, as Fort Bend County’s authorized official with the power to apply, reject, alter or terminate the grant on behalf of Fort Bend County.

NOW THEREFORE, BE IT RESOLVED that the County Court of Commissioners approves submission of the grant application listed above by the Fort Bend County Judge to the Texas General Land Office.

Passed, Approved and Resolved on the 28th day of May, 2019.

KP George, County Judge

ATTEST:

Laura Richard, County Clerk
Maps

1. Big Creek Expansion Project – Project Map
   - This map shows the location and scope of the project. Also on this map is the latitude
     and longitude in decimal degrees for the center point of the project as well as the
     lat/long for the beginning and end points of the project.

2. Big Creek Project Overview – All Phases
   - This map shows all phases of the expansion and excavation of Big Creek. Fort Bend
     County has complete over 20 miles of expansion and excavation from the Brazos River up
     to FM 2977. This last phase (segment 5) is the project listed in this application.

3. Project Beneficiary Maps
   - PL 94-171 County Block Map (2010 Census): Fort Bend County, TX – CDBGUOGID
     489157_048
   - 2010 Census – Census Block Map: Pleak Village, TX – Place 58088

4. Floodplain (FIRM) Maps
   - FIRM Map – Fort Bend County
   - FIRM Map – Big Creek from FM 2977 to Spur 10
   - FIRMETTE – Big Creek at Pleak
Additional Information

Funding Information
- FEMA Coverage
  - Fort Bend County did not submit this project to FEMA for possible reimbursement under FEMA’s Public Assistance (PA) Program. This is due to the fact that Big Creek from FM 2977 up to its confluence at Coon Creek and Cottonwood Creek (near Spur 10) sustained little direct damage to the channel itself as a result of Hurricane Harvey. That said, the limited capacity of Big Creek’s channel meant that it was unable to contain the large amounts of water moving through the channel during Hurricane Harvey, causing flooding in homes, roads, and agricultural lands.
  - (Note that Fort Bend County did submit a FEMA Public Assistance Project Worksheet for damage that occurred to Big Creek further downstream.)
  - As stated in the application, this project was not submitted to the FEMA Hazard Mitigation Grant Program as this project did not meet the FEMA requirement of having a Benefit Cost Ratio of 1.1 or greater. Attached is the PowerPoint presentation (DR-4332 HMGIP applicant briefing FINAL 03292018) used by the Mitigation Unit of the Texas Division of Emergency Management (TDEM) that states projects must demonstrate the 1.1 Benefit Cost Ratio (see slide 14).
- Other Funding
  - In the past, Fort Bend County Commissioners Court allocated funds to contribute towards the previous phases of the expansion of Big Creek. Fort Bend County has had a recent change in leadership and subsequent changes in priorities. No funds have been allocated for this project at this time.

Project Detail
- The Fort Bend County Drainage District maintains the Big Creek channel and has existing easement along Big Creek, including through the Village of Pleak. Since the Fort Bend County Drainage District maintains the Big Creek channel, no agreement between Fort Bend County and the Village of Pleak is necessary. Instead, the Drainage District will see right-of-way entry to Big Creek from the individual property owners along Big Creek.
- The expansion and excavation of Big Creek from FM 2977 up to confluence at Cottonwood Creek and Coon Creek (near Spur 10) would provide immediate benefit the Village of Pleak, making the Village of Pleak the main service area for this project. The Village of Pleak is a Census Defined Place (Place 58088) with 64.33% LMI.
Benefit-Cost Analysis

- Hurricane wind retrofit
- $175,000 elevations in SFHA
- $276,000 acquisitions in SFHA
- Substantially damaged
- Pre-calculated benefits
- Greater benefit-cost ratio of 1:1 or
- Projects must demonstrate a

measures
1.0 INTRODUCTION

The Big Creek Expansion Project is located about five miles south of Rosenberg, Texas. This project proposes widening the creek from its intersection with FM 2977 to its confluence with Cottonwood Creek and Coon Creek. The excavation of this portion of the creek marks the last 18% (and furthest upstream) of the planned creek improvements in a multi-phase project. An initial screening of the benefits received in this project area indicate that the widening of the channel and addition of weirs will:

- Increase the channel’s capacity to convey a 10-year frequency rainfall event as well as reduce its floodplain levels; and
- Reduce the probability of structural and roadway flooding within the watershed.

The analysts compared the estimated construction costs of this final phase of the Big Creek Expansion project (i.e., $13,615,531) to the benefits anticipated from the modeled flood reductions. The BCA (Benefit Cost Analysis) indicated that the benefits received from the proposed final phase are not significant enough to obtain a Benefit Cost Ratio (BCR) that is greater than 1.0 – required to be eligible to receive FEMA Hazard Mitigation Grant Program funding. After testing multiple scenarios, the analysts concluded that the BCR would be a maximum of 0.09. The analysis indicates that the likely cause for this low score is that previous phases of the project have already maximized ultimate benefits.

Section 2 of this memorandum addresses the BCA screening inputs. The final BCA inputs are summarized in Appendix A.
2.1 ADJUSTMENTS TO RI

The Tetra Tech team conducted an analysis of the return intervals determined by the HEC-RAS models developed by AECOM and Dodson & Associates. This analysis was done to ensure the return intervals of the modeled flows were being represented based on the best available data. Using USGS gage data and USGS flood frequency analysis program, Peak FQ, the team found that the modeled flows have a lower return interval than previously presented and have been mischaracterized. The analytical team made adjustments to the original RIs for the modeled events to reflect the findings of the analysis (Table 1). While this discovery did not change the overall outcome of the BCA screening, it was critical when determining the overall benefits calculated by FEMAs BCA tool (Attachment A). Lower RIs result in greater benefits due to a higher likelihood of damaging storms which could be eliminated by a proposed project.

Table 1. AECOM and Dodson & Associates modeled return intervals versus the USGS Peak FQ (flood-frequency) analysis of streamflow records.

<table>
<thead>
<tr>
<th>Modeled RI (years)</th>
<th>Modeled Flow (cfs)</th>
<th>Peak FQ RI (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECOM Cross Section B5570.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4,167</td>
<td>4.8</td>
</tr>
<tr>
<td>25</td>
<td>5,395</td>
<td>8.5</td>
</tr>
<tr>
<td>50</td>
<td>6,376</td>
<td>13.6</td>
</tr>
<tr>
<td>100</td>
<td>7,416</td>
<td>22.4</td>
</tr>
<tr>
<td>500</td>
<td>10,046</td>
<td>78.7</td>
</tr>
</tbody>
</table>

2.2 STRUCTURAL ASSETS

The key limitation that the Tetra Tech analysts identified in the structural damages is that there are more outbuilding structures affected within the project area than residential structures (Table 2). For example, in the 100-year floodplain, 25 residential structures are flooded pre-mitigation compared to 53 outbuilding structures. This affects the expected damages seen on the site because outbuildings have a smaller replacement cost compared to residential structures (i.e., $199,732 vs $2,183,818 respectively).

Table 2. Example of Total Damages to Residential Structures and Outbuildings Pre-Mitigation.

<table>
<thead>
<tr>
<th>Return Interval</th>
<th>Total Damages to Residential Buildings Pre-Mitigation</th>
<th>Total Damages to Outbuildings Pre-Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.8</td>
<td>$550,962</td>
<td>$39,511</td>
</tr>
<tr>
<td>8.5</td>
<td>$879,756</td>
<td>$85,476</td>
</tr>
<tr>
<td>13.6</td>
<td>$1,348,070</td>
<td>$143,152</td>
</tr>
<tr>
<td>22.4</td>
<td>$2,183,818</td>
<td>$199,732</td>
</tr>
<tr>
<td>78.7</td>
<td>$5,343,751</td>
<td>$423,319</td>
</tr>
</tbody>
</table>

With only structural assets, the BCR was calculated at 0.06.
Appendix A. BCA Input

1.0 BCA DATA DOCUMENTATION

The analysis was performed by Jenn Lenart of Tetra Tech, Inc. under contract with Fort Bend County, TX. The damage frequency module of BCAR version 5.3.0 was utilized for this analysis. While there was data available to support the use of the full-data flood model, the sheer number of structures impacted by this project dictated use of the damage frequency module with data generated outside of BCAR version 5.3. This memorandum has been prepared to explain and document those BCAR data entries that require an explanation and citation of data source and act as a guide for the technical review of this benefit-cost analysis.

1.1 HAZARD AND MITIGATION DATA

The hazard type selected for this assessment was flood and the mitigation type selected was floodwater diversion and storage. The basis for the damages was expected damages.

1.2 COST ESTIMATION INFORMATION

The overall costs reflect current 2018 average low bids for the state of Texas. A breakdown of these prices has been provided by the project engineers.

1.2.1 Project Useful Life

The analyst utilized a project useful life of 35-years for this project. FEMA Guidance provides recommendations for major drainage systems and localized flood reduction projects at a range from 35 to 100 years for drainage improvement projects. Since there was not a project useful life suggested by the project engineers, the FEMA standard value of 35-years was chosen considering these suggestions and a lower bound analysis.

1.2.2 Mitigation Project Costs

A detailed project cost was developed and utilized during the BCA (Attachment B).

1.2.3 Annual Maintenance Cost

According to Fort Bend County and the Project Design Engineer, this project will require little or no post maintenance. However, to support the concept of a lower bound analysis, the analyst included a value of $1,000/year under the assumption that county and city staff will need to monitor the project area periodically during high flow events to confirm the project's functionality. This $1,000 was based on an estimate of 25 hours at $40/hour.
3.2 DISPLACEMENT COSTS

In part two of this assessment, the analyst used displacement costs that occurred in this project area. These values were determined using FEMA’s Full-data Flood Module displacement depth damage function (Figure 3). Under FEMAs BCA Flood Module, the current costs for federal lodging per diem is $91 per person and the current costs for federal meals per diem is $51.

Figure 3. Screen grab from FEMA’s BCA Flood Module to determine the trendline for displacement costs.

Using the flood depth curve, the analyst created a trendline that would determine the number of days pre-mitigation that residents would be displaced (Figure 4).

Figure 4. The trendline used to determine the number of days residents would be displaced during flood events depending on the feet of inundation for homes in the project area.

The depth of inundation as determined by the GIS analysis generated the number of days residents were displaced during a 10-, 50-, 100-, and 500-year flood event in the project area. The number of days displaced was multiplied against Fort Bend County’s average persons per household (i.e., 3.17) and cost
To: Fort Bend County

From: Troy Dorman, Peter Cada, Christy Williams, Jamie Childers, Ruben Martinez, Kim Truong, Jenn Lenart -- Tetra Tech

Date: Friday, July 27, 2018

Subject: Big Creek Channel Expansion Project – Frequency Analysis

The following memorandum discusses the frequency analysis performed on stream flows modeled by AECOM and Dodson & Associates using gage data from USGS gage 08115000 in Big Creek at Trinity Road and the USGS PeakFQ program.

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   2.2. Dodson & Associates........................................................................5
3.0 CONCLUSION..........................................................................................7

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Figure 3. Peak FQ flow duration curve for USGS gage 08115000 ..............................................4
Figure 2. Peak FQ fitted frequency curve of peak flow rates at USGS gage 08115000

Table 1. Peak FQ estimated annual exceedance probability and return intervals for flow rates at USGS gage 08115000

<table>
<thead>
<tr>
<th>Annual Exceedance Probability (AEP) (%)</th>
<th>Return Interval (RI) (years)</th>
<th>Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.5</td>
<td>1.01</td>
<td>612.3</td>
</tr>
<tr>
<td>99</td>
<td>1.01</td>
<td>699.3</td>
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<tr>
<td>98</td>
<td>1.02</td>
<td>809.7</td>
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<tr>
<td>97.5</td>
<td>1.03</td>
<td>851.9</td>
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<td>1.04</td>
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<td>1.05</td>
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<td>1.11</td>
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<td>1.25</td>
<td>1581</td>
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<td>70</td>
<td>1.43</td>
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<td>66.7</td>
<td>1.50</td>
<td>1995</td>
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<td>60</td>
<td>1.67</td>
<td>2209</td>
</tr>
<tr>
<td>57.0</td>
<td>1.75</td>
<td>2308</td>
</tr>
</tbody>
</table>
cross section geometries. Flow rates and return intervals were analyzed using the USGS gage 08115000 flow
duration curve for model cross section 85570.08, which corresponds to the USGS gage location. Using Peak FQ
data, AEP and return intervals (RI) for the AECOM modeled flows were calculated to be much more frequent than
presented in the model (Table 2). A 10-year return interval flow of 4,167 cfs was determined to be closer to a 5-
year return interval. Similarly by this analysis, a flow of 10,046 cfs, which was considered a 500-year event in the
AECOM model, was calculated to be closer to an 80-year event.

Table 2. AECOM post-project peak flow return intervals

<table>
<thead>
<tr>
<th>AECOM RI (years)</th>
<th>AECOM AEP (%)</th>
<th>AECOM Q Total (cfs)</th>
<th>Peak FQ AEP (%)</th>
<th>Peak FQ RI (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>4,167</td>
<td>21.0</td>
<td>4.8</td>
</tr>
<tr>
<td>25</td>
<td>4</td>
<td>5,395</td>
<td>11.7</td>
<td>8.5</td>
</tr>
<tr>
<td>50</td>
<td>2</td>
<td>6,376</td>
<td>7.3</td>
<td>13.6</td>
</tr>
<tr>
<td>100</td>
<td>1</td>
<td>7,415</td>
<td>4.5</td>
<td>22.4</td>
</tr>
<tr>
<td>500</td>
<td>0.2</td>
<td>10,046</td>
<td>1.3</td>
<td>78.7</td>
</tr>
</tbody>
</table>

2.2. Dodson & Associates

In 2003 Dodson & Associates developed a similar HEC-RAS model for the Big Creek Channel Improvement
Project and modeled post-project peak flow rates at multiple locations along Big Creek (Table 3). USGS gage
08115000 is located in between two of the modeled locations, Below Seabourne Creek Confluence and Below
Unnamed Tributary #1 (Figure 1). The peak flow for both locations were analyzed using the Peak FQ flow
duration curve. Calculated return intervals for the location below Seabourne Creek ranged from 2.4 years to 12.9
years for the same flow rates that were considered to be 5- and 100-year events in the Dodson & Associates
model (Table 4). The 5-year and 100-year events at the location below Unnamed Tributary #1 were determined
to be closer to 4- and 19-year events when compared to Peak FQ data for the same 3,540 cfs and 7,045 cfs flow
rates, respectively (Table 5).
3.0 CONCLUSION

The 20 highest peak flow rates at USGS gage 08115000 were reviewed within the context of the Peak FQ flow duration curve and are presented in Table 6 from highest to lowest peak flow. It can be seen that in the last 60 years there have been 5 events greater than Hurricane Harvey, one of which occurred in May 2015 and is the second highest on record. Hurricane Harvey, which would be considered to have a return interval between a 25-50-year by the AECOM model, is likely closer to a 12-year event. Of the 20 highest peak flows experienced at this gage, three of the events occurred in the last three years and according to the analysis have return intervals from 4-years to 20-years.

Using historical USGS gage data and USGS frequency analysis program, Peak FQ, this analysis has found that previously modeled peak flow return intervals have been mischaracterized. In both AECOM and Dodson & Associates HEC-RAS models, return intervals were presented to be longer than what was determined using Peak FQ data. This means that a peak flow rate that was characterized to have a probability of occurring only 1 time in 100 years could be more likely to occur once every 22 years. In other words, the creek will reach higher peak flow rates more frequently and pose more risk than previously presented.

Table 6. Highest 20 peak flows from available data at USGS gage 08115000 (1947-2018)

<table>
<thead>
<tr>
<th>Date</th>
<th>Gage Peak Flow (cfs)</th>
<th>Peak FQ AEP (%)</th>
<th>Peak FQ RI (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/26/1960</td>
<td>10,400</td>
<td>1.1</td>
<td>93.1</td>
</tr>
<tr>
<td>5/26/2015</td>
<td>7,250</td>
<td>4.8</td>
<td>20.7</td>
</tr>
<tr>
<td>9/20/1979</td>
<td>7,140</td>
<td>5.1</td>
<td>19.6</td>
</tr>
<tr>
<td>11/11/1985</td>
<td>6,490</td>
<td>6.9</td>
<td>14.4</td>
</tr>
<tr>
<td>8/31/1981</td>
<td>6,420</td>
<td>7.2</td>
<td>13.9</td>
</tr>
<tr>
<td>8/27/2017</td>
<td>6,160</td>
<td>8.1</td>
<td>12.3</td>
</tr>
<tr>
<td>6/19/1961</td>
<td>6,050</td>
<td>8.6</td>
<td>11.7</td>
</tr>
<tr>
<td>10/18/1994</td>
<td>6,000</td>
<td>8.8</td>
<td>11.4</td>
</tr>
<tr>
<td>10/15/2006</td>
<td>4,600</td>
<td>17.1</td>
<td>5.8</td>
</tr>
<tr>
<td>10/15/1957</td>
<td>4,500</td>
<td>17.9</td>
<td>5.6</td>
</tr>
<tr>
<td>8/18/1983</td>
<td>4,380</td>
<td>19.0</td>
<td>5.3</td>
</tr>
<tr>
<td>4/18/2009</td>
<td>4,330</td>
<td>19.5</td>
<td>5.1</td>
</tr>
<tr>
<td>6/13/1973</td>
<td>4,220</td>
<td>20.5</td>
<td>4.9</td>
</tr>
<tr>
<td>11/18/2003</td>
<td>4,050</td>
<td>22.2</td>
<td>4.5</td>
</tr>
<tr>
<td>5/30/1975</td>
<td>4,000</td>
<td>22.8</td>
<td>4.4</td>
</tr>
<tr>
<td>5/13/1982</td>
<td>3,960</td>
<td>23.2</td>
<td>4.3</td>
</tr>
<tr>
<td>11/23/2004</td>
<td>3,940</td>
<td>23.4</td>
<td>4.3</td>
</tr>
</tbody>
</table>
ATTACHMENT B

Project Costs
<table>
<thead>
<tr>
<th>Item/Description</th>
<th>Quantity</th>
<th>Unit of Measure</th>
<th>Cost Per Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 Clearing and grubbing</td>
<td>127.41</td>
<td>AC</td>
<td>$4,800.00</td>
<td>$613,558.00</td>
</tr>
<tr>
<td>110 Excavation and Hauling</td>
<td>42582.22</td>
<td>CY</td>
<td>$15.00</td>
<td>$63,873.30</td>
</tr>
<tr>
<td>110 Backslope Drains (1000' max spacing)</td>
<td>54</td>
<td>EA</td>
<td>$4,284.41</td>
<td>$235,884.16</td>
</tr>
<tr>
<td>760 - 6001 Ditch cleaning and reshaping (backslope swales)</td>
<td>52856</td>
<td>LF</td>
<td>$3.17</td>
<td>$167,553.52</td>
</tr>
<tr>
<td>164 &amp; 166 Drill Seeding (PERM) (WARM or COOL) &amp; Fertilizing</td>
<td>127.41</td>
<td>AC</td>
<td>$1,095.85</td>
<td>$139,672.50</td>
</tr>
<tr>
<td>506 Stabilized Construction Exit (TY 1) (Install)</td>
<td>333.3</td>
<td>SY</td>
<td>$31.20</td>
<td>$10,398.56</td>
</tr>
<tr>
<td>506 Stabilized Construction Exit (Remove)</td>
<td>333.3</td>
<td>SY</td>
<td>$9.08</td>
<td>$3,026.36</td>
</tr>
<tr>
<td>247 Staging Area (Flexible Base CMB in place, TYA GR1-2) (5')</td>
<td>1500</td>
<td>SY</td>
<td>$18.44</td>
<td>$27,660.00</td>
</tr>
<tr>
<td>506 Temporary Sediment Control Fence (Install)</td>
<td>58080</td>
<td>LF</td>
<td>$3.37</td>
<td>$178,421.76</td>
</tr>
<tr>
<td>506 Temporary Sediment Control Fence (Remove)</td>
<td>58080</td>
<td>LF</td>
<td>$0.82</td>
<td>$55,555.92</td>
</tr>
<tr>
<td>506 Biodegradation Erosion Control Logs 12' (Install)</td>
<td>58080</td>
<td>LF</td>
<td>$6.04</td>
<td>$345,570.88</td>
</tr>
<tr>
<td>506 Biodegradation Erosion Control Logs (Remove)</td>
<td>58080</td>
<td>LF</td>
<td>$1.15</td>
<td>$66,908.16</td>
</tr>
<tr>
<td>Item/Description</td>
<td># of Hours</td>
<td>Unit of Measure</td>
<td>Rate</td>
<td>Total Cost</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------</td>
<td>-----------------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>506 Stabilized Construction Exit (install)</td>
<td>128.19211</td>
<td>Hour</td>
<td>$110.00</td>
<td>$14,101.15</td>
</tr>
</tbody>
</table>
### Other Costs (including fees paid and other project costs)

<table>
<thead>
<tr>
<th>Item/Description</th>
<th>Quantity</th>
<th>Unit of Measure</th>
<th>Unit Cost/Rate</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 Mobilization</td>
<td>0.05</td>
<td>PCNT</td>
<td>$8,228,084.23</td>
<td>$411,404.21</td>
</tr>
<tr>
<td>Engineer Fee</td>
<td>0.12</td>
<td>PCNT</td>
<td>$8,228,084.23</td>
<td>$987,370.11</td>
</tr>
<tr>
<td>Program Management Fee</td>
<td>0.03</td>
<td>PCNT</td>
<td>$8,228,084.23</td>
<td>$246,842.53</td>
</tr>
<tr>
<td>Administrative Fee</td>
<td>0.04</td>
<td>PCNT</td>
<td>$8,228,084.23</td>
<td>$329,123.37</td>
</tr>
<tr>
<td>Public Outreach</td>
<td>0.01</td>
<td>PCNT</td>
<td>$8,228,084.23</td>
<td>$82,280.84</td>
</tr>
<tr>
<td>Material Testing</td>
<td>0.015</td>
<td>PCNT</td>
<td>$8,228,084.23</td>
<td>$123,421.26</td>
</tr>
<tr>
<td>Construction Contingency</td>
<td>0.2</td>
<td>PCNT</td>
<td>$8,635,488.44</td>
<td>$1,727,897.69</td>
</tr>
<tr>
<td>Engineer Contingency</td>
<td>0.04</td>
<td>PCNT</td>
<td>$8,228,084.23</td>
<td>$329,123.37</td>
</tr>
<tr>
<td>Land acquisition</td>
<td>1</td>
<td>Each</td>
<td>$1,115,882.26</td>
<td>$1,115,882.26</td>
</tr>
<tr>
<td>Perform environmental site assessments</td>
<td>1</td>
<td>Each</td>
<td>$20,000.00</td>
<td>$20,000.00</td>
</tr>
</tbody>
</table>