#### NOTICE OF OPEN MEETING OF THE SAN ANTONIO REGIONAL FLOOD PLANNING GROUP TECHNICAL SUBCOMMITTEE

Region 12 San Antonio RFPG

02/09/2023

1:00 PM

TAKE NOTICE that a meeting of the Technical Subcommittee of the San Antonio Regional Flood Planning Group as established by the Texas Water Development Board will be held on Thursday, February 9, 2023, at 1:00 PM, in-person at the San Antonio River Authority, located at 100 E. Guenther St and virtually at https://meet.goto.com/955587445.

#### Agenda:

- 1. (1:00 PM) Roll-Call
- 2. Public Comments limit 3 minutes per person
- 3. Review Progress on Task 12
- 4. Public Comments limit 3 minutes per person
- 5. Date and Potential Agenda Items for Next Meeting
- 6. Adjourn

If you wish to provide written comments prior to or after the meeting, please email your comments to <u>khayes@sariverauthority.org</u> or physically mail them to the attention of Kendall Hayes at San Antonio River Authority, 100 E. Guenther, San Antonio, TX, 78204 and include "Region 12 San Antonio Flood Planning Group Meeting" in the subject line of the email.

Additional information may be obtained from: Kendall Hayes, (210) 302-3641, <u>khayes@sariverauthority.org</u>, San Antonio River Authority, 100 E. Guenther, San Antonio, TX 78204.





#### Amended 2023 San Antonio Regional Flood Plan Project Summary Sheet

Project Name: Project Limits:	Floresville: Project From US Highway Lodi Branch.	1A, B, C 181 to 3000 feet upstream along	N DEFEN
Watershed:	Lodi Branch		
Future Project #:	XX		The second secon
Benefit Cost Analysis		<b>Cost Information</b>	Bar at at a start and a start
Event DamagesBaseline10-year storm25-year storm100-year storm\$ 2,79BCA0.02	Project 1,157 \$ 2,083,814 ,	CategoryCostDesign\$1,178,874Real Estate\$313,194Environmental\$10,900Construction\$2,992,426Total Cost*\$4,500,000*Rounded up to the nearest ten thousand	Legend Contours (IR) Contours (IR) Streams Project Conditions 1% Future Chance Lising Conditions 1% Future Chance
<b>Project Description</b> Detention pond, channel improvem flooding, aid in removing the major the 100-year flow. The proposed de Alley and store approximately 60-a from the confluence with Lost Sprin feet long with a bottom width of 10 Highway 181, this project proposes will reduce flooding issues and imp	ents, and additional culverts and rity of the existing structures fr etention pond will be located al cres-ft. The proposed channel ngs Hallow to US Highway 18 0 feet. Currently there are nines to add three additional 4-foot prove access to businesses and	re required to reduce the downstream om the FEMA floodplain and convey long Lodi Branch north of Haddox improvements run along Lodi Branch, 1. The proposed channel will be 1,200 e 4-foot by 7-foot culverts under by 7-foot. The proposed improvements neighborhoods in the area.	Reculteratives as as as a second seco
Project Type:	Drainage		430 Legend Contours (10ft.)
Type of Estimate:	Planning		Lodi Contoura (6t.) Streams Project Boundary Building Foolprints
Project Status:	Unfunded		Post-Project Conditions 1% Future Chance Existing Conditions 1% Future Chance
Consultant:	HDR		

Amended 2023 San Antonio Regional Flood Plan - Project Narrative

Project Name:	Damage Center 1: Project 1A, B, C
FME ID:	121000150
<b>Project Sponsor:</b>	City of Floresville
Date:	2/6/2023

#### **BACKGROUND INFORMATION:**

As part of the amended 2023 San Antonio Regional Flood Plan (the Plan), Task 12 expands on previously identified FMXs from the Plan dated January 10<sup>th</sup>, 2023. The Damage Center 1: Project 1A, 1B, 1C, FME ID 121000150, from the 2012 Wilson County Watershed Master Plan was further developed during Task 12. The sponsor for this project is the City of Floresville.

The problem area is located along Lodi Branch, where it confluences with Lost Springs Hallow just upstream of US Highway 181. Currently there is a backwater effect on Lodi Branch from Lost Springs Hallow flooding the surrounding structures. The backwater effect is in part due to conveyance issues under US Highway 181 from the existing nine 4-foot by 7-foot culverts. The limited conveyance results in US Highway 181 overtopping during the 100-year storm.

The Task 12 work that was completed for the Damage Center 1 project was an update to the cost estimate, impact analysis, and a Benefit Cost Analysis (BCA).

#### PROPOSED PROJECT SCOPE

Detention pond, channel improvements, and additional culverts are required to reduce the downstream flooding, aid in removing the majority of the existing structures from the FEMA floodplain and convey the 100-year flow. The proposed detention pond will be located along Lodi Branch north of Haddox Alley and store approximately 60-acres-ft. The proposed channel improvements run along Lodi Branch, from the confluence with Lost Springs Hallow to US Highway 181. The proposed channel will be 1,200 feet long with a bottom width of 100 feet. Currently there are nine 4-foot by 7-foot culverts under Highway 181, this project proposes to add three additional 4-foot by 7-foot. The proposed improvements will reduce flooding issues and improve access to businesses and neighborhoods in the area.

#### PROPOSED PROJECT SCOPING COST

Refer to the Amended Flood Plan Technical Memo for documented assumptions and methodologies on project costs.

The estimated the project construction cost was \$2,274,293 in the 2012 Wilson County Watershed Master Plan. A Construction Cost Index (CCI) factor of 1.25 was applied to convert the costs from 2012 to 2020 dollars. These costs were combined with additional project costs (Design, Permitting, Project Management, etc.) resulting in a project cost of \$4,495,393. See attached Floresville Cost Summary for cost breakdown. There are underground utilities that require adjustments, this may increase depending upon any additional adjustments required. At this time, funding for the project has not been identified or approved.

#### **PROPOSED PROJECT BENEFITS**

This project will eliminate overtopping at US Highway 181 and improve the level of service by providing a 100-year conveyance design. The detention and channelization will improve the flooding in the surrounding community and remove structures from the FEMA floodplain.

Amended 2023 San Antonio Regional Flood Plan - Project Narrative					
Project Name:	Damage Center 1: Project 1A, B, C				
FME ID:	121000150				
<b>Project Sponsor:</b>	City of Floresville				
Date:	2/6/2023				

Refer to the Amended Flood Plan Technical Memo for documented assumptions and methodologies on benefit cost analysis.

The 100-year benefits that were evaluated for this project include; residential buildings and commercial buildings. The resulting benefit cost analysis was 0.02. The Table 1 below summarizes the components calculated in the TWDB BCA Tool.

Input Into BCA Toolkit		
Project Useful Life	30	
Event Damages	Baseline	Project
100 - year storm	\$2,791,157	\$2,083,814
Total Repotits from BCA Toolkit	\$27 760	
Other Benefits (Not Recreation)	\$0,709	
Recreation Benefits	-	
Total Costs	\$4,978,424	
Net Benefits	-\$4 890 655	
Net Benefits with Recreation	-\$4,890,655	
Final BCR	0.02	
Final BCR with Recreation	0.02	

#### Table 1: TWDB BCA Toolkit

#### **IMPACT ANALYSIS**

Refer to the Amended Flood Plan Technical Memo for documented assumptions and methodologies on impact analysis.

Existing and proposed conditions were analyzed for impact, the impacts that were evaluated were the water surface elevations (wse), velocities, and flooded buildings. The wse and velocities were compared in the HEC-RAS v4.1 model, see attached digital submittal for Table 1: HEC-RAS Existing vs Proposed Results Comparison Summary - the proposed conditions showed reduced levels with both components. From the RAS results, the total inundated boundary was reduced in proposed conditions, see Exhibits 1-3 for existing,

Amended 2023 Sa	an Antonio Regional Flood Plan - Project Narrative
Project Name:	Damage Center 1: Project 1A, B, C
FME ID:	121000150
<b>Project Sponsor:</b>	City of Floresville
Date:	2/6/2023

proposed, and a comparison of flooded areas. Flooded building depths were evaluated in the BCA, reduced impacts show lower flooded depths in proposed conditions. The following table summarizes the total amount of impacted structures in each storm;

#### Table 2: Total Impacted Structures per Storm Frequency

Storm (Year)	Existing	Proposed	Difference	
100	38	28	-10	

(See full list of impacted buildings, in the attached BCA results as well as Table 2: BCA Flooded Depth Structure Comparison)

#### PROJECT RISKS

ROW/Real Estate Acquisition:

Yes, land acquisition is required.

Utilities Coordination:

Yes, there is possible utility conflict running underground along US Highway 181. The proposed culverts would cause them to relocate.

Permitting/Environmental:

Yes, a USACE nationwide permit and a TxDOT ROW Permit will be required.

Stakeholder coordination:

Due to the land acquisition, road improvement, and utility relocation, there will be various stakeholders involved in the process.

#### **MITIGATION OF RISKS**

ROW/Real Estate Acquisition:

Land will need to be acquired to build the detention pond, potential increase in cost could acquire depending on the admin costs.

Utility Coordination:

The utility coordinator will need to closely work with the affected utility companies to ensure timely completion of the proposed project. The project manager and contractor should minimize, as much as feasible, the amount of disruption of services and travel.

Permitting/Environmental:

Coordination and permitting process should be started early on with USACE and TxDOT acquisitions to avoid schedule delays.

Stakeholder Coordination:

US Highway 181 is the main access for several commercial properties. Road reconstruction will cause traffic disruptions and inconveniences for businesses due to limited alternative access points. Public

Amended 2023 San Antonio Regional Flood Plan - Project NarrativeProject Name:Damage Center 1: Project 1A, B, CFME ID:121000150Project Sponsor:City of Floresville

meetings and flyers will help communicate construction impacts to affected businesses of any service interruption or inconvenience. The businesses near the project limits should be notified several weeks before the construction start date. Construction phasing and traffic control will be an important design component for this project.

#### NATURE BASED SOLUTION CONSIDERATION

2/6/2023

During the design phase, nature-based solutions could be considered for this project. This project could incorporate natural channel design components and possible floodplain buffers. To preserve the open space, the space used for the proposed detention pond could include a park as a recreational benefit.

#### **INTERRELATED PROJECTS**

Date:

Originally in the 2012 Wilson County Watershed Master Plan the different components of this project were split (1A Detention, 1B Culvert Improvement, and 1C Channelization). However, in order to have the most benefit, it is recommended to construct these components together.

#### SAN ANTONIO REGIONAL FLOOD PLAN COST ESTIMATE PROJECT ESTIMATE SUMMARY FORM

Version: 7/2/2021

Project Number:	xx	
Project Name:	Floresville: Project 1A, B, C	
Project Limits:	From US Highway 181 to 3000 feet upstream along	g Lodi Branch.
Council District:	N/A	
Ferguson's Page #:	0	
Firm Developing:	HDR	
Person Developing:	LV	
Date Developed:	1/0/1900	
Unit Prices Used:	11/1/2020	
CONSTRUCTION CO - STREET COST - DRAINAGE COST	STS	\$0.00 \$1,927,885.72
- TRAFFIC COST		\$0.00
- TREE PRESERVA	ΓΙΟΝ (2%)	\$38,557.71
- LANDSCAPING (39	%)	\$57,836.57
- BOND AND INSUR	ANCE (3%)	\$60,728.40
- BARICADES (3%)		\$62,550.25
- MOBILIZATION &	PREPARATION OF R.O.W. (11% + 4%)	\$303,642.00
TOTAL CONSTRUCT	ION COST ESTIMATE	\$2,451,200.65
PROGRAM MANAGE	MENT FEE (0% of Costs)	\$0.00
<b>ENGINEER FEE (Fee</b>	Table plus 5%)	\$404,448.11
ENGINEER CONTING	ENCY (10%)	\$40,444,81
<b>CONSTRUCTION CO</b>	NTINGENCY (10%)	\$245,120.07
<b>DESIGN ENHANCEM</b>	ENT (0% Construction Costs)	\$0.00
PERMIT REQUIREME	INT COSTS	\$628,000.00
UTILITY RELOCATIO	N COSTS	\$0.00
<b>RIGHT-OF-WAY (LAN</b>	ID ACQUISITION)	\$284,834.00
<b>RIGHT-OF-WAY SUR</b>	VEY	\$2,500.00
ENVIRONMENTAL		\$10,000.00
<b>MATERIAL TESTING</b>	(2% Construction Cost - <\$3M, 1.5% - >\$3M)	\$49,024.01
FEMA FLOOD PLAIN	STUDY	\$0.00
<b>PROJECT ADMIN. (9</b>	%)	\$370,401.45
<b>PRIMELink Costs (0.2</b>	21%)	\$9,420.54
INFLATION FACTOR	(0% compounded for 5 years)	\$0.00
TOTAL PROJECT CO	OST ESTIMATE	\$4,495,393.64
DESIGN PHASE		\$1 502 967 88
CONSTRUCTION PH	ASE	\$2,992.425.76
		, ,,

FEMA BCA Calculator - https://bcaofficeaddin-prod.azurewebsites.net/projects?\_host\_Info=Excel\$Win32\$16.01\$en-US\$telemetry\$isDialog\$\$0

+ Add Project ←I Import Projects → Export Projects 📮 Batch Processing 前 Delete Projects



			Using 7% Discount Rate Using 3% Discount Rate (For FY22 BRIC and FMA only)			t Rate MA only)			
Select	Project Title 🔻	County, State	Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	Сору
<ul> <li>Image: A start of the start of</li></ul>	Damage Center 1: Project 1A, B, C	Wilson, TX	\$ 87,769	\$ 1	87,769.00	\$ 138,634	\$ 1	138,634.00	ß
TOTAL	_ (SELECTED)		\$ 87,769	\$ 1	87,769.00	\$ 138,634	\$ 1	138,634.00	
TOTAL	-		\$ 87,769	<b>\$</b> 1	87,769.00	\$ 138,634	\$ 1	138,634.00	



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### ☑ **□** View Case Studies



This workbook has been designed to work in conjunction with FEMA's BCA Toolkit v6.0 to calculate the Benefit-Cost Ratio (BCR) of flood risk management projects for the Texas Water Development Board (TWDB).

The BCA Input Workbook is designed to help collate the necessary input data and to calculate the Baseline (Before Mitigation) and Project (After Mitigation) Damages. These damages are then input into the FEMA BCA Toolkit to calculate the Project benefits.

Instructions on how to download and install the FEMA BCA Toolkit v6.0 can be found here. Please refer to Model Instructions for detailed instructions on how to use this workbook. Input cells are highlighted green.

The TWDB BCA Input Workbook calculates benefits from the following benefit areas, which will be input into the BCA Toolkit:

Structure damages & associated loss of function Reduction in street flooding Utility loss of function Agricultural damages Low water crossings replacements

The following benefit areas are calculated entirely in the BCA Toolkit: Critical facility loss of function

The following benefit areas are calculated entirely in the TWDB BCA Input Workbook:

Recreation benefits Water supply benefits Environmental benefits of green infrastructure Residual value of investment



Project Name	Damage Center 1: Project 1A, B, C		
Project Region	Region 12		
Project Type	drainage improvements		
Start Construction Vear	2021		
End Construction Year	2022		

Input up to 3 Recurrence Intervals for which you have water level (H&H) data.

At least 1 Recurrence Interval must be the 100-year storm.

Recurrence Intervals must be input in decreasing order of likelihood (i.e., 50-year storm before 100-year storm).

Recurrence Interval 1 Recurrence Interval 2 100 year storm

#### **Types of Project Impacts**

Residential Structure Damage Reduction
Commercial Structure Damage Reduction
Critical Facility (Police, Fire, Hospital) Loss of Function Reduction
Reduction in Street Flooding
Utility Outage Reduction
Agricultural Damage Reduction
Water Supply Benefits
Recreation Benefits
Does this project include Green Infrastructure elements?

Does this project include Green Infrastructure elements? Does this project replace a low-water crossing? Input structure data and water levels in 'Residential\_Structu Input structure data and water levels in 'Commercial\_Struct

Yes

Yes No No No No No

No

No



rres' sheet; Damage totals will be shown in 'Total Impacts'
ures' sheet; Damage totals will be shown in 'Total Impacts'

# Texas Water Composition Development Board

Capital Cost	
Right-of-Way	
Utility Relocation	
Construction	\$4,495,394
Total Capital Cost	\$4,495,394
<b>Operations &amp; Maintenance (O&amp;M</b>	)
Baseline Annual O&M	
Project Annual O&M	
Increased Annual O&M	\$0
Project Lifespan (years)	30



Address or Business Name	Structure Type	Basis of Value	Structure Value	Square Footage
1 Commercial	Retail - Clothing	Square Footage		195.3
2 Commercial	Retail - Clothing	Square Footage		146.7
3 Commercial	Retail - Clothing	Square Footage		990.8
4 Commercial	Retail - Clothing	Square Footage		53.3
5 Commercial	Retail - Clothing	Square Footage		62.7
6 Commercial	Retail - Clothing	Square Footage		356.6
7 Commercial	Retail - Clothing	Square Footage		281.7
8 Commercial	Retail - Clothing	Square Footage		326.5
9				

2,414



	100 - year storm													
	Baseline Flood Depth	Baseline Damages	Project Flood Depth	Project Damages										
1	2"	\$646	0											
2	19"	\$2,718	0											
3	34"	\$26,901	15"	\$15,799										
4	42"	\$1,692	21"	\$1,057										
5	24"	\$1,365	0											
6	39"	\$10,692	19"	\$6,608										
7	36"	\$7,952	16"	\$4,674										
8	8"	\$3,177	0											
9														
		\$55,143		\$28,137										

	24965 S	24731 S	24726 S	24691 S	24671 S	24490 S	24446 S	24170 S	24156 S	24139 S	24137 S	23749 S	23669 S	23638 S	23505 S	23373 S	23224 S	23216 S	23209 S	23194 S	23180 S	23146 S	23137 S	25840 S	25279 S	25107 S	25091 S	25059 S	25008 S	24999 S	Location S	Stru
	mall Home	tructure Type Number of Structures	cture Information																													
30	1 12"	1 13"	1 35"	1 48"	1 22"	1 5	1 14"	1 26"	1 20"	1 26"	1 26"	1 28"	1 11"	1 22"	1 24"	1 28"	1 14"	1 18"	1 21"	1 11"	1 11"	1 4"	1 1"	1 9"	1 6"	1 14"	1 7"	1 5"	1 43"	1 26"	<b>Baseline Flood Depth</b>	

\$1,021,410	\$32,397	\$33,068	\$43,660	\$47,890	\$39,110	\$20,142	\$33,740	\$41,035	\$37,767	\$41,035	\$41,035	\$41,619	\$30,890	\$39,110	\$40,452	\$41,619	\$33,740	\$36,425	\$38,439	\$30,890	\$30,890	\$17,273	\$11,938	\$27,873	\$23,350	\$33,740	\$24,857	\$20,142	\$46,249	\$41,035	<b>Baseline Damages</b>	100 - year
	2"	8	23"	38"	11"	0	9"	18"	11"	20"	18"	23"	7"	17"	20"	24"	11"	16"	17"	<u>8</u>	9"	0	0	9"	0	3"	0	0	33"	6"	Project Flood Depth	storm
\$773,051	\$20,142	\$26,366	\$39,781	\$44,608	\$30,890		\$27,873	\$36,425	\$30,890	\$37,767	\$36,425	\$39,781	\$24,857	\$35,753	\$37,767	\$40,452	968'05\$	\$35,082	\$35,753	\$26,366	\$27,873			\$27,873		\$13,010			\$43,077	\$23,350	<b>Project Damages</b>	



	100 - year	r storm
Project Impacts by Recurrence Interval	Baseline	Project
Residential Flood Damage	\$2,677,298	\$2,025,168
Commercial Flood Damage	\$113,859	\$58,646
Flooded Streets		-
Utility Impacts		-
Agricultural Losses		-
Low Water Crossing Damages		
	100 - year	r <b>storm</b>
	100 100	. ctorm
Flooded Structures by Recurrence Interval	100 - year Baseline	r storm Project
Flooded Structures by Recurrence Interval	100 - year Baseline	r storm Project 24
Flooded Structures by Recurrence Interval Flooded residential structures	100 - year           Baseline           30           90	r storm Project 24 72
Flooded Structures by Recurrence Interval Flooded residential structures Impacted Residents Flooded commercial structures	100 - year           Baseline           30           90           8	r storm Project 24 72 4
Flooded Structures by Recurrence Interval Flooded residential structures Impacted Residents Flooded commercial structures Impacted Employees	100 - year           Baseline           30           90           8           80	r storm Project 24 72 40
Flooded Structures by Recurrence Interval Flooded residential structures Impacted Residents Flooded commercial structures Impacted Employees	100 - year           Baseline           30           90           8           80	r storm Project 24 72 40
Flooded Structures by Recurrence Interval Flooded residential structures Impacted Residents Flooded commercial structures Impacted Employees Other Project Impacts	100 - year       Baseline       30       90       80       80	r storm Project 24 72 40
Flooded Structures by Recurrence Interval Flooded residential structures Impacted Residents Flooded commercial structures Impacted Employees Other Project Impacts Water Supply Benefits	100 - year         Baseline         30         90         90         80         80         80         80         80         80         90<	r storm Project 24 72 4 40
Flooded Structures by Recurrence Interval Flooded residential structures Impacted Residents Flooded commercial structures Impacted Employees Other Project Impacts Water Supply Benefits Environmental Benefits	100 - year         Baseline         30         90         8         80 </td <td>r storm Project 24 72 40</td>	r storm Project 24 72 40
Flooded Structures by Recurrence Interval Flooded residential structures Impacted Residents Flooded commercial structures Impacted Employees Other Project Impacts Water Supply Benefits Environmental Benefits Residual Value of Investment	100 - year           Baseline           30           30           90           80	r storm Project 24 72 40 40



## Texas Water Development Board

Input Into BCA Toolkit		
Project Useful Life	30	
Event Damages	Baseline	Project
100 - year storm	\$2,791,157	\$2,083,814
Total Benefits from BCA Toolkit	\$87,769	
Other Benefits (Not Recreation)	\$0	
Recreation Benefits	-	
Total Costs	\$4,978,424	
Net Benefits	-\$4,890,655	
Net Benefits with Recreation	-\$4,890,655	
Final BCR	0.0	
Final BCR with Recreation	0.0	













River Station         Location         USELINITY         VIEVING	Table 1: HEC-RAS Existing vs Proposed Results Comparison Summary												
New Station         Q <sub>0</sub> xn         WSEL <sub>0x70</sub> V <sub>11x70</sub> Q <sub>10</sub> xn         W <sub>0</sub> xn				Existing			Proposed			Difference			
Deck         (cfs)         (ft)         (fts)         (	River Station	Location	Q <sub>(1% FC)</sub>	WSEL <sub>(1% FC)</sub>	V <sub>(1% FC)</sub>	<b>Q</b> <sub>(1% FC)</sub>	WSEL <sub>(1% FC)</sub>	V <sub>(1% FC)</sub>	∆ <b>Q</b> <sub>(1% FC)</sub>	∆ <b>WSEL</b> (1% FC)	∆ <b>V <sub>(1% FC)</sub></b>		
26733         US Limit         290         466.81         3.16         290         466.84         3.03         -         0.03         -0.13           225732         290         465.69         1.52         290         465.67         1.54         -         -0.14         0.02         0.02           25322         1403         455.48         3.47         1403         455.47         1.54         -         -         -           24066         1403         449.40         2.63         1403         446.81         3.19         -         -         -         -           23966         1403         449.00         2.63         1403         446.10         2.63         -			(cfs)	(ft)	(fps)	(cfs)	(ft)	(fps)	(cfs)	(ft)	(fps)		
2225         200         451.75         2.79         200         451.81         3.16         -         -         0.10         0.02           25322         1403         453.46         3.47         1403         453.46         3.47         -         -         -         0.02           2532         1403         453.46         3.47         1403         453.46         3.47         -<	26733	US Limit	290	466.81	3.16	290	466.84	3.03	-	0.03	-0.13		
25732         280         455.69         1.52         280         455.67         1.54         -         -0.02         0.02           2242         1403         451.77         3.64         1403         451.77         3.64         -         -         -           24066         1403         448.00         2.63         1403         448.00         2.63         1403         448.00         2.63         -         -         -           23068         1403         448.01         3.45         1403         446.21         3.45         1403         446.21         3.45         -	26285		290	461.75	2.79	290	461.61	3.16	-	-0.14	0.37		
25242         1403         453.46         3.47         1403         453.46         3.47         .<	25732		290	455.69	1.52	290	455.67	1.54	-	-0.02	0.02		
24797         1403         445177         3.64         1403         445.77         3.64         1403         449.84         3.19         1403         449.84         3.19         1403         449.84         3.19         1.03         449.84         3.19         2.366           23966         1403         448.01         2.63         1403         446.21         3.45         1.463         3.45         1.57         1.57         1.57         1.57         1.669         439.32         6.97         1.5         1.56         1.669         439.52         6.97         1.5 <td>25242</td> <td></td> <td>1403</td> <td>453.46</td> <td>3.47</td> <td>1403</td> <td>453.46</td> <td>3.47</td> <td>-</td> <td>-</td> <td>-</td>	25242		1403	453.46	3.47	1403	453.46	3.47	-	-	-		
24406         1403         449.44         3.19         1403         449.44         3.19         .         .         .           23566         1403         448.00         2.63         1403         448.00         2.63         .	24797		1403	451.77	3.64	1403	451.77	3.64	-	-	-		
2366         1403         448.00         2.63         -         -         -           23699         1403         446.21         3.45         1403         446.20         3.45         1403         446.20         3.45         1403         446.20         3.45         1403         446.27         3.45         1403         446.27         3.45         1403         446.27         3.45         1403         446.27         -	24406		1403	449.84	3.19	1403	449.84	3.19	-	-	-		
23669         1403         446.21         3.45         1-0         -         -         -           22639         1.587         443.70         3.00         1587         443.70         3.00         - </td <td>23966</td> <td></td> <td>1403</td> <td>448.00</td> <td>2.63</td> <td>1403</td> <td>448.00</td> <td>2.63</td> <td>-</td> <td>-</td> <td>-</td>	23966		1403	448.00	2.63	1403	448.00	2.63	-	-	-		
23069         1587         443.70         3.00         1         1         443.70         443.70         3.00         1         1         1           22016         1669         439.32         6.97         1669         439.32         6.97         1         6.97         1	23569		1403	446.21	3.45	1403	446.21	3.45	-	-	-		
22638         .         442.57         .         .         442.57         .	23069		1587	443.70	3.00	1587	443.70	3.00	-	-	-		
22016         1669         433.32         6.97         1669         433.32         6.97         .         .         .           21382         1669         438.38         1.55         1669         438.32         0.79         .         .         .            20742         1669         438.32         0.79         1669         438.42         5.22              20626         SH 97         0          0.00         0          0.00	22638		-	442.57	-	-	442.57	-	-	-	-		
21382         1669         438.38         1.55         1669         438.38         1.55         -         -         -           20742         1669         438.32         0.79         1669         438.32         0.79         -	22016		1669	439.32	6.97	1669	439.32	6.97	-	-	-		
20742(1669) $438.32$ $0.79$ $1669$ $438.22$ $0.79$ $$	21382		1669	438.38	1.55	1669	438.38	1.55	-	-	-		
20626         SH 97         0         .         0.00         0         .         0.00         .         .         0.00         .	20742		1669	438.32	0.79	1669	438.32	0.79	-	-	-		
20524         1669         434.62         5.22         1669         434.62         5.22         .         .         .           20175         1629         432.50         3.95         1629         431.68         2.38         .         .         .         .         .           19313         2462         430.36         4.84         2452         430.36         4.84         .         .         .         .           18872         2452         427.12         2.95         2452         427.12         2.95         .         .         .         .           18876         2452         427.12         2.95         2452         427.12         2.95         .         .         .         .         .           17366         LETERED XS G         2650         426.26         2.69         2650         426.26         2.69         .	20626	SH 97	0	-	0.00	0	-	0.00	-	-	-		
20175         1629         432.50         3.95         1629         432.50         3.95         -         -         -           19769         1629         431.68         2.38         1629         431.68         2.38         -         -         -           18872         2452         430.36         4.84         2452         426.4         426.4         426.4         427.12         2.95         -         -         -         -           18358         2452         427.12         2.95         2452         427.12         2.95         -         -         -         -           17366         2650         426.26         2.660         426.26         2.660         426.26         2.690         -         -         -         -           17376         LDBW6 LWC         0         -         0.00         0         -         0.00         -	20524		1669	434.62	5.22	1669	434.62	5.22	-	-	-		
19769         1629         431.68         2.38         1629         431.68         2.38         -         -         -           19313         2452         430.36         4.84         2452         430.36         4.84         -         -         -           18372         2452         428.49         3.51         2452         428.49         3.51         24.52         428.49         3.51         -         -         -         -           18358         2452         427.12         2.95         2452         427.12         2.95         -	20175		1629	432.50	3.95	1629	432.50	3.95	-	-	-		
19313         2452         430.36         4.84         2452         430.36         4.84         -         -         -           18872         2452         428.49         3.51         2452         428.49         3.51         -         -         -           18358         2452         427.12         2.95         2452         427.12         2.95         -         -         -           17386         2650         426.26         2.69         2650         424.21         5.65         -         -         -         -           17376         LDBW6 LWC         0         -         0.00         0         -         0.00         -	19769		1629	431.68	2.38	1629	431.68	2.38	-	-	-		
18872         2452         428.49         3.51         2452         428.49         3.51         2.452         427.12         2.95              18358         2452         427.12         2.95         2452         427.12         2.95	19313		2452	430.36	4.84	2452	430.36	4.84	-	-	-		
18358         2452         427.12         2.95         2452         427.12         2.95         -         -         -           1786         2650         426.26         2.69         2650         426.26         2.69         -         -         -           17376         LETTERED XS G         2650         424.21         5.65         2650         424.21         5.65         -         -         -         -           17376         LDBW6 LWC         0         -         0.00         0         -         0.00         -         <	18872		2452	428.49	3.51	2452	428.49	3.51	-	-	-		
17886         2650         426.26         2.69         2650         426.26         2.69         -         -         -           17376         LETTERED XS G         2650         424.21         5.65         2560         424.21         5.65         -         -         -           17367         LDBW6 LWC         0         -         0.00         0         -         0.00         -         -         -           17339         LDBW6 LWC         0         -         0.00         0         -         0.00         -         -         -           16938         2650         422.52         3.42         2650         422.52         3.42         -         -         -         -           16938         2650         421.00         3.66         2650         421.00         3.66         -         -         -         -         -         -         -         -         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.02         0.03         0.01         1.02         -0.	18358		2452	427.12	2.95	2452	427.12	2.95	-	-	-		
17376       LETTERED XS G       2650       424.21       5.65       2.650       424.21       5.65       -       -       -         17367       LDBW6 LWC       0       -       0.00       0       -       0.00       -       0.00       - <t< td=""><td>17886</td><td></td><td>2650</td><td>426.26</td><td>2.69</td><td>2650</td><td>426.26</td><td>2.69</td><td>-</td><td>-</td><td>-</td></t<>	17886		2650	426.26	2.69	2650	426.26	2.69	-	-	-		
17367         LDBW6 LWC         0         -         0.00         0         -         0.00         -         -         -         -           17339         2650         424.20         4.03         2650         424.20         4.03         -         0.02         0.02         0.02         1         1         5         6         419.54         4.19         4.16.53         2.21         -1,022         0.03         0.02         0.34         1         16032         1.22         -0.78         0.31         1         13830         1.162         2.042         1.11	17376 LETTERED XS G		2650	424.21	5.65	2650	424.21	5.65	-	-	-		
17339         2650         424.20         4.03         2650         424.20         4.03         -         -         -           16938         2650         422.52         3.42         2650         422.52         3.42         -         -         -           16379         2650         421.00         3.66         2650         421.00         3.66         -         -         -         -           15983         2650         419.56         4.17         2650         419.54         4.19         -         -0.02         0.02           15741         LETTERED XS F         Detention Pond         2800         418.52         3.88         2800         418.32         4.22         -         -0.02         0.03           15741         LETTERED XS F         Detention Pond         2800         416.98         2.55         1778         416.53         2.21         -1,022         -0.45         -0.34           14623         2800         415.69         3.23         1778         414.91         3.74         -1,022         -0.78         0.51           13085         LETTERED XS E         3168         411.90         6.69         2074         410.28         6.27         -1,0	17367	LDBW6 LWC	0	-	0.00	0	-	0.00	-	-	-		
16938         2650         422.52         3.42         2650         422.52         3.42         -         -         -           16379         2650         421.00         3.66         2650         421.00         3.66         -         -         -         -           15983         2650         419.56         4.17         2650         419.54         4.19         -         -         0.02         0.02           15741         LETTERED XS F         Detention Pond         2800         418.52         3.88         2800         418.32         4.22         -         -         0.02         0.34           1568         2800         416.68         2.55         1778         416.53         2.21         -1,022         -0.78         0.51           13830         2800         415.69         3.23         1778         414.91         3.74         -1,022         -0.48         0.51           13095         LETTERED XS E         3168         411.31         2.07         2074         410.28         6.27         -1,094         -1.62         -0.42           13089         US HWY 181         0         -         0.00         0         -         -         -	17339		2650	424.20	4.03	2650	424.20	4.03	-	-	-		
16379         2650         421.00         3.66         2650         421.00         3.66         -         -         -           15983         2650         419.56         4.17         2650         419.54         4.19         -         -0.02         0.02           15741         LETTERED XS F         Detention Pond         2800         418.52         3.88         2800         418.32         4.22         -         -0.02         0.34           15168         2800         416.98         2.55         1778         416.53         2.21         -1,022         -0.45         -0.34           14623         2800         415.69         3.23         1778         414.91         3.74         -1,022         -0.78         0.51           13830         3168         414.31         2.07         2074         412.90         2.11         -1,094         -1.41         0.04           13095         LETTERED XS         3168         411.90         6.69         2074         410.28         6.27         -1,034         -1.41         0.04           13089         US HWY 181         0         -         0.00         0         -         -         -         - <t< td=""><td>16938</td><td></td><td>2650</td><td>422.52</td><td>3.42</td><td>2650</td><td>422.52</td><td>3.42</td><td>-</td><td>-</td><td>-</td></t<>	16938		2650	422.52	3.42	2650	422.52	3.42	-	-	-		
159832650419.564.172650419.544.190.020.0215741LETTERED XS FDetention Pond2800418.523.882800418.324.220.200.34151682800416.982.551778416.532.21-1,022-0.45-0.34146232800415.693.231778414.913.74-1,022-0.780.51138303168414.312.072074412.902.11-1,094-1.410.0413095LETTERED XS E3168411.906.692074410.286.27-1,094-1.62-0.4213089US HWY 1810-0.000-0.00128883411408.334.422074407.573.23-1,337-0.76-1.19122003554407.803.982161406.944.04-1,393-0.860.0611620LETTERED XS D3554407.105.232161406.084.85-1,393-1.02-0.3811584Sutherland Springs Rd.0-0.000115683554407.036.982161406.036.46-1,393-1.00113693715404.359.292380403.198.92-1,335-1.16-0.37103706.98	16379		2650	421.00	3.66	2650	421.00	3.66	-	-	-		
15741         LETTERED XS F         Detention Pond         2800         418.52         3.88         2800         418.32         4.22         -         -0.20         0.34           15168         2800         416.98         2.55         1778         416.53         2.21         -1,022         -0.45         -0.34           14623         2800         415.69         3.23         1778         414.91         3.74         -1,022         -0.78         0.51           13830         3168         414.31         2.07         2074         412.90         2.11         -1,094         -1.41         0.04           13095         LETTERED XS E         3168         411.90         6.69         2074         410.28         6.27         -1,094         -1.62         -0.42           13089         US HWY 181         0         -         0.00         0         -         0.00         -	15983		2650	419.56	4.17	2650	419.54	4.19	-	-0.02	0.02		
15168       2800       416.98       2.55       1778       416.53       2.21       -1,022       -0.45       -0.34         14623       2800       415.69       3.23       1778       414.91       3.74       -1,022       -0.78       0.51         13830       3168       414.31       2.07       2074       412.90       2.11       -1,094       -1.41       0.04         13095       LETTERED XS E       3168       411.90       6.69       2074       410.28       6.27       -1,094       -1.62       -0.42         13095       LETTERED XS E       3168       411.90       6.69       2074       410.28       6.27       -1,094       -1.62       -0.42         13089       US HWY 181       0       -       0.00       0       -       0.00       -	15741 LETTERED XS F	Detention Pond	2800	418.52	3.88	2800	418.32	4.22	-	-0.20	0.34		
14623       2800       415.69       3.23       1778       414.91       3.74       -1,022       -0.78       0.51         13830       3168       414.31       2.07       2074       412.90       2.11       -1,094       -1.41       0.04         13095       LETTERED XS E       3168       411.90       6.69       2074       410.28       6.27       -1,094       -1.62       -0.42         13089       US HWY 181       0       -       0.00       0       -       0.00       -       -       -       -         12888       3411       408.33       4.42       2074       407.57       3.23       -1,337       -0.76       -1.19         12200       3554       407.80       3.98       2161       406.94       4.04       -1,393       -0.86       0.06         11620       LETTERED XS D       3554       407.10       5.23       2161       406.08       4.85       -1,393       -1.02       -0.38         11584       Sutherland Springs Rd.       0       -       0.00       0       -       -       -       -         11568       0       -       0.00       0       -       0.00       - <td>15168</td> <td></td> <td>2800</td> <td>416.98</td> <td>2.55</td> <td>1778</td> <td>416.53</td> <td>2.21</td> <td>-1.022</td> <td>-0.45</td> <td>-0.34</td>	15168		2800	416.98	2.55	1778	416.53	2.21	-1.022	-0.45	-0.34		
13830       3168       414.31       2.07       2074       412.90       2.11       -1,094       -1.41       0.04         13095       LETTERED XS E       3168       411.90       6.69       2074       410.28       6.27       -1,094       -1.62       -0.42         13089       US HWY 181       0       -       0.00       0       -       0.00       - <td< td=""><td>14623</td><td></td><td>2800</td><td>415.69</td><td>3.23</td><td>1778</td><td>414.91</td><td>3.74</td><td>-1.022</td><td>-0.78</td><td>0.51</td></td<>	14623		2800	415.69	3.23	1778	414.91	3.74	-1.022	-0.78	0.51		
13095       LETTERED XS E       3168       411.90       6.69       2074       410.28       6.27       -1,094       -1.62       -0.42         13089       US HWY 181       0       -       0.00       0       -       0.00       - <td>13830</td> <td></td> <td>3168</td> <td>414.31</td> <td>2.07</td> <td>2074</td> <td>412.90</td> <td>2.11</td> <td>-1.094</td> <td>-1.41</td> <td>0.04</td>	13830		3168	414.31	2.07	2074	412.90	2.11	-1.094	-1.41	0.04		
13089       US HWY 181       0       -       0.00       0       -       0.00       -	13095 LETTERED XS E		3168	411.90	6.69	2074	410.28	6.27	-1.094	-1.62	-0.42		
12888       3411       408.33       4.42       2074       407.57       3.23       -1,337       -0.76       -1.19         12200       3554       407.80       3.98       2161       406.94       4.04       -1,393       -0.86       0.06         11620       LETTERED XS D       3554       407.10       5.23       2161       406.08       4.85       -1,393       -1.02       -0.38         11584       Sutherland Springs Rd.       0       -       0.00       0       -       0.00       -       -       -         11568       3554       407.03       6.98       2161       406.03       6.46       -1,393       -1.00       -0.52         11340       3715       404.35       9.29       2380       403.19       8.92       -1,335       -1.16       -0.37	13089	US HWY 181	0	-	0.00	0	-	0.00	-	-	-		
12200       3554       407.80       3.98       2161       406.94       4.04       -1,393       -0.86       0.06         11620       LETTERED XS D       3554       407.10       5.23       2161       406.08       4.85       -1,393       -0.86       0.06         11620       LETTERED XS D       3554       407.10       5.23       2161       406.08       4.85       -1,393       -1.02       -0.38         11584       Sutherland Springs Rd.       0       -       0.00       0       -       0.00       - </td <td>12888</td> <td></td> <td>3411</td> <td>408.33</td> <td>4.42</td> <td>2074</td> <td>407 57</td> <td>3.23</td> <td>-1.337</td> <td>-0.76</td> <td>-1.19</td>	12888		3411	408.33	4.42	2074	407 57	3.23	-1.337	-0.76	-1.19		
11620       LETTERED XS D       3554       407.10       5.23       2161       406.08       4.85       -1,393       -1.02       -0.38         11620       LETTERED XS D       Sutherland Springs Rd.       0       -       0.00       0       -       0.00       -       -       -0.38         11584       Sutherland Springs Rd.       0       -       0.00       0       -       0.00       -       -       -         11568       3554       407.03       6.98       2161       406.03       6.46       -1,393       -1.00       -0.52         11340       3715       404.35       9.29       2380       403.19       8.92       -1,335       -1.16       -0.37         10970       0.970       3715       402.55       3.05       2380       403.19       8.92       -1,335       -0.02       0.53	12200		3554	407 80	3.98	2161	406.94	4 04	-1,393	-0.86	0.06		
11584       Sutherland Springs Rd.       0       -       0.00       0       -       0.00       -       -       -       -         11568       3554       407.03       6.98       2161       406.03       6.46       -1,393       -1.00       -0.52         11340       3715       404.35       9.29       2380       403.19       8.92       -1,335       -1.16       -0.37         10970       0.970       3715       403.55       3.05       3280       403.63       3.43       1.335       0.03       0.53	11620 LETTERED XS D		3554	407 10	5.23	2161	406.08	4.85	-1.393	-1.02	-0.38		
11561     3554     407.03     6.98     2161     406.03     6.46     -1,393     -1.00     -0.52       11340     3715     404.35     9.29     2380     403.19     8.92     -1,335     -1.16     -0.37       10870     3715     402.55     9.29     2380     403.62     8.92     -1,335     -1.16     -0.37	11584	Sutherland Springs Rd	0	-	0.00	0	-	0.00	-	-	-		
11340       3715       404.35       9.29       2380       403.19       8.92       -1,335       -1.16       -0.37         10870       3715       403.55       3.05       3280       403.63       3.43       1.335       -0.02       0.53	11568		3554	407.03	6.98	2161	406.03	6.46	-1 303	-1.00	-0 52		
	11340		3715	404 35	9.20	2380	403 19	8 92	-1 335	-1 16	-0.37		
100/8 $-100$ $-100$ $-100$ $-100$	10879		3715	403.55	3 95	2380	402.63	3.42	-1 335	-0.92	-0.53		
10527 3715 403 18 3 97 2380 402 34 3 16 -1 335 -0.84 -0.81	10577		3715	403 18	3 97	2380	402.34	3 16	-1 335	-0.84	-0.81		

Table 1: HEC-RAS Existing vs Proposed Results Comparison Summary													
			Existing			Proposed			Difference				
River Station	Location	Q <sub>(1% FC)</sub>	WSEL <sub>(1% FC)</sub>	V <sub>(1% FC)</sub>	Q <sub>(1% FC)</sub>	WSEL <sub>(1% FC)</sub>	V <sub>(1% FC)</sub>	∆ <b>Q <sub>(1% FC)</sub></b>	∆ <b>WSEL</b> (1% FC)	$\Delta oldsymbol{V}_{(1\%FC)}$			
		(cfs)	(ft)	(fps)	(cfs)	(ft)	(fps)	(cfs)	(ft)	(fps)			
9947		4010	402.93	2.80	2731	402.16	2.28	-1,279	-0.77	-0.52			
9559		4010	402.87	2.03	2731	402.12	1.59	-1,279	-0.75	-0.44			
9280		4010	402.78	2.74	2731	402.04	2.26	-1,279	-0.74	-0.48			
9259	4th Street	0	-	0.00	0	-	0.00	-	-	-			
9222		4010	399.04	13.15	2731	398.60	9.57	-1,279	-0.44	-3.58			
8887		4010	397.81	5.60	2731	397.27	5.13	-1,279	-0.54	-0.47			
8400		4062	396.49	3.00	2886	395.89	2.78	-1,176	-0.60	-0.22			
8059		4062	395.72	3.82	2886	395.16	3.13	-1,176	-0.56	-0.69			
7697		4062	394.59	2.97	2886	394.07	2.90	-1,176	-0.52	-0.07			
7305		4062	394.04	2.25	2886	393.52	1.99	-1,176	-0.52	-0.26			
7043		4062	393.48	4.16	2886	392.98	3.81	-1,176	-0.50	-0.35			
6721 LETTERED XS C		4062	392.07	3.15	2886	391.42	3.07	-1,176	-0.65	-0.08			
6173		4062	391.30	2.67	2886	390.76	2.20	-1,176	-0.54	-0.47			
5790 LETTERED XS B		4062	390.12	8.34	2886	389.91	6.74	-1,176	-0.21	-1.60			
5759	Peach St.	0	-	0.00	0	-	0.00	-	-	-			
5732		4062	388.90	8.90	2886	388.54	8.26	-1,176	-0.36	-0.64			
5607		4253	388.20	3.96	3183	387.83	3.64	-1,070	-0.37	-0.32			
5429		4253	387.26	4.76	3183	386.88	4.26	-1,070	-0.38	-0.50			
5143		4253	386.14	3.83	3183	385.75	3.51	-1,070	-0.39	-0.32			
5026 LETTERED XS A		4253	385.31	5.49	3183	384.96	4.97	-1,070	-0.35	-0.52			
4785		4253	384.65	2.84	3183	384.40	2.38	-1,070	-0.25	-0.46			
4784		0	-	0.00	0	-	0.00	-	-	-			
4611		4253	384.54	2.20	3183	384.32	1.74	-1,070	-0.22	-0.46			
4596	Unpaved Road	0	-	0.00	0	-	0.00	-	-	-			
4475	DS Limit	4253	382.98	6.72	3183	382.38	6.00	-1,070	-0.60	-0.72			

					Prop	
Structure ID	sa.ft.	Size	Type	Fx. Depth (in)	Depth (in)	Difference (in)
24803	195.3	Small	Commercial	2"	0"	-2
24892	146.7	Small	Commercial	19"	0"	-19
24915	990.8	Small	Commercial	34"	15"	-19
24957	53.3	Small	Commercial	42"	21"	-21
24999	171.5	Small	Residential	26"	6"	-20
25008	178.3	Small	Residential	43"	33"	-10
25023	62.7	Small	Commercial	24"	0"	-24
25059	122.2	Small	Residential	5"	0"	-5
25091	201.5	Small	Residential	7"	0"	-7
25107	67.5	Small	Residential	14"	3"	-11
25185	356.6	Small	Commercial	39"	19"	-20
25206	281.7	Small	Commercial	36"	16"	-20
25232	326.5	Small	Commercial	8"	0"	-8
25279	117.4	Small	Residential	6"	0"	-6
25840	184.8	Small	Residential	9"	9"	0
23137	121.7	Small	Residential	1"	0"	-1
23146	210.7	Small	Residential	4"	0"	-4
23180	89.1	Small	Residential	11"	9"	-3
23194	131.4	Small	Residential	11"	8"	-3
23209	110.8	Small	Residential	21"	17"	-3
23216	199.2	Small	Residential	18"	16"	-3
23224	181.4	Small	Residential	14"	11"	-3
23373	71.0	Small	Residential	28"	24"	-4
23505	226.8	Small	Residential	24"	20"	-4
23638	131.3	Small	Residential	22"	17"	-6
23669	62.1	Small	Residential	11"	7"	-4
23749	114.7	Small	Residential	28"	23"	-5
24137	48.5	Small	Residential	26"	18"	-8
24139	84.9	Small	Residential	26"	20"	-6
24156	79.4	Small	Residential	20"	11"	-9
24170	59.0	Small	Residential	26"	18"	-8
24446	71.7	Small	Residential	14"	9"	-5
24490	365.2	Small	Residential	5"	0"	-5
24671	141.3	Small	Residential	22"	11"	-11
24691	109.4	Small	Residential	48"	38"	-10
24726	101.7	Small	Residential	35"	23"	-12
24731	259.0	Small	Residential	13"	8"	-6
24965	235.7	Small	Residential	12"	5"	-7

Table 2: BCA Flooded Depth Structure Comparison