

Flood Risk Management Initiatives in the Metropolitan Houston Region

Sheridan Willey
Deputy Chief, Project Management
USACE, Galveston District

February 26, 2019



"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."

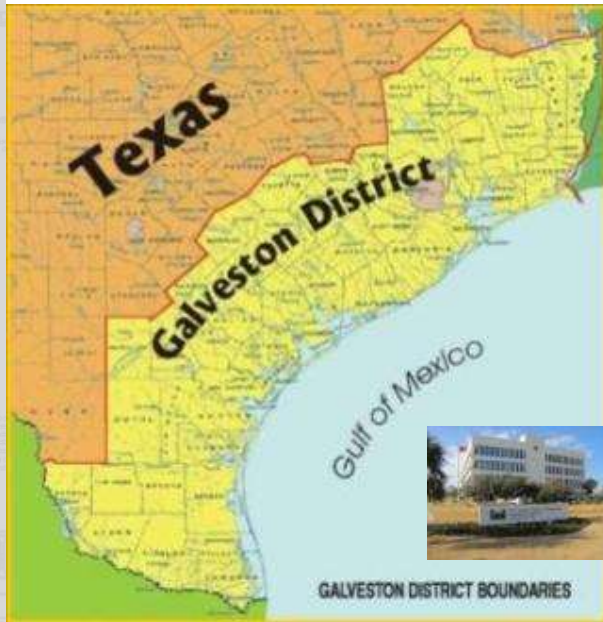


US Army Corps
of Engineers.



USACE Galveston District (SWG): History and Mission

2



- Navigation
- Flood Risk Management
- Regulatory
- Ecosystem Restoration
- Emergency Management
- Interagency & International Support

- First engineer district in Texas, established 1880
- 50,000 square mile district boundary, ~100+ miles inland
- 28 ports handling 550+ M tons of commerce annually (FY 15)
- 1,000+ miles of channels
 - 750 miles shallow draft
 - 270 miles of deep draft
- 367 miles of Gulf coastline
- 30-40 M cubic yards/yr material dredged
- 16 Congressional districts
- 48 Texas counties, 4 Louisiana parishes
- 18 Coastal counties - bays / estuaries
- 9 river basins



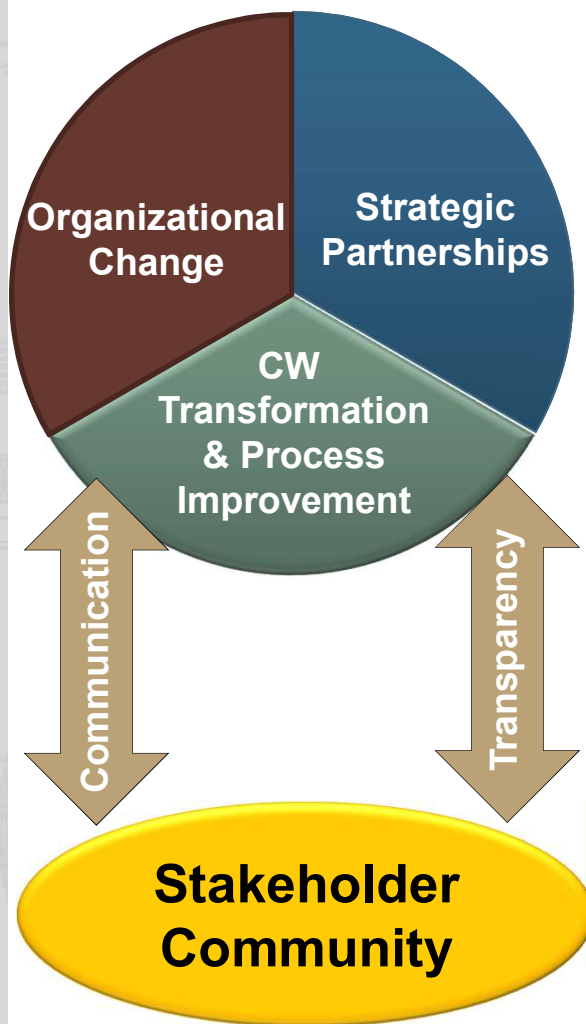
US Army Corps
of Engineers



Managing Integrated Water Resources through a USACE SWG Corporate Strategy

3

Maximizing Capital



Lines of Effort



Future

Texas Coast is:

- A resilient community with healthy ecosystem
- Positioned for sustainable economic growth
- Enabled by strategic partnerships that support Non-Federal investment



US Army Corps
of Engineers



Galveston District Missions and Business Lines 4

Civil Works

- Navigation
- Flood Risk Management
- Environmental Restoration

Interagency and International Support

Regulatory

- Section 10 and Section 404 Permits

Disaster Response and Recovery

- FEMA Missions



US Army Corps
of Engineers



Current Civil Works Projects/Studies

5

Flood Risk Management

- Greens Bayou
- Addicks & Barker Dams
- Buffalo Bayou & Tributaries Resiliency
- Brays Bayou
- White Oak Bayou
- Hunting Bayou
- Sims
- Clear Creek
- Brazos River, Fort Bend County
- Lower Colorado River Basin (Wharton)
- Raymondville Drain

Coastal Storm Risk Management

- Sabine Pass to Galveston Bay
- Coastal Texas

Watershed Assessment

- Houston Regional Watershed Assessment

Deep-Draft Navigation

- Sabine-Neches Waterway
- Houston Galveston Navigation Channels
 - Entrance Channel
 - Galveston Harbor & Channel
 - Houston Ship Channel
 - Bayport/Barbours
- Freeport Channel
- Matagorda Ship Channel
- Corpus Christi Ship Channel
 - Main Channel
 - LaQuinta Channel
- Brazos Island Harbor

Shallow-Draft Navigation

- Gulf-Intracoastal Waterway BRFG/CRL
- Cedar Bayou
- Chocolate Bayou



US Army Corps
of Engineers



Bipartisan Budget Act of 2018

Title IV - Corps of Engineers

• Investigations

- \$75M (of \$135M total) for States and areas impacted by Harvey, Irma, and Maria
- Full Federal expense
- Reduce flood and hurricane risk

• Construction

- \$10.425B (of \$15B total) for States and areas impacted by Harvey, Irma, and Maria
- NFS cash contribution financed over 30 years post construction completion
- Construct flood and storm damage reduction projects authorized/Chief's Reports/studies under investigations

• Implementation Guidance and Investment Program:

<https://www.usace.army.mil/Missions/Civil-Works/Budget/>

USACE – Galveston District Funded Projects

Project Name	Funding
CONSTRUCTION	
Addicks and Barker Dam Safety (Phase 1)	\$1,454,000
Brays Bayou, TX	\$75,000,000
Clear Creek, TX	\$295,165,000
Hunting Bayou, TX	\$65,000,000
Lower Colorado River (Wharton, TX)	\$73,290,000
Sabine Pass to Galveston Bay, TX	\$3,957,134,000
White Oak Bayou, TX	\$45,000,000
TOTAL CONSTRUCTION	\$4,512,043,000
GENERAL INVESTIGATION STUDIES	
Coastal Texas Protection & Restoration Study, TX	\$3,804,000
Buffalo Bayou Resiliency Study, TX	\$6,000,000
Houston Regional Watershed Assessment, TX	\$3,000,000
Brazos River Erosion Management Study, TX	\$3,000,000
TOTAL STUDIES	\$15,804,000



US Army Corps
of Engineers



7

FEDERAL BRIEFING
April 2017 | Washington, D.C.

Metropolitan Houston Flood Risk Management (FRM) Construction Projects

8

PROJECT	AUTHORIZATION	PHASE	NON-FED SPONSOR	DESCRIPTION
Addicks & Barker Dams	H.D. 456, 75 th Congress, 2 nd Session 1938 modified by 1954 Flood Control Act	Construction (ongoing)	100% Federal	Construct new outlet structures at both dams and grout and abandon existing outlet structures in place
Greens Bayou	WRDA1990, Sec 101(a)(21)	Construction (ongoing)	Harris County Flood Control District (HCFCD)	1 detention basins; 3.7 miles of channelization; environmental enhancements
Brays Bayou	WRDA 1990, Sec 101(a)(21), WRDA 1996 Sec 211(f)	211(f) Reimbursement of HCFCD Construction	HCFCD 100% FED Funded by Bipartisan Budget Act of 2018 (BBA 2018)	4 detention basins; 21.2 miles of channelization; environmental enhancements
White Oak Bayou	WRDA 1990, Sec 101(a)(21), WRDA 1996 Sec 211(f)	211(f) Reimbursement of HCFCD Construction	HCFCD 100% FED Funded by BBA 2018	4 detention basins; 15.0 miles of channelization; recreation; environmental enhancements
Hunting Bayou	WRDA 1990, Sec 101(a)(21), WRDA 1996 Sec 211(f)	211(f) Reimbursement of HCFCD Construction	HCFCD 100% FED Funded by BBA 2018	1 detention basins; 3.8 miles of channelization; environmental enhancements
Sims Bayou	WRDA 1986, Sec 401(a) amended by Energy and Water Appropriations Act 1990 and WRDA 1992 Sec 102(bb)	Construction Complete; Recreation work ongoing	HCFCD	19.3 miles of channelization (flood bench section); environmental mitigation & enhancements
Clear Creek & Tributaries	Flood Control Act 1968, Sec 203	New Start Design/ Construction	HCFCD: 65%FED/35%Non-Fed Funded by BBA 2018 30-yr payback	15 miles main stem, approximately 5 miles of tributaries improvements: in-line detention, flood bench installation, tributaries alignment

Metropolitan Houston FRM Studies and Assessments

9

PROJECT	AUTHORIZATION	PHASE	COST SHARING	DESCRIPTION
Buffalo Bayou & Tributaries Resiliency Study	Sec 216 of the Flood Control Act of 1970 (review of completed projects)/ H.D. 456, 75th Congress, 2nd Session 1938 modified by 1954 Flood Control Act	General Investigations/ Dam Safety Study	Non-Federal sponsor: HCFCFCD 100% FED Funded by BBA 2018	Address incremental risk, overtopping with breach and residual risks associated with flood risk impacts to structures in the pool area and upstream and downstream of both reservoirs, including life safety
Houston Regional Watershed Assessment	WRDA 1986, Sec 729, as amended by WRDA 2000 and 2007	General Investigations - New Start	Non-Federal sponsor: HCFCFCD 100% FED Funded by BBA 2018	Develop a watershed management assessment to provide a system wide approach to water resource management of 22 primary watersheds within Harris County
Brazos River, Fort Bend County	WRDA 2016, Sec 1201	General Investigations - New Start	Non-Federal sponsor: Fort Bend County 100% FED Funded by BBA 2018	Investigate stream bank measures to reduce or mitigate erosion losses, reduce impacts of increased flood risk and provide protection benefits for public infrastructure



US Army Corps
of Engineers



Addicks & Barker Dams Construction Mega Project

10

Location: Houston, Texas

Program: Dam Safety (Phase 1)

Phase: Construction

Contract Amount: \$74,891,901

Completion Date: April 2020

Project Status: 62% Complete

Sponsor: 100% FED

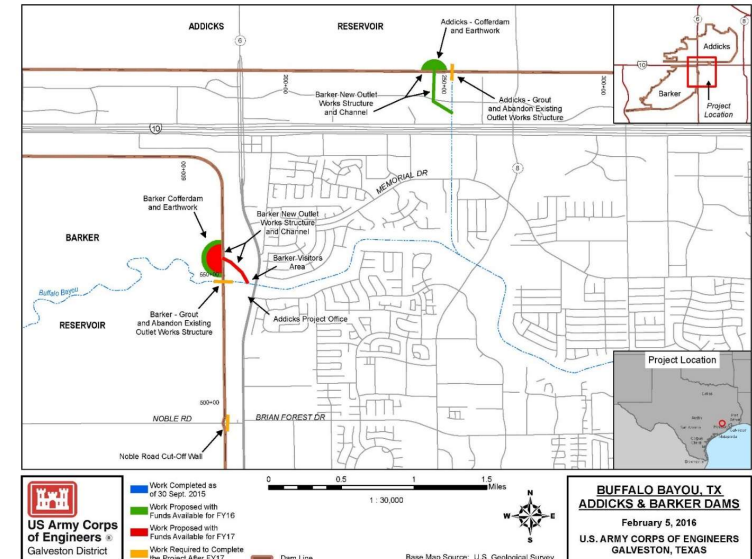
Purpose: Flood Damage Reduction

Dam Safety Action Classification: DSAC 1

Dam Safety Issues: High risk associated with the seepage and piping beneath, around, and near the outlet works structure conduits

Population at Risk: 1.2 million

Potential Economic Consequences: \$60 billion



Barker Dam



Addicks Dam



Addicks New Outlet Structure

Addicks Structure Progress

16 Nov 18



21 Jan 19



18 Dec 18

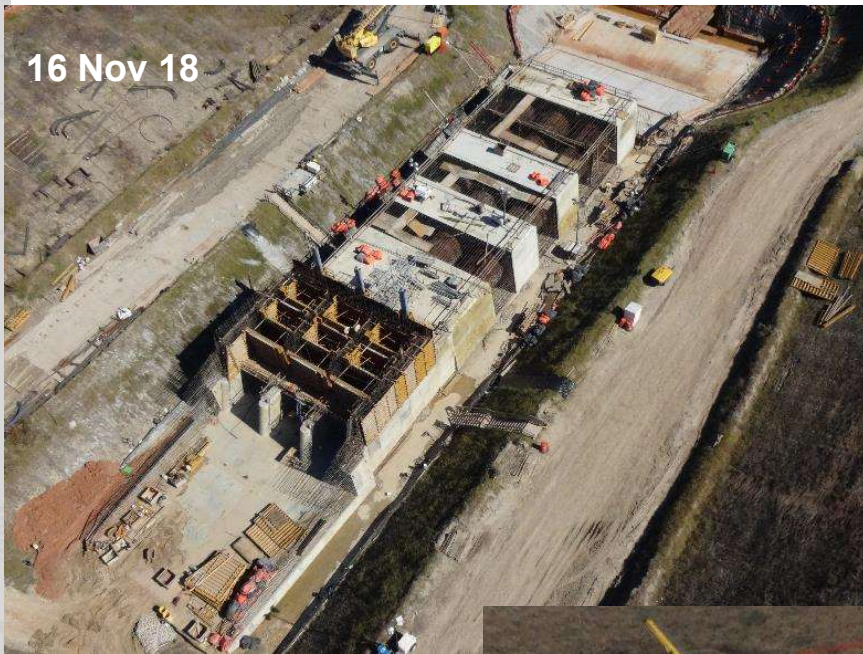


US Army Corps
of Engineers



Barker Structure Progress

16 Nov 18



21 Jan 19



18 Dec 18



US Army Corps
of Engineers



Buffalo Bayou and Tributaries Resiliency Study, TX

Authorization: Section 216 of Flood Control Act of 1970

Purpose: Flood Risk Management (FRM)

Phase: Feasibility

Non-Federal Sponsor: Harris County Flood Control District

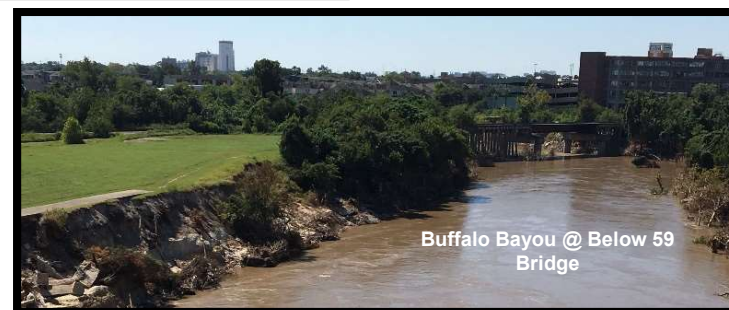
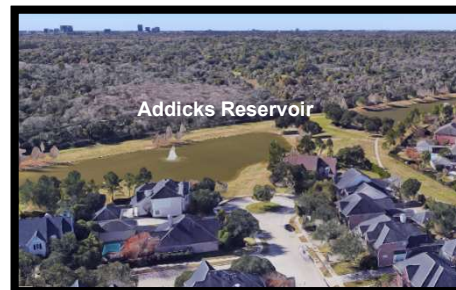
Scope: Address residual risks associated with flood risk impacts to structures in the pool area upstream of both reservoirs and downstream along Buffalo Bayou

Potential FRM Measures:

- Additional reservoir/dam
- Increased reservoir storage capacity
- Reservoir water level equalization
- Improved outlet discharge capacity
- Improved inflow and outlet discharge channels
- Acquisition of flowage easements and buyouts
- Changes in dam operation plan
- Harris County may develop ways to better inform residents of their risks

Status:

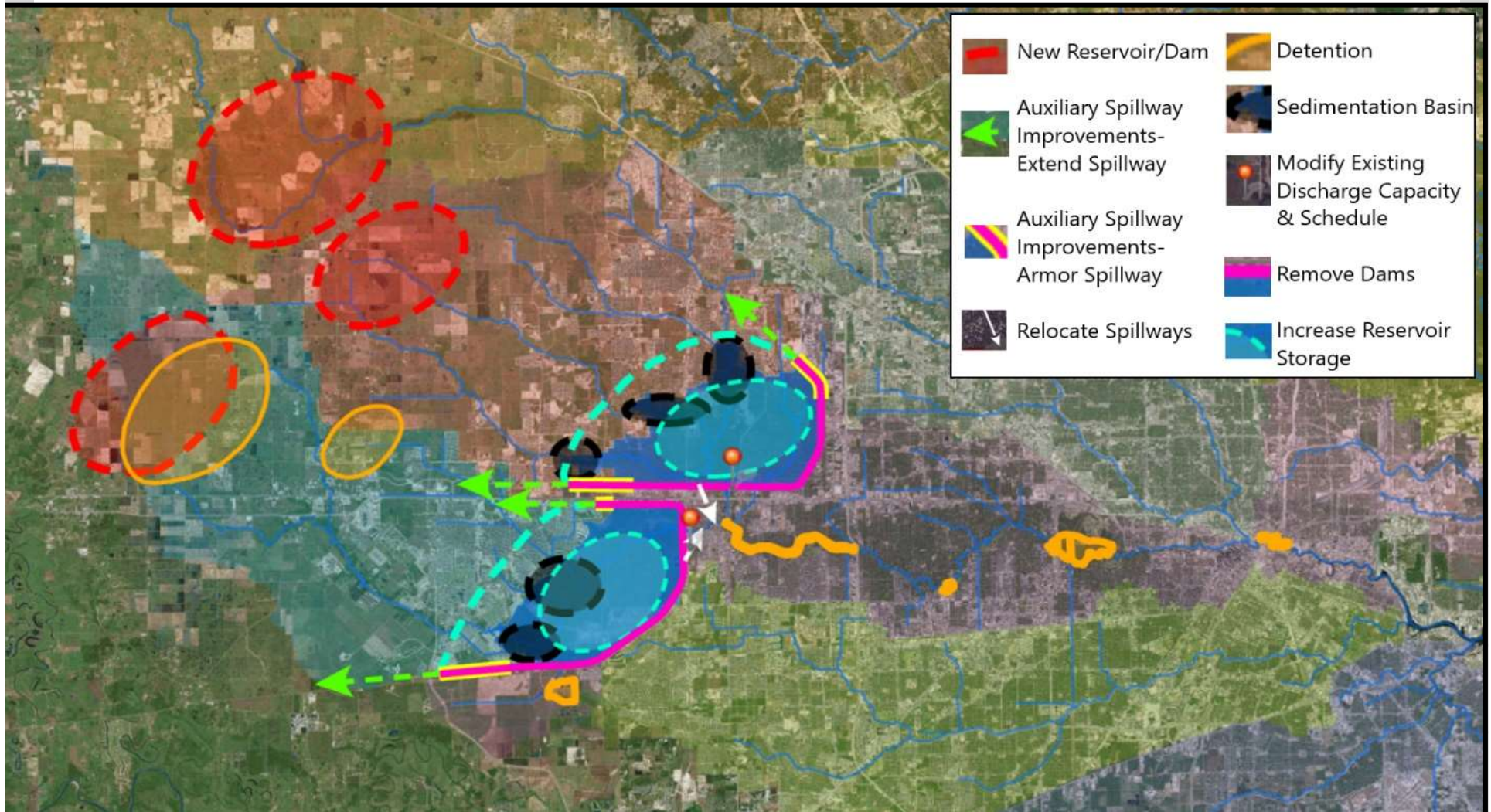
- Signed Cost Sharing Agreement – Oct 2018
- Alternatives Milestone – Feb 2019
- Scheduling Public Scoping Mtgs for Mar/Apr 2019





Storage Strategies

15

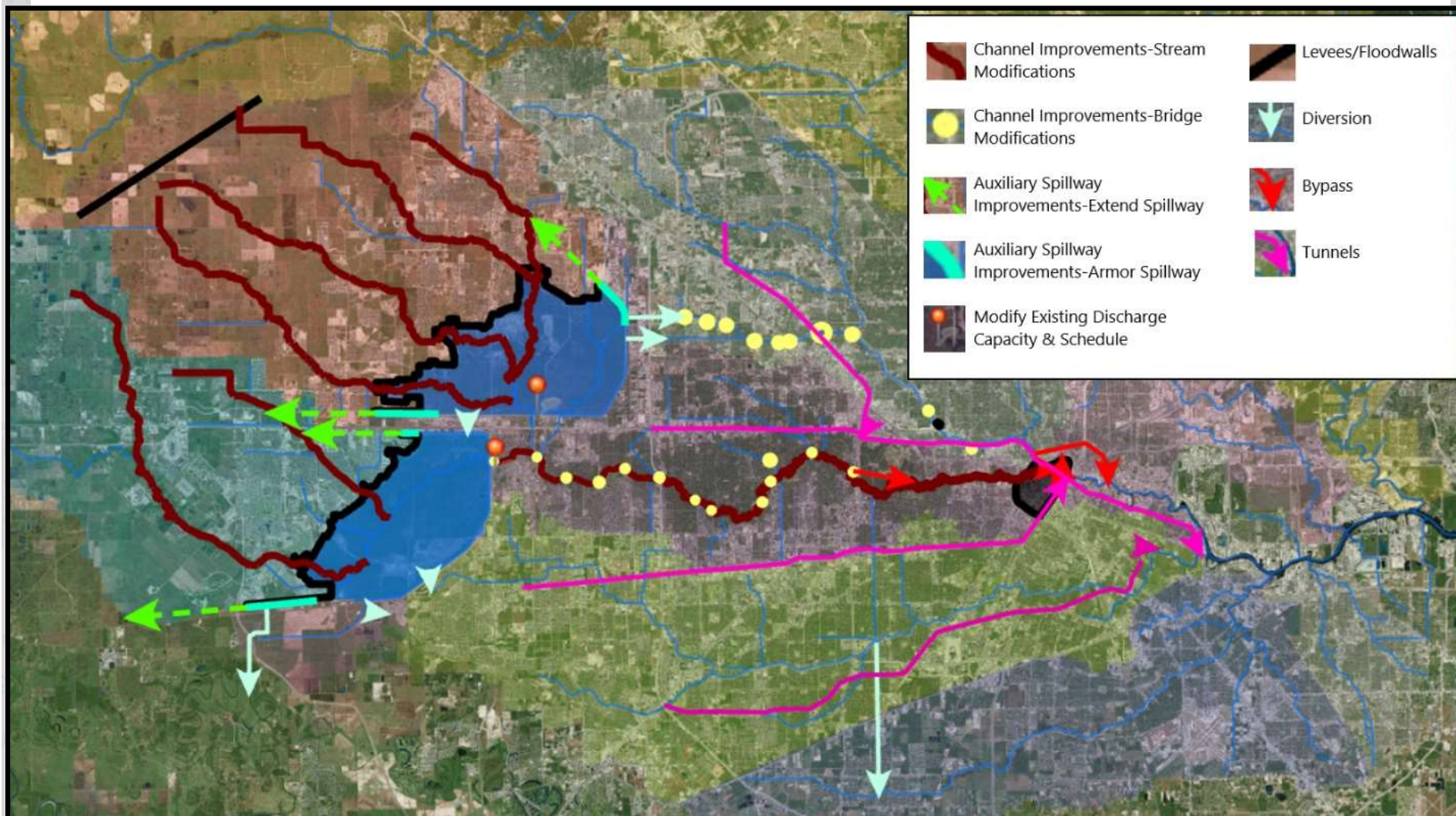


US Army Corps
of Engineers



Conveyance Strategies

16



US Army Corps
of Engineers



Schedule

17

Activities/Milestones	Date (Actual (A)/ Projected)
Execute FCSA	10-October-18 (A)
Alternative Milestone Meeting	4-February-19 (A)
Tentatively Selected Plan	April 2020
Agency Decision Milestone	September 2020
Chief's Report	October 2021



US Army Corps
of Engineers



Greens Bayou

18

Location: Houston, Texas

Purpose: FRM

Phase: Construction (ongoing)

Non-Federal Sponsor: HCFCD

Project Description: Construction of a detention basin, 3.7 miles of channelization, and environmental enhancements

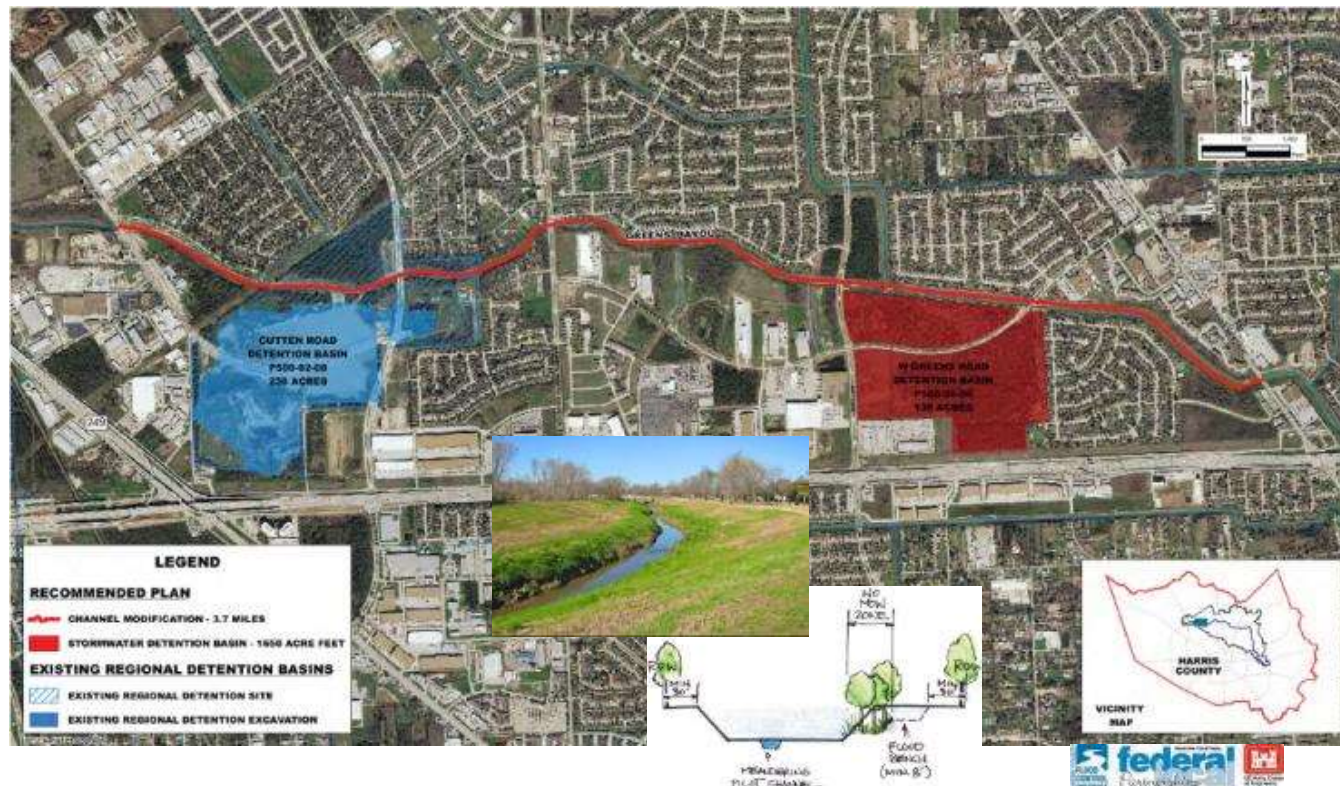
Estimated Total Project Cost: \$63M

Current Estimated Completion Cost: \$4M

Current Status: Work began in 2015 and physical completion is anticipated in March 2020

Population at Risk: 8,200

Potential Economic Consequences: \$10M



Brays Bayou

19

Location: Houston, Texas

Purpose: FRM

Phase: Sec 211(f) - Construction by HCFCD, Reimbursement by USACE

Non-Federal Sponsor: HCFCD

Construction Completed: 2021

Authorized Total Project Cost:
\$506M

Population at Risk: 350,000
Residents

Critical Infrastructure at risk without completion of construction:

- 12 Police & Fire Stations
- 24 Hospitals
- 138 Health Clinics
- 88 Pharmacies
- 51 Public School
- 40,000 Homes



Brays Bayou Stormwater Detention Basin/Arthur Storey Park
West Sam Houston Parkway
Completed 2014



Brays Bayou Federal Project



Freshwater Tidal Marsh and Channel
Construction Complete, 2014



Brays Bayou Federal Project
Mid-Reach Channel Modification at SH 288, 2012



White Oak Bayou

Location: Houston, TX

Purpose: FRM

Phase: Sec 211(f) - Construction by HCFCD, Reimbursement by USACE

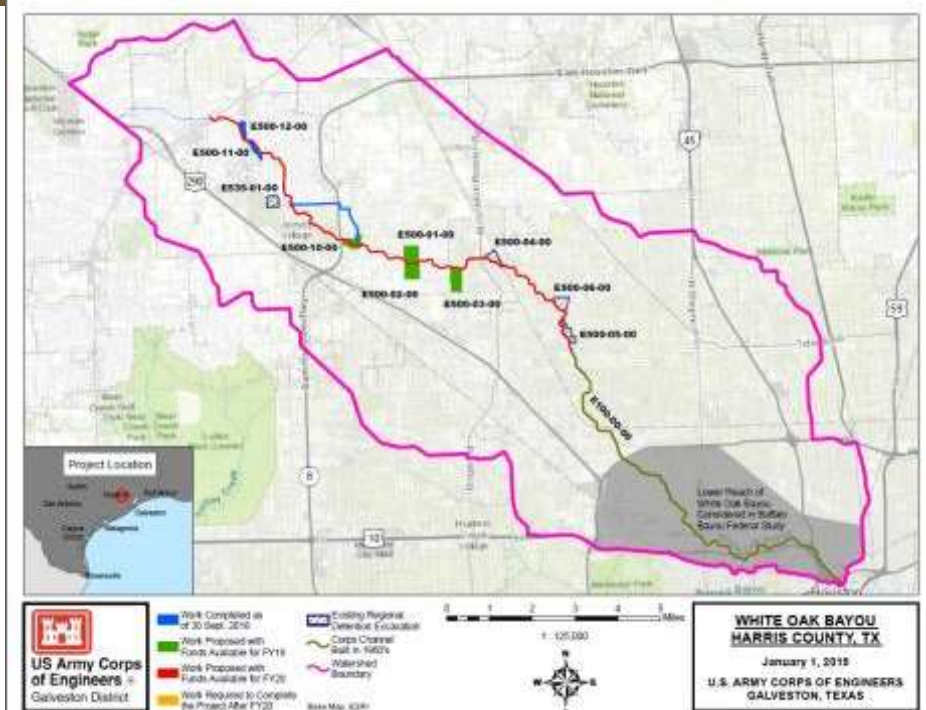
Non-Federal Sponsor: HCFCD

Scope: Address flood risks of White Oak Bayou

Costs: \$45M

FRM Measures:

- Channel conveyance improvement from Cole Creek to FM 1960
- 4 detention basin with approx. 2,940 acre-ft of storage
- 12 miles of a linear bikeway



Hunting Bayou

21

Location: Houston, TX

Purpose: FRM

Phase: Sec 211(f) - Construction by HCFCD, Reimbursement by USACE

Non-Federal Sponsor: HCFCD

Scope: Address flood risks of Hunting Bayou

Costs: \$65M

FRM Measures:

- 3.8 miles grass-lined channel conveyance improvement
- 75 acre detention basin
- 17 bridge replacements/modifications



Hunting Bayou Federal Project, Reach Kashmere Gardens
Wayne Street - Pre-Project



Hunting Bayou Federal Project
Proposed Grass-Lined Channel

Sims Bayou

22

Location: Houston, Texas

Purpose: FRM

Phase: FRM Construction
(completed), Recreation (ongoing)

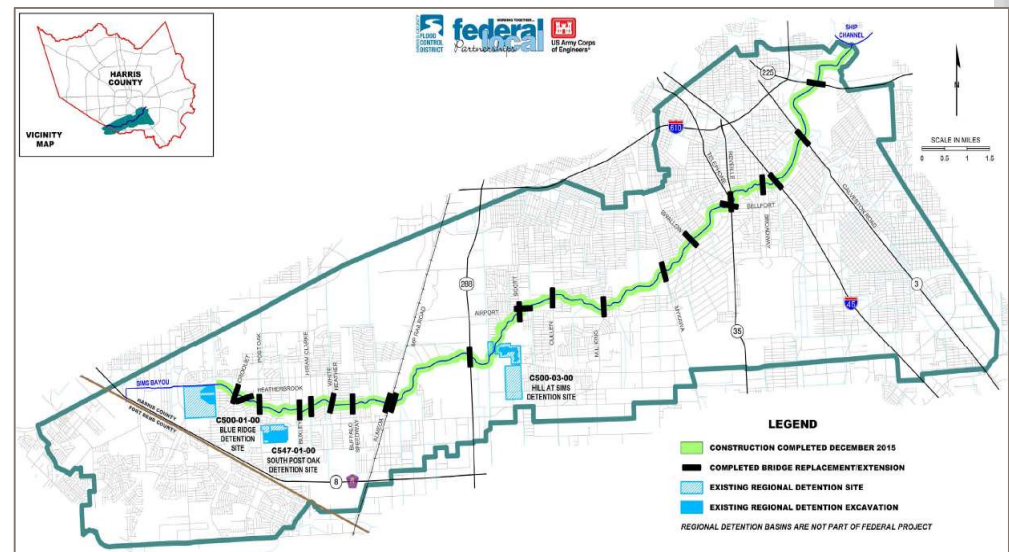
Non-Federal Sponsor: HCFCD

Date Completed: FRM - Dec 2015
Recreation feature – Dec 2019

Authorized Total Project Cost: \$389
million

Population at Risk: 105,000

Potential Economic Consequences:
\$518M



Clear Creek, TX

Authorization: Flood Control Act of 1968

Purpose: Flood Risk Management

Phase: Preconstruction Engineering and Design

Non-Federal Sponsor: HCFCD

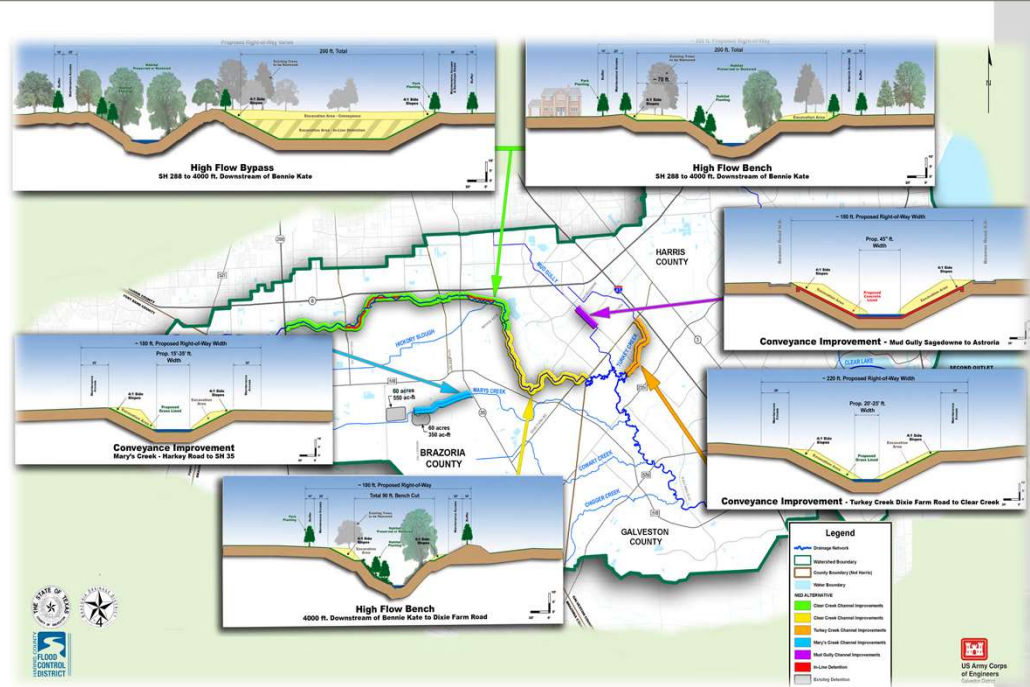
Total Project Cost: \$295M (remaining features)

Project Features:

- 15.2 miles of high flow channel benches; leaving intact the existing low flow stream bottom ecology
- In line detention basins (485 acre-foot)
- 2.4 miles of Turkey Creek widening (Dixie Farm Rd to confluence with Clear Creek)
- 0.8 miles of Mud Gully – concrete-lined (Sagedowne to Astoria)
- 2.1 miles of Mary's Creek (Harkey Rd to SH 35)

Status:

- Plans & Specs for Mud Gully being developed
- Mary Creek topographic survey complete
- Turkey Creek Survey Contract/Geotechnical for Turkey & Mary's Creeks to be awarded early March
- Clear Creek Main Stem
 - Draft Scope of Work - early March
 - Request for Proposals – early April



Houston Regional Watershed Assessment

Authorization: Section 729 of
WRDA 1986, as amended

Type of Project: FRM

Project Phase: Feasibility

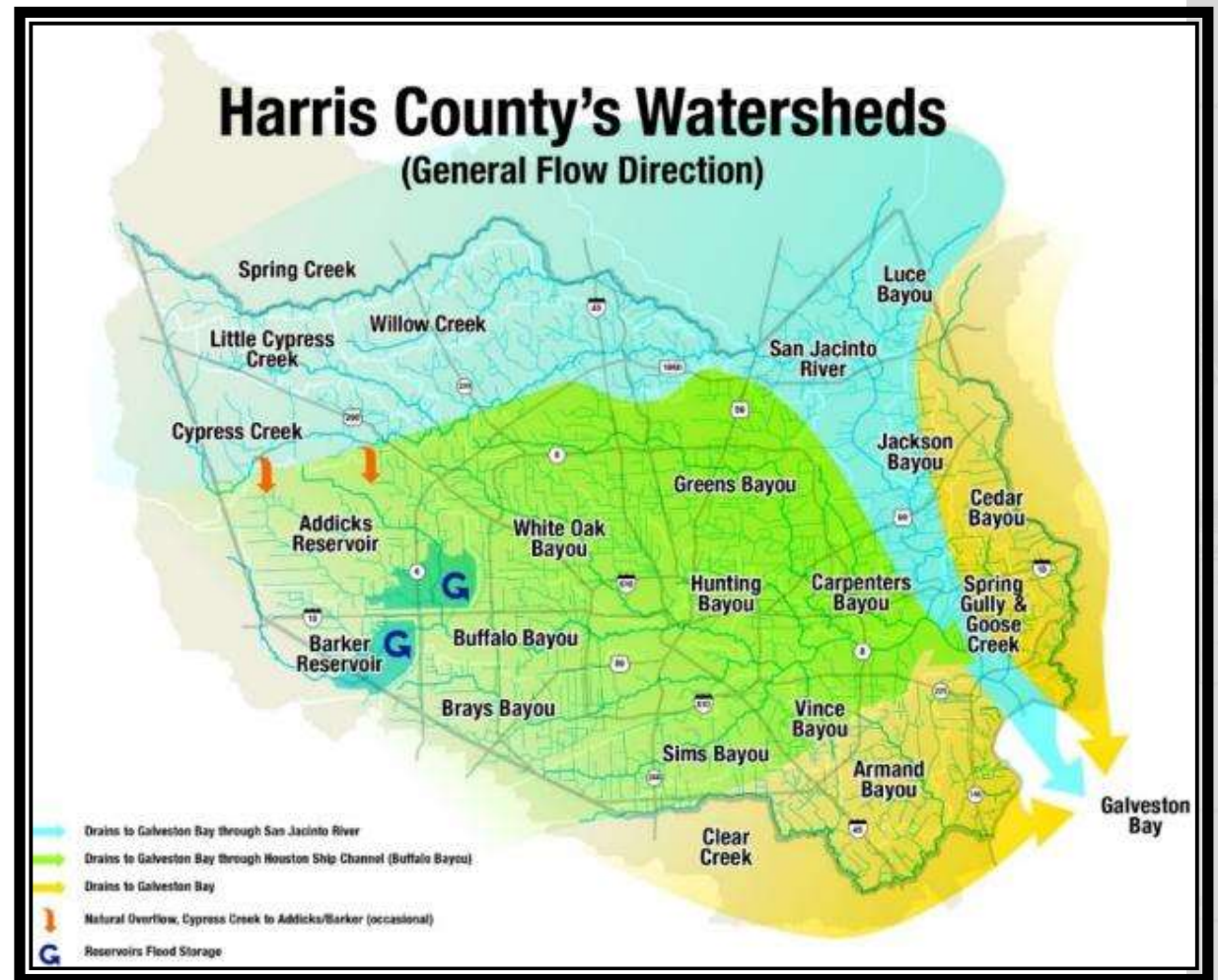
Non-Federal Sponsor:
HCFCD

Scope:

- Characterize performance of flood risk management features in the Metropolitan Houston Region as an integrated system of 22 watersheds
- Understand how development patterns are affecting watershed hydrology across systems
- Update statistics of extreme precipitation events for systems simulation to explain current and future potential flooding problems

Status:

- Study kickoff
- Data collection underway



**US Army Corps
of Engineers®**



Brazos River, Fort Bend County, TX

Authorization: Section 1201 of WRDA 2016

Purpose: FRM

Phase: Feasibility

Non-Federal Sponsor: Fort Bend County

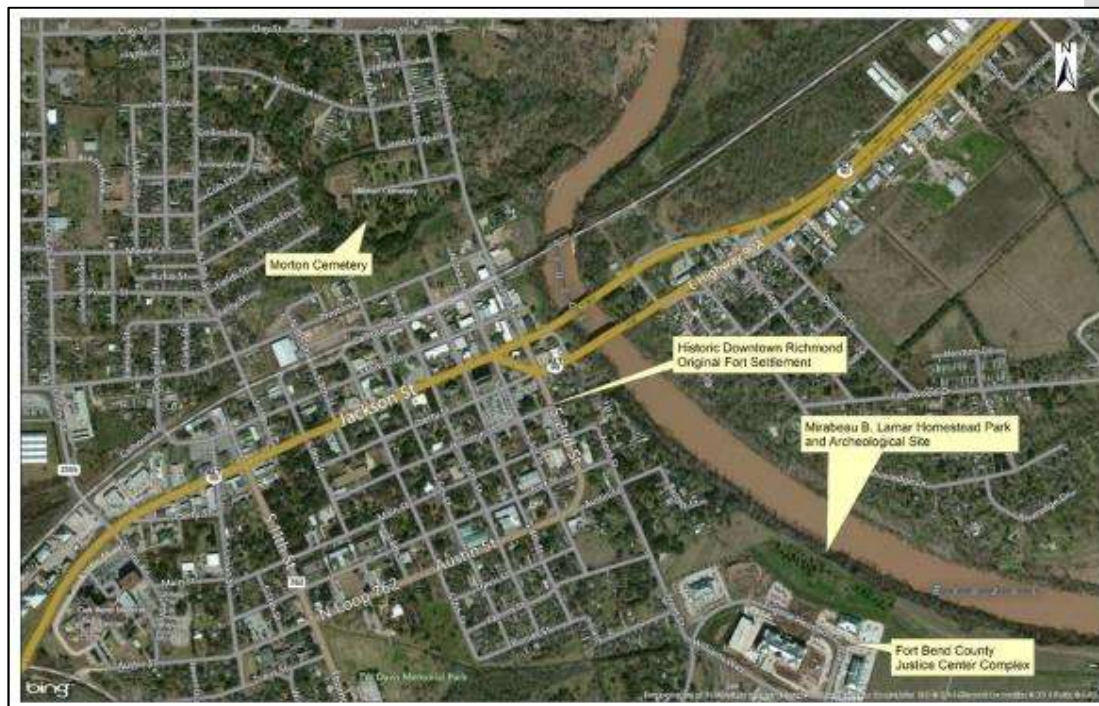
Scope: Investigate stream bank measures to reduce or mitigate erosion losses, reduce the impacts of increased flood risk and provide protection benefits for the above listed public and infrastructure

Potential FRM Measures:

- Levees
- Shoreline stabilization features

Status:

- Study Kickoff
- Alternatives Milestone – Feb 2019
- Working towards Tentatively Selected Plan





ON FACEBOOK

www.facebook.com/GalvestonDistrict



ON TWITTER

www.twitter.com/USACEgalveston



ON YOUTUBE

www.YouTube.com/GalvestonDistrict



ON DVIDS

www.dvidshub.net/units/USACE-GD



ONLINE

www.swg.usace.army.mil



US Army Corps
of Engineers

