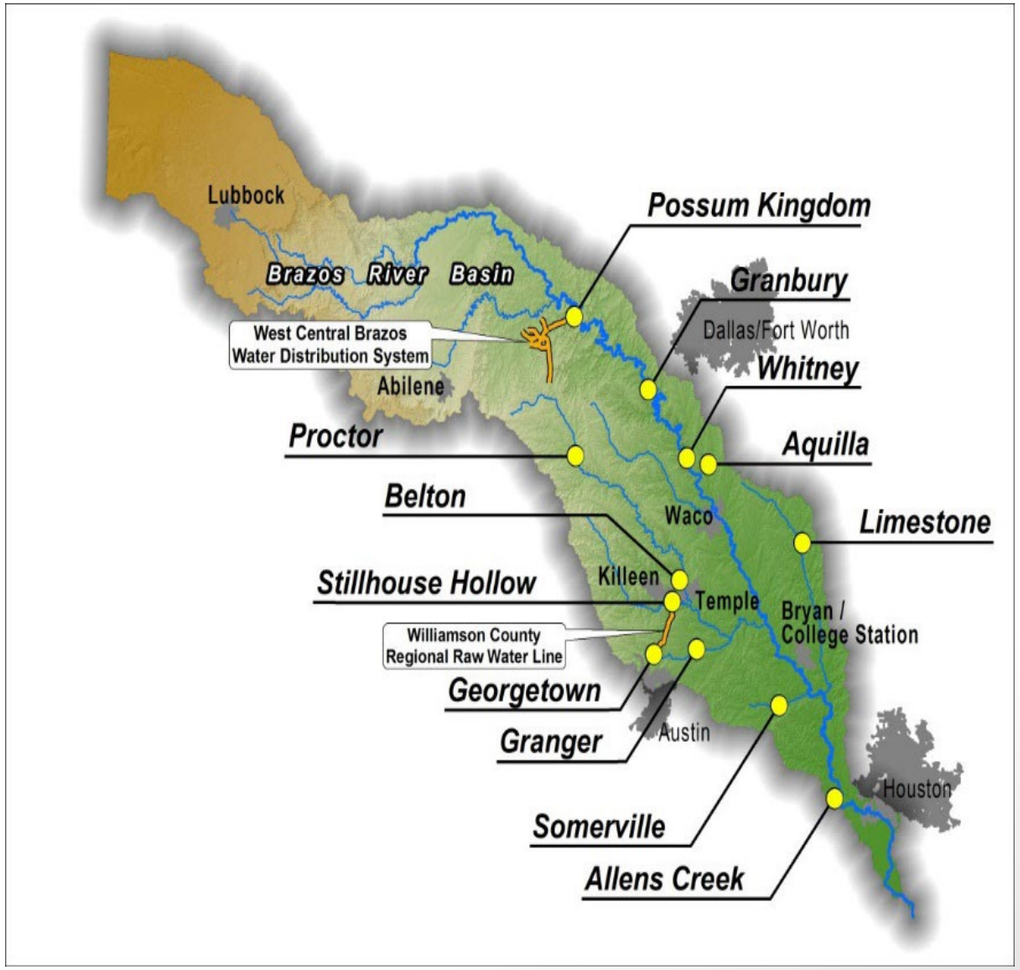
The Brazos River Simonton Cutoff

August 30, 2022

HUITT-ZOLLARS

The Brazos River – One of Texas' Largest Rivers

- Brazos River watershed ~ 44,000 sq. miles
- Stretches more than 1,280 miles from the New Mexico to the Gulf of Mexico in Freeport
- 11th longest river in the US
- System includes
  - 11 reservoirs
    - 8 US Army Corps of Engineers (flood control)
    - 3 Brazos River Authority (water supply)
- Approximately 89 miles of the Brazos River runs through Fort Bend County



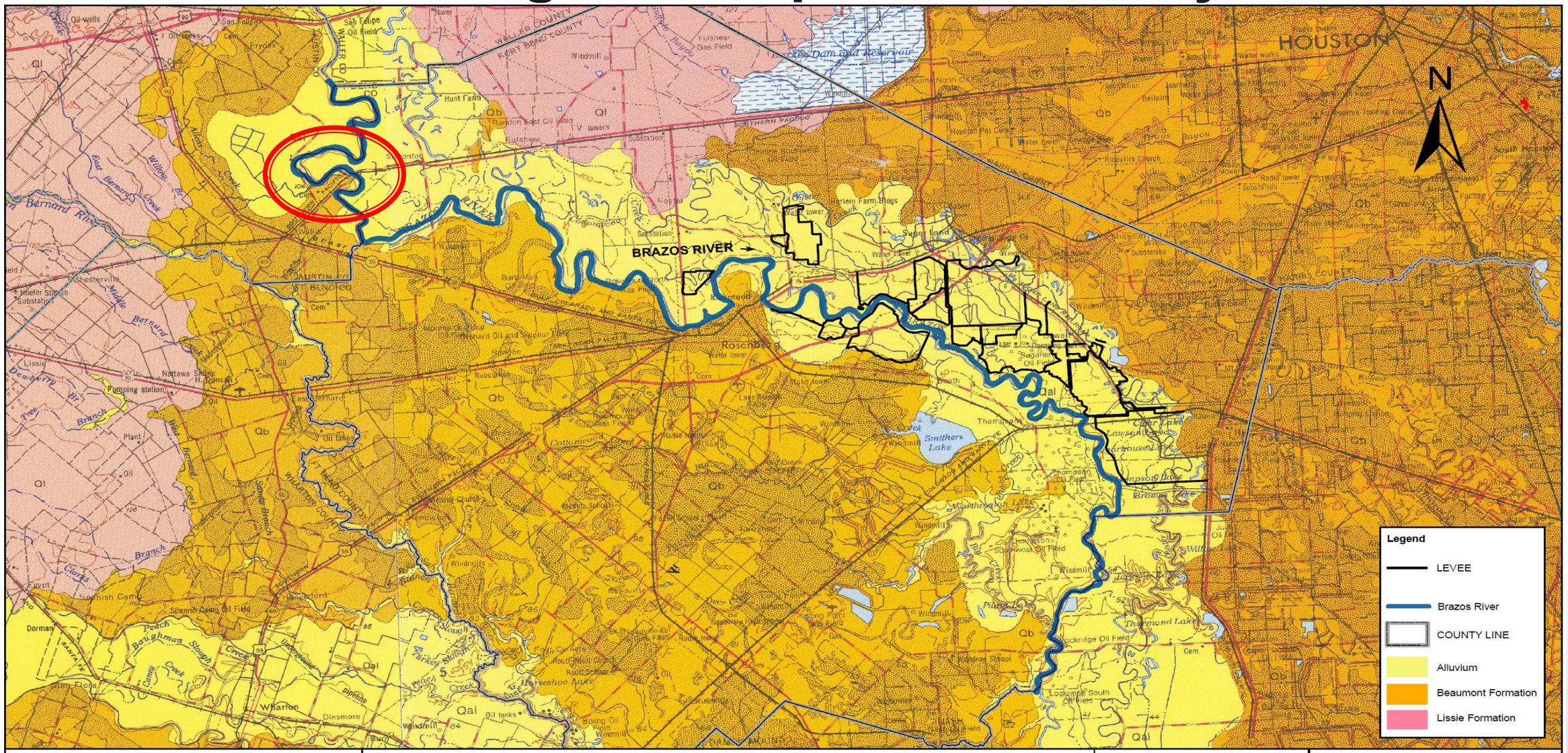
River Channel Cutoffs – Chute & Neck (Progressive)

- Drives changes in channel morphology, sediment load and habitat attributes of alluvial floodplain rivers
- Chute Cutoff – occurs when overbank flows carve a new channel across the floodplain usually during a significant flood event. This causes split flows initially until the majority of the river flows through the widening cutoff results in a silted oxbow in what was formerly the river.
- Neck Cutoff – occurs from increasing sinuosity and decreasing radius of curvature until the channel double backs upon itself via progressive migration. Ultimately, an oxbow will form. This is what is occurring at Simonton Cutoff.
- Planning for the impact of a cutoff requires balancing ecological function, flood protection and water supply.

River Channel Cutoffs

- A river with large bed loads, like the Brazos, will continuously shorten and lengthen itself by cutoffs and meander migration (bank erosion on the outside of river curves), respectively. The net result is the river will strive to maintain a certain length. History – On the lower Mississippi River, over 100 year period the river shortened itself by 218 miles due to cutoffs, however the corresponding increased meander migration, resulted in a net change in length of only 8 miles (Winkley 1977).
- Losing 6 miles of the river length due to the Simonton Cutoff from the overall 140 miles to Freeport (nearly 4% of its centerline length), the river will regain its length by increased sediment deposition, channel widening and increased meander migration both upstream and downstream.
- The millions of cubic yards of sediment from the cutoff and the resulting upstream head cut will be deposited downstream on the inside of the meanders of the river causing increased bank erosion on the outside of the meanders increasing normal flow velocities from 1 fps to 4 fps.

Geologic Floodplain Boundary



Brazos River
Geological Formations

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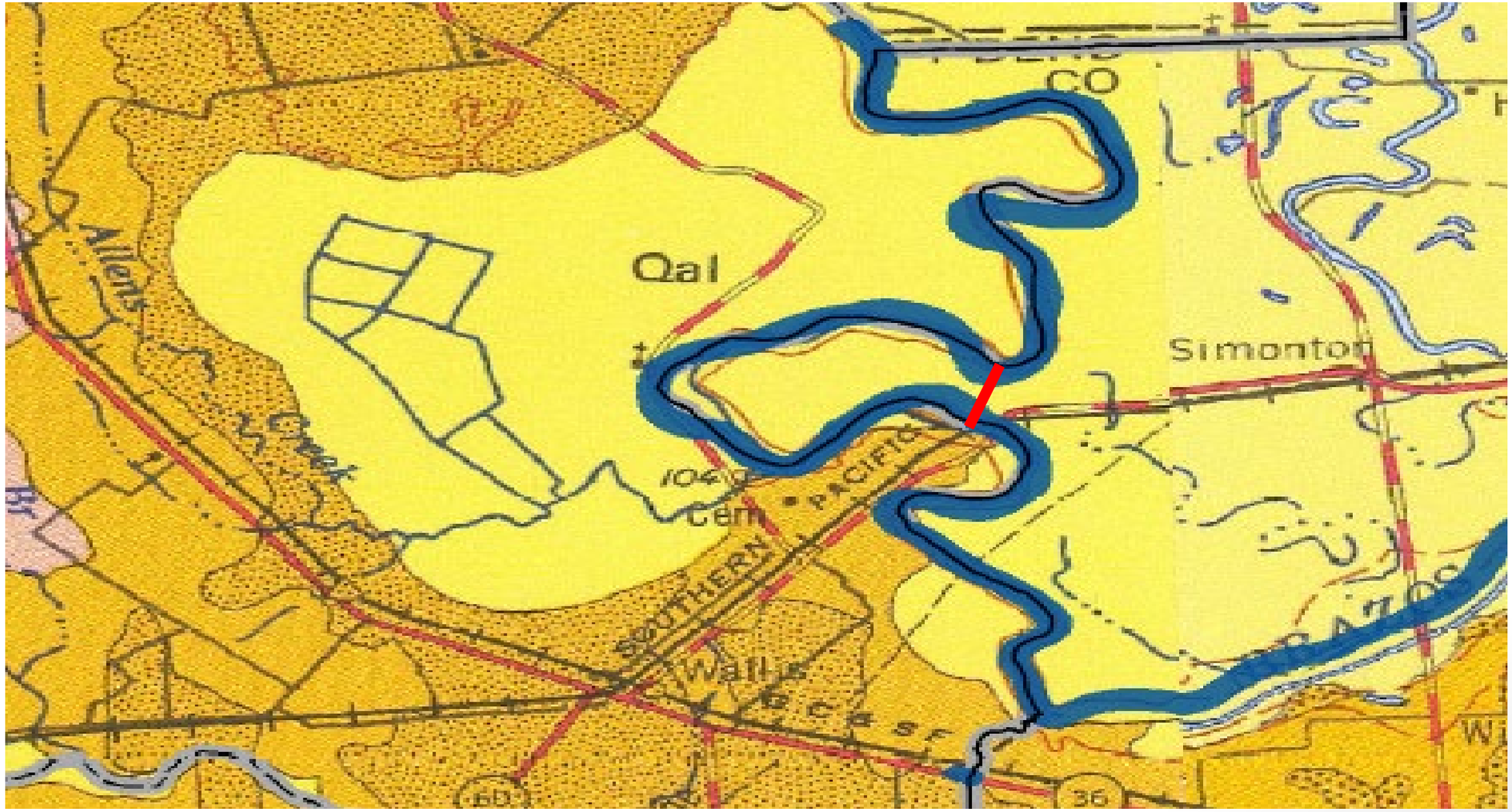
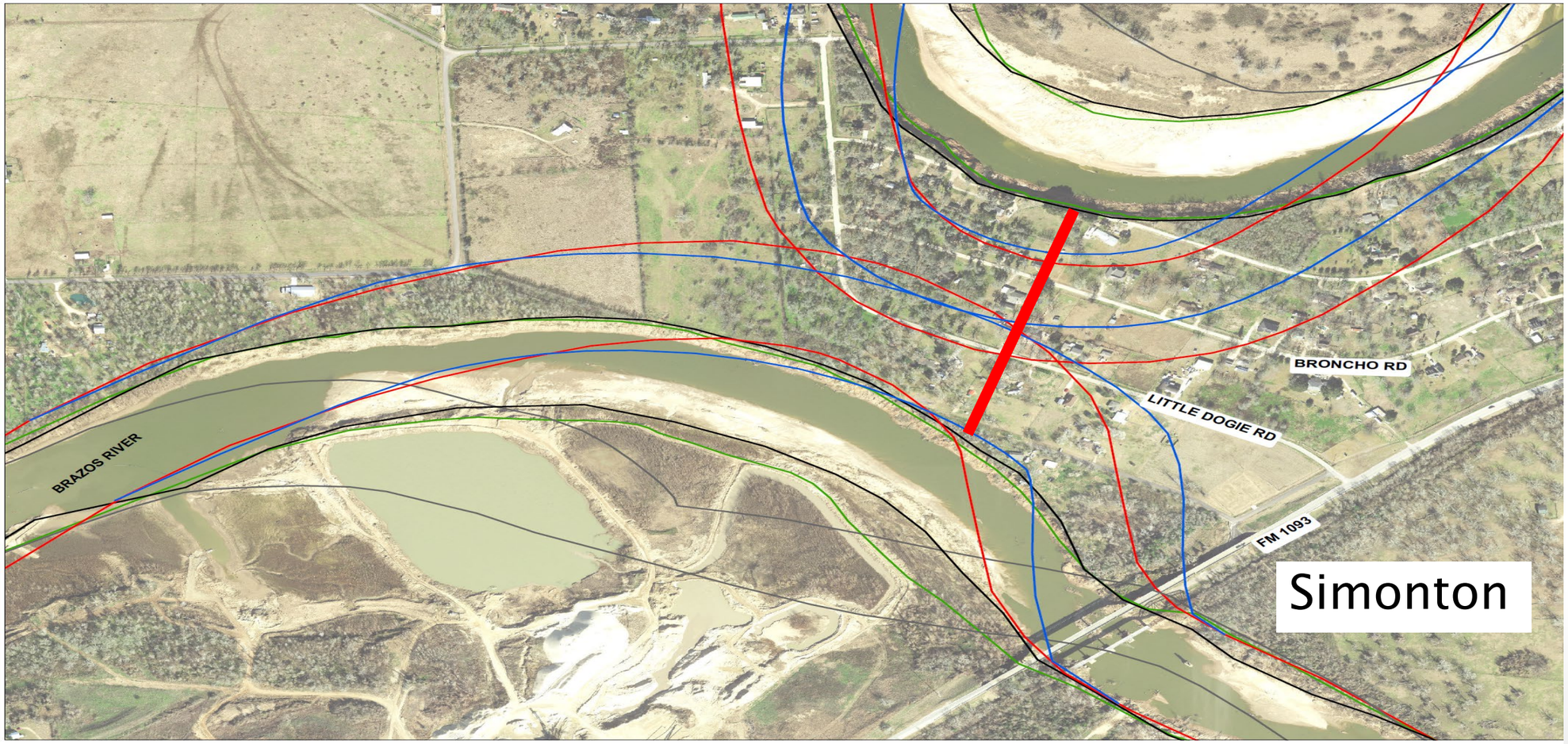
Simonton Cutoff Location



TAMU-OMMM
Probable Neck (Progressive) Cutoff of the Brazos River in 2048

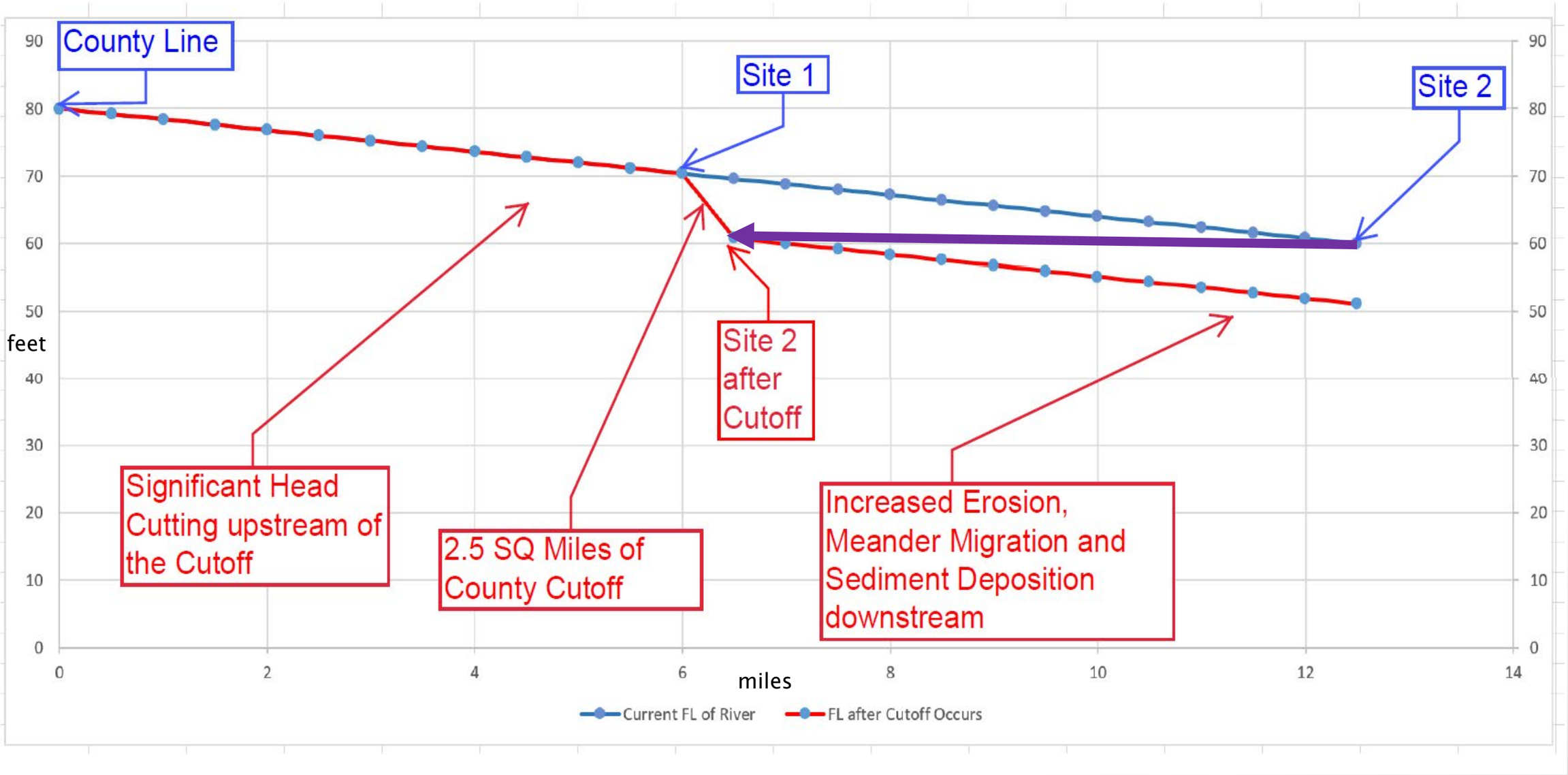
Sites 1 & 2



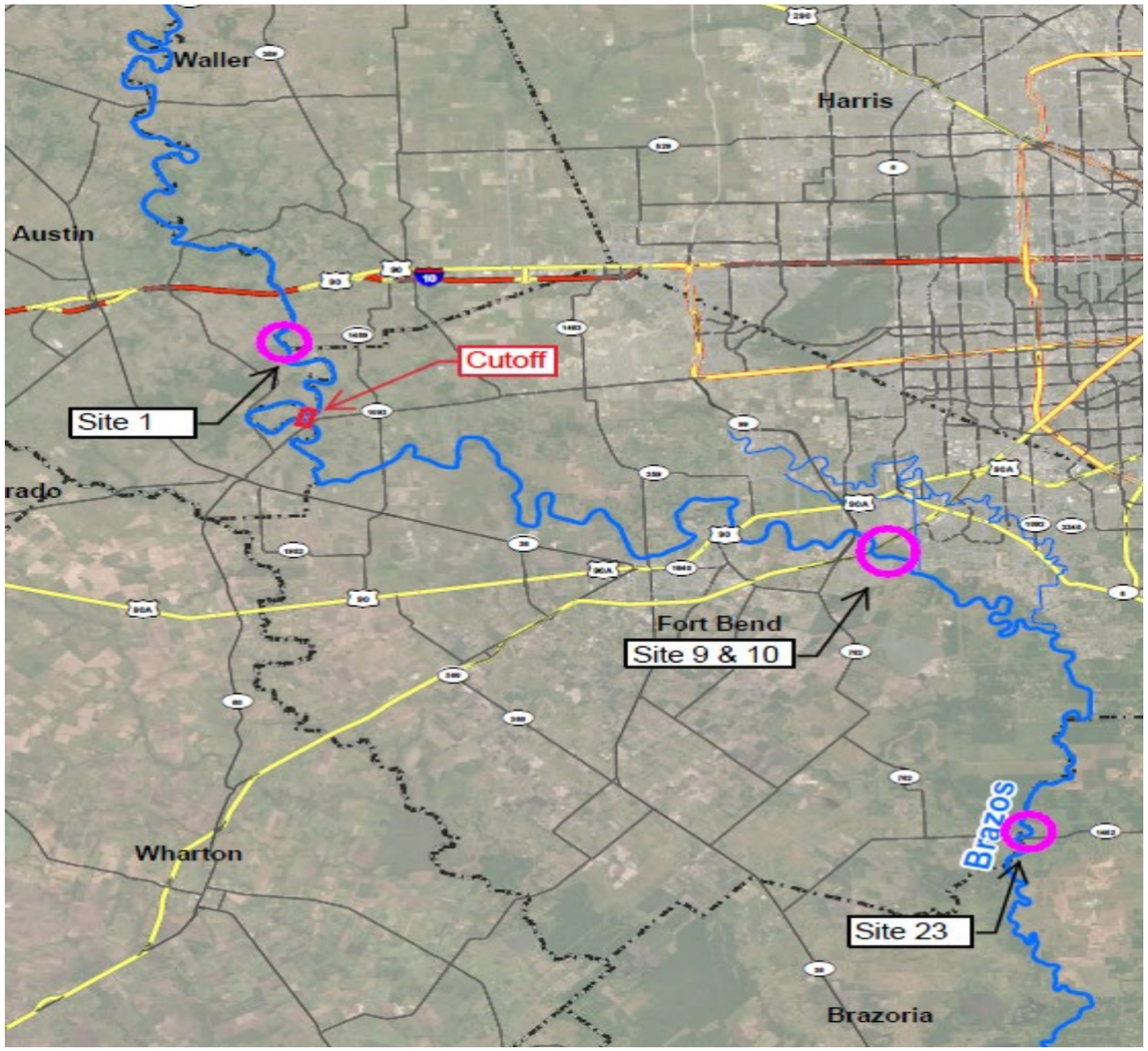
Blue based on avg. annual meander migration from 1980–2015
Red based on avg. annual meander migration from 1953–1979 and 2016–2017

Brazos River Erosion in Simonton (Looking upstream RS at Site 1)

Simonton Cutoff Impact to River's Flowline

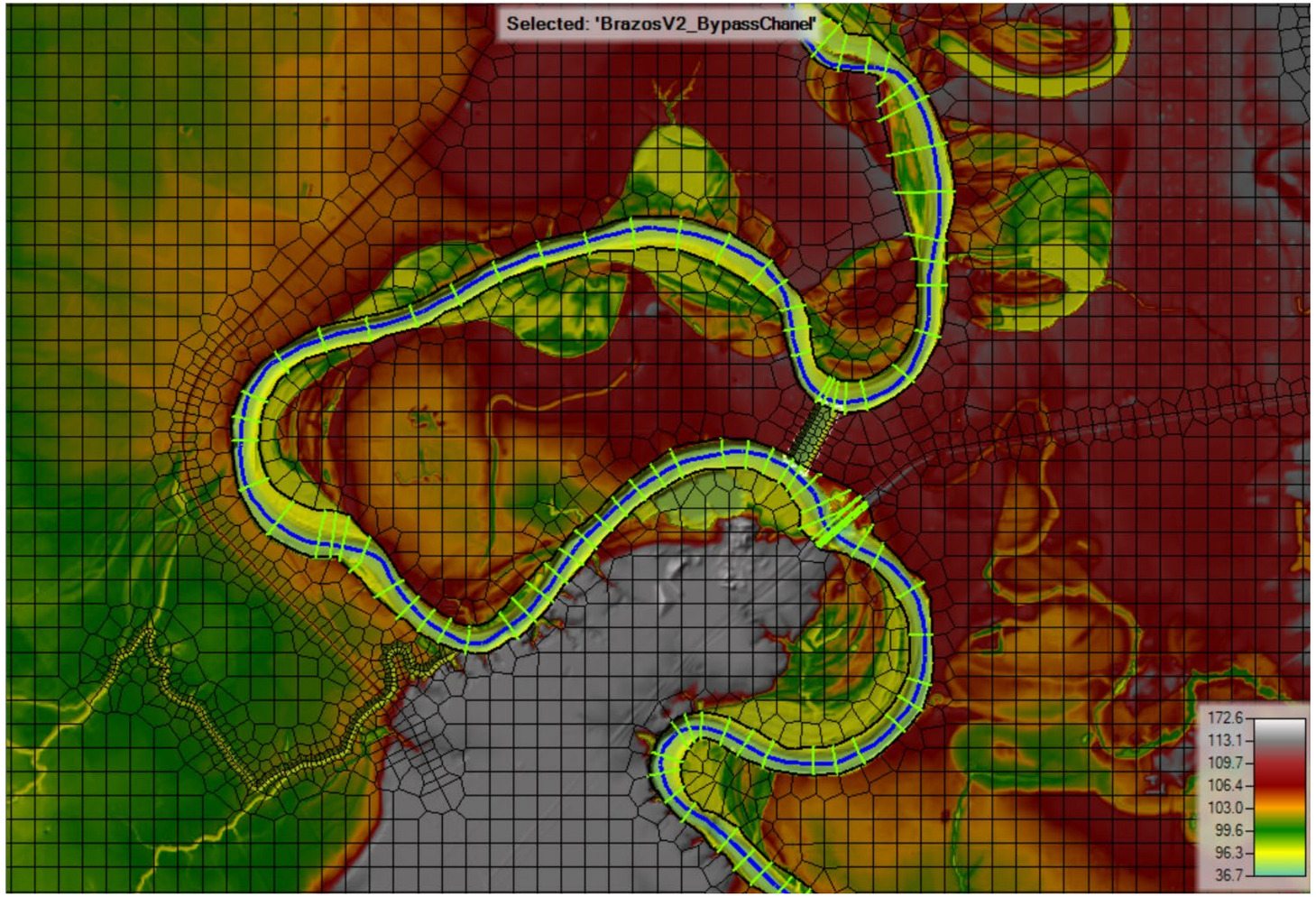


2D HEC RAS Modeling of Cutoff



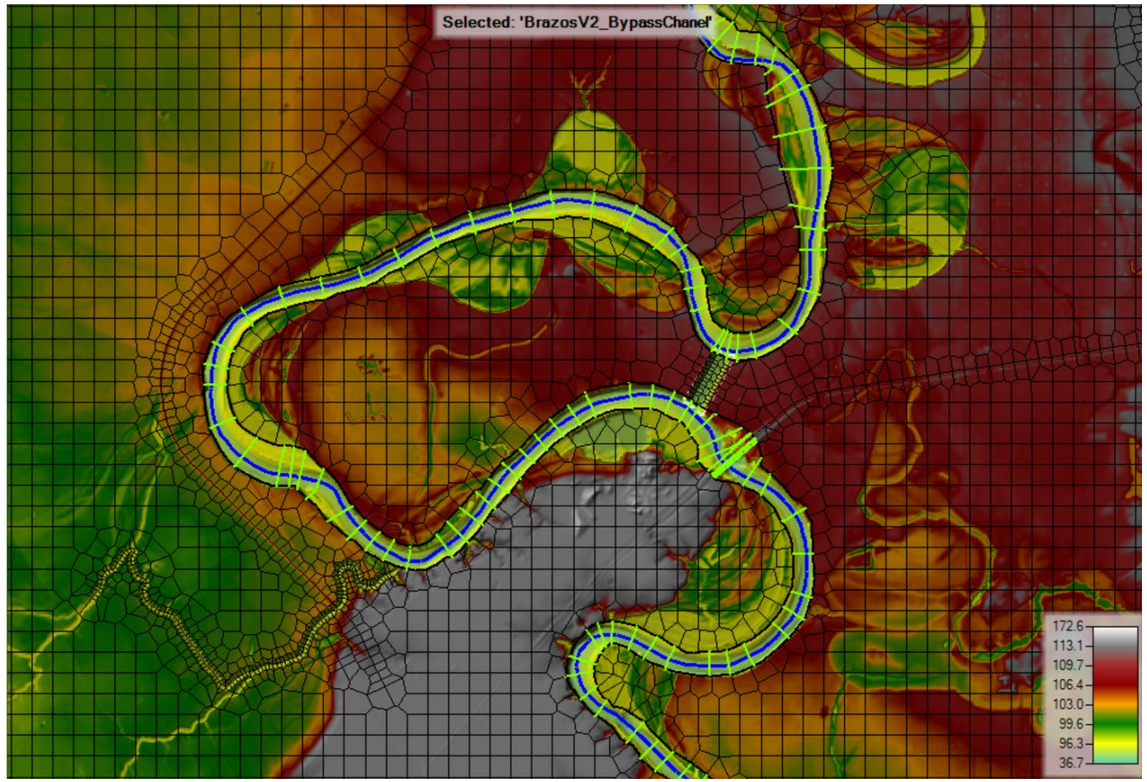
Using the Fort Bend Drainage District's 2D HEC RAS Model, modeled the impact of the Cutoff on the flows and velocities in the river and compared to the current model without the cutoff.

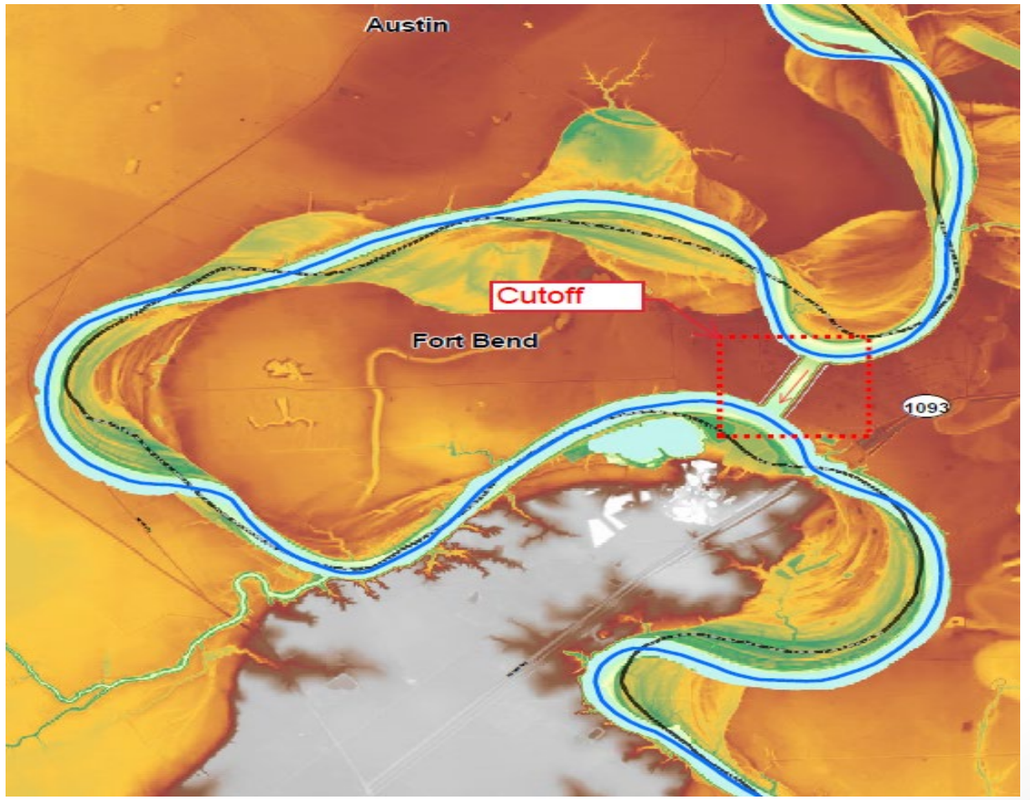
2D HEC RAS Modeling of Cutoff



For the 100-year event, modeled the impact of the Cutoff on the flows and velocities in the river and compared to the current model without the cutoff.

2D HEC RAS Modeling of Cutoff





Downstream of Cutoff – Modeled the impact of the increased sedimentation (10% to 20% of the rivers area) on the flows and velocities in the river and compared to the current model without the cutoff.

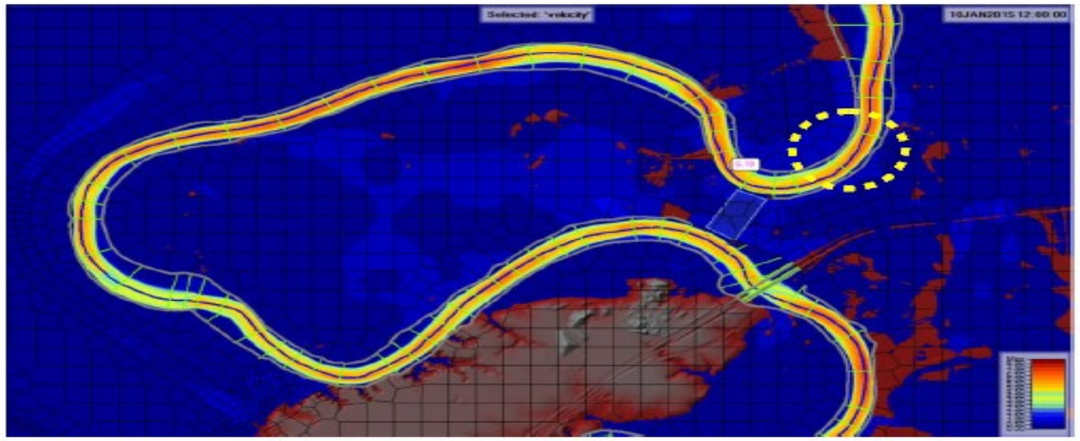
2D HEC RAS Modeling of Cutoff

Modeled the impact of the Cutoff on the flows and velocities in the river and compared to the current model without the cutoff.

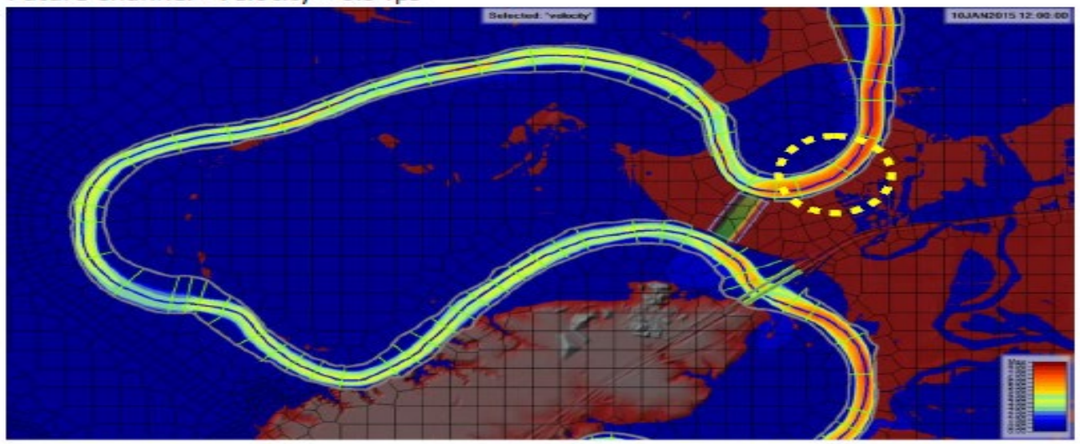
2D HEC RAS Modeling of Cutoff

100-yr

Existing Channel - Velocity=5.8 fps



Future Channel - Velocity = 6.9 fps



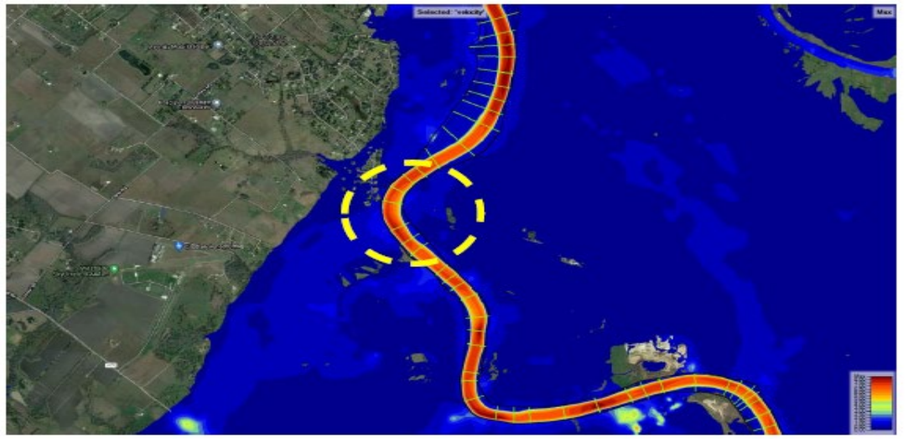
For 100-yr event, river velocities just upstream of the cutoff increase by nearly 19% when the Cutoff occurs.

2D HEC RAS Modeling at Site 1 – Waller & Austin Counties

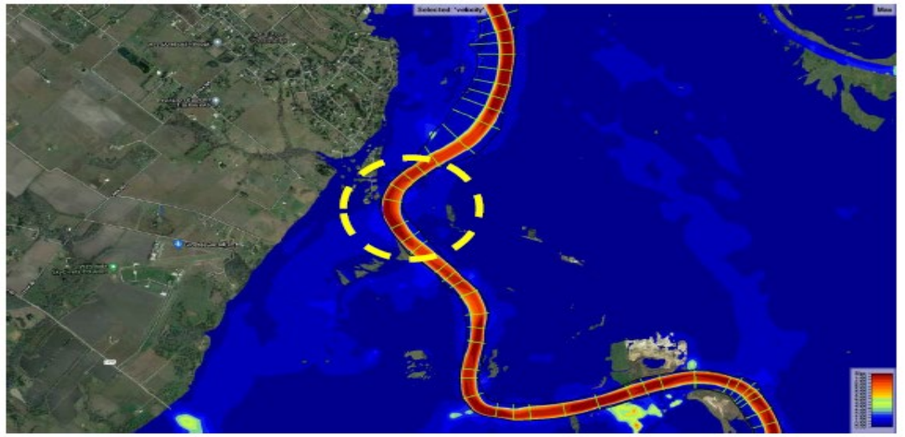
100-Year Storm Event

Location: Site 1

Existing Channel - Velocity = 7.2 (fps)



Future Channel - Velocity = 8.2 (fps)

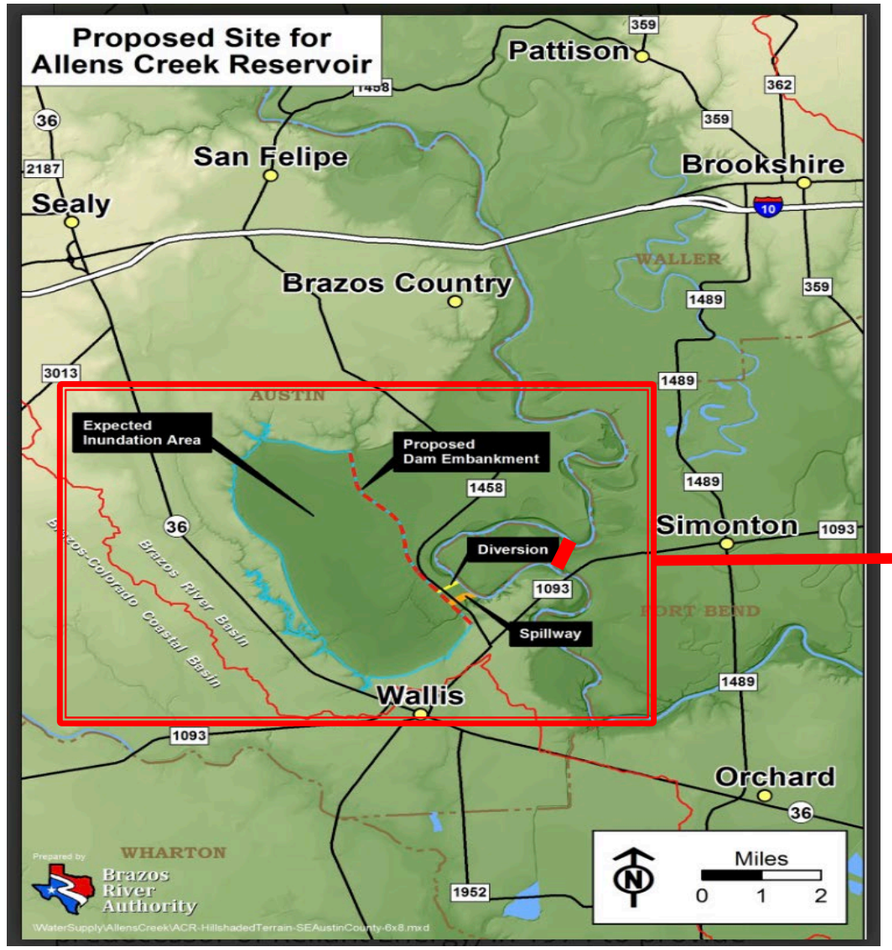


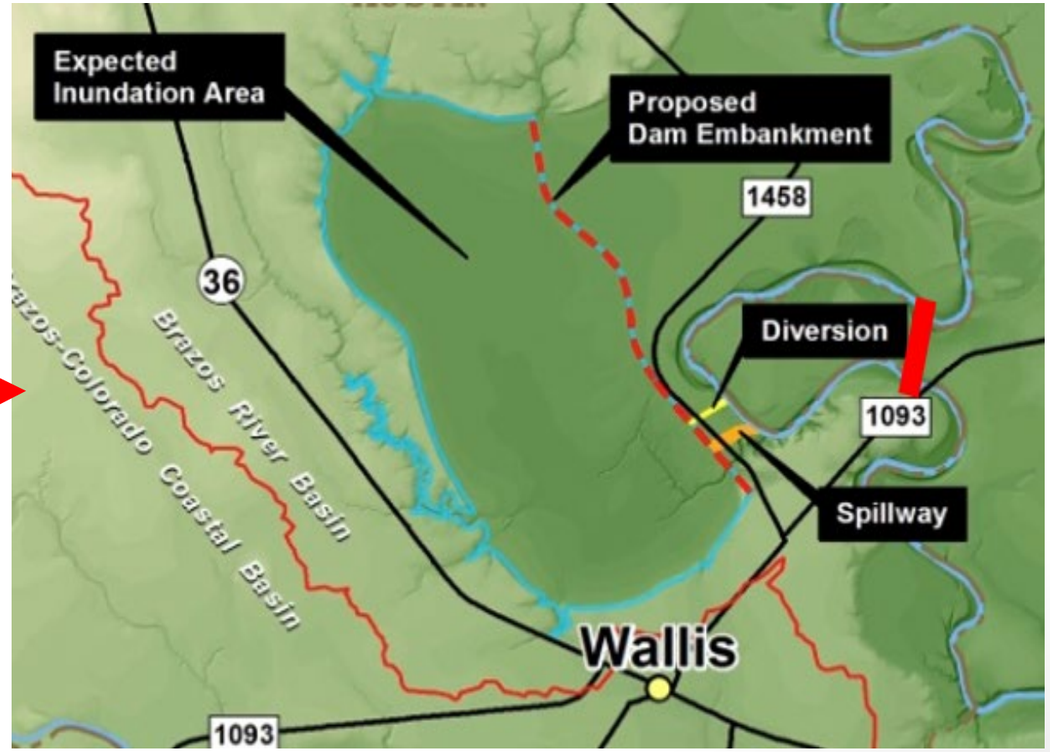
For 100-yr event, river velocities increase by nearly 14% when the Cutoff occurs.

Observation Method for Meander Migration (OMMM)
Site 1 – Austin & Waller Counties

Significant increase in projected Meander Migration over what is normally anticipated.

Cutoff will impact Allens Creek Reservoir





The reservoir's diversion and spillway structures will ultimately be silted in due the cutoff.

Proposed Improvements – Stone Toe Protection & Tie Backs

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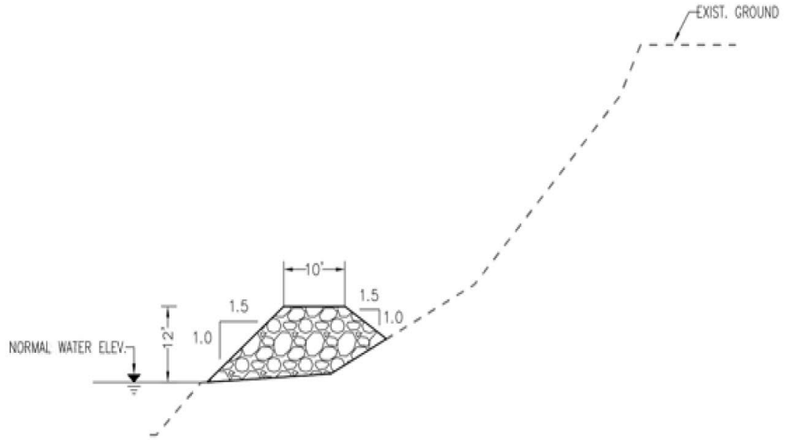

2 TYPICAL STONE DIKE - LONGITUDINAL FILL
SCALE : N.T.S.

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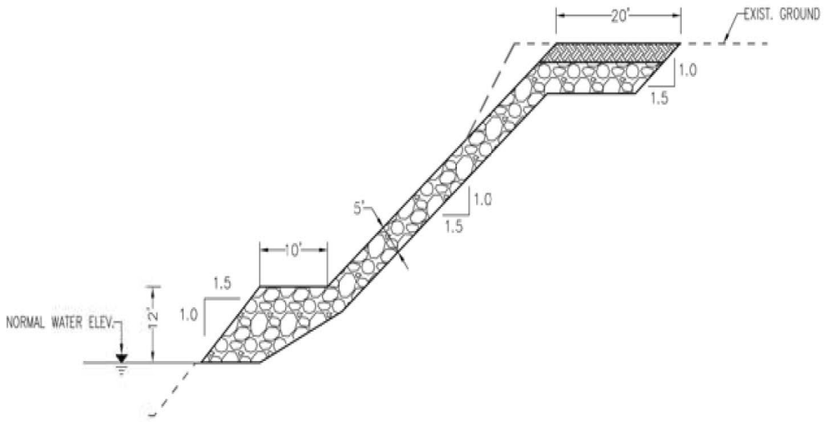
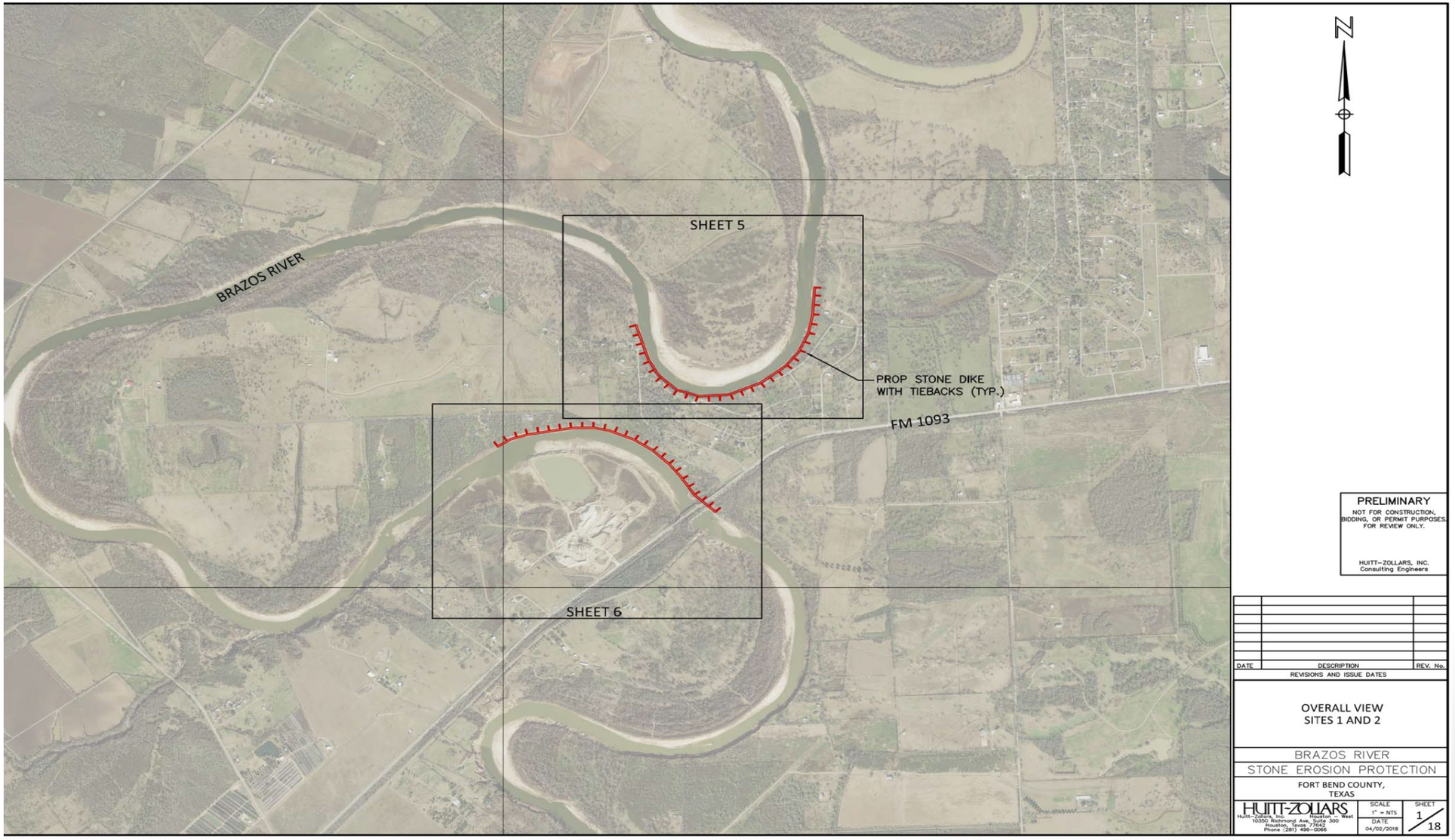
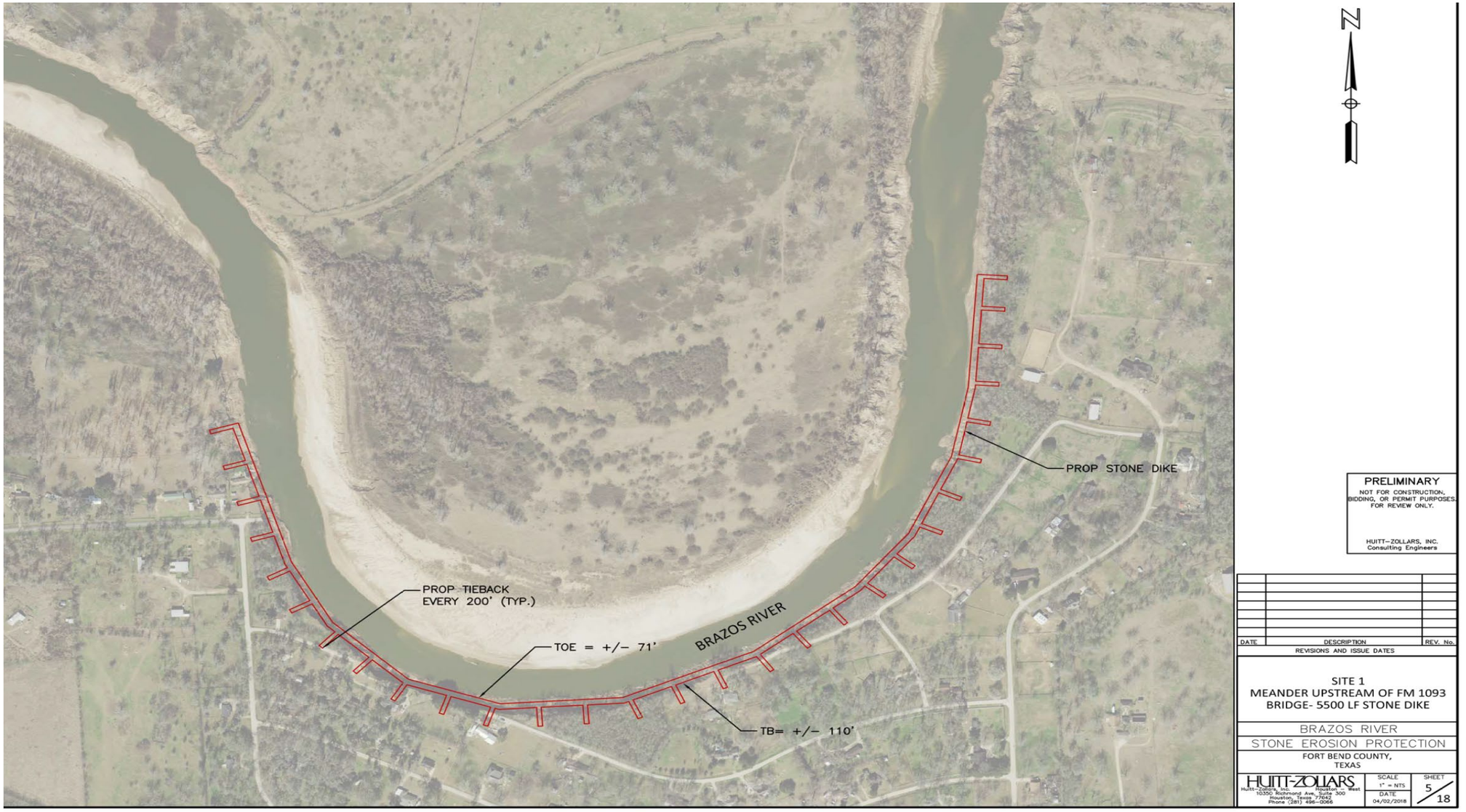


1 TYPICAL STONE DIKE WITH TIEBACK
TIE BACK WIDTH = 10'
SCALE : N.T.S.

Proposed Improvements – Sites 1 and 2



Proposed Improvements
Site 1 – Upstream Meander of Simonton Cutoff (RS)



Proposed Improvements
Site 2 – Downstream Meander of Simonton Cutoff (RS)

Probable Project Cost

Huitt-Zollars, Inc
25-Jun-21

Simonton Cutoff (Sites 1 and 2)
Probable Project Cost

Location #	Repair Location		Project Cost
1	Upstream Meander - Simonton Cutoff (RS)	$	12,036,397
2	Downstream Meander - Simonton Cutoff (RS)	$	13,355,593
		Total $	25,391,990

Current Funding

Attachment B, Table 1: Local Government Allocations, H-GAC Recommended MOD Formula			
Jurisdiction	H-GAC MOD Allocation by Jurisdiction	Jurisdiction	H-GAC MOD Allocation by Jurisdiction
Alvin city	$6,000,500.38	Katy city	$1,128,164.00
Angleton city	$1,792,931.27	La Marque city	$4,165,518.17
Austin county unincorporated	$6,750,123.20	Lake Jackson city	$2,138,653.88
Bay City city	$3,189,452.74	League City city	$15,561,524.83
Baytown city	$2,686,858.46	Liberty city	$2,684,331.37
Brazoria county unincorporated	$43,326,945.43	Liberty county unincorporated	$21,274,202.95
Brookshire city	$1,309,959.05	Manvel city	$1,557,251.35
Brookside Village city	$1,580,215.93	Matagorda county unincorporated	$8,048,311.11
Chambers county unincorporated	$14,923,204.92	Missouri City city	$5,070,896.33
Cleveland city	$1,498,233.40	Montgomery county unincorporated	$60,374,962.11
Clute city	$1,220,939.36	Palacios city	$1,384,700.63
Colorado county unincorporated	$5,284,438.05	Patton Village city	$1,259,091.48
Columbus city	$1,018,348.44	Pearland city	$14,008,885.85
Conroe city	$7,584,676.87	Regional and urgent need projects	$62,000,000.00
Dayton city	$1,453,574.93	Richmond city	$1,535,524.10
Dickinson city	$15,761,029.82	Richwood city	$2,456,537.52
El Campo city	$1,554,085.23	Rosenberg city	$4,121,319.48
Fort Bend county unincorporated	$56,030,013.06	Santa Fe city	$2,743,679.59
Freeport city	$1,837,967.01	Simonton city	$1,559,065.30
Friendswood city	$4,636,108.85	Stafford city	$1,228,083.21
Galveston city	$15,761,416.68	Sugar Land city	$4,063,639.47
Galveston county unincorporated	$18,221,223.37	Texas City city	$8,012,688.75
Hitchcock city	$3,864,154.83	Walker county unincorporated	$6,175,023.19
Holiday Lakes town	$1,581,998.68	Waller county unincorporated	$8,774,400.10
Houston city	$9,232,730.04	Wharton city	$4,360,821.44
Huntsville city	$2,256,231.70	Wharton county unincorporated	$11,758,515.79
Iowa Colony city	$958,846.32	**Total**	**$488,762,000.00**

Tentative Schedule

- **Preparation and Submission of GLO CDBG-MIT Application: 6 months**
- **GLO Processing of Application & Contract Aware: 3-4 months**
- **Engineering, Surveying, Geotech & Environmental: 6-8 months**
- **Construction: 20-24 months**

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