Welcome

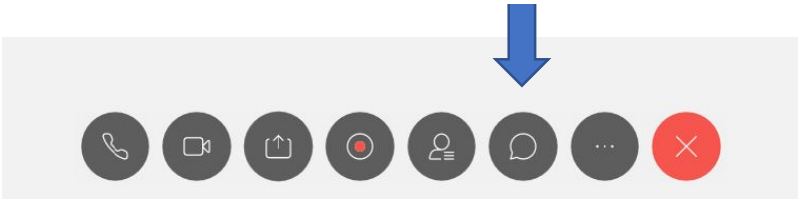
Buffalo Bayou and

Tributaries Resiliency Study

Public Information Sessions
October 13, 15, 22, 26
2020

Use the Chat feature to:

- Provide your name & email to be added to our email list
- Type questions for the Q&A session at the end of the meeting



Session details

Tonight

- Use the Chat feature to
  - Provide your name & email to be added to our email list
  - Type in your questions and get some answers today
    - These questions will help us know what else to include on our web page – if you have the question, it's possible others do too
    - If you have a question after this meeting you can email us:
      email: BBTRS@usace.army.mil
- To help this event run smoothly, we will keep all phones on mute

Buffalo Bayou and Tributaries Resiliency Study

Interim Feasibility Report

HARRIS COUNTY FLOOD CONTROL DISTRICT

US Army Corps of Engineers®

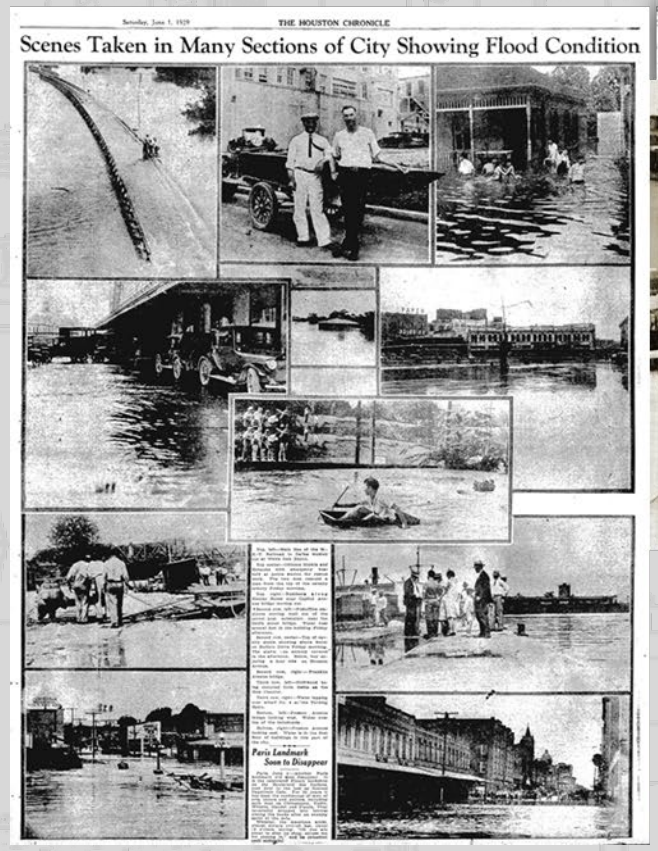
U.S.ARMY

Our goals today

- Introduce the Buffalo Bayou & Tributaries Resiliency Study and its goals – why this matters to you and the region
- Update those who might have participated previously
- Answer your questions
- Explain how to send written comments for our consideration by November 2nd

History and commitment

Early Houston Floods
May-June 1929 and December 1935



Hurricane Harvey 2017

Evaluating alternatives

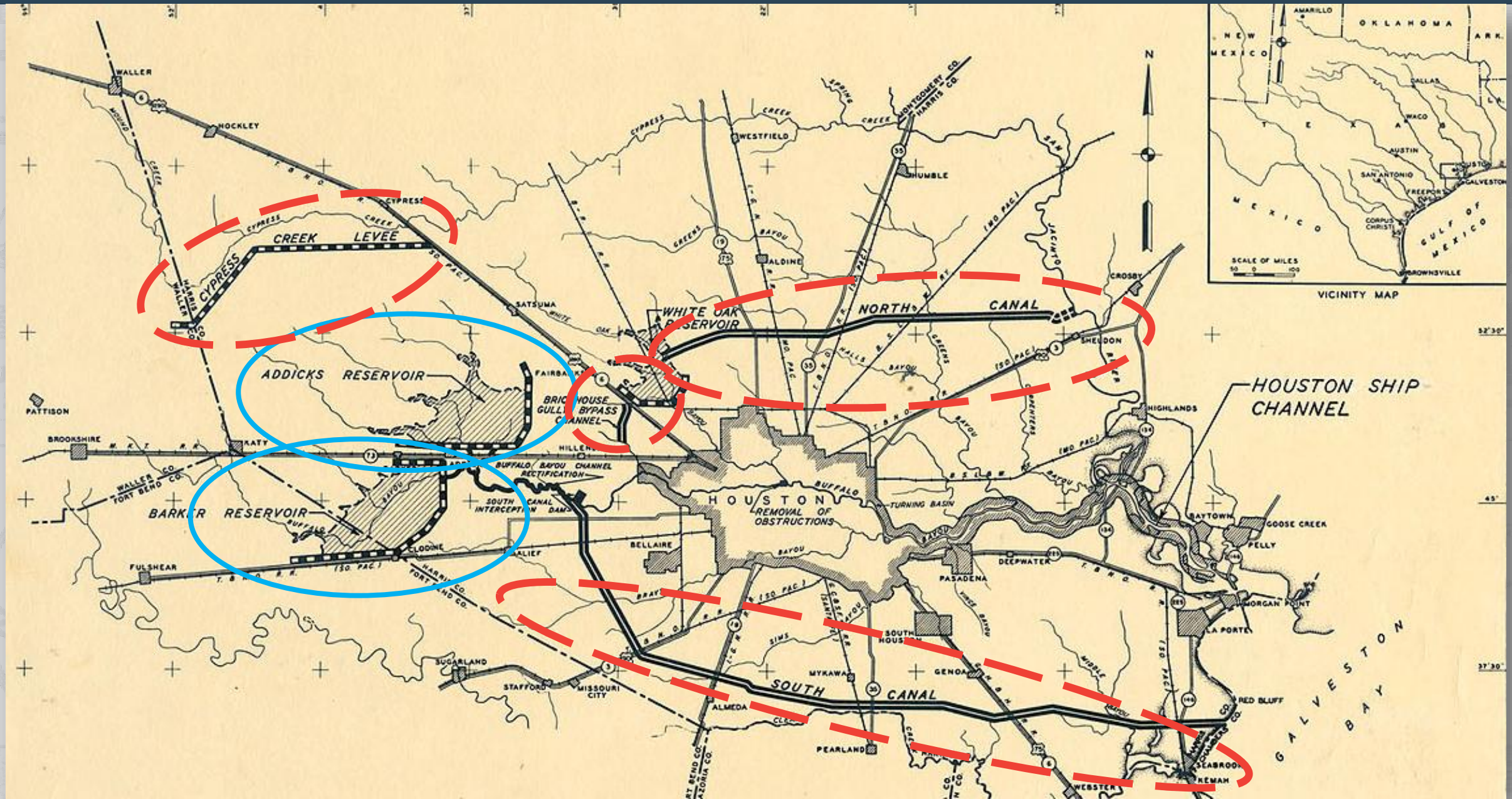
- ✓ ability to meet reduce risks to life safety and property
- ✓ technical feasibility (Can the alternative be designed and built?)
- ✓ economic feasibility (Is the alternative a cost-effective way of meeting the purpose and need?)
- ✓ consideration of potential effects to identified environmental and social resources

Our roles today

Presentation overview

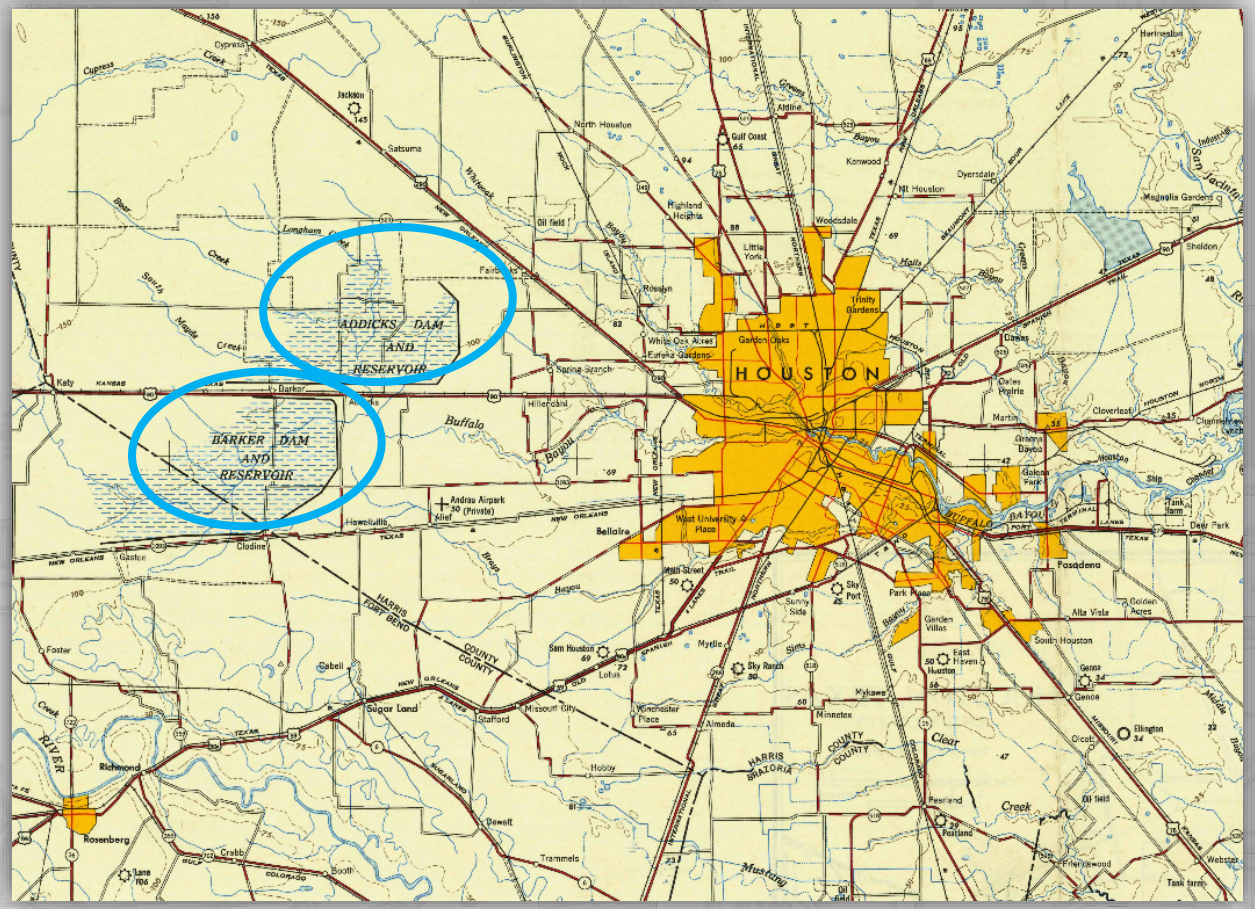
- Outline Study process and progress
- Goals of Interim Feasibility Report, including current comment period
- Overview of alternatives considered to date
- Next steps and your role

Buffalo Bayou & Tributaries 1940's original plan

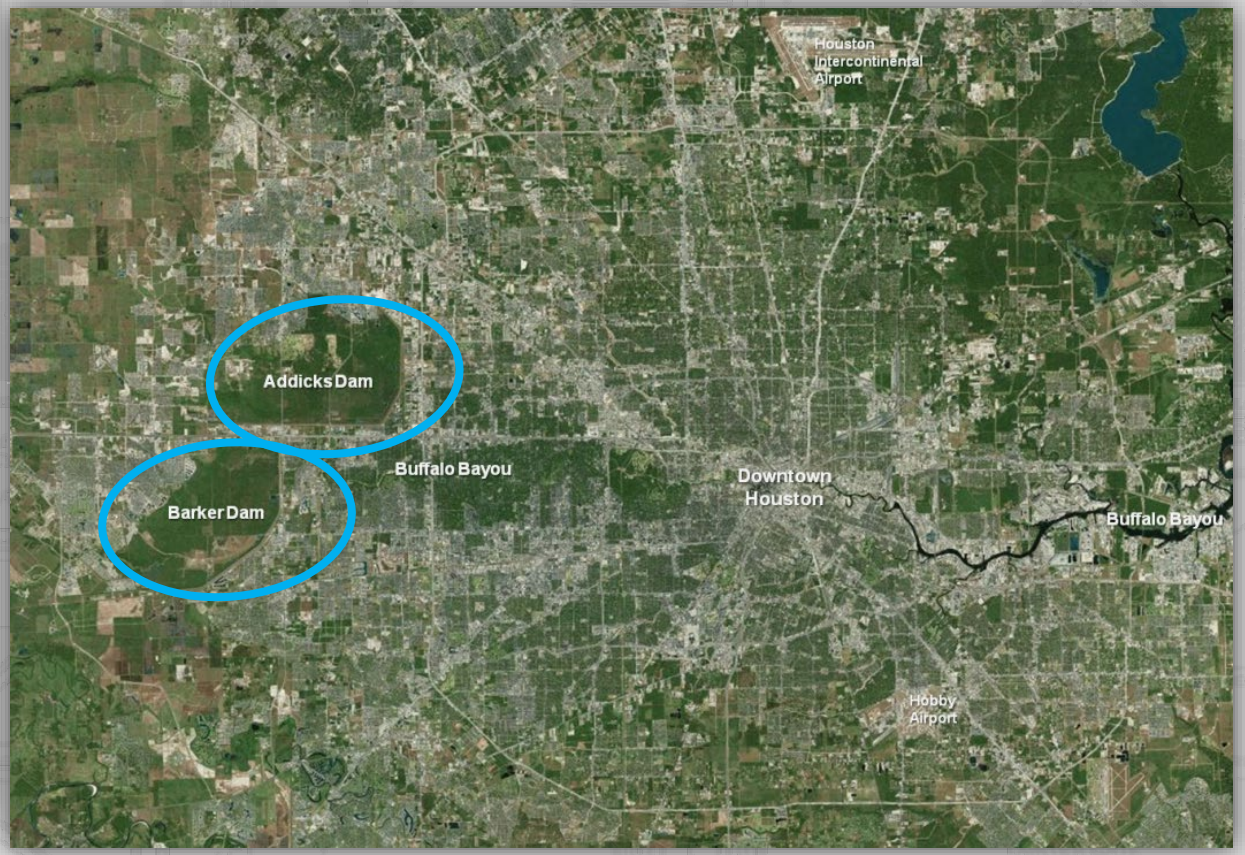


Houston then and now

1952



2016



View the interactive storymaps on our website to learn more about the history of flooding in your neighborhood

Hurricane Harvey – August 2017

Upstream

Downstream

ADDICKS RESERVOIR				BARKER RESERVOIR			
DATE	ELEVATION AT DAM	SURFACE AREA IN ACRES	STORAGE IN ACRE-FEET	DATE	ELEVATION AT DAM	SURFACE AREA IN ACRES	STORAGE IN ACRE-FEET
30 AUG 2017	109.09	16,982	217,726	30 AUG 2017	101.56	15,149	170,941
23 APR 2016	102.65	12,834	123,067	23 APR 2016	95.25	12,090	85,816
09 MAR 1992	97.46	9,189	65,264	09 MAR 1992	93.60	11,494	66,489
SPILLWAY DESIGN FLOOD	115.00	20,910	329,676	SPILLWAY DESIGN FLOOD	108.00	19,330	281,267

Spillway Design Flood: Largest flood event that Addicks and Barker are designed to safely handle

The Dams are designed for events as large and larger than Harvey. But the system is constrained due to:

- Upstream change in land use. More water reaches the dams and reservoirs fill up faster
- Increased presence of life and property upstream and downstream. If the dams hold too much water, then pool levels exceed government owned land; If too much water is released then there are impacts downstream.

Study overview

Authorization: Section 216 of Flood Control Act of 1970

Appropriation: Bipartisan Budget Act of 2018

Budget: $6 Million (100% federal)

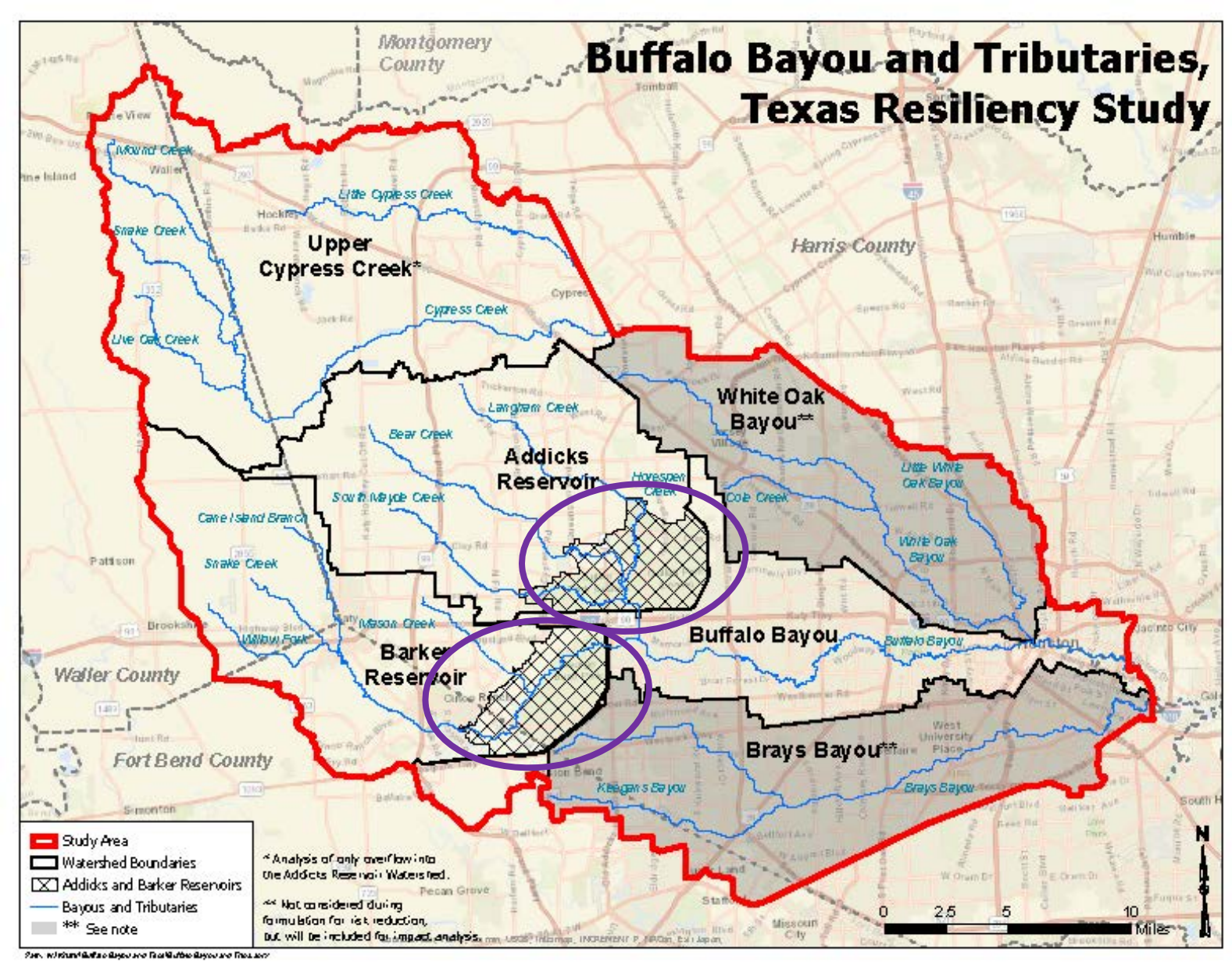
Purpose: Flood Risk Management

Non-Federal Sponsor: Harris County Flood Control District

Study goals

Goals

- Identify and evaluate how we can reduce flood risks downstream and upstream of Addicks and Barker Dams
- Evaluate the dams for continued structural integrity, focusing on the uncontrolled spillways



Dam Safety Program

Location: Houston, Texas

Program: Dam Safety (Phase 1)

Phase: Construction

Contract Amount: $82,448,259

Required Completion Date: December 2020

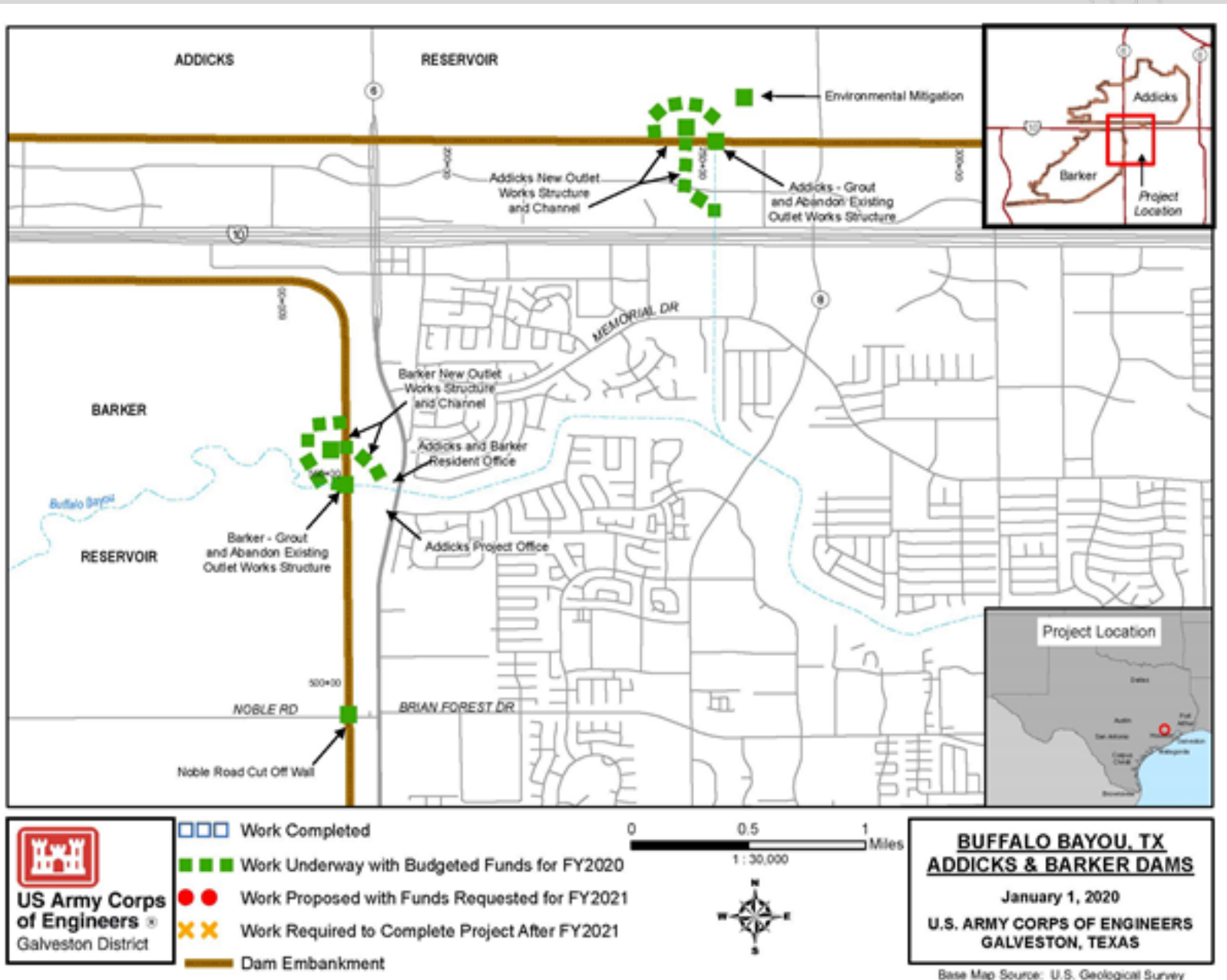
Sponsor: 100% FED

Purpose: Flood Damage Reduction

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



Dam Safety Program


Addicks Structure—Spring 2019


Addicks Structure—21 April 2020


Barker Structure—Spring 2019


Barker Structure—21 April 2020

Construction of new outlet control structures at Addicks and Barker dams

Both new outlet works have been in operation since March 2020

Study to date

Spring 2019

Scoping

- Early alternatives concepts
- Public engagement and input

Formulation of Alternatives and Technical Analysis

- Hydraulics & hydrology modeling
- Engineering conceptual design
- Environmental habitat & impact assessments
- Economic analysis

October 2020

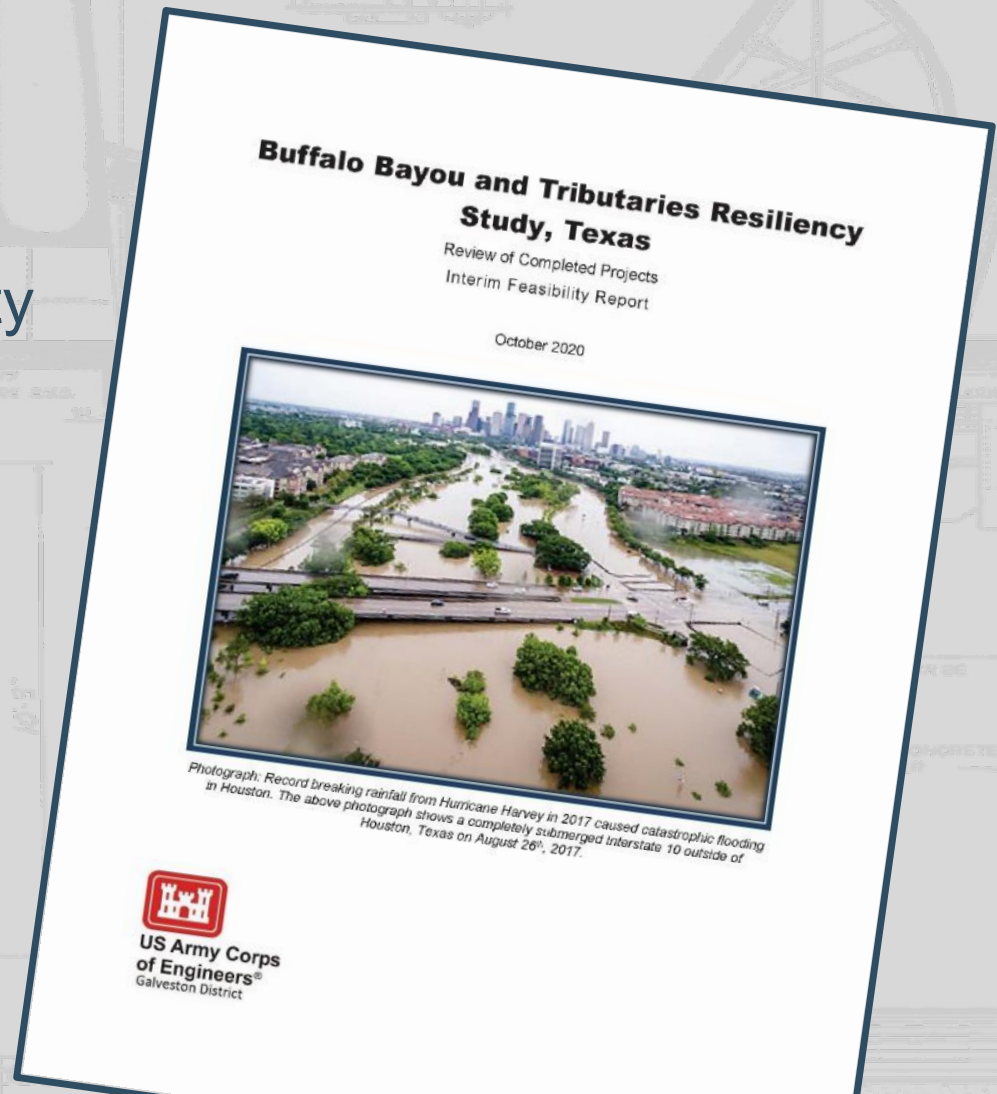
Interim Report

- Analysis and alternatives to date
- Public engagement and input

Where we are today

Inviting public review and feedback of the Interim Feasibility Report

- Help us further evaluate the benefits, feasibility, impacts and costs of alternatives
- Your comments will inform a future draft feasibility report and draft environmental impact statement (which will be released for public review and comment)



Submit written comments by Nov. 2, 2020

Our email and mailing address can be found in the Chat and on our website

Explaining flood event terms

It's not really a 100-year flood
…it has a 1% estimated chance of occurring in any one year

- Annual Exceedance Probability means that certain levels of flooding have a chance of happening in any given year

- The term 50-year event, for example, has a 2% estimated chance of happening in any given year; a 500-year event has a 0.2% estimated chance of occurring in any given year. It does not mean that the event can only happen every 500 years

Recurrence Interval (years)	Annual Exceedance Probability (percent)
2	50
5	20
10	10
25	4
50	2
100	1
200	0.5
500	0.2

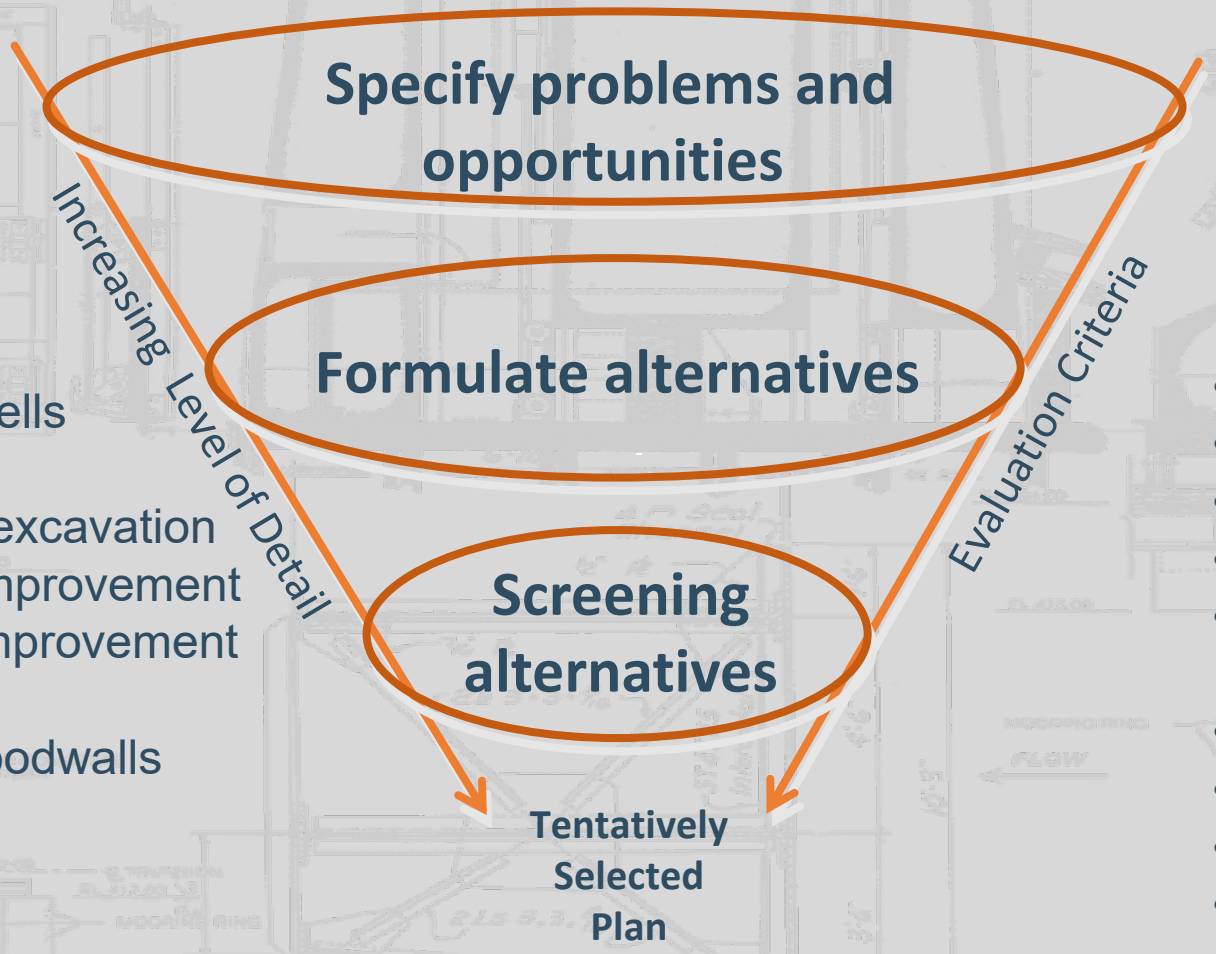
Formulating alternatives

Each alternative must be evaluated to determine its

- ✓ ability to meet reduce risks to life safety and property
- ✓ technical feasibility (Can the alternative be designed and built?)
- ✓ economic feasibility (Is the alternative a cost-effective way of meeting the purpose and need?)
- ✓ consideration of potential effects to identified environmental and social resources

Based on these criteria, screening removed some alternatives from further consideration and allowed others to advance to the next step in evaluation

Screening process



Initial Measures

Pumps	Injection wells
Diversions	Relocation
Tunnels	Reservoir excavation
Acquisition	Channel Improvement
Elevation	Spillway Improvement
Detention	Bypass
Dam Raising	Levees/Floodwalls

Evaluation Criteria

- Reduction in Flood Damages
- Depths of flooding
- Impacts to Life Safety
- Costs
- Impacts to Critical Infrastructure
- Required Mitigation
- Impacts to T&E species
- Cultural Impacts
- Resiliency

Anchor and ancillary measures

Anchor Measures

- Those measures best able to substantially reduce flood risk across the study area

Ancillary Measures

- Those measures best able to reduce the remaining residual risks after one or more Anchor Measures were identified; Complementary measures

All ancillary measures were screened out after evaluation

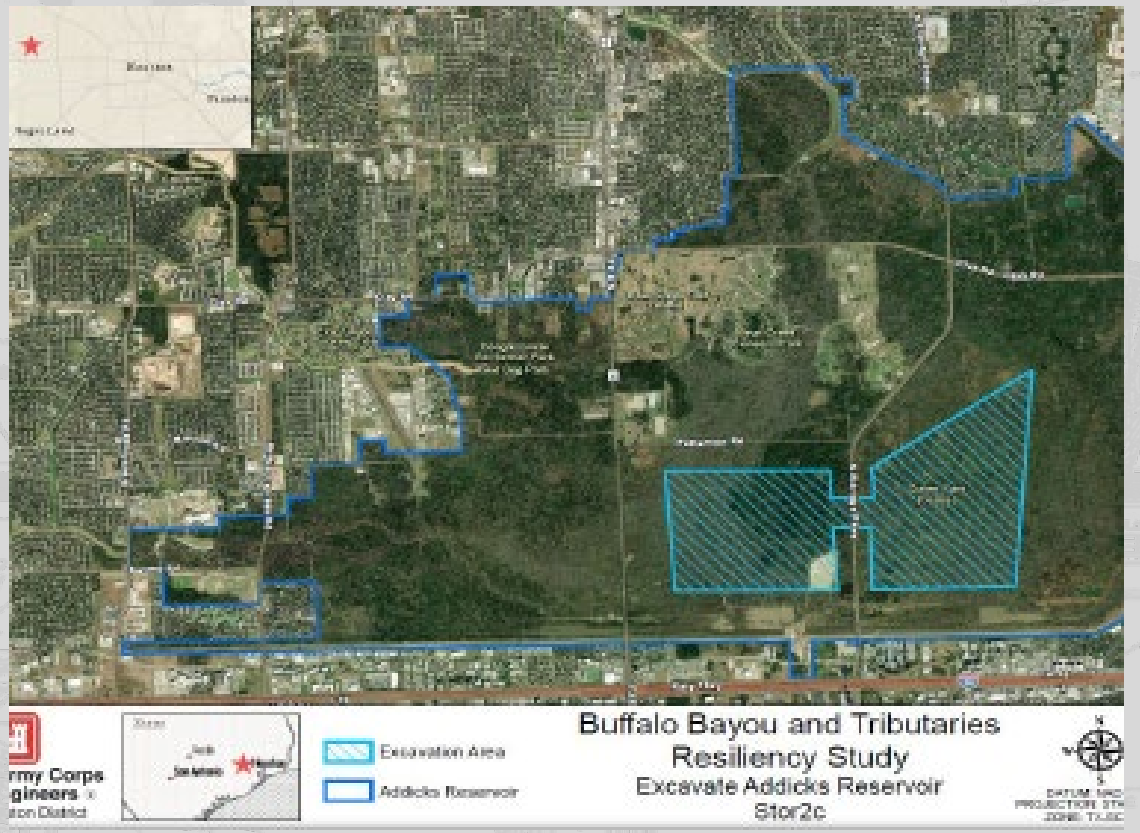
Screened out ancillary measure

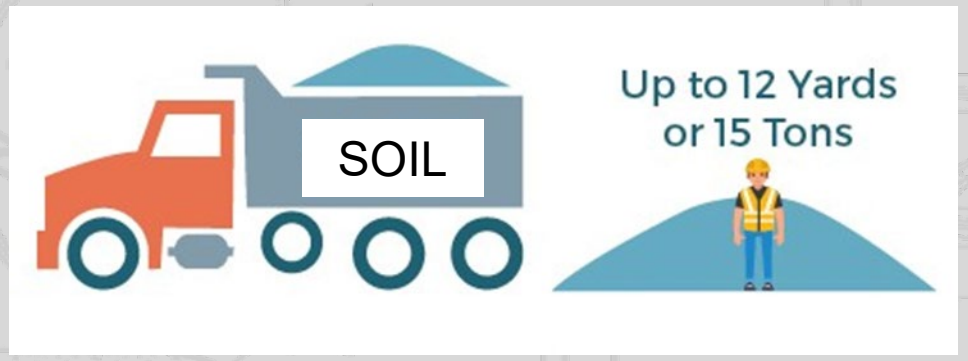
Deepen existing reservoirs

- Capacity increase of 5% to 15%
- Cost range: $1.3B – $1.8B

Major Finding:

- Requires removal of ~15 to 47 million cubic yards of soil, but produces only limited local benefits



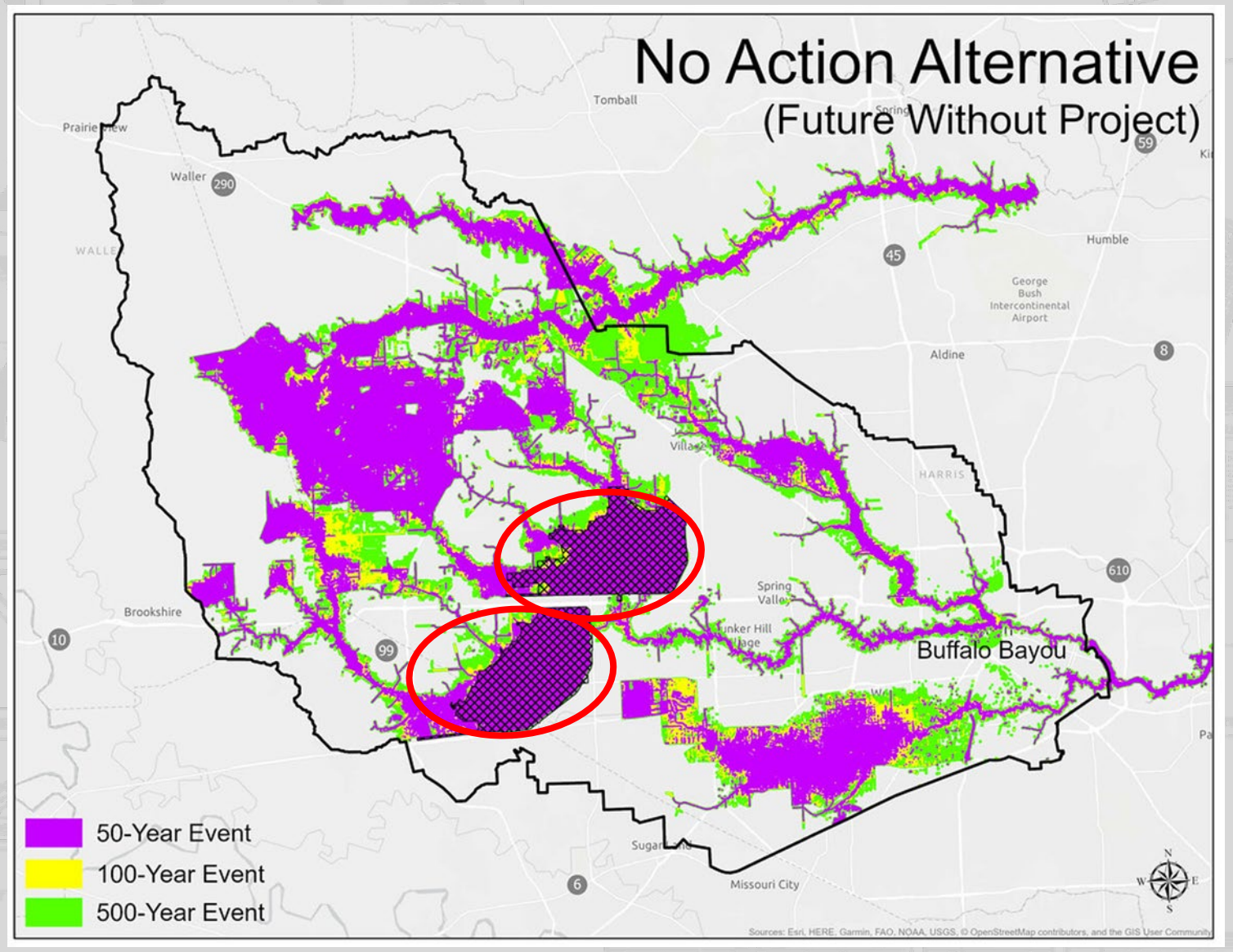


- 62,856 standard rail cars for 47 million cubic yards
- Or 3.9 million dump trucks for same (12 cy/truck)

No action alternative

No Action

- Forms the baseline for comparing alternatives; costs and benefits, environmental and social impacts, and life safety
- Default recommendation if a viable alternative cannot be identified
- $191.6M Expected Average Annual Damages



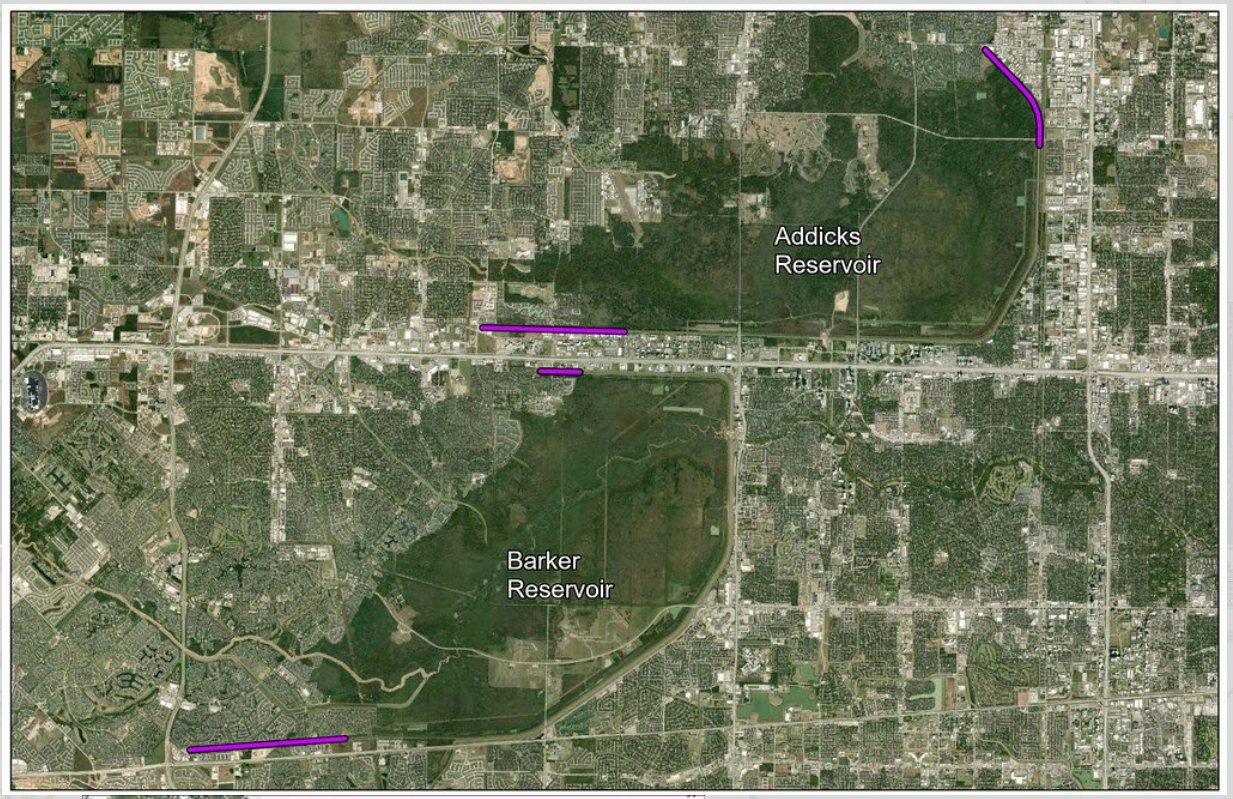
Dam safety alternatives

Dam Safety Improvements

- Armoring spillways to improve structural integrity
- Cost: ~$160M (100% Federally Funded)

Major Finding:

There exists a credible risk of failure of the spillways during a max pool event



Example of Articulated Concrete Block Armoring

Example of Roller Compacted Concrete Armoring

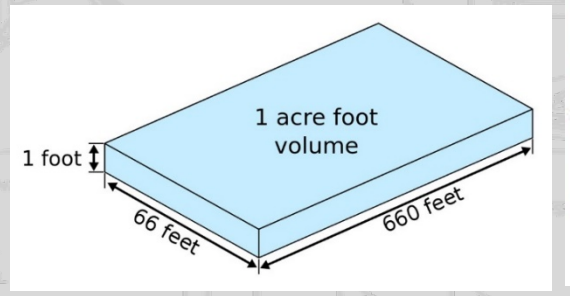
A new storage alternative

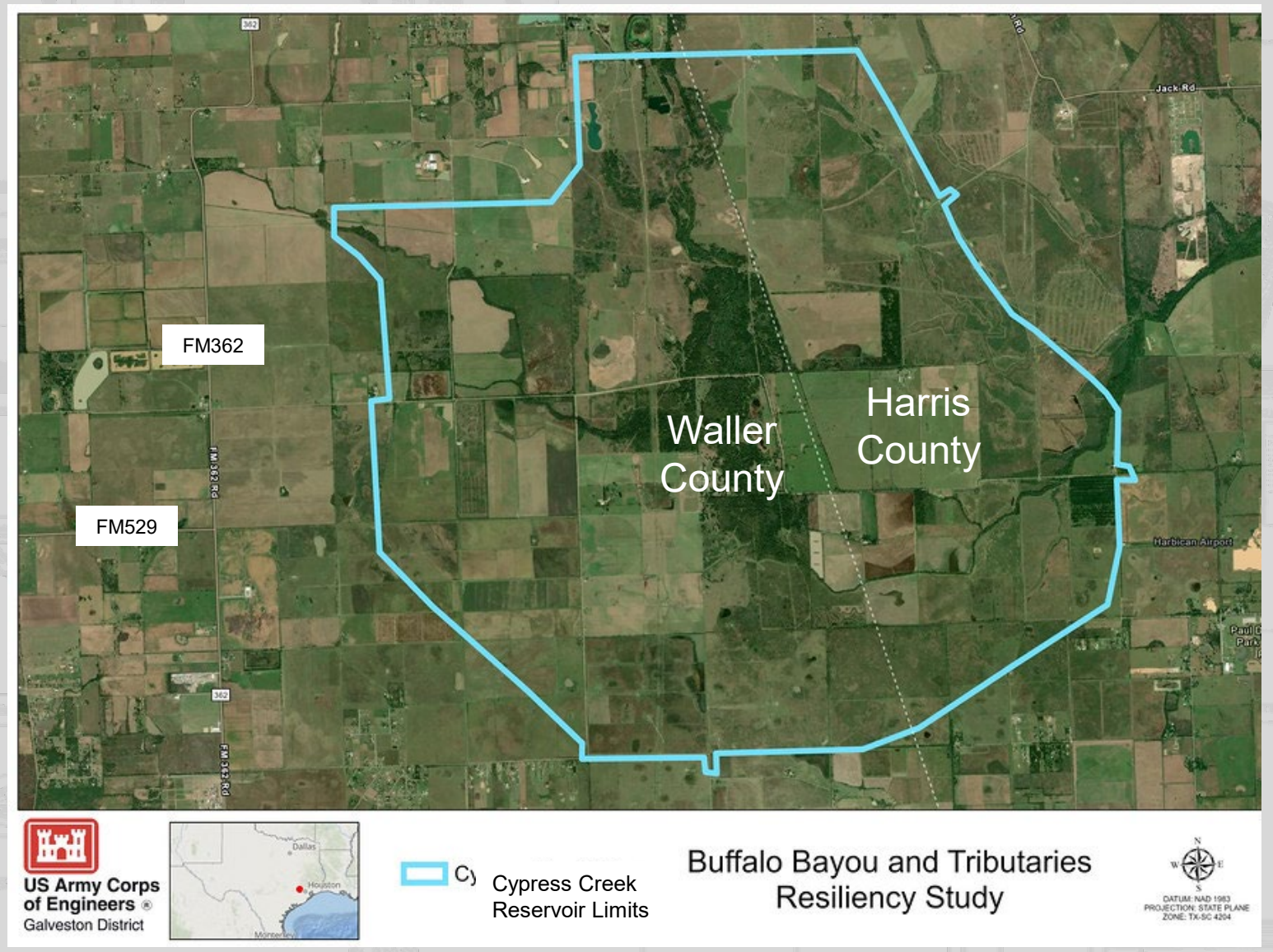
New Cypress Creek Reservoir

- Land acquisition: 22,000 acres
- Storage: 190,000 acre-feet
- Cost range: $2.1B – $2.9B

Major finding:

- Added storage reduces Addicks reservoir levels during large flood events





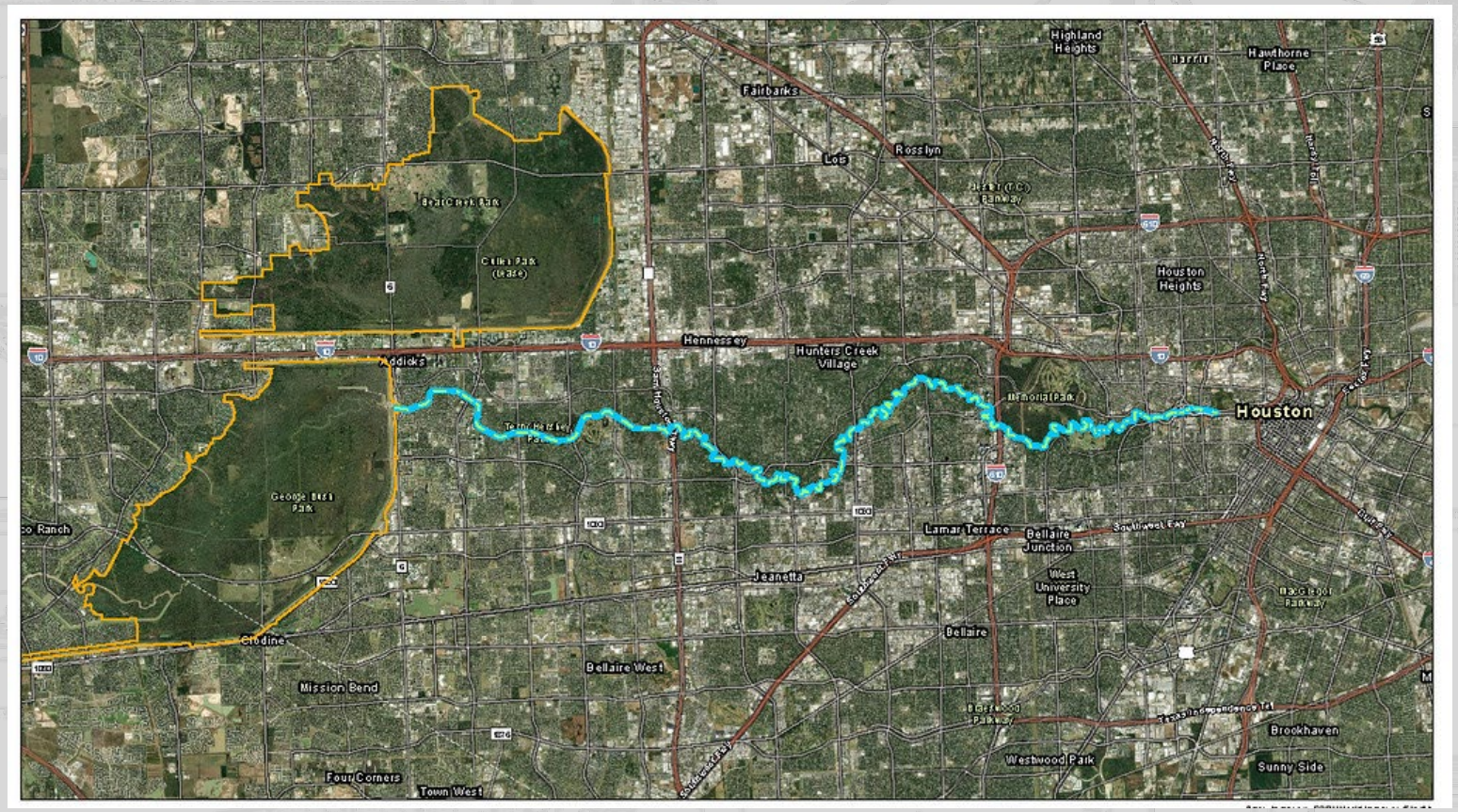
A conveyance alternative

Buffalo Bayou Channel Improvements

- Capacity increase up to 15,000 cubic feet per second
- Cost range: $1B – $1.3B

Major Finding:

- Additional downstream channel capacity reduces duration of high reservoir levels and overall downstream flood risk



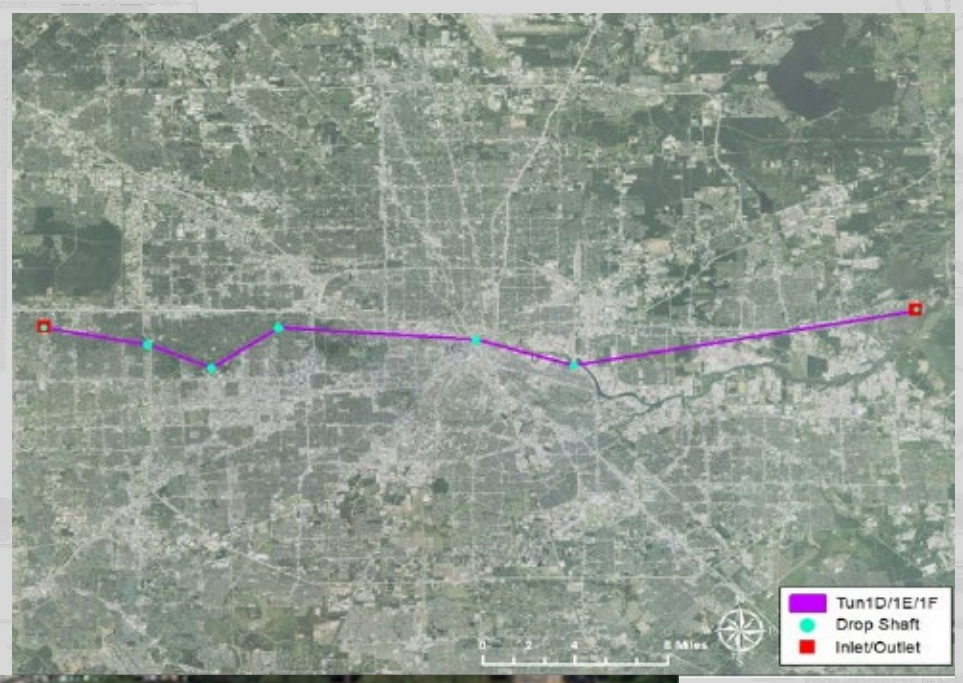
A screened out alternative

Tunnels

- Underground conveyance
- Cost range: $6.5B - $12B

Major Finding:

- Technically feasible in Harris County geology but cost prohibitive compared to other alternatives with similar benefit



Example tunnel intake structure

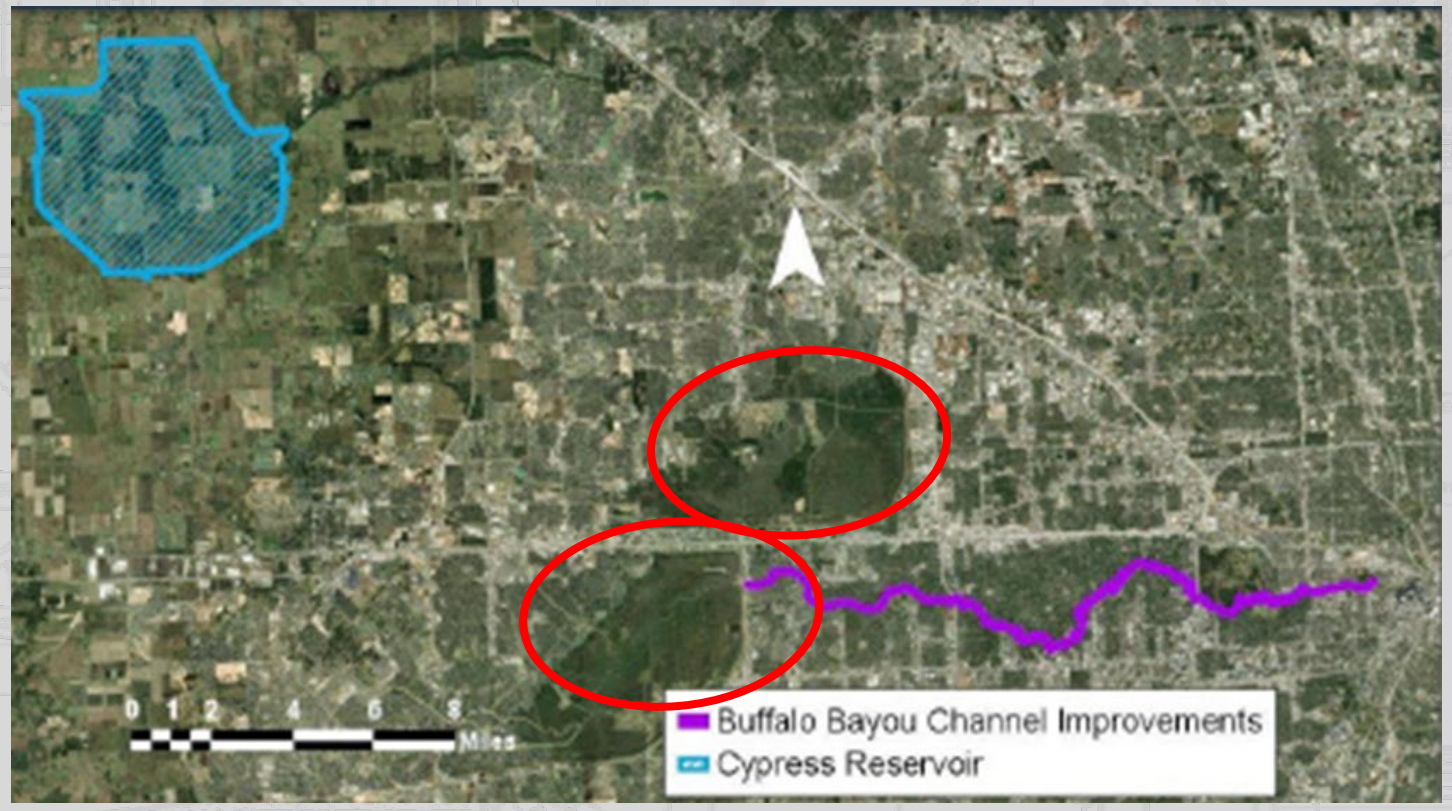
A combination alternative

Buffalo Bayou Channel Improvements and Cypress Creek Reservoir

- Provides additional storage and conveyance.
- Cost range: $3.1B – $4.2B

Major Finding:

- Provides maximum storage and conveyance opportunity



A system operations alternative

Real Estate Acquisition

- Land acquisition: ~14,000 – 24,000 properties
- Cost range: $8.1B – $13.1B

Major finding:

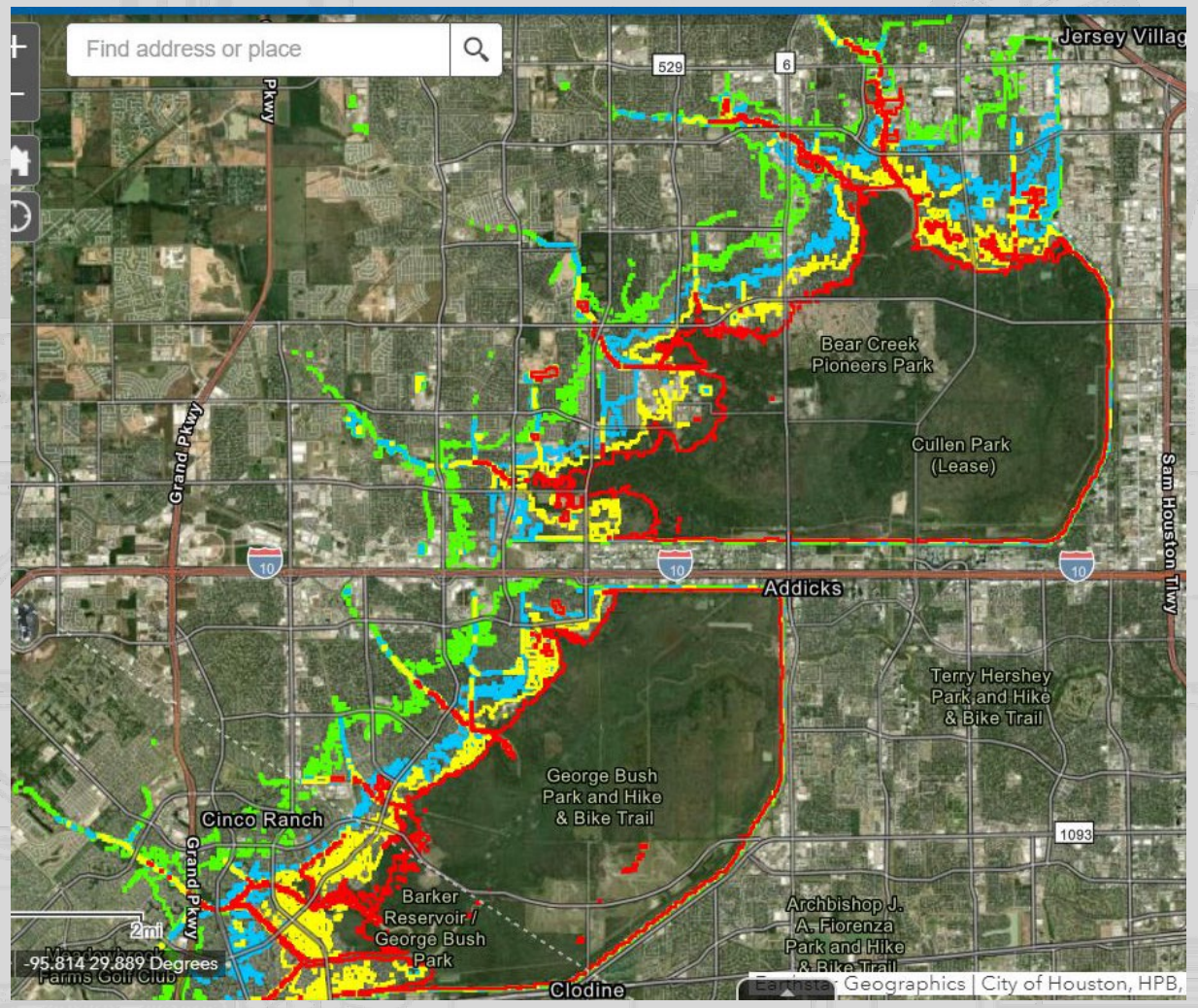
- No other study alternative under consideration can remove the upstream properties from peak reservoir pool elevations

Red: Existing government-owned land

Yellow: Minimum acquisition area proposed under this alternative

Blue: Maximum range of acquisition proposed under this alternative

Green: Probable Maximum Flood; area of remaining flood risk



A systems operations alternative

Estimated real estate acquisitions, as of October 2020

Location	Residential Acquisitions	Commercial Acquisitions	Number of Real Estate Parcels	Cost (billions)
Estimated Minimum Acquisitions				
Addicks	5,000	200	6,000	$ 3.0
Barker	9,000	100	10,000	$ 6.0
Estimated Maximum Acquisitions				
Addicks	12,000	400	14,000	$ 7.0
Barker	11,000	100	12,000	$ 7.0

View the website Study Alternatives StoryMap to explore this alternative on an interactive map

Study phases and public involvement

Spring 2019

Scoping Period:

The public and interested stakeholders were invited to public meetings to learn about the study, ask questions and provide input on potential alternatives and identify the issues or concerns to consider in the study.

Scoping comments were considered in development of initial range of alternatives

October 2020

Formulation of Alternatives and Technical Analysis:

Technical experts identified and evaluated solutions to the problem, developed conceptual designs, determined rough cost estimates and benefits of each alternative, and began to identify environmental and social impacts of these alternatives.

At this phase, the alternatives must meet the engineering goals of the Study and be technically and economically feasible

Interim Report Completed:

The technical studies and alternatives evaluated to date were compiled into an Interim Report.

We Are Here

Public Review and Comment on Interim Report:

Virtual public information sessions will summarize the study and alternatives; staff available to answer questions.

Spring 2021

Complete Draft Feasibility Report & EIS:

Technical studies are compiled into a Draft Feasibility Report and all impacts disclosed in the EIS (Environmental Impact Statement). At this point, the team completes sufficient analysis to propose the most cost-effective and technically feasible "Tentatively Selected Plan" in the draft report.

Public Review and Comment on the Draft Report & EIS:

Comments will be considered in development of the recommended plan and final reports

Complete Final Reports:

Based on more detailed analysis and the consideration of public comments, the team refines the features of the TSP and presents a recommended plan in a Final Feasibility Report & EIS which is sent to the USACE Chief of Engineers.

Spring 2022

Study Complete:

The Chief of Engineers endorses the recommended plan in a Chief's Report and the Corps signs a Record of Decision.

All reports are forwarded to Congress with additional details for authorization and funding.

Congressional authorization provides the approval to proceed with final design and other actions. Additional steps are necessary to move a recommendation into design and construction, including funding and the identification of an appropriate non-federal partner or partners.

www.swg.usace.army.mil

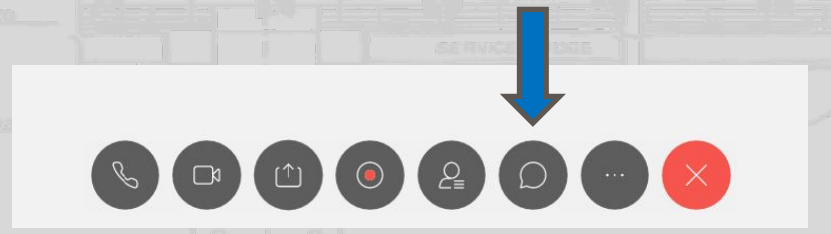
Stay informed through website updates and progress emails

Questions

Please enter your zip code into the chat

- We'd like to see where you're from in order to learn about our audience and how well our outreach is working!

At any time, please use the Chat feature indicated by the blue arrow to provide your name and email to be added to our project email list



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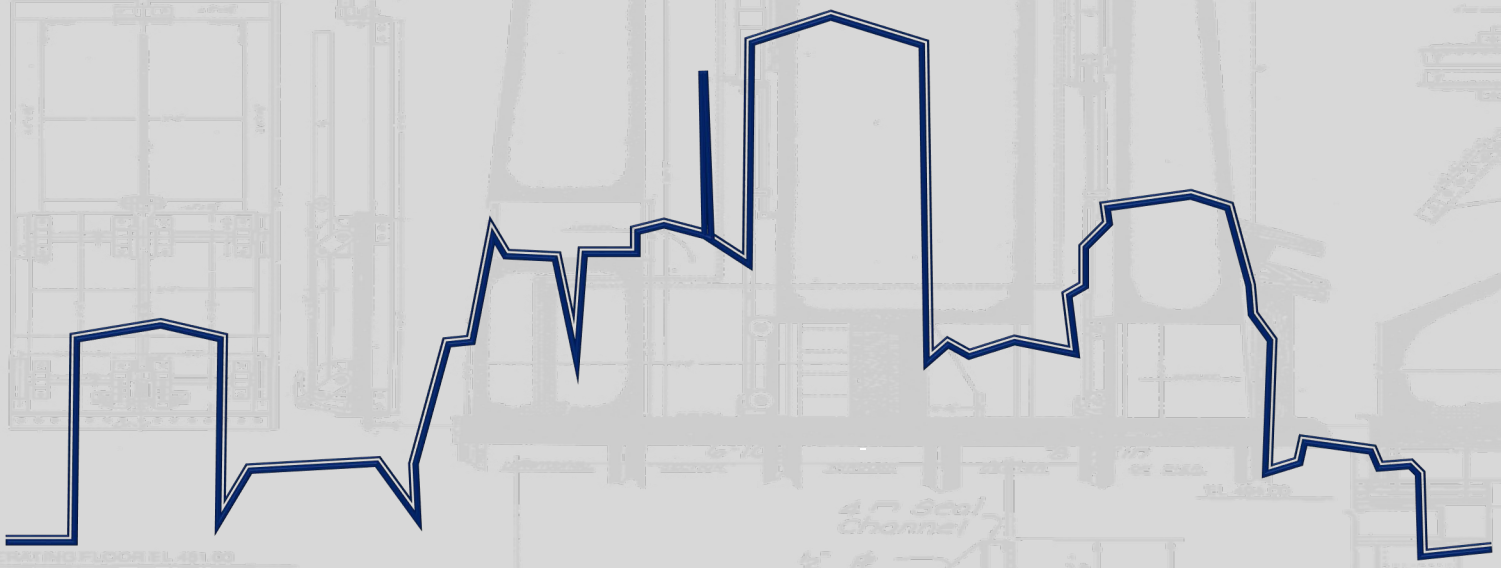
Questions



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Thank You