

# United States Army Corps of Engineers

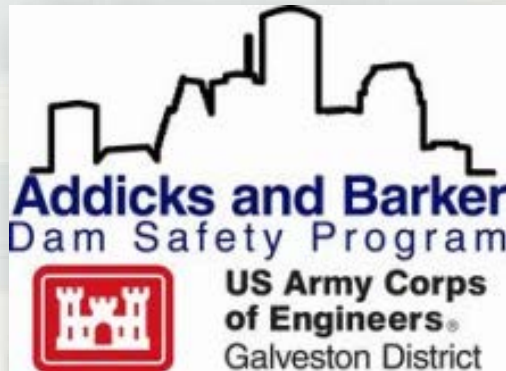
## Addicks and Barker Dam Safety Overview

COL Richard P. Pannell  
District Commander, Galveston District  
U.S. Army Corps of Engineers  
Oct. 29, 2014



# Purpose & Agenda

**Inform the public on the role of the U.S. Army Corps of Engineers (USACE) Galveston District and improve awareness and understanding of the Addicks and Barker Dam Safety Program.**



- History of Addicks & Barker Reservoirs
- Dam Safety Findings
- Interim Risk Reduction Measures
- Remediation Measures



# USACE Vision

Engineering solutions for the nation's toughest challenges.

## ***USACE Mission***

*Deliver vital engineering solutions, in collaboration with our partners, to secure our nation, energize our economy and reduce risk from disaster.*

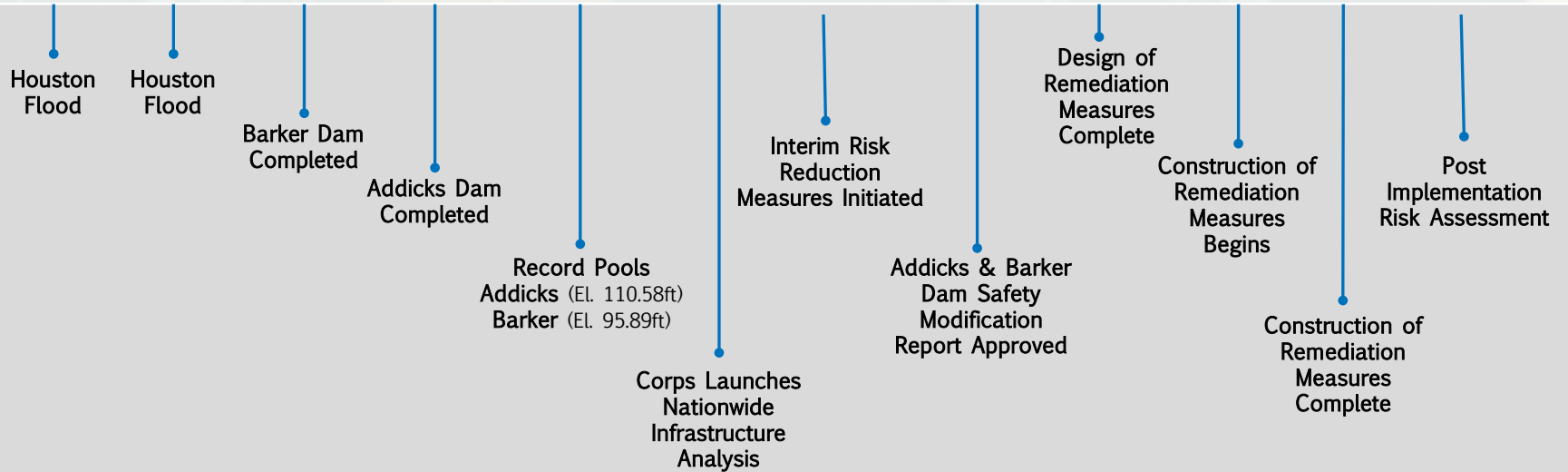


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# Timeline

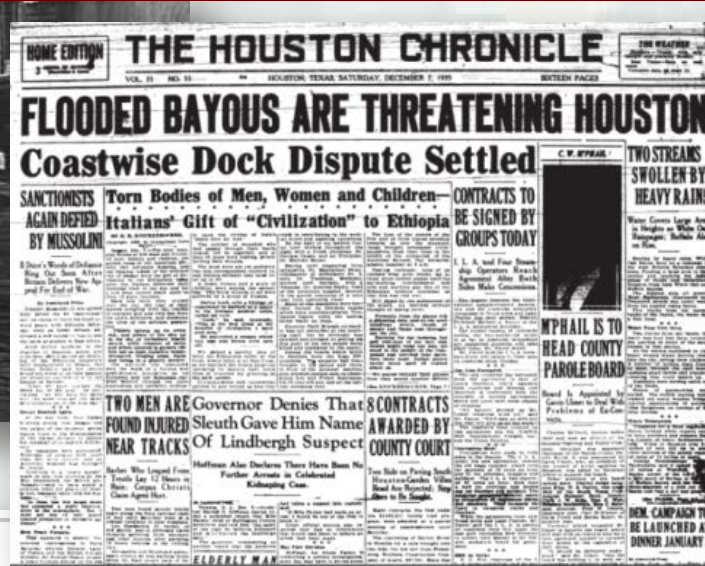


1929 | 1935 | 1946 | 1948 | 1992 | 2005 | 2009 | 2013 | 2014 | 2015 | 2018



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# Early Houston Floods 1929 and 1935



**CITY, COUNTY ORDER FLOOD CONTROL PLAN**  
Officials Ask Engineers to Prepare Program; Fugate Has Plan He Begun Work On in 1909.

**Little Girl Who Lost Doll In Flood Asks Goodfellows To Bring Toys To Little Brother**  
BY THE GOODFELLOW EDITOR  
A little girl, mentioned and weeping a weeping down, came to the Goodfellow headquarters last before noon Sunday. She had been the Christmas Eve, she had been almost entirely submerged by the flood. Emerging in the flood was last. The little girl and she was 10 years old.

**MUC OF C FLO**  
Med M...  
Deep Port I

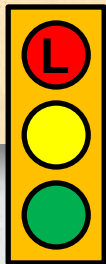
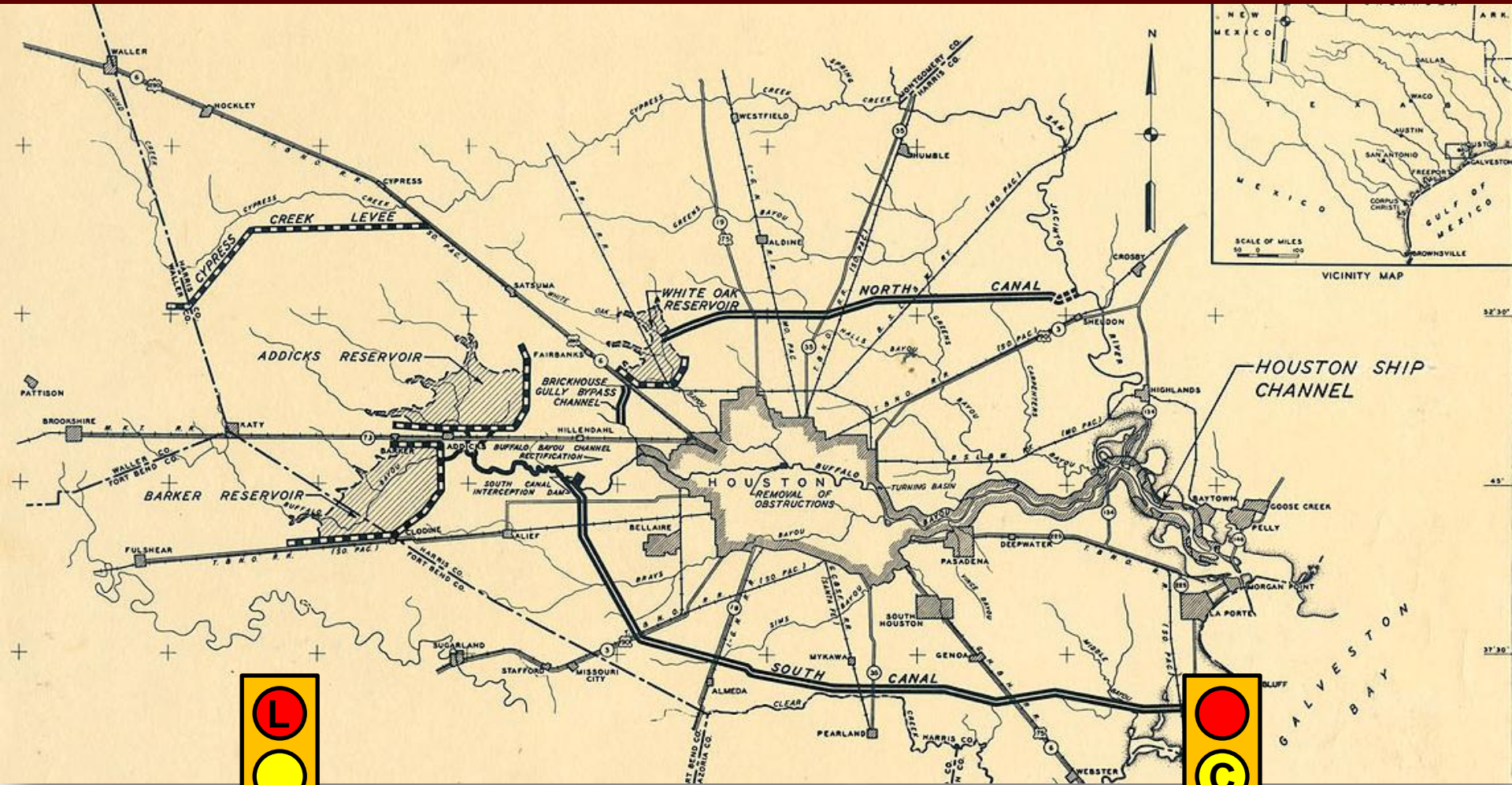
With days succeeded through a...  
The city and county officials...  
"We had Artian."

**STATE RELIEF BUDGETED TO NEXT MARCH**  
**JONES DOING "GREAT JOB," ALDRICH SAYS**  
N. Y. Banker, Here to Talk at C. of C. Banquet, Lauds Chairman of Finance Agency.  
Washington W. Aldrich, Chairman of the Board of American Overseas...  
All Employables Will Be Dropped January 1; Last U. S. Allotment Received at Austin.



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# Houston Proposed Plan 1940

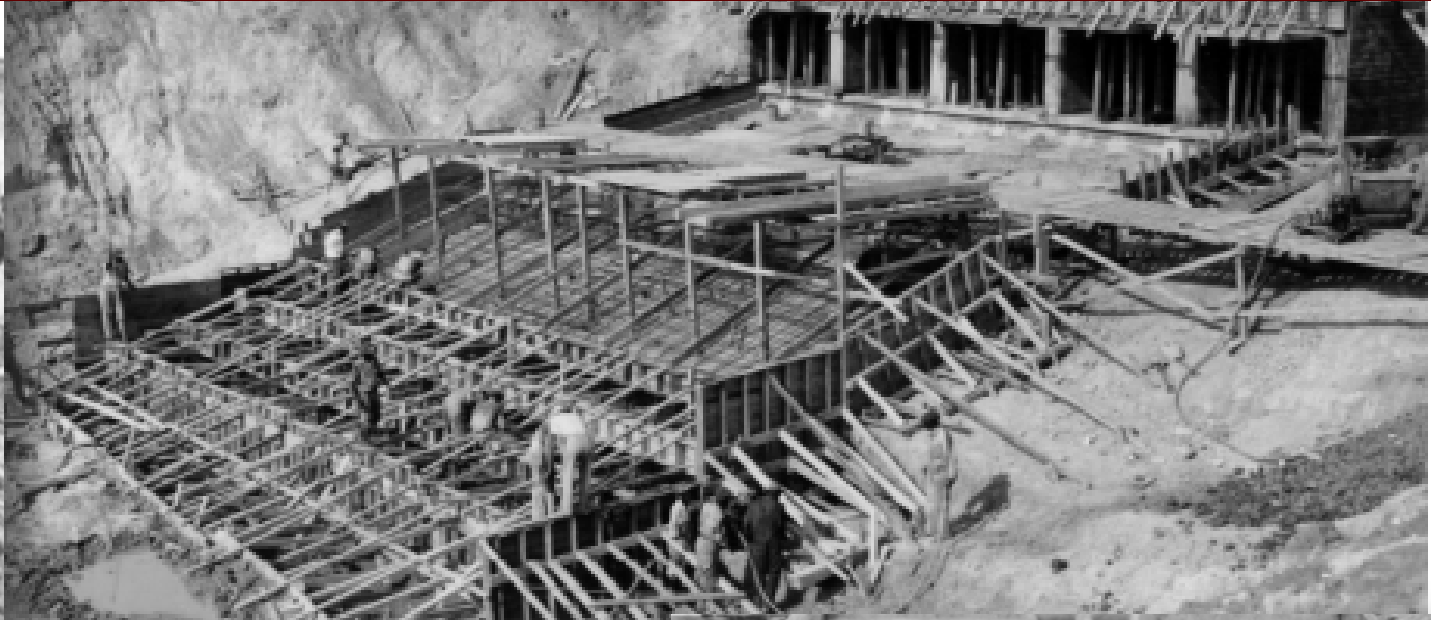


**L – Likelihood of Flood Risk**  
**C – Consequences to Greater Houston Community**



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# Construction of Addicks and Barker Dams 1942-1948



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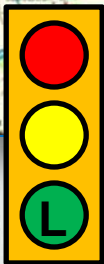
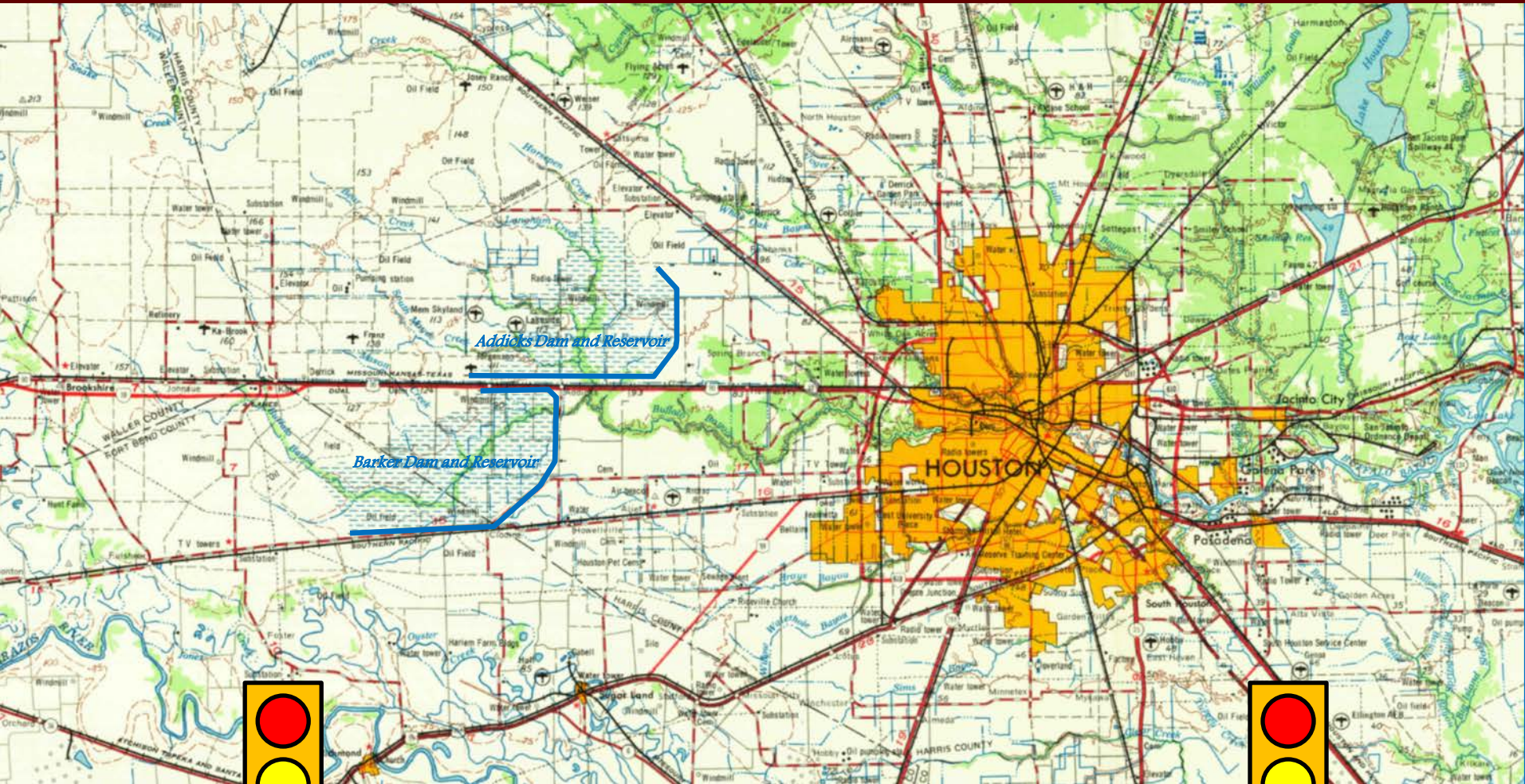
# Construction of Addicks and Barker Dams 1942-1948



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# Houston with Addicks & Barker Dams 1950's



L – Likelihood of Flood Risk

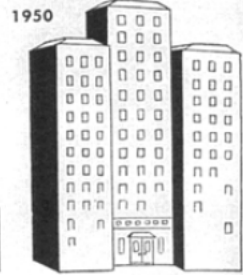
C – Consequences to Greater Houston Community



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# Houston - 1950's

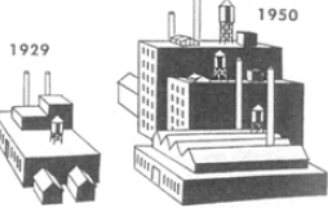
## BUILDING PERMITS



1930 \$17,616,202

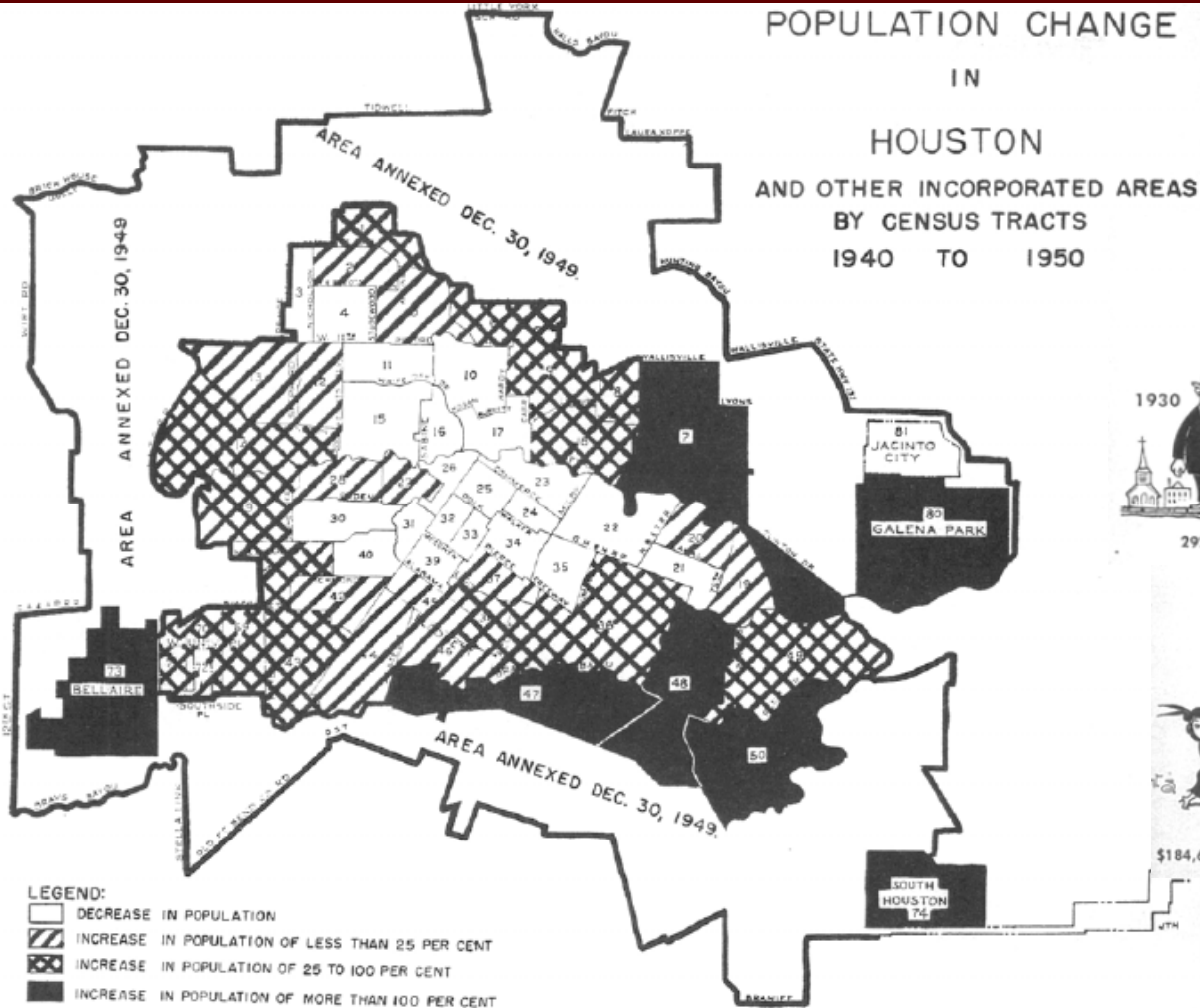
1950 \$176,932,907

## NUMBER OF FACTORIES



1929 429

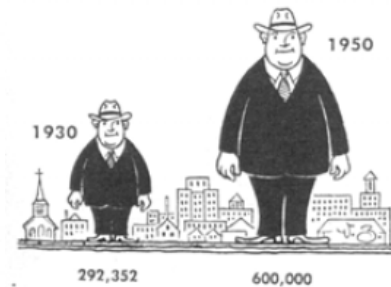
1950 1079



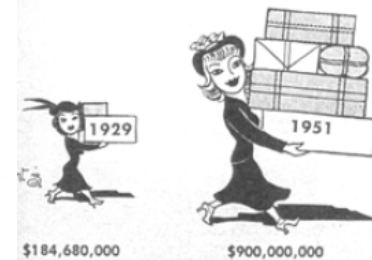
No percentages could be computed for the territory marked "Area Annexed" because no 1940 Census figures are available. However, the available data do show that this annexed area as a whole more than doubled in population during the decade. This also applies to Jacinto City, which was not incorporated in 1940.

PREPARED BY THE RESEARCH AND STATISTICS COMMITTEE  
HOUSTON CHAMBER OF COMMERCE

## POPULATION



## RETAIL SALES



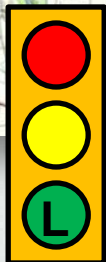
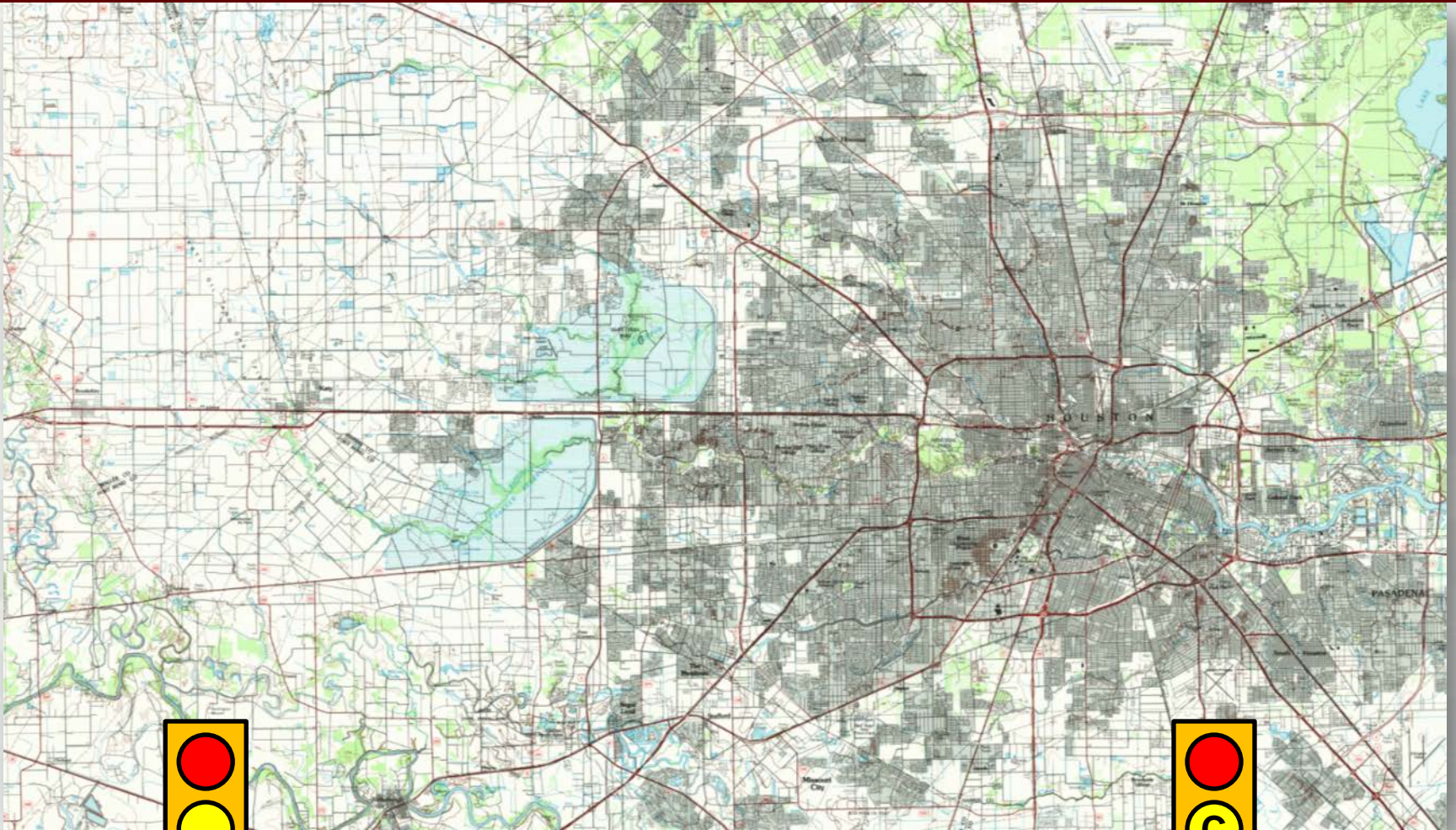
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# Improvements to Addicks and Barker Dams

- 1963  
Gated the conduits to provide additional protection from flooding to the downstream
- 1978-1982  
Constructed seepage control at both dams (included slurry trench cutoff walls and seepage blankets)
- 1986-1991  
Raised the main dam embankment to provide freeboard (eliminate possibility of waves overtopping)
- 1987-1988  
Armored the uncontrolled spillway at the ends of the dams with roller-compacted-concrete



# Houston - 1992



**L – Likelihood of Flood Risk**  
**C – Consequences to Greater Houston Community**



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# Reservoir Record Pools



City of Bunker Hill - March 4, 1992



- ▶ **Addicks Reservoir (Top of Dam – El. 122.7)**
  - ▶ Record High Pool - El. 100.58 ft. on March 9, 1992
  - ▶ Recent High Pool – El. 100.02 ft. on April 30, 2009
- ▶ **Barker Reservoir (Top of Dam – El. 114.7)**
  - ▶ Record High Pool - El. 95.89 ft. on March 7, 1992
  - ▶ Recent High Pool - El. 91.14 ft. on May 1, 2009



Addicks Reservoir - April 29, 2009



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# Corps' Dam Safety Assessment

- Corps continually inspects its dams nationwide. It owns and operates 707 dams at 557 projects. These projects reduce risk and strengthen the nation's economy through infrastructure.
- Life and safety are paramount.
- Living with dams is a shared responsibility.
- Addicks and Barker Dams Assessment (2009)
  - Reliability of Structural Features
    - Outlet Structures Seepage and Piping
    - Ends of the Dams
  - Potential Consequences
    - Densely Populated Urban Environment
    - Critical Economic Infrastructure



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# Dam Safety Findings – Seepage, Piping & Voids

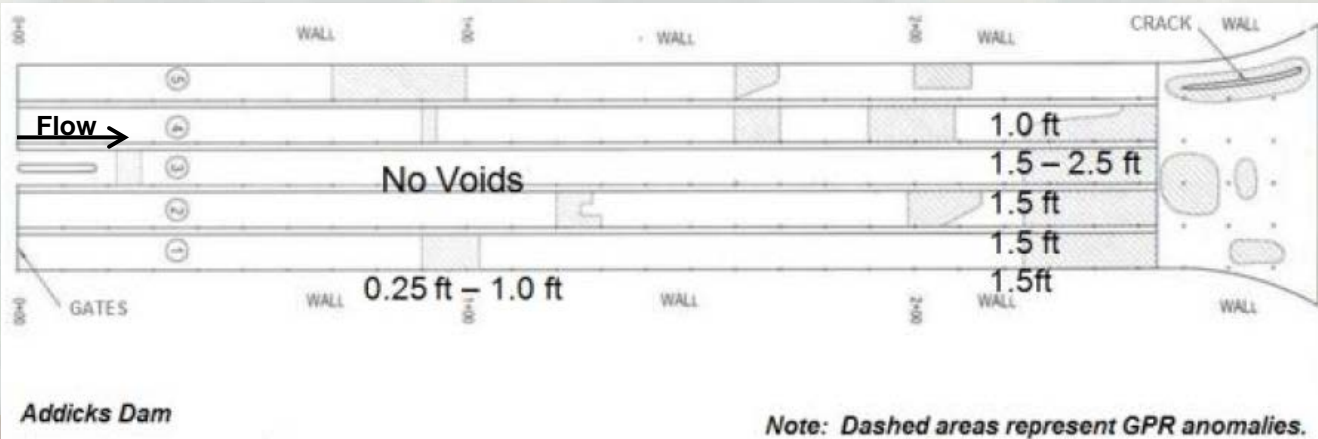
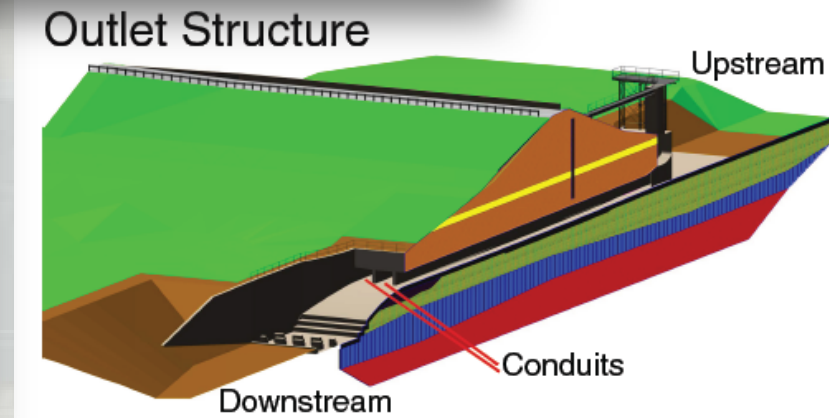
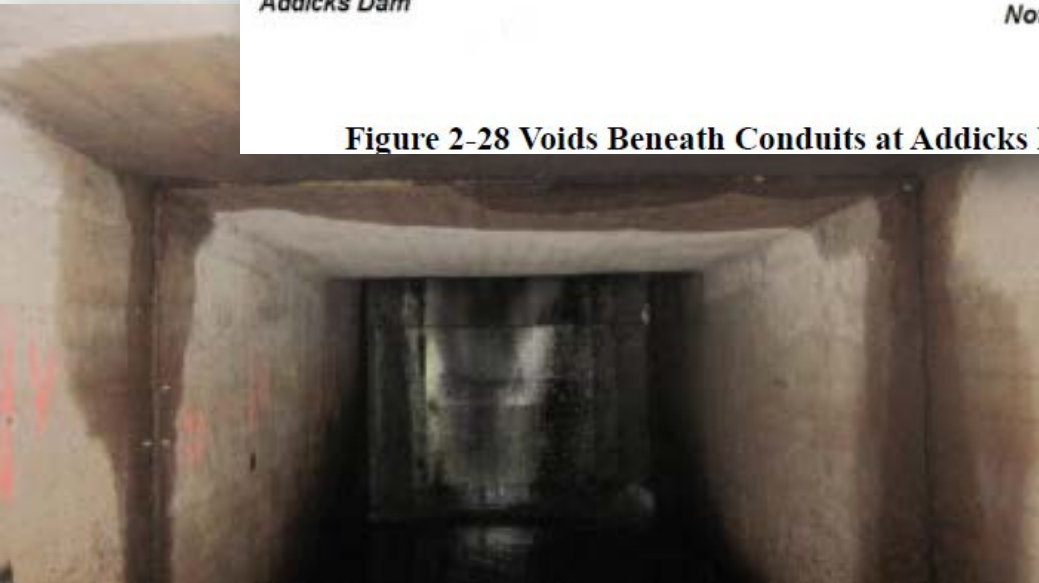
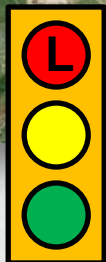
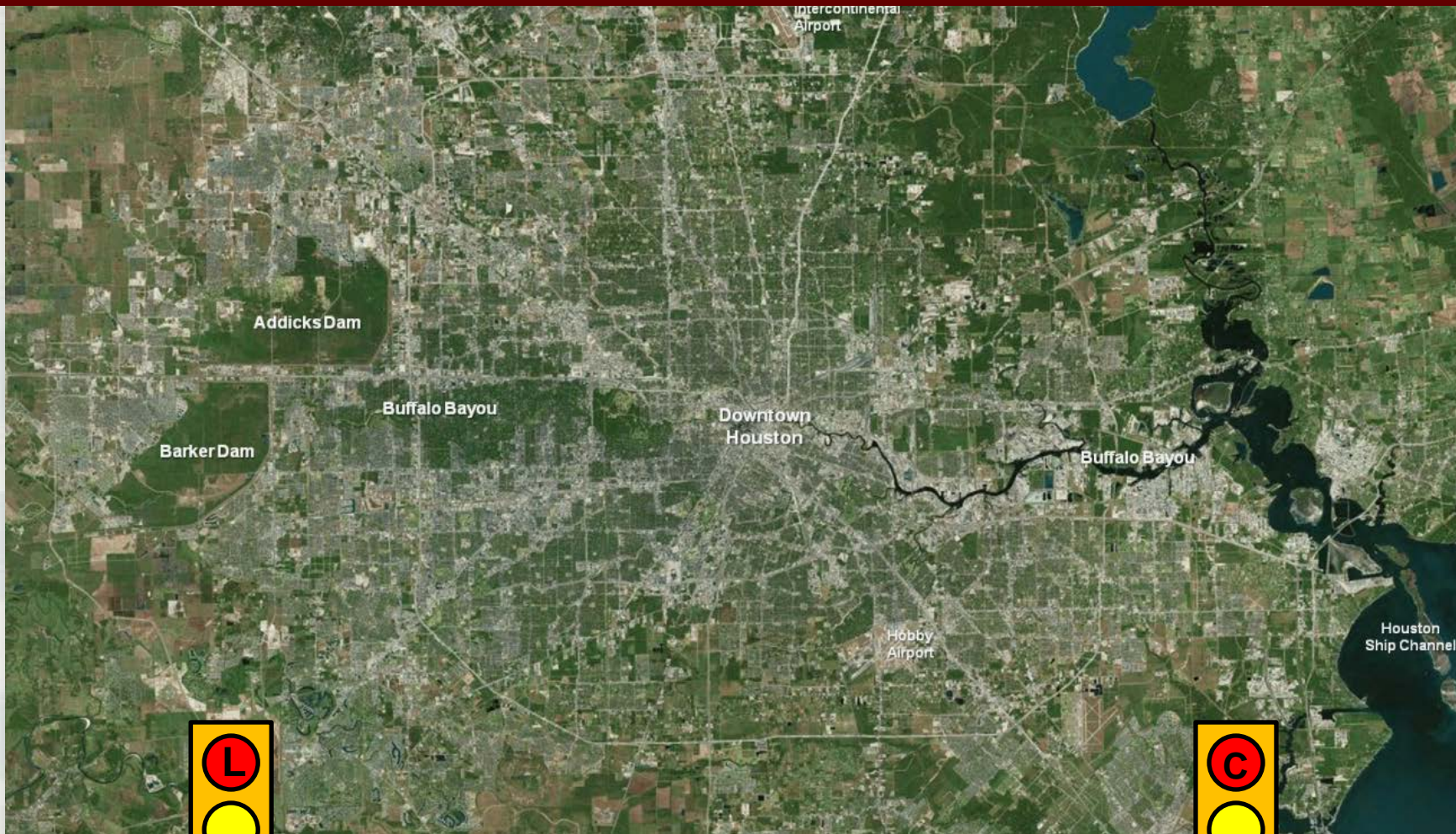


Figure 2-28 Voids Beneath Conduits at Addicks Dam, Generalized Locations.



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# Houston 2009



**L – Likelihood of Flood Risk**  
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# Interim Risk Reduction Measure (IRRM) Grouting of Conduits



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# IRRM - Granular Filter Around Ends of Conduits



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# IRRM - Gate Replacement at Barker



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# IRRM - Gate Operators & Emergency Generators



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# IRRM - Parabolic Chute Slab Steel Plate



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# Dam Safety Modification Study



## Addicks and Barker Dam Safety Modification Report

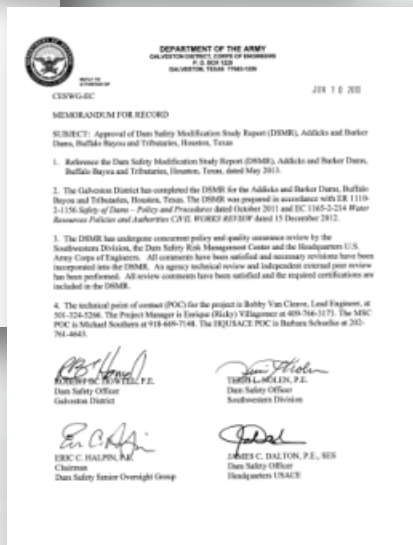


Buffalo Bayou & Tributaries  
Houston, Texas  
May 2013

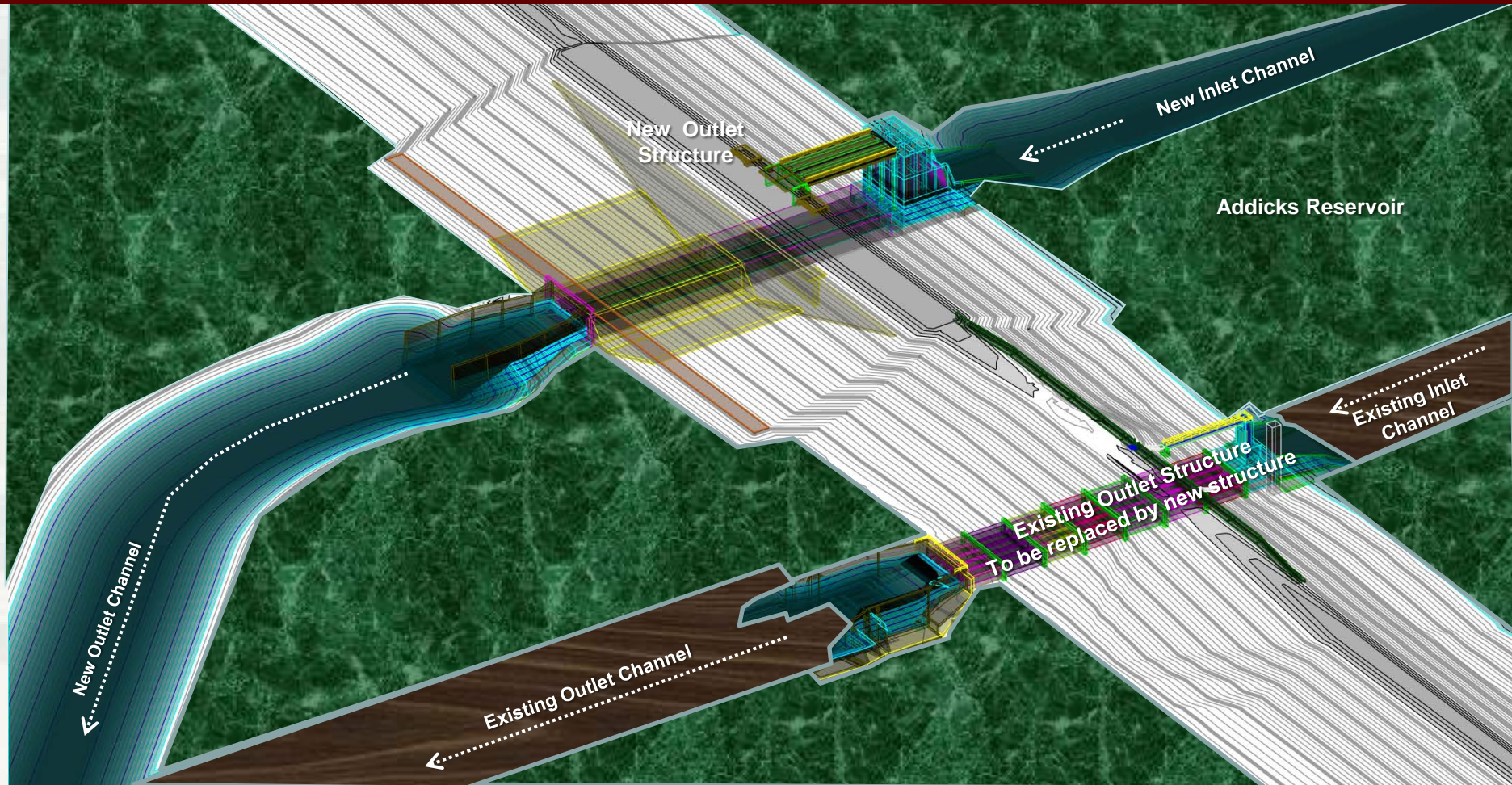


## Summer 2013

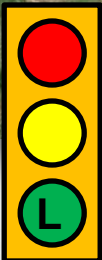
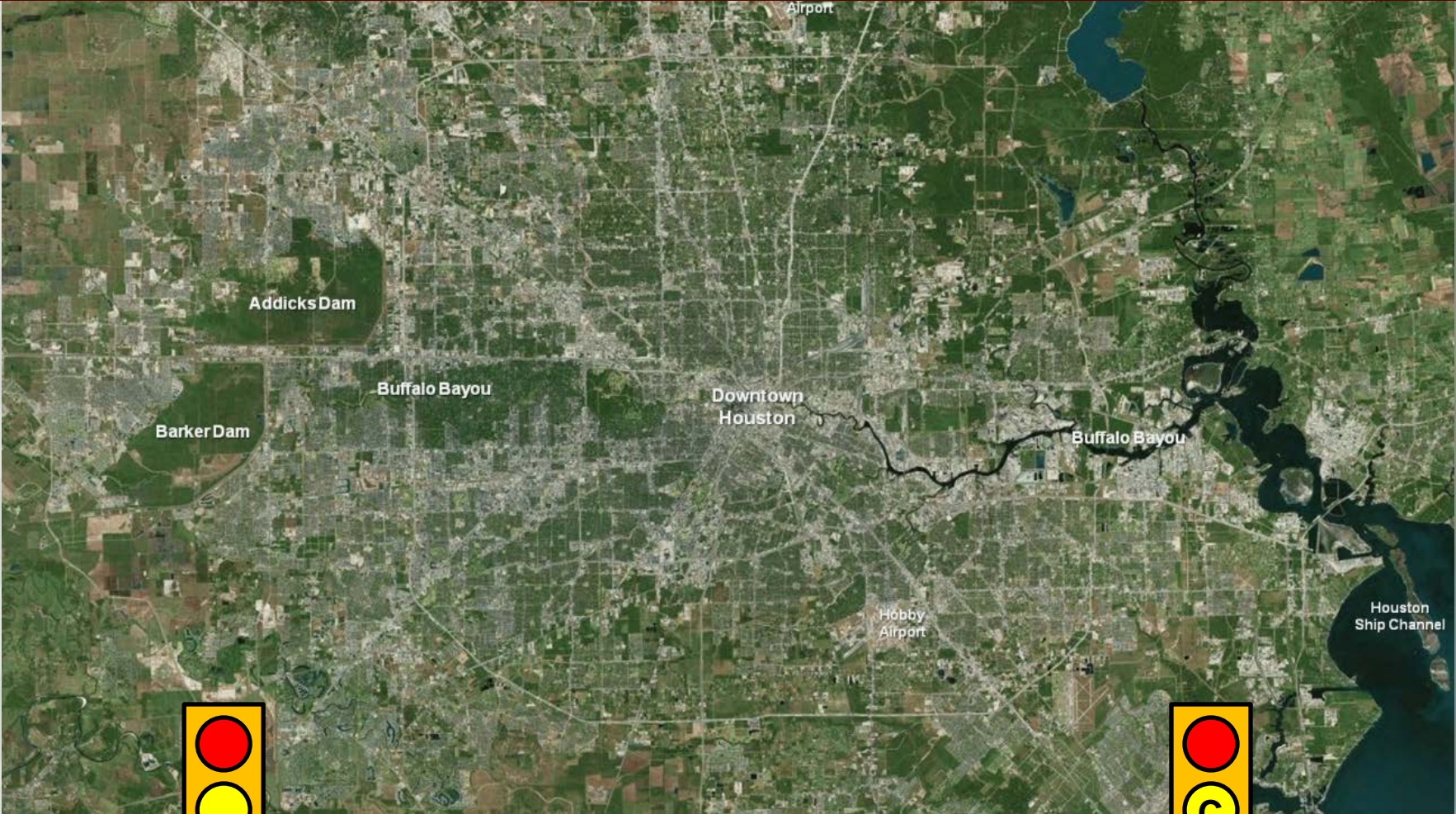
- Dam Safety Modification Report and Environmental Assessment Approved
- Finding of No Significant Impact Signed
- Dam Safety Modifications will address issues related to seepage and piping beneath, around and near the conduits.
- Approved Risk Management Plan consists of the construction of new:
  - outlet structures
  - parabolic spillway
  - stilling basin and outlet channel



# Addicks Dam Proposed Modification Design 3-D Model Rendering



# Houston 2018



**L – Likelihood of Flood Risk**  
**C – Consequences to Greater Houston Community**



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# Benefits



- Has protected the 4<sup>th</sup> largest city in the nation against loss of life for nearly 70 years
- Has enabled continued growth to city
- Protects against \$60 billion in potential flood damage
- Reduces risks against loss of life and property
- Provides recreational opportunities



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# Summary

- Houston is NOT in imminent danger of flooding from Addicks and Barker
  - ▶ Addicks and Barker are normally dry reservoirs
  - ▶ Addicks and Barker are continually monitored, inspected, and maintained
  - ▶ Improvements have been undertaken over the years—this is an ongoing process
- Public safety is our number one priority
- Dam failure is not likely due to completed “Interim Risk Reduction Measures”
- Living with dams is a shared responsibility. We will continue to work closely with local agencies and partner with the greater Houston Community for flood reduction and recreation
- Construction updates will be posted online at [www.swg.usace.army.mil](http://www.swg.usace.army.mil)





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# Addicks Dam Proposed Modification Design 3-D Model Rendering

