

Water Management for Dam Construction

Update of Bulletin 48a (1986)

ICOLD Workshop 28 May 2022

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National Inventory of Dams

<http://nid.usace.army.mil>

> 90,500 dams



Please select your organization type to enter the National Inventory of Dams



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Cofferdam risk sharing considerations

Contractor-led

- Primary consequence center is the work area
- Greater flexibility of means and methods

Owner/Engineer-led

- Potential for downstream consequences
- Dam safety potential failure modes can occur due to the cofferdam
- Cofferdam will be incorporated into the permanent works



Cofferdam considerations for rehabilitation/modification projects

Risks should be determined by the Owner/Engineer construction

Level of protection is the fundamental criteria to be determined

Owner Risk and Responsibility

Engineer Risk and Responsibility

Contractor Risk and Responsibility

Contractor Risk vs. Public Risk (Dam Safety)



Level of Protection?

- Hydrologic frequency
- Inflow, Storage, Outflow Requirements
- Operational Requirements



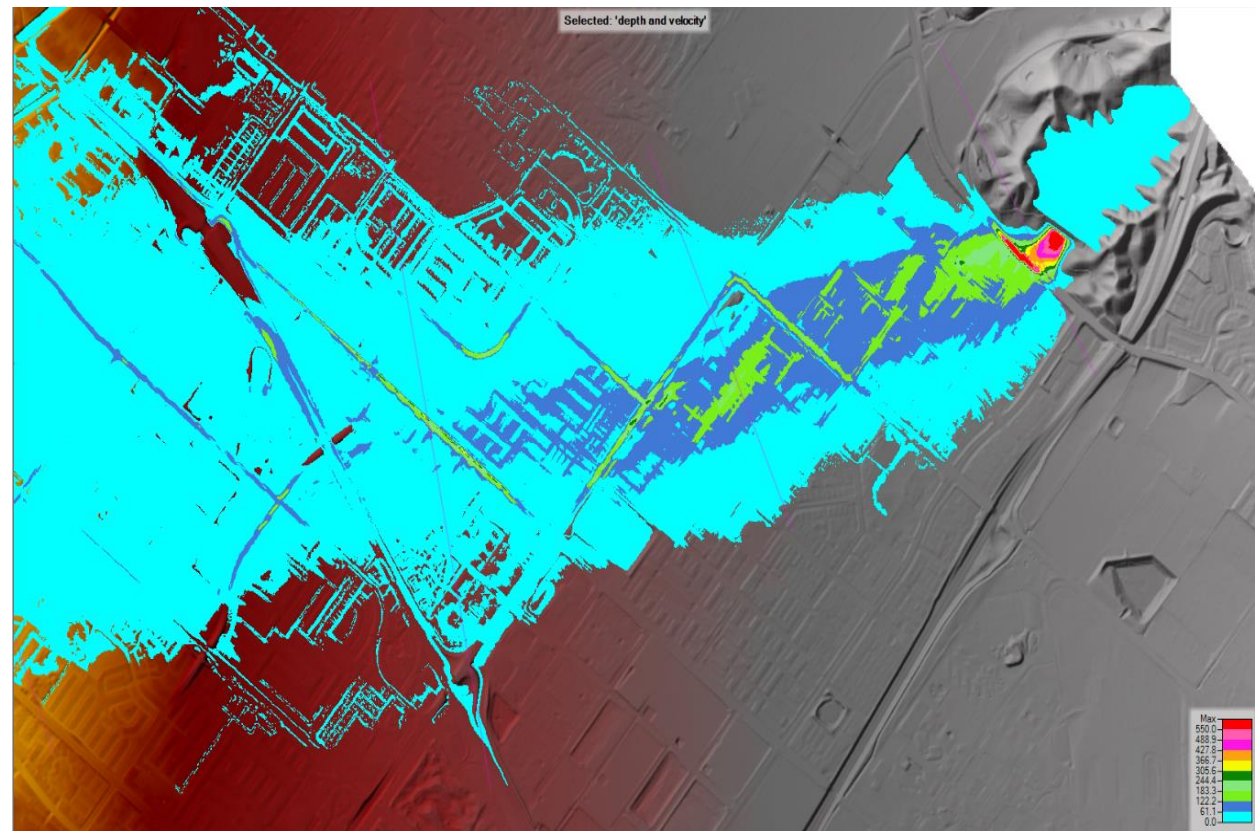
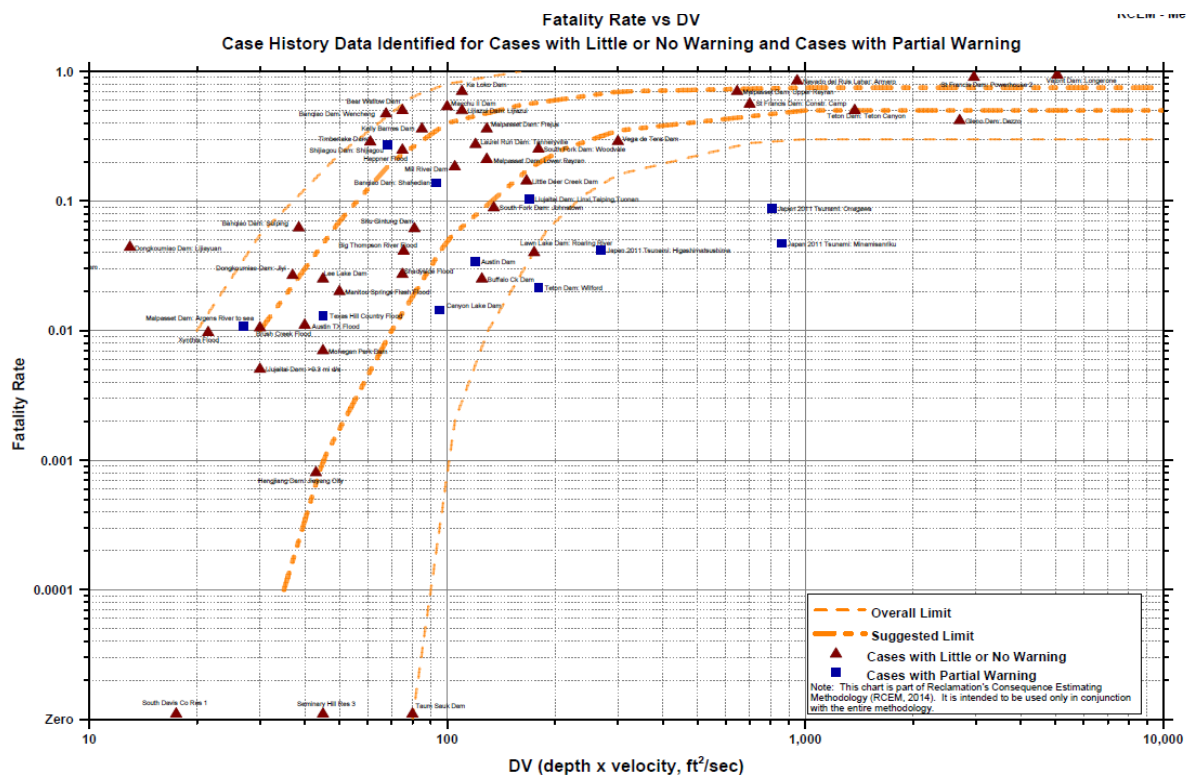
What are Dam Safety Risks?

- “the **probability** that some **undesirable events** occurs”
- What are **undesirable events**?
 - Dam failure (breach - uncontrolled release of reservoir)
 - Partial dam failure (damage states)
 - Life loss
 - Economic loss
 - Environmental consequences
 - Loss of function/benefits
 - Impacts to reputation/credibility



Consequences

- RCEM
- LifeSym
- Hazus and other GIS based tools



- Risk Implications
 - D/S consequences, Life loss, Project Costs, Site Loss
- Design Responsibility
 - A/E or Contractor?
- Construction period
 - On time, or extensions needed?
- Environmental Risks
 - Construction period
 - Schedule – On time, or extensions needed?
 - Probability of success?
 - Seasonal issues?
 - Winter cold concerns
 - River/ lake icing
 - Rainy season or Hurricanes



Chimney Hollow Dam Cofferdam - Colorado



Portugues Dam – Ponce P.R.

- Overtopped more than once (expected)



Perspective

Probability” is NOT an empirical relationship!

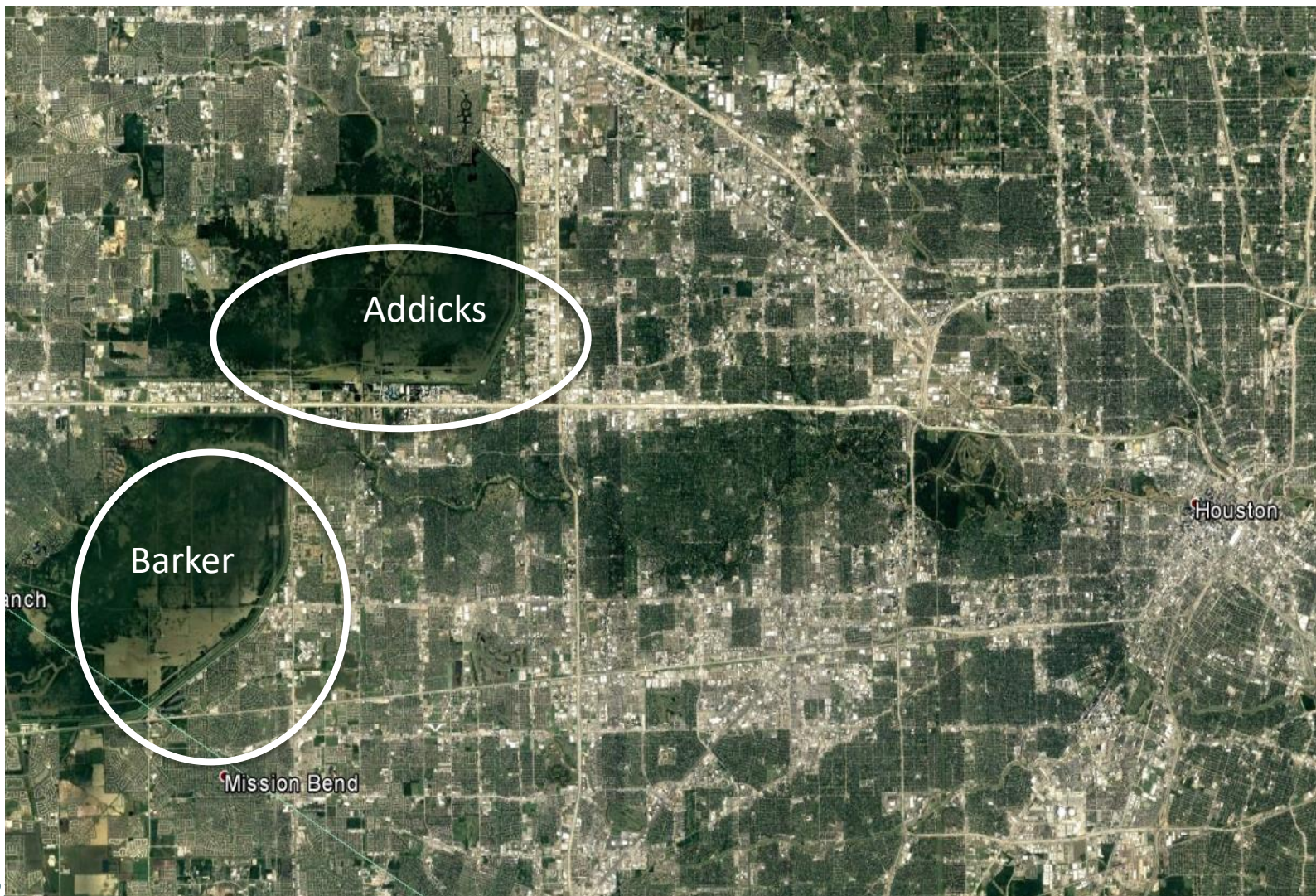
ALTUS DAM, Altus, OK

Similar magnitude events:

- Memorial Day: 1970 flood event;
100-yr flood
- Memorial Day: 1972 flood event;
50-yr flood
- Memorial Day: 1974 flood event;
20-yr flood
- ... and a funny thing happened,
Memorial Day, 2019; flood of record! (50
yrs later)



Addicks and Barker Dams - Houston



May 30th, 2021

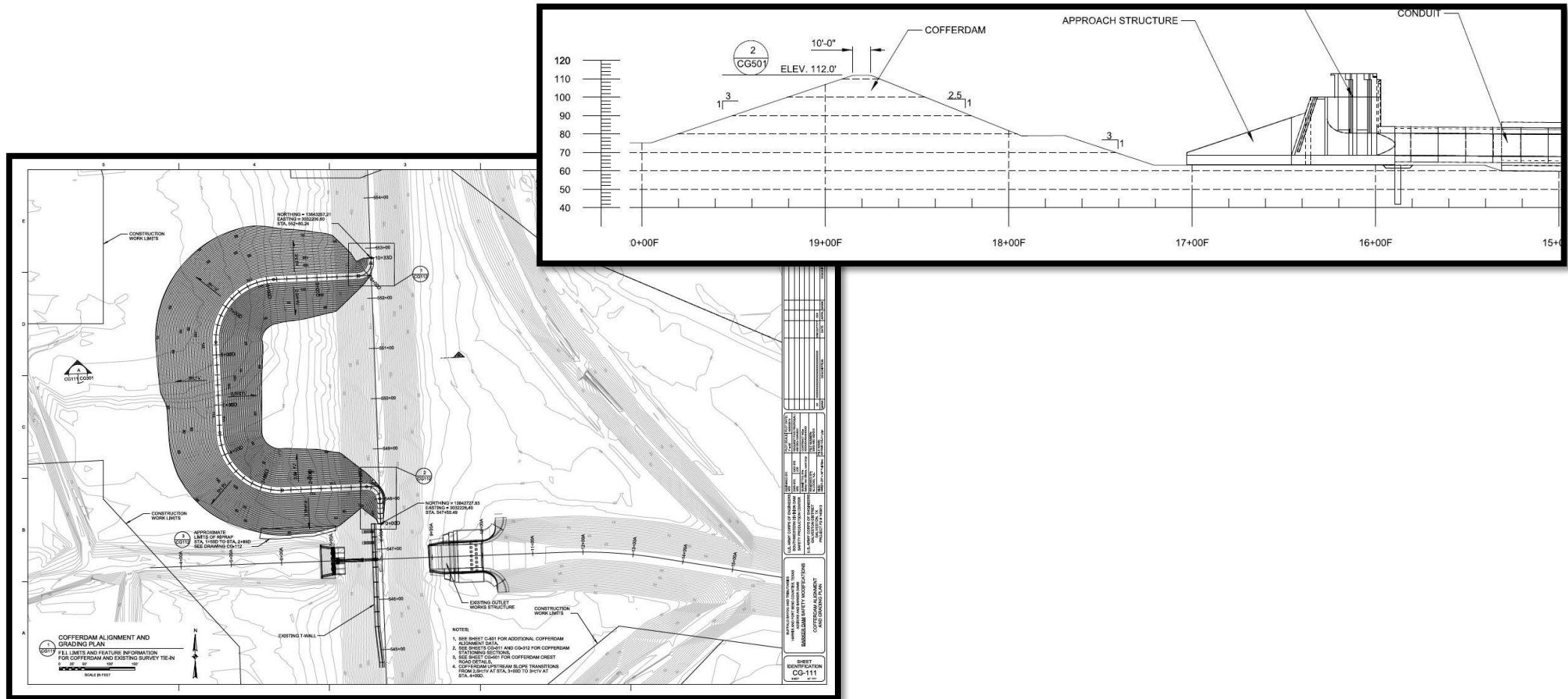
Addicks & Barker Dams - Houston

- Replace Outlets – Cut & Cover Construction
- Cofferdam considerations
 - Construction cost versus cofferdam elevation
 - Consequences versus cofferdam elevation
 - Consequences higher for lower cofferdam elevation
 - $ACE_{pool} / P_{failure}$ versus cofferdam elevation
- Potential Failure Modes
 - Spillway erosion
 - Abutments lower than dam crests
 - Seepage & Piping along outlets and Foundation
 - Replace outlets
- Extremely High Incremental Risk
 - City of Houston, Population at Risk ~ 1 M
- Combination of life and economic consequences with likelihood of failure considered unacceptable

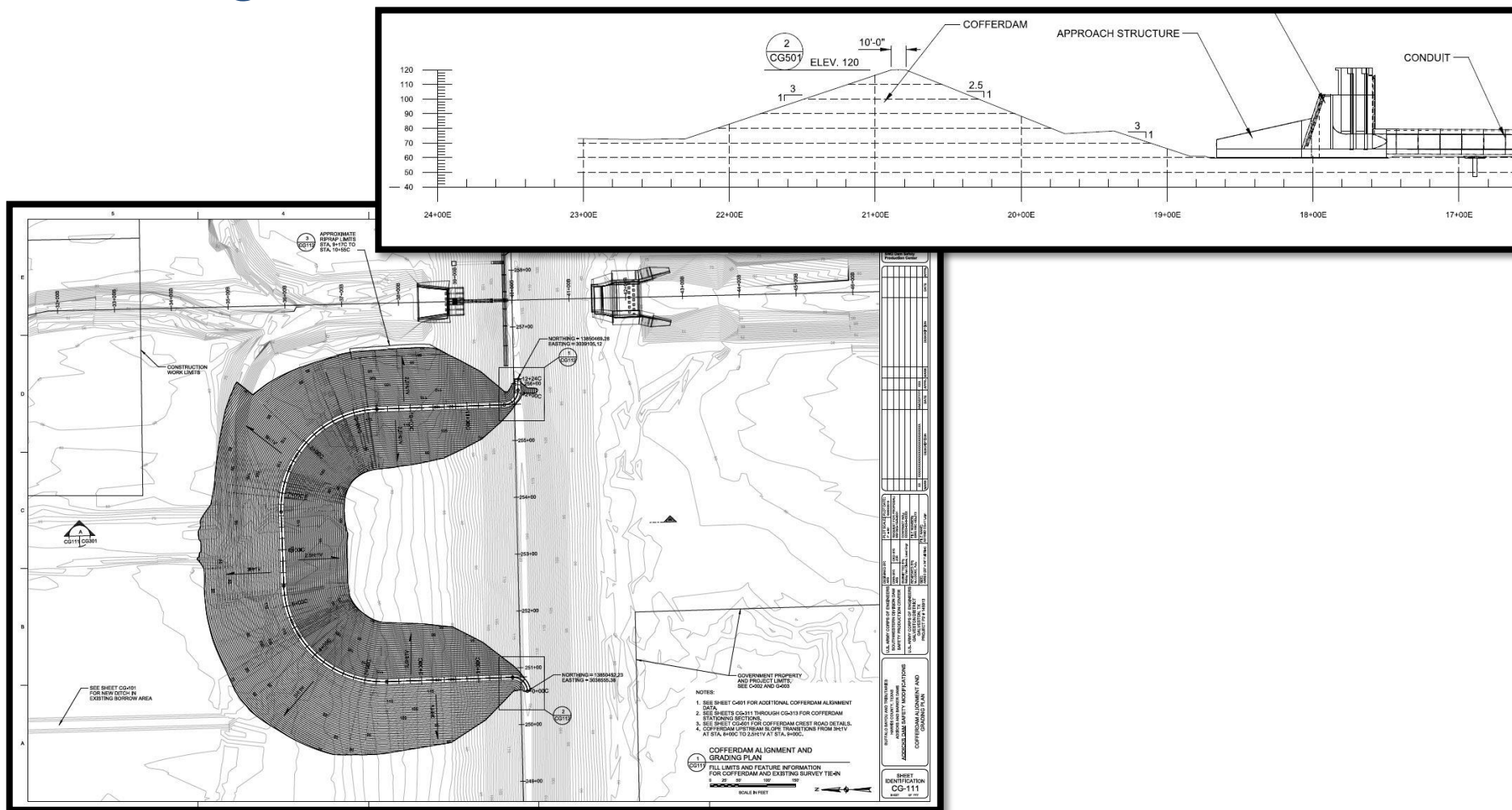




Barker Dam Design



Addicks Dam Design



Barker Dam - Houston



Record Pool @ EL 109.09, 30 August



May 30th, 2022





Record Pool @ EL 109.09,
30 August

