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Texas Association of Watershed Sponsors

Hot Dam!
What Is This BLE Study?

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AGENDA

1. Background: BLE Studies
2. Background: Dams and Traditional Studies
3. Leveraging BLE for Dams
4. Next Steps

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Base Level Engineering

(BLE)

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WHAT IS BLE

- Efficient modeling & mapping approach to provide flood hazard data
- To complement current effective FEMA flood risk data
- Considered as an “Approximate” study
- Used as the best available data where no other information is available
- Generally large-scale analysis, at a watershed level rather than focusing on individual streams

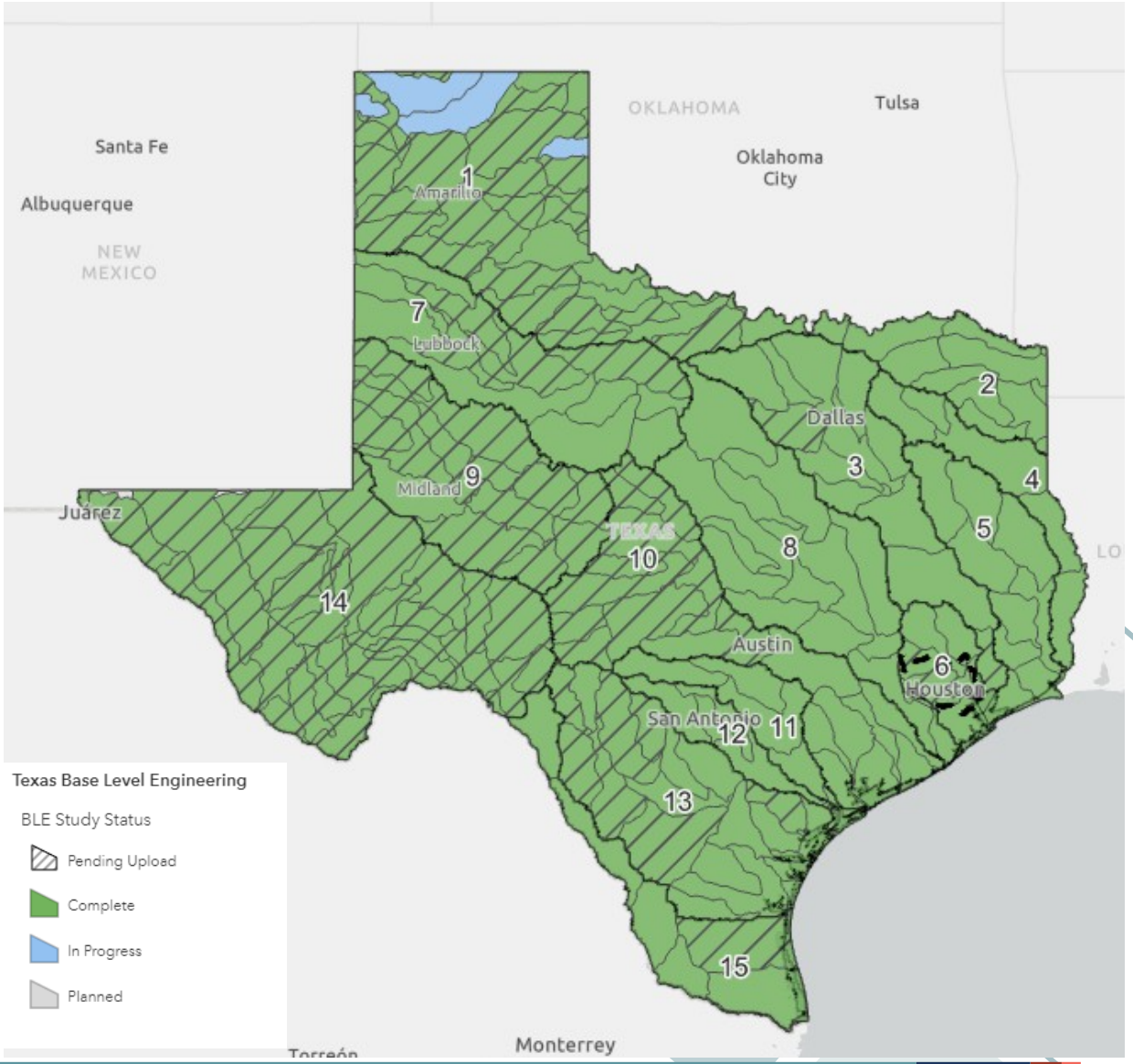
BLE IN TEXAS

2019 – 86th Legislature

- SB 7: Established the Flood Infrastructure Fund
- SB 8: Established the statewide flood planning process
- SB 500: Funding mechanism
- Culminated in the creation of the BLE modeling and mapping program

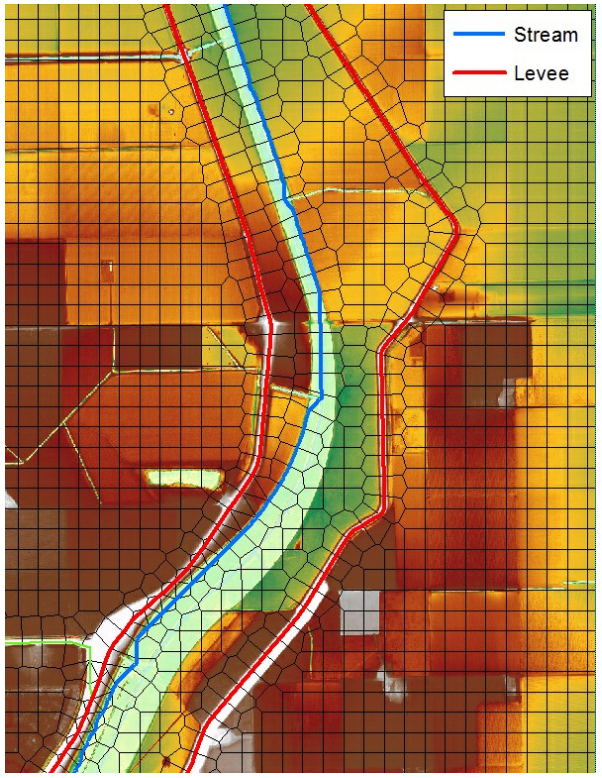
TEXAS BLE STATUS

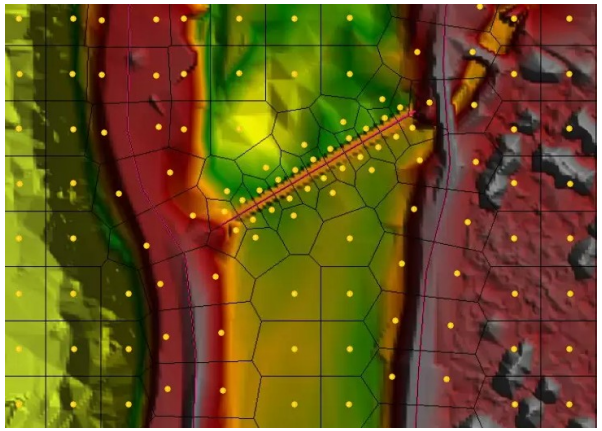
- Prioritized Coastal / East Texas & Moving West
- Total 208 HUCs
- 200 HUCs complete
  - 110 HUCs available for download, 90 HUCs pending upload
  - 46 HUCs modeled with 1D, 154 HUCs modeled with 2D
- Partnership with FEMA
  - Bridging Gaps and Complementing FEMA Studies

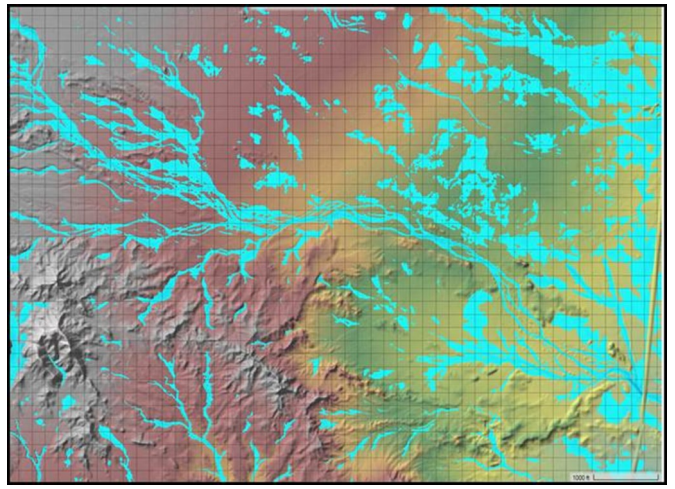


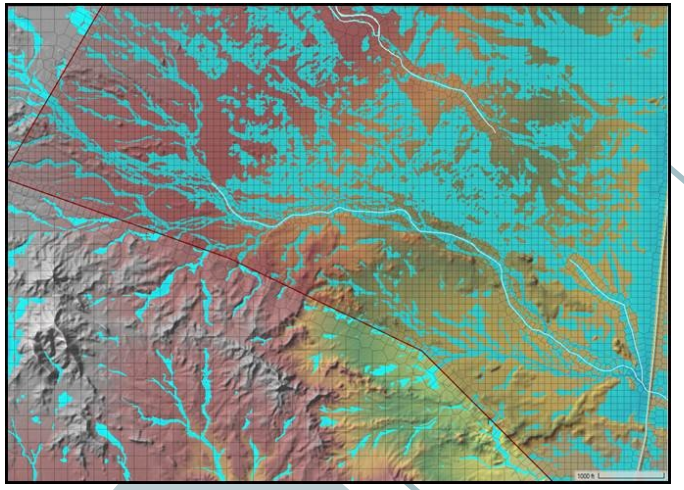
TEXAS BLE PROCESS

- HUC8 / HUC10 Model Size
  - Approx. 500 -1,000 Sq. Mi.
- High Level Analysis
  - 1D / 2D
  - No road structures / storm drain
- Multiple Frequency Events
  - 10 yr - 500 yr, 1% Plus/Minus
- Validation
  - Gages, Effective FEMA Studies, WHAs









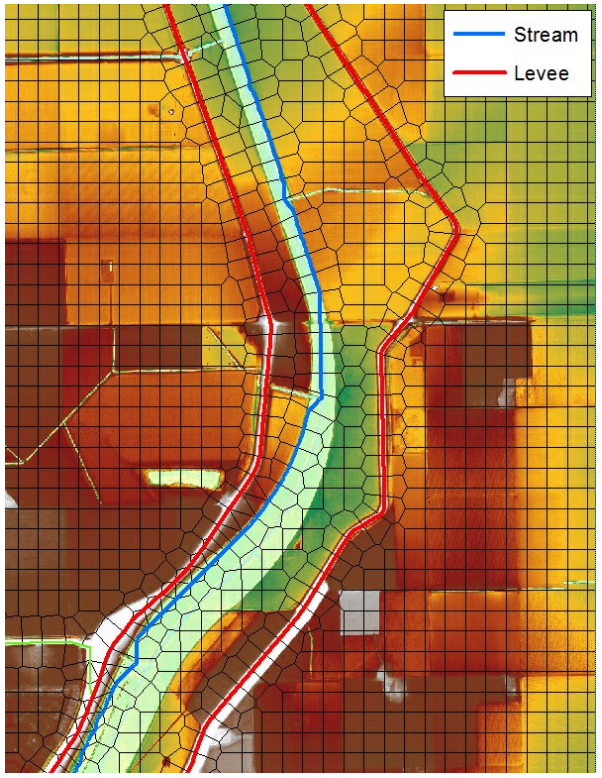
TEXAS BLE PROCESS

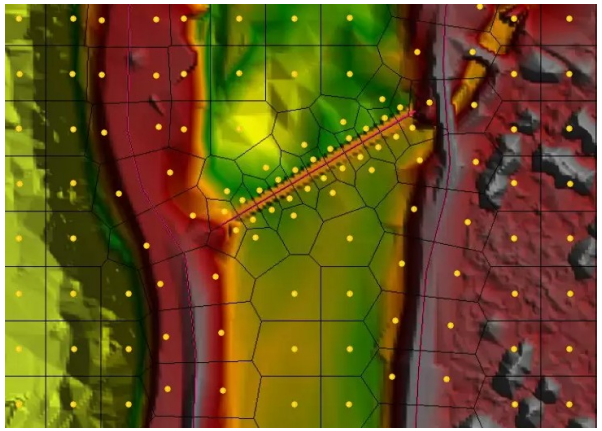
2D Modeling

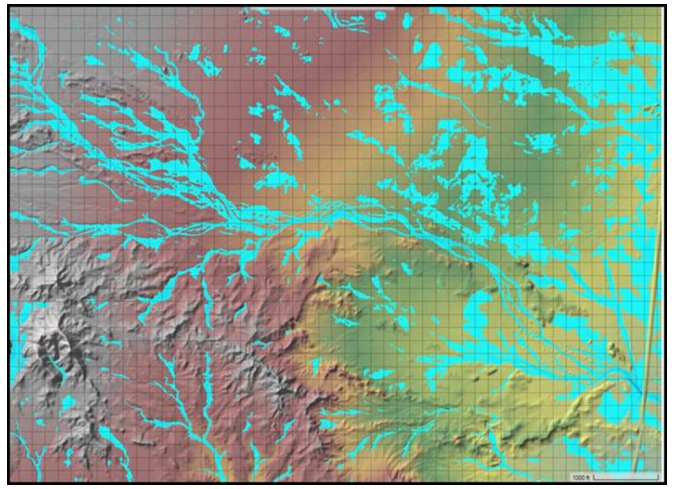
- Rain-on-mesh approach
- Inundation mapping not limited to creeks/rivers (pluvial and fluvial)
- Account for full hydrograph, timing of flood wave, and available storage
- Infiltration and loss modeling included
- Breaklines for high areas (roads, levees, etc.) and flow conveyance (streams)
- Terrain modifications or “leaky” cells for smaller structures

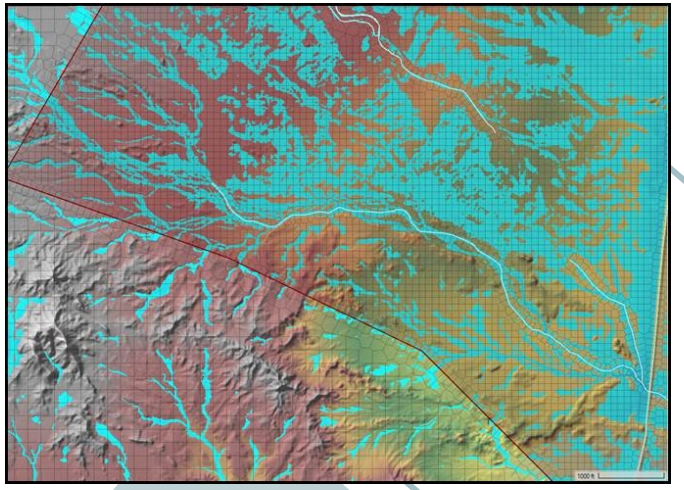
Modeling Dams

- Cell size adjustment for reservoir vs. embankment
- Breaklines for embankments
- Uncontrolled spillways: Use 2D equations modeled as breaklines or SA/2D connections
- Controlled spillways / gates / drop structures: rating curves (if available)









Dams and Traditional Studies

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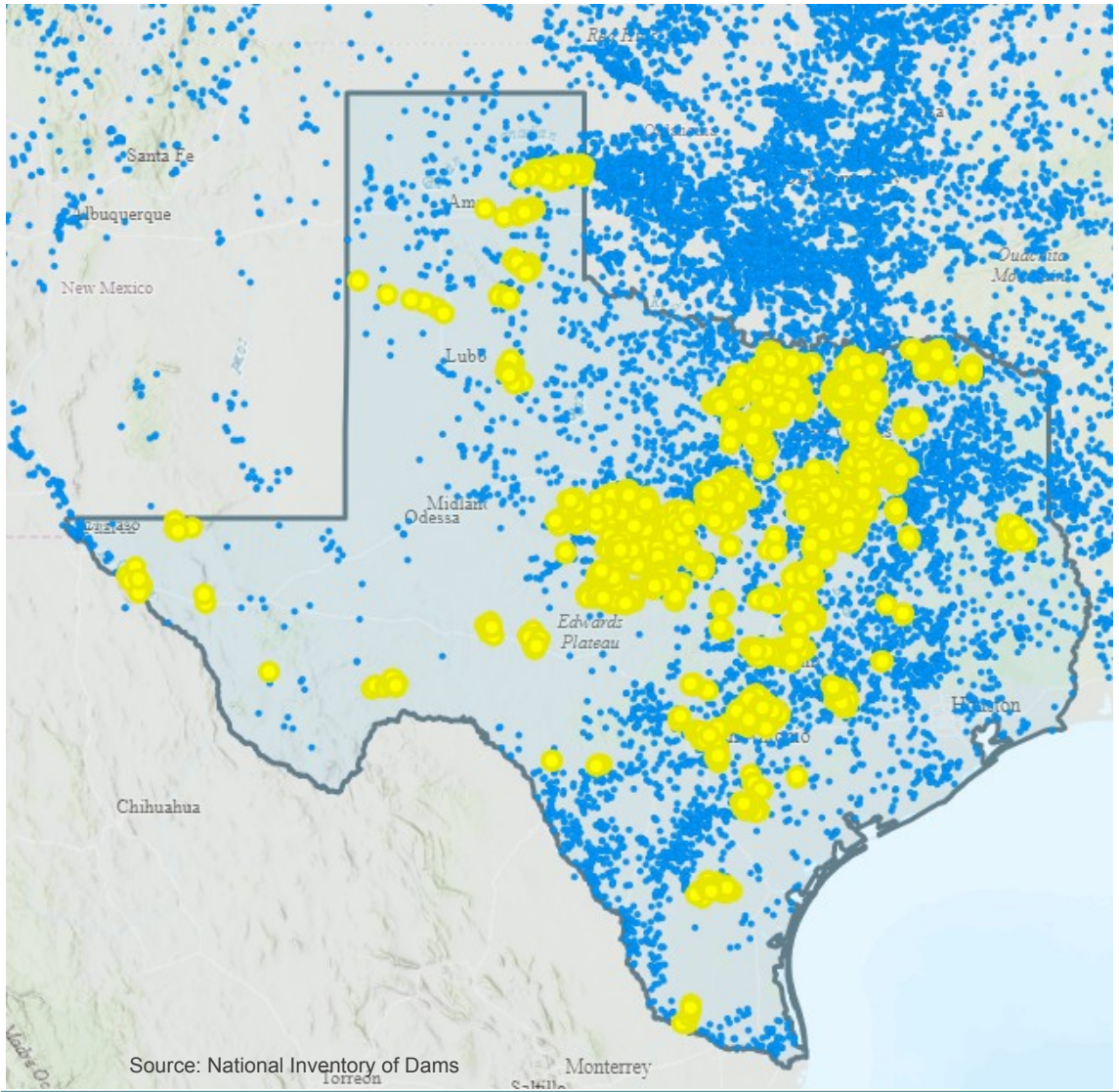
DAMS IN TEXAS



- A structure built across a body of water to hold, divert, or regulate water
- Texas dams regulated by TCEQ Dam Safety Program
  - Height >/= 25 ft & Storage >/= 15 ac-ft
  - Height > 6 ft & Storage >/= 50 ac-ft
- Dam owners include:
  - Federal/State/Local governments
  - Private companies/utilities
  - Individuals
- Total number of dams – 7,405
- NRCS designed/built dams – 2,002

TEXAS NRCS DESIGNED/BUILT DAMS IN NUMBERS

>2,000

Total Number of Dams

83%

Built more than 50 years ago

40%

Classified as High or Significant Hazard

89%

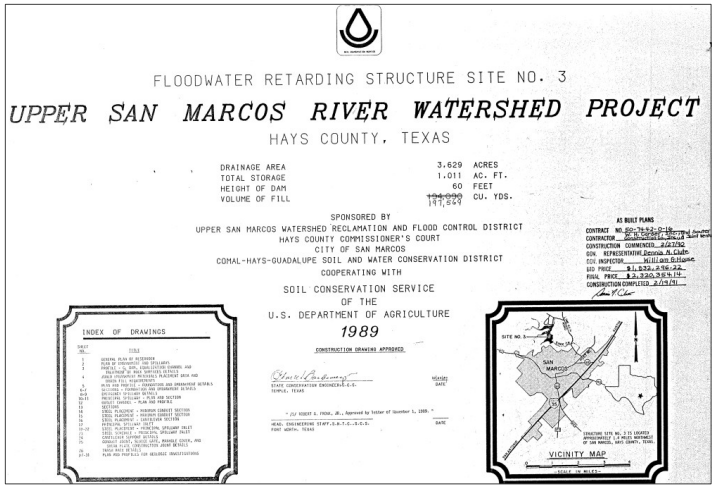
DAMS WITH < 50 FT HEIGHT

Source: National Inventory of Dams

POTENTIAL DAM RISKS

- Even flood control dams do not prevent flooding
- Potential flood damage during dam operations
  - Upstream infrastructure developed below top of dam
  - Development downstream of dam
- Drowning hazards for people who live near the dam
- Risk of property damage and loss due to dam failures

TRADITIONAL STUDIES FOR DAMS


FLOODWATER RETARDING STRUCTURE SITE NO. 3

UPPER SAN MARCOS RIVER WATERSHED PROJECT

HAYS COUNTY, TEXAS

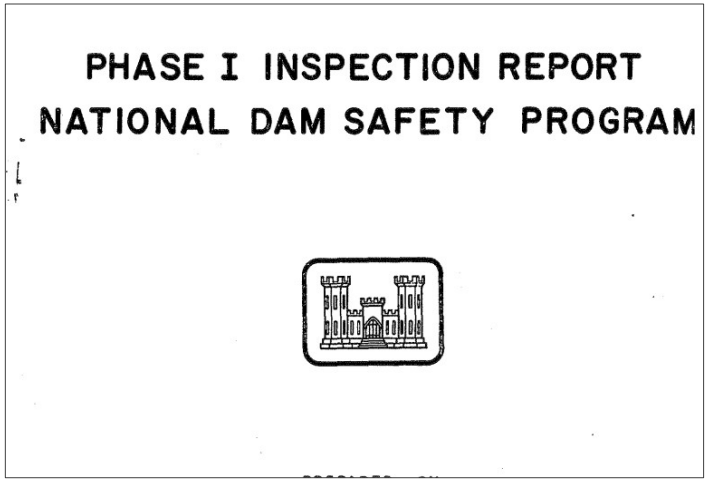
DRAINAGE AREA 3.629 ACRES
TOTAL STORAGE 1,011 AC. FT.
HEIGHT OF DAM 60 FEET
VOLUME OF FILL 141,849 CU. YDS.

SPONSORED BY
UPPER SAN MARCOS WATERSHED RECLAMATION AND FLOOD CONTROL DISTRICT
HAYS COUNTY COMMISSIONER'S COURT
CITY OF SAN MARCOS
COMAL-HAYS-GUADALUPE SOIL AND WATER CONSERVATION DISTRICT
COOPERATING WITH
SOIL CONSERVATION SERVICE
OF THE
U.S. DEPARTMENT OF AGRICULTURE
1989

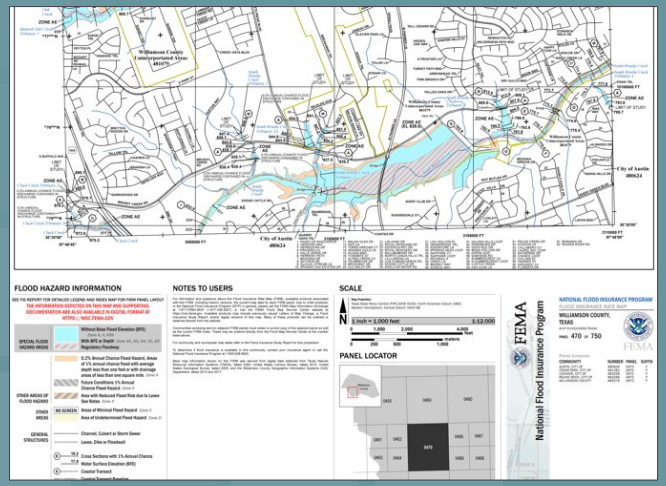
INDEX OF DRAWINGS

VICINITY MAP

As-Built/Rehab Design Plans


PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Dam Specific Inspection Reports

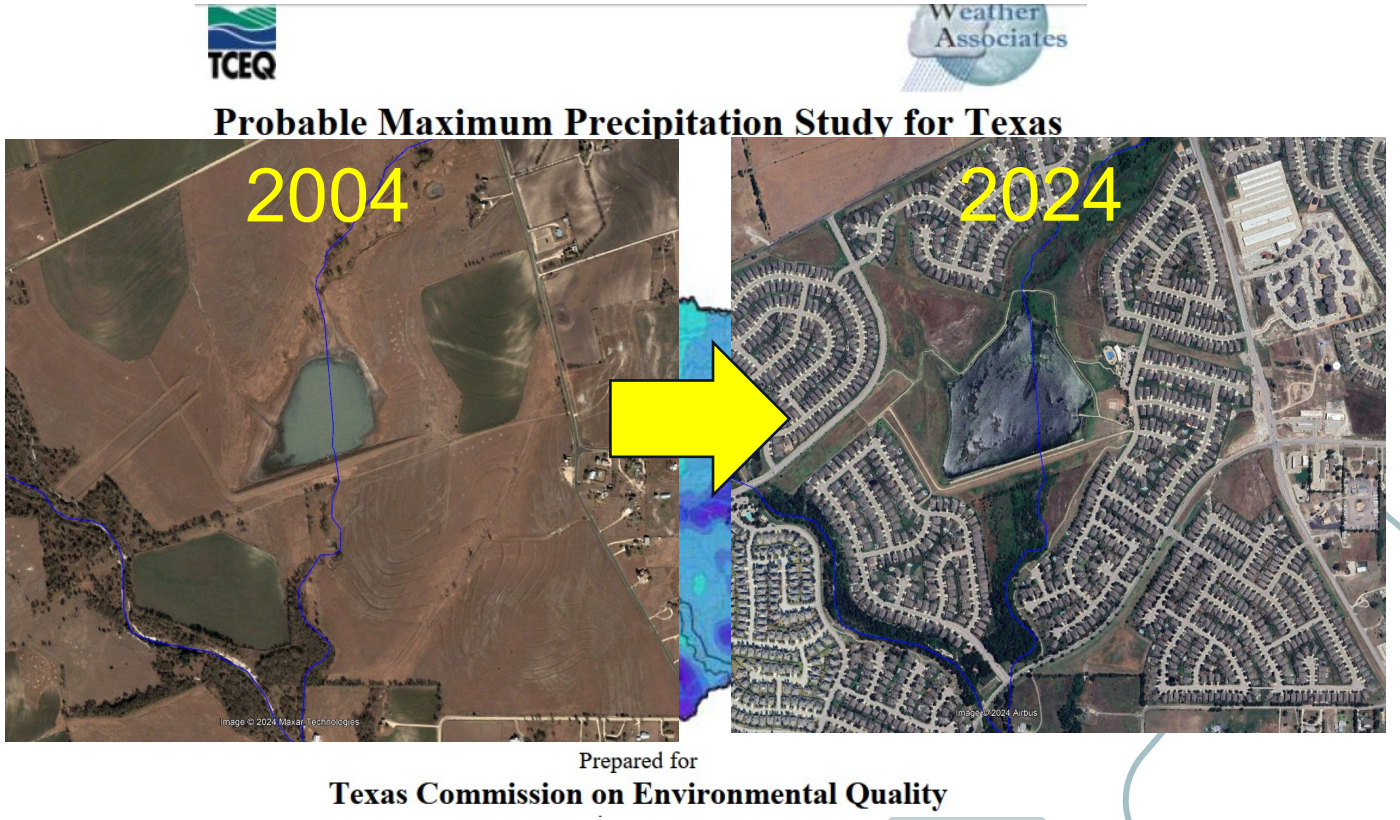


FEMA Flood Hazard Data

Dam Breach Inundation Maps

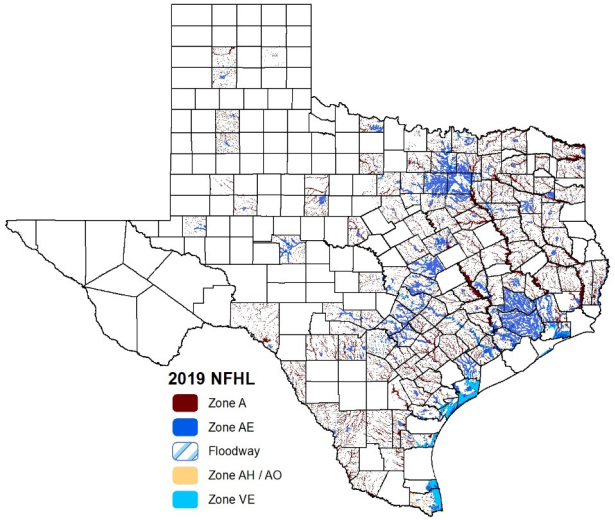
TRADITIONAL DAM STUDIES LIMITATIONS

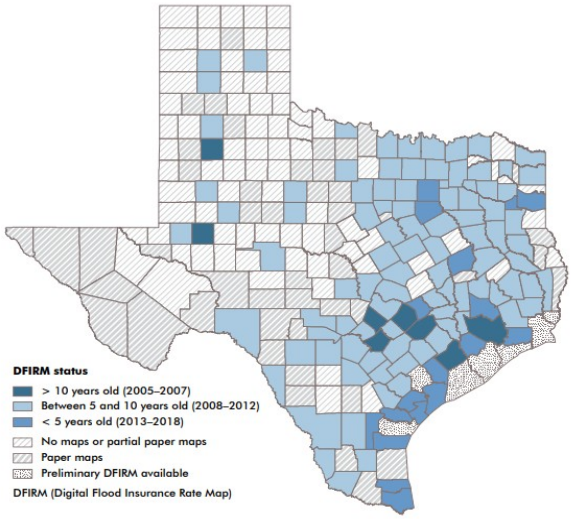
- Design studies typically include extreme rainfall (% of PMP)
- Inflows for various frequency storms not available
- Dam breach maps may not be publicly available
- Old plans may not show current risk due to recent development
- Flooding risks for structures in the reservoir flood pool may not be available

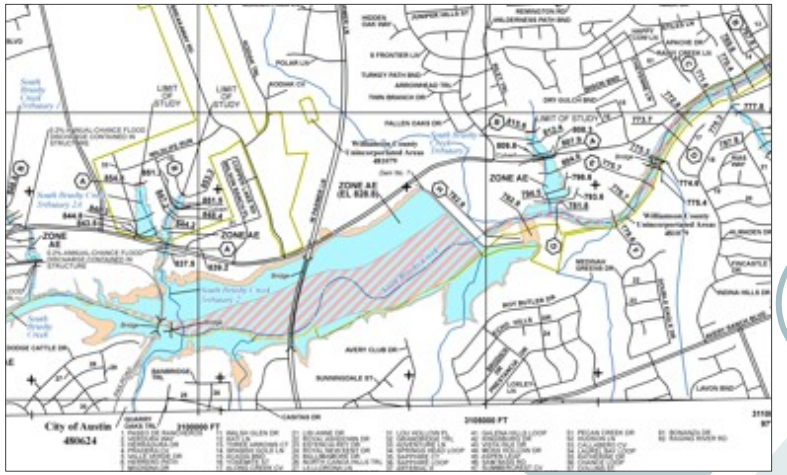


TRADITIONAL DAM STUDIES LIMITATIONS

- All dams may not have a FEMA study available
- Available studies may be outdated or approximate
- FEMA maps may not show downstream flood risk due to potential dam breach







Leveraging BLE for Dams

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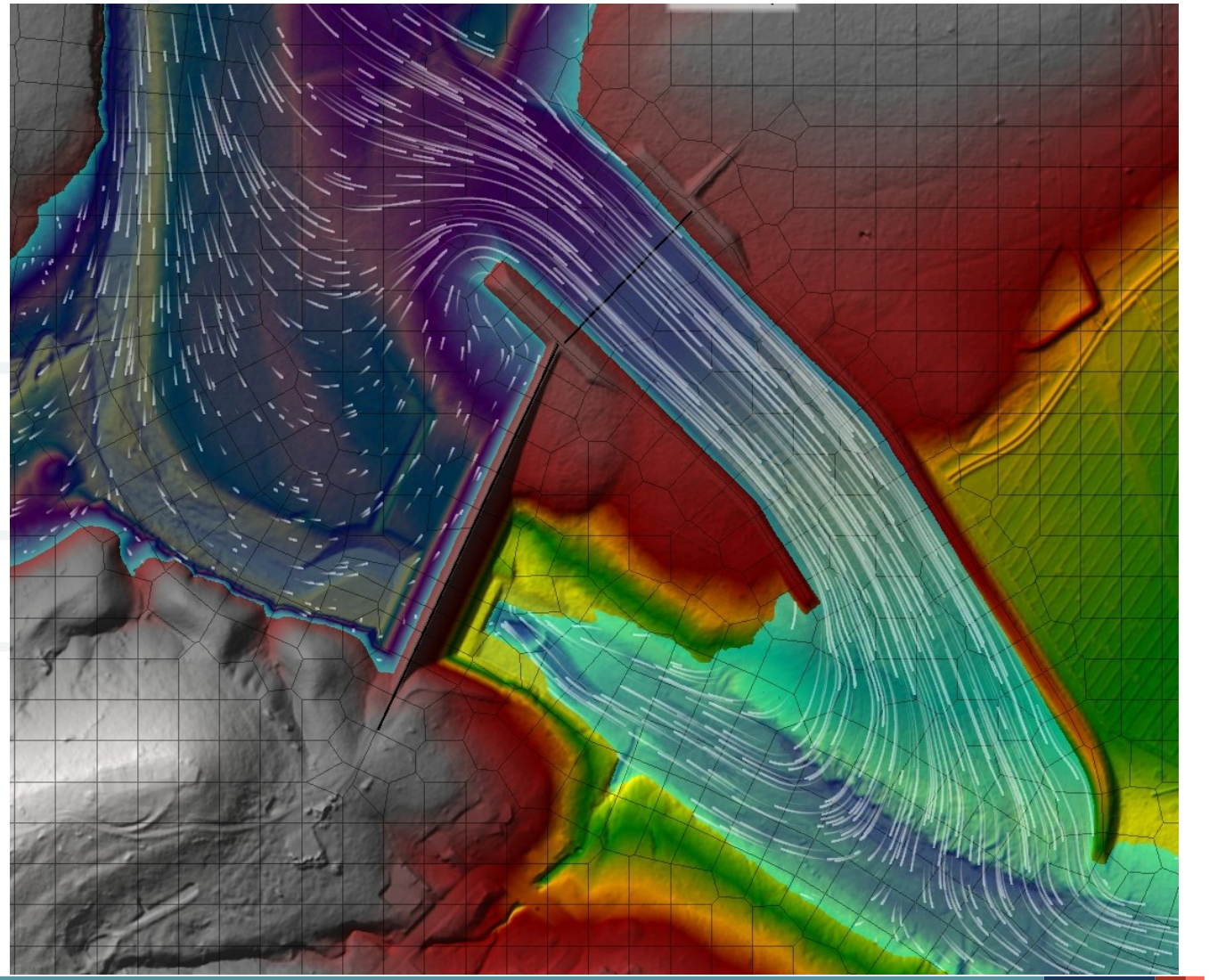
BLE FOR DAMS – WHAT IS INCLUDED

- Readily Available Dam Data from TCEQ, NID
- Validated Flows (using Gages, FEMA Data, WHA, Regression Equations)
- Best available Lidar and Land-Use Data
- Modeling Open Spillways with 2D Connections
- Modeling Closed Spillways with Rating Curves (if available)



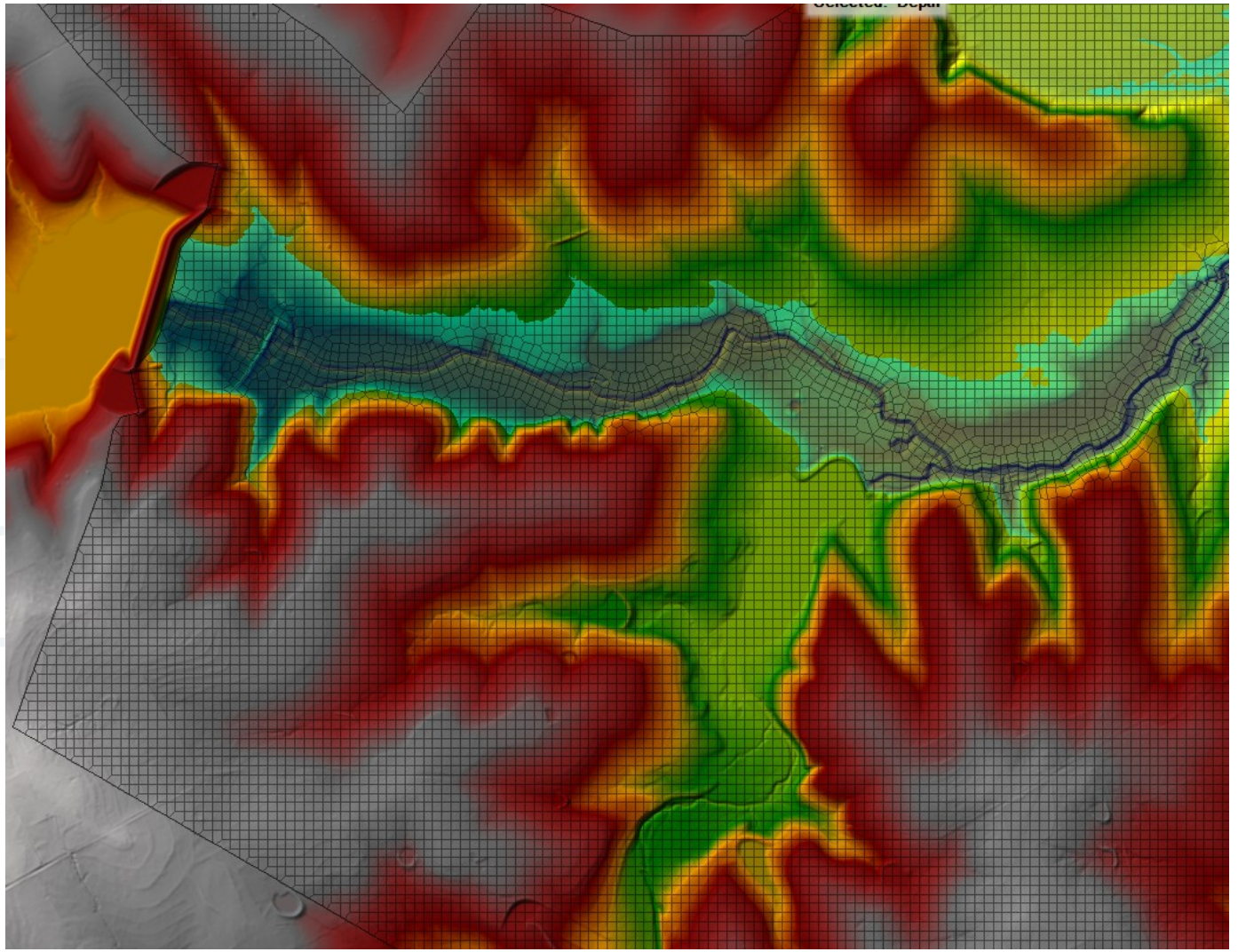
BLE FOR DAMS – LIMITATIONS

BLE Studies Lack the Following Details for Dams -

- Gate Operations
- Bathymetry Data or Surveys
- Evaluation for Appropriate (State/Federal) Design Criteria
  - Design Storms/Probable Maximum Flows (PMFs)
  - Rehab Improvements

BLE FOR DAMS – WHAT IS LEVERAGEABLE

- Terrain, Land-Use, Soils Data
- 2D Model Set-up (whole model or truncated version)
  - Breaklines
  - Boundary Conditions
- H&H Parameters
  - Losses
  - Attenuation / Storage
  - Friction (N-Values)



Next Steps

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BLE FOR DAMS – NEXT STEPS

- Define Study Goal
  - Evaluate meeting design criteria
  - Study in detail for dam improvements
  - Evaluate upstream / downstream structure flooding
  - Evaluate dam breach scenario
  - Establish risk and emergency response

BLE FOR DAMS – NEXT STEPS

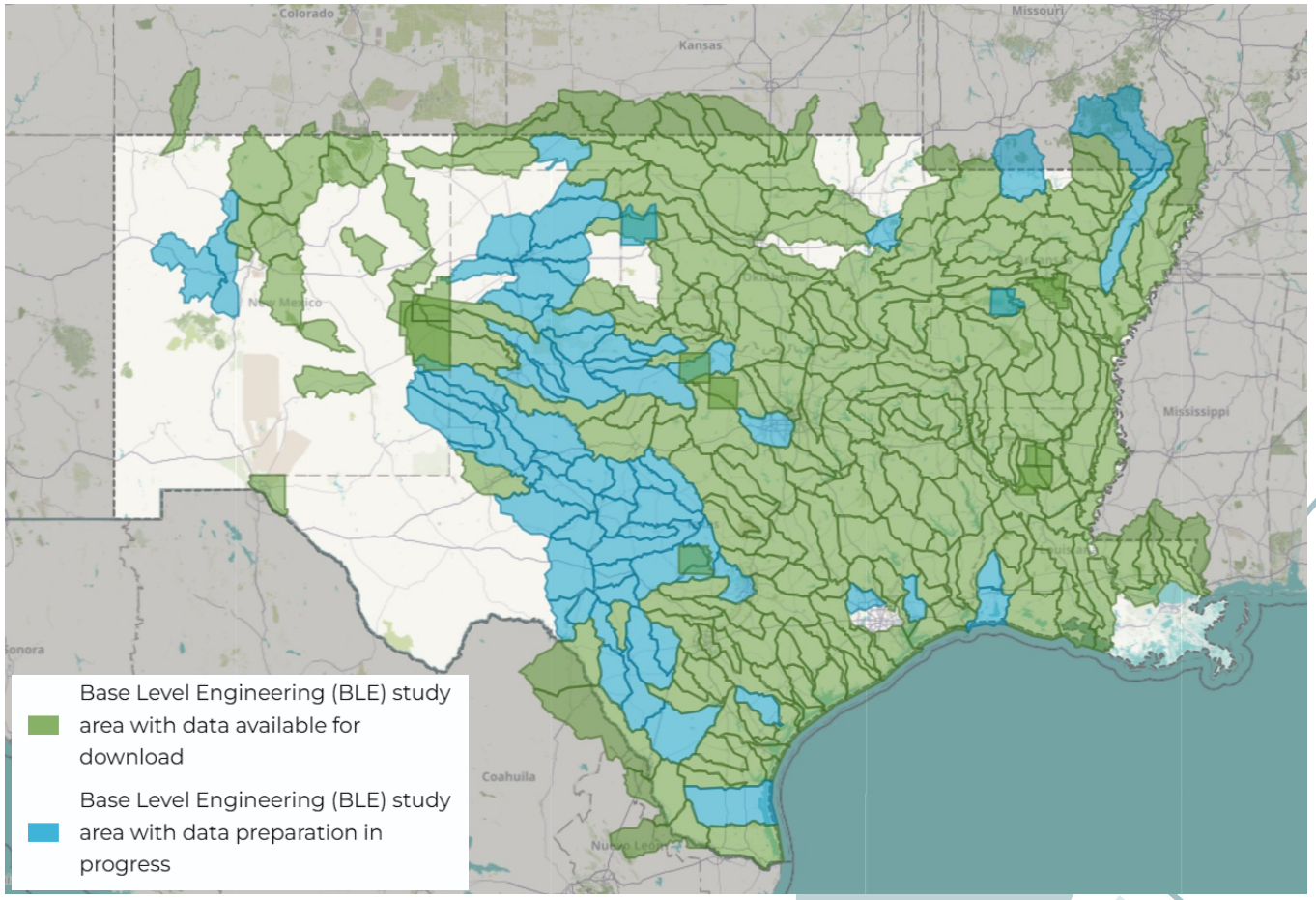
- Revise BLE model for missing structural details, as appropriate
  - Reservoir Stage-Storage-Discharge data (including Bathymetry)
  - Gate operations
  - Complex spillway rating curves
  - Design alternatives configurations

BLE FOR DAMS – NEXT STEPS

- Truncate model (if appropriate)
- Revise rainfall data to appropriate design (PMP)
- Include additional parameters for dam breach analysis

TEXAS BLE FUTURE STEPS

- Updating 1D into 2D BLE
  - Goal – Full 2D BLE statewide coverage
- BLE Enhancement Studies
  - Identifying and prioritizing areas of study
    - Lacking or out of date FEMA FIRMs
  - Adding structures through detailed study areas
  - Increased modeling detail for areas of increasing development
- BLE to regional flood planning
  - Engage with local RFPGs
- Finding your BLE data
  - eBFE Viewer
  - TWDB BLE Status Map



Q&A

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