Developing Base Level Engineering for Texas Watersheds

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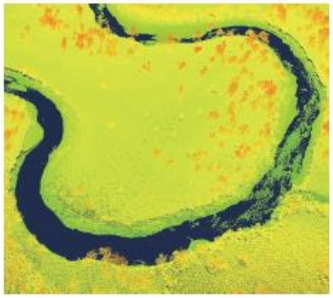
*Unless specifically noted, this presentation does not necessarily reflect official Board positions or decisions.

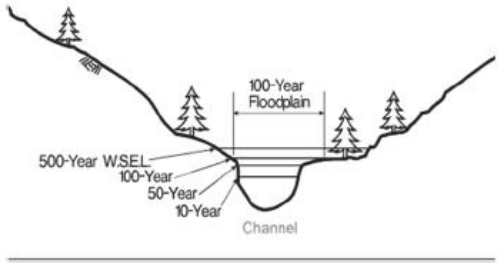
What is Base Level Engineering?

Base Level Engineering



Lidar

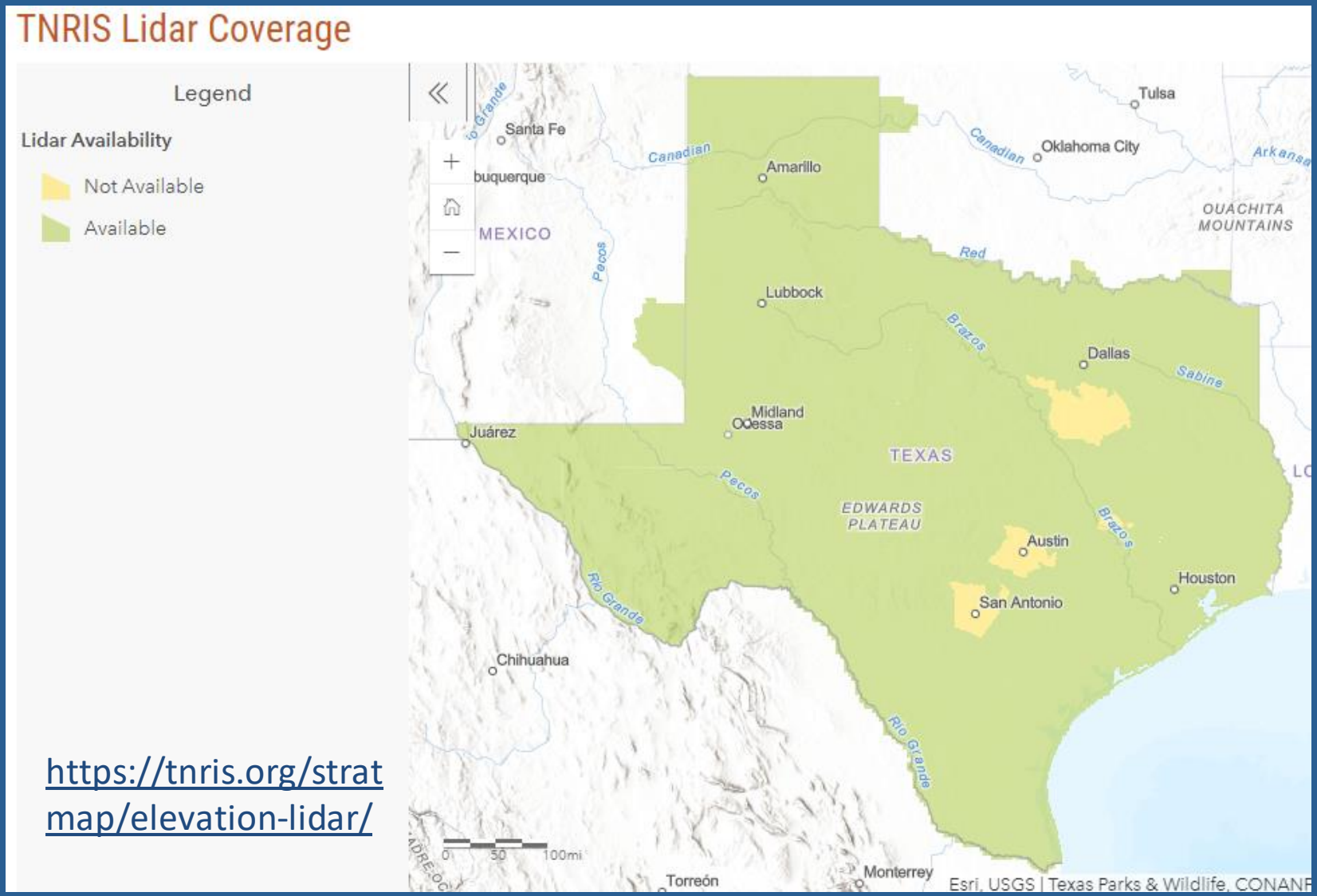
Hydrology



Hydraulics

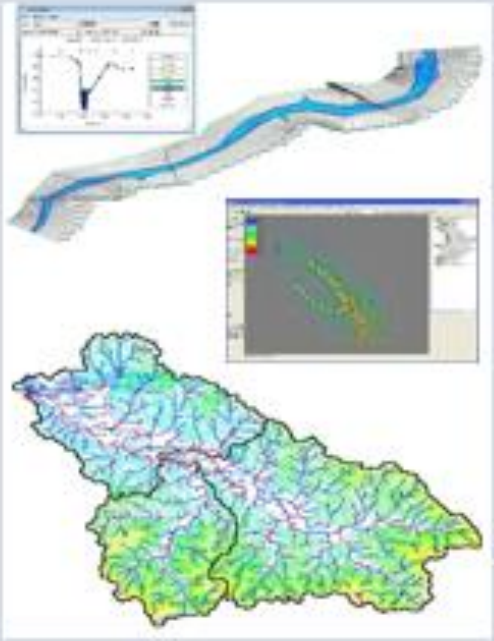
Base Level Engineering

Texas Lidar Coverage

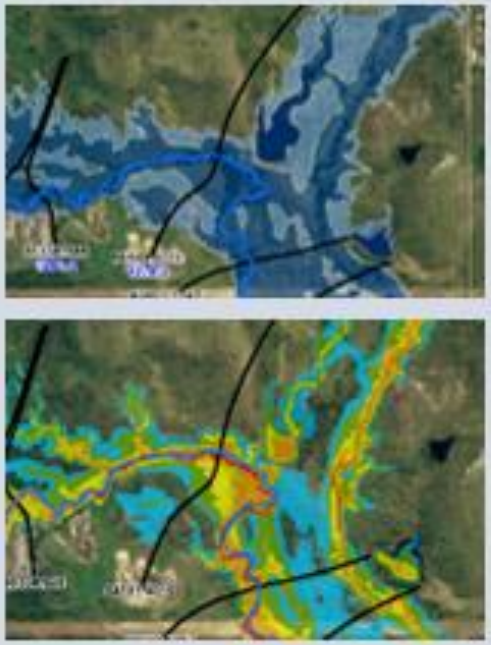


https://tnris.org/stratmap/elevation-lidar/

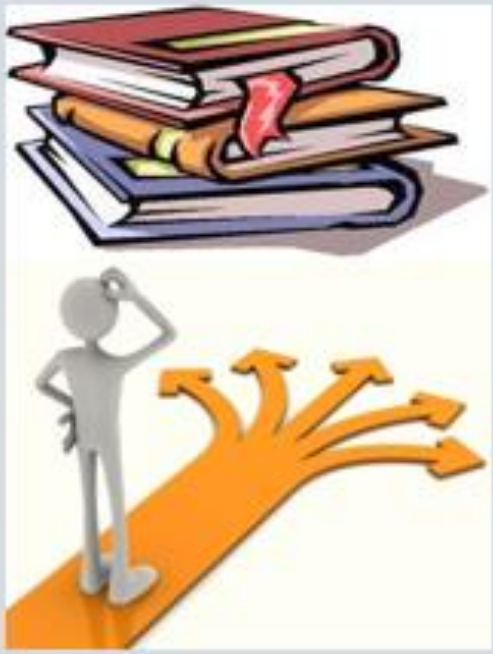
Base Level Engineering is a programmatic evolutionary step which provides:



Credible engineering analysis and modeling for local communities and developers.



Estimation of flood extents, water surface elevations and flood depths



May be adopted as Best Available Information (BAI) by communities & inform development decisions.

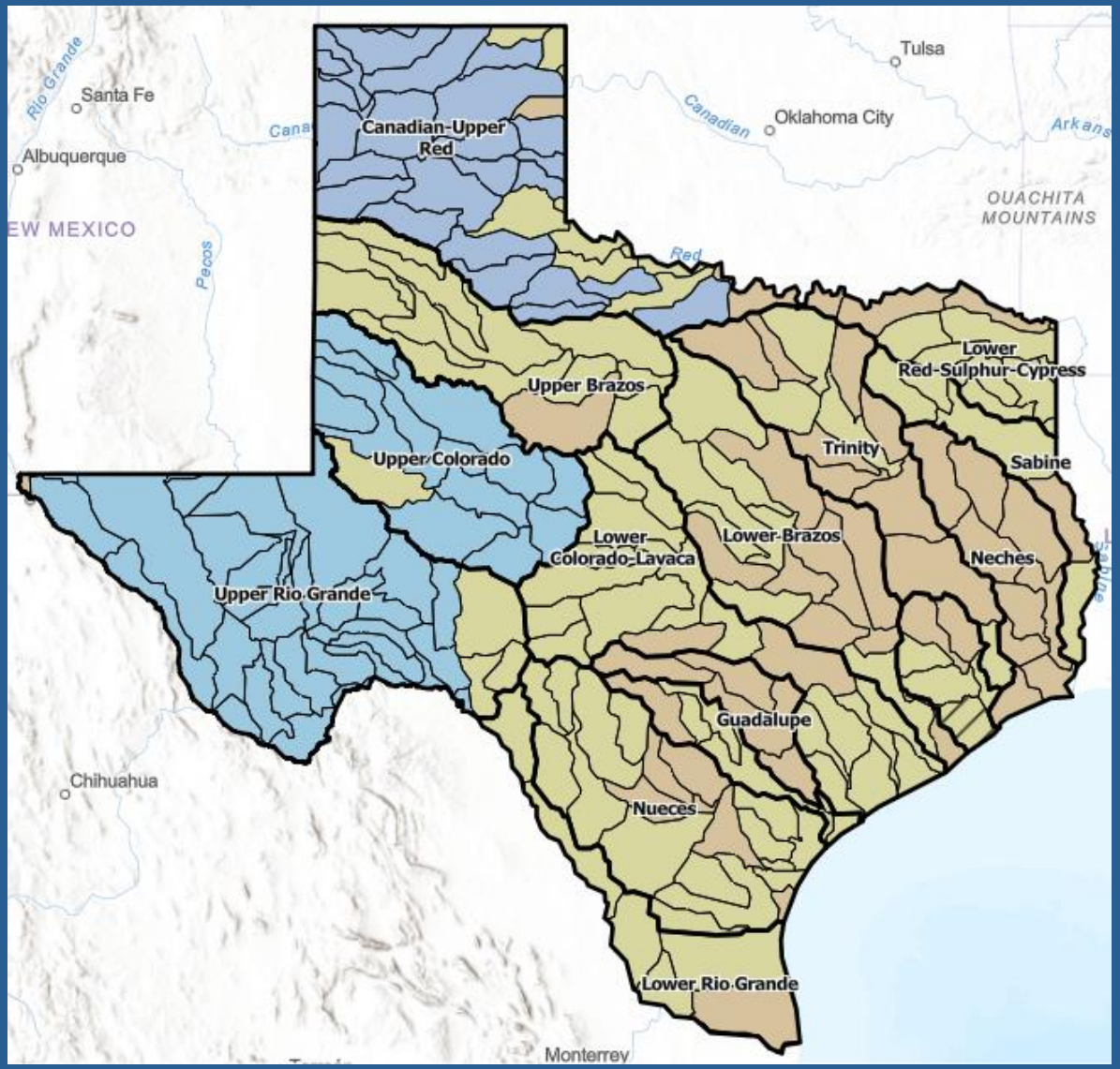
BLE Benefits

- Comprehensive picture of flood risk for entire watershed (Zone A's)
- Provides modeling to support local flood mitigation strategies, projects, and initiatives
- Information to support local planning and development decisions for multiple community departments.
- Less time intensive than detailed study/FIRM update
- Provided by state and federal partners with no additional cost to communities

Statewide BLE Coverage

- Our goal is to get updated flood hazard data to Texas communities quickly
  - BLE development ~9-12 months/watershed
- Cost effective
  - Larger scale studies can build on modeling efficiencies
- Support for Regional Flood Planning Groups
  - The TWDB will be administering a new state and regional flood planning process with flood planning regions based on river basins
  - BLE data can inform decision making for the Regional Flood Planning Groups

Texas BLE Coverage



BLE Status

- Complete
- In Progress
- Pending upload to FEMA's EstBFE Viewer

Estimated FY Completion

- FY2022
- FY2023
- FY2024

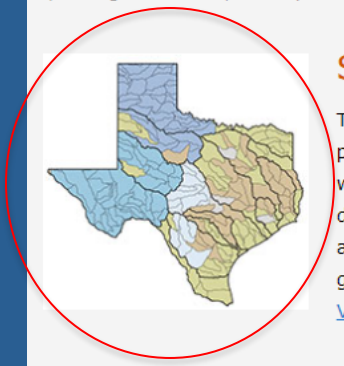
Flood Planning Regions

HUC 8 Watershed Boundaries

BLE Status Map

Base Level Engineering (BLE) Status

The map and tables below show progress and development of new BLE products as of 2/8/2021. This information is subject to change as the projected BLE progress and schedule are contingent on many factors including federal funding availability, partnering agency involvement, and evolving prioritizations. The TWDB will be updating this data quarterly and will include any changes that have developed.



Status Map

This interactive map application provides the current progress of BLE development throughout the state. For watersheds with status 'complete' (meaning BLE development is complete for that watershed) access and download the BLE modeling files and results by going to FEMA's Estimated Base Flood Elevation Viewer.

Current BLE Status

	Complete	In Progress	Planned	Total
HUC 8s in Texas	35	66	107	**208**
State Funded BLE	2	30	98	**130**
Cooperating Technical Partner (CTP) Funded BLE	2	16	0	**18**
FEMA Funded HUCs	31	20	9	**60**
1D BLE	34	16	0	**50**
2D BLE	1	50	107	**158**

- HUC stands for Hydrologic Unit Code and is a unit of measurement for watersheds determined by the United States Geological Survey. HUC-8s are very roughly the size of Texas counties.
- 1D and 2D are terms for different flood modeling methods.

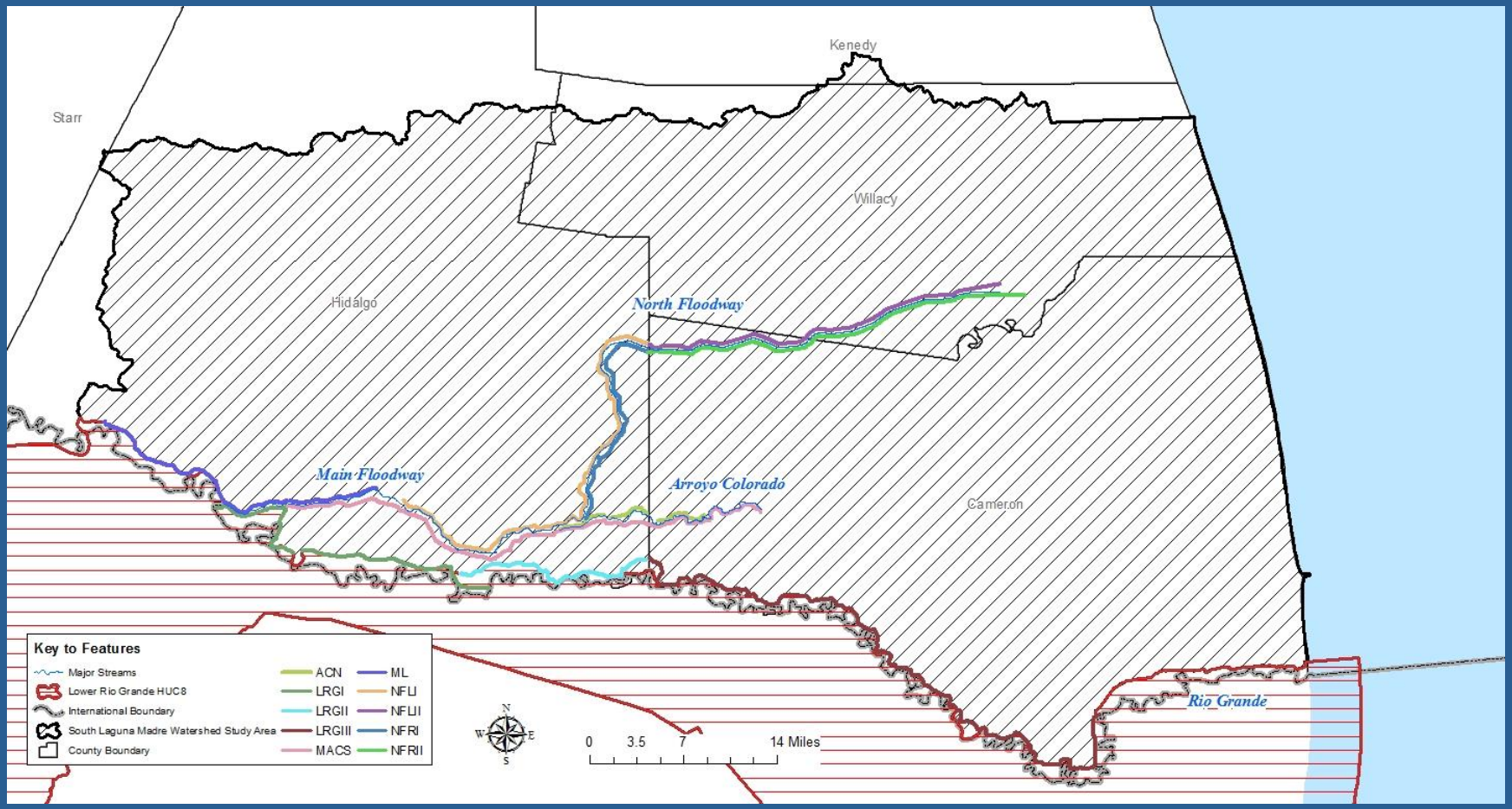
What to Do? Before, During, and After a Flood
Flood Infrastructure Fund (FIF)
Flood Planning
Flood Financial Assistance Programs
National Flood Insurance Program (NFIP)
Flood Mapping

- Base Level Engineering (BLE)
- Base Level Engineering (BLE) Status
- Modeling and Mapping Program
- Flood Mapping Resources

Floodplain Management Training
Community Resources
Flood Science and Community Assistance Staff
Flood Planning Staff

TNRIS

South Laguna Madre BLE & Levee Analysis

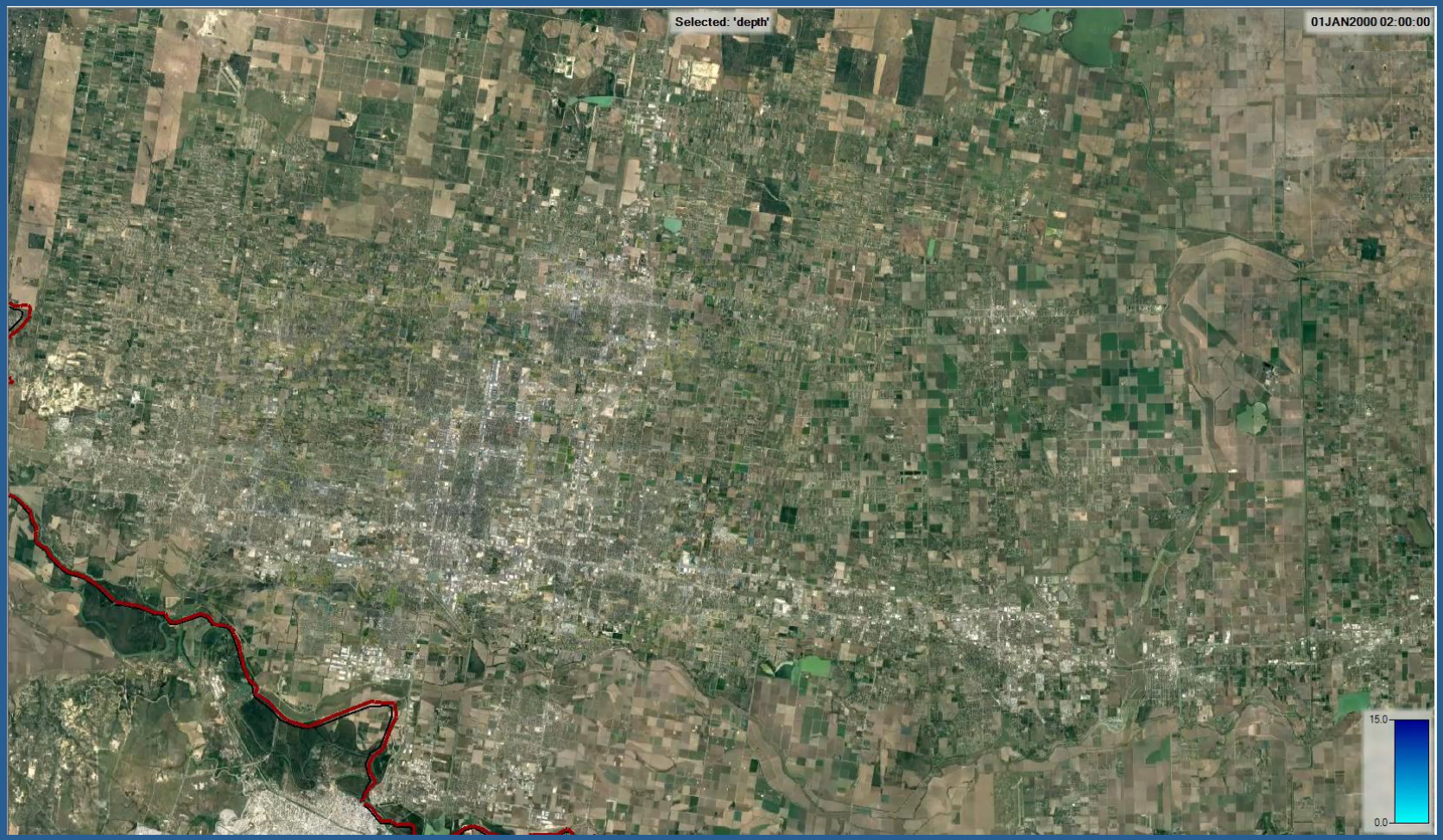


South Laguna Madre BLE

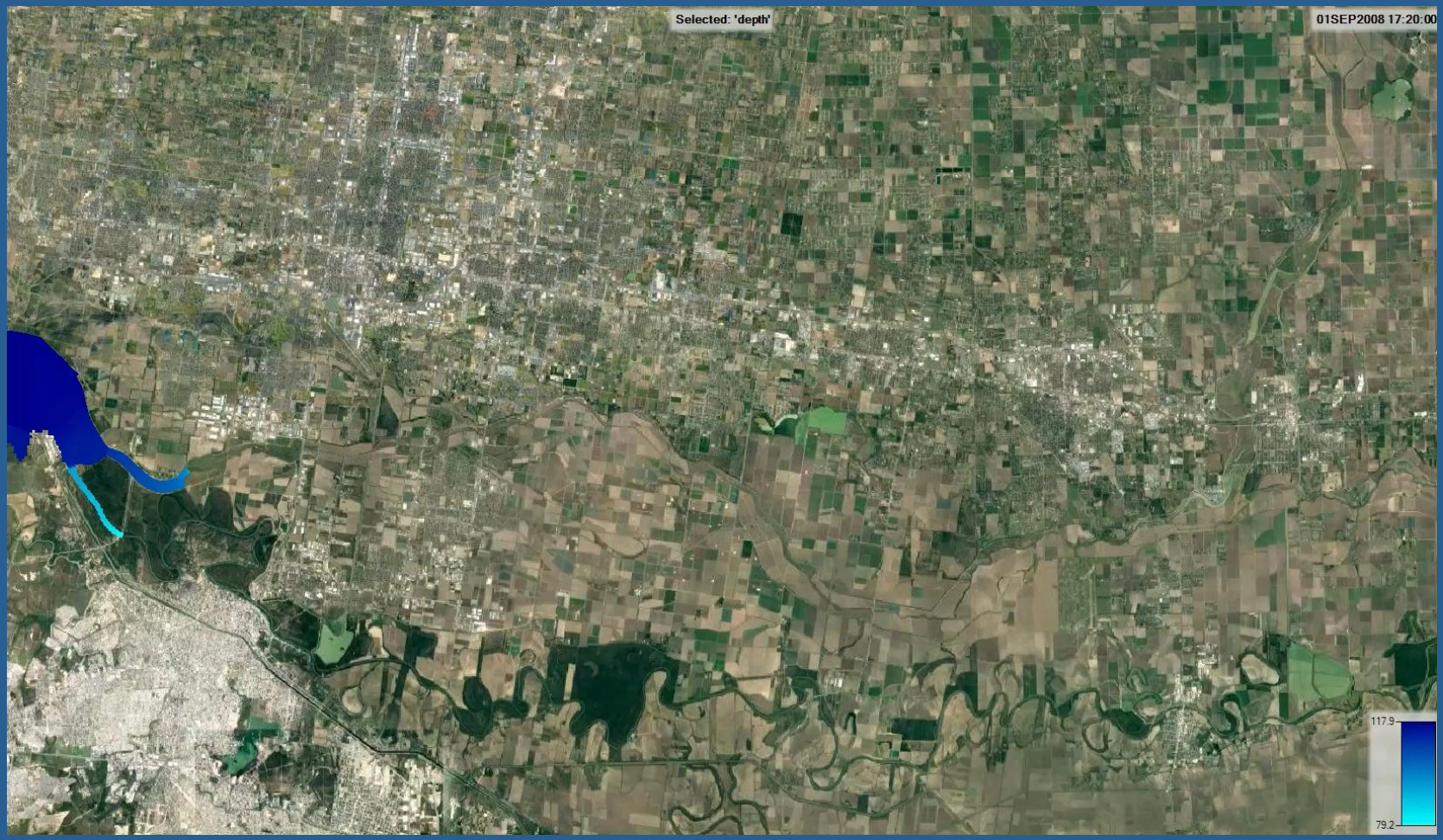
Incorporated Data:

- 2018 USGS LiDAR
  - 10 ft Cell Size
- Atlas 14 Rainfall Data
  - 10, 4, 2, 1, 1±, 0.2% ACE
- 300 ft Model Cell Size
- Breaklines (Model Refinement)
  - Major Roadways
  - Irrigation Channels
  - Railroads
  - Levee Systems
  - Channels/Ditches/Streams
- USIBWC Data for Rio Grande River Inflow Model

South Laguna Madre BLE 1% ACE Interior Drainage Model



South Laguna Madre BLE 1% ACE Rio Grande Inflow Model



Natural Valley Procedure

The Natural Valley procedure is used to establish areas that may be flooded if the levee system were to breach, overtop, or fail completely.

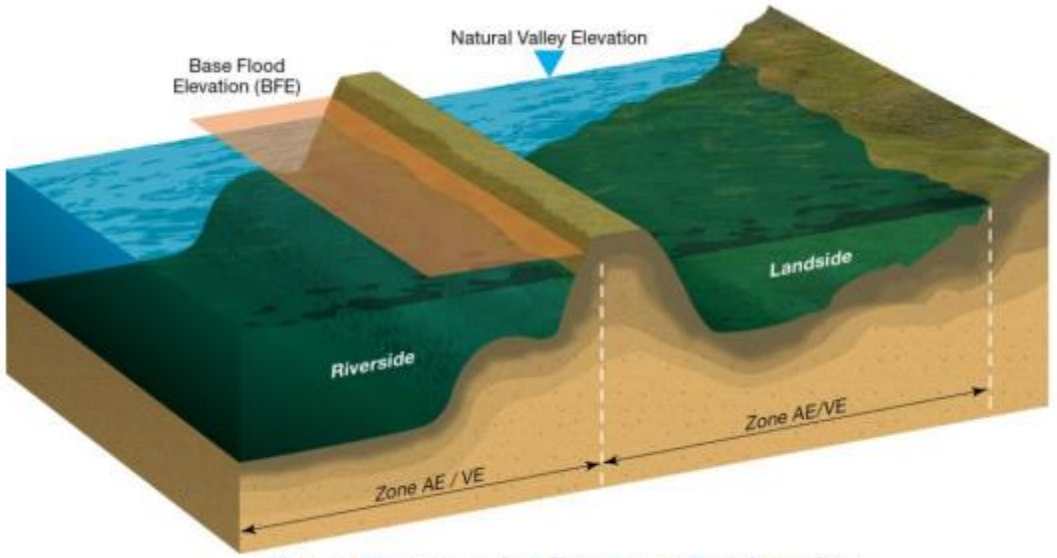
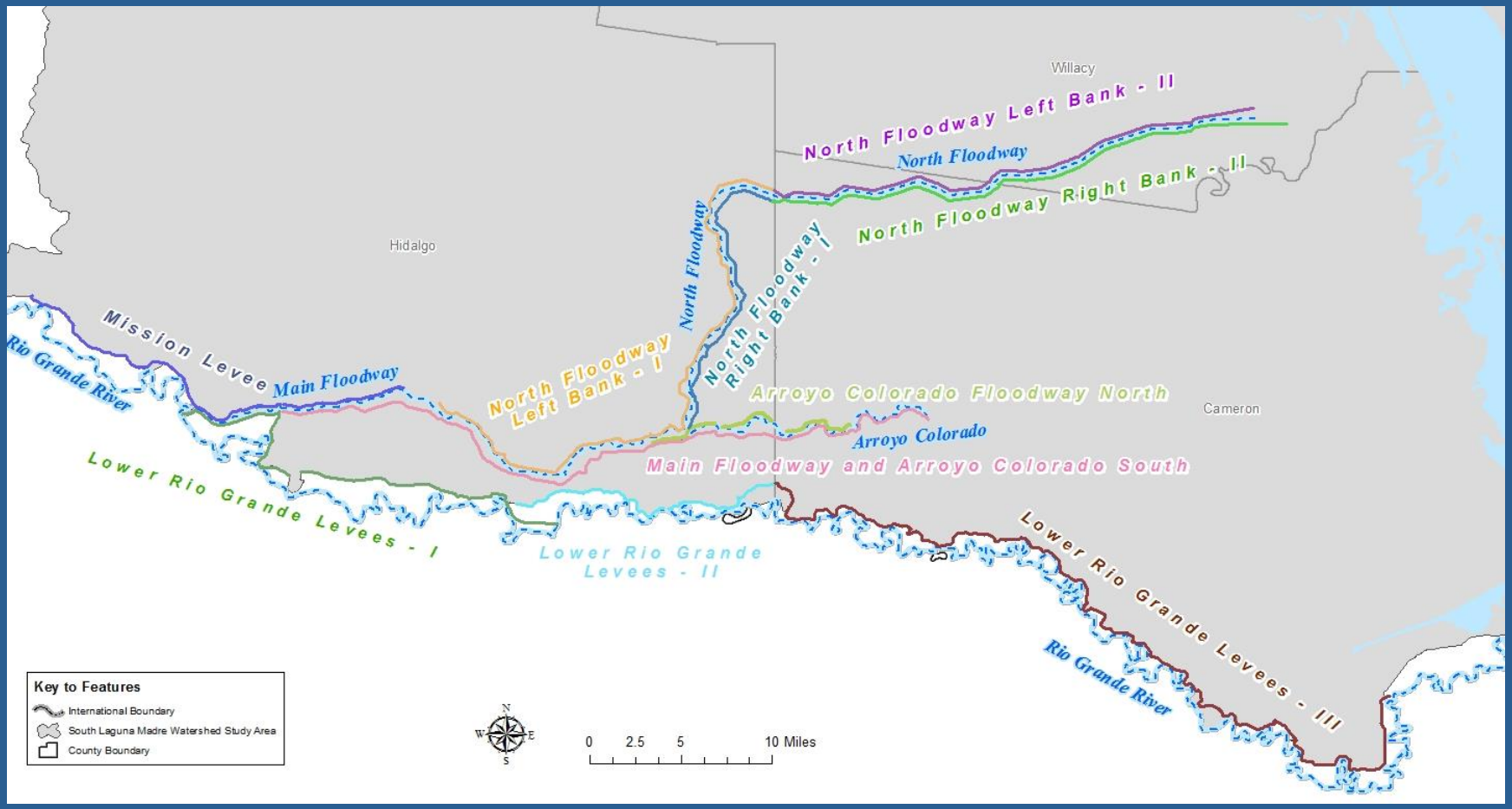


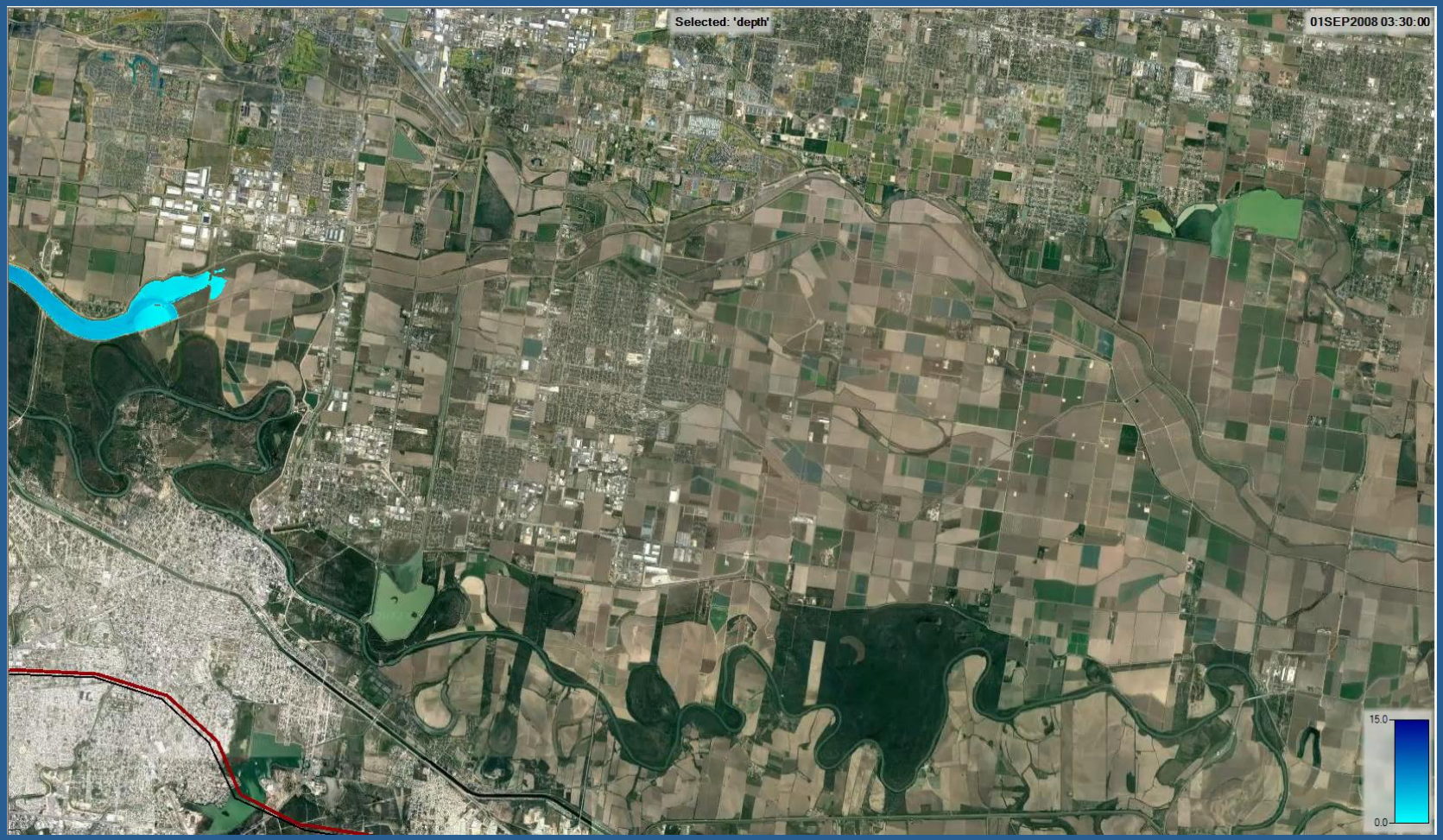
Figure 15: Natural Valley Cross-Section View

https://www.fema.gov/sites/default/files/documents/fema_levee-guidance.pdf

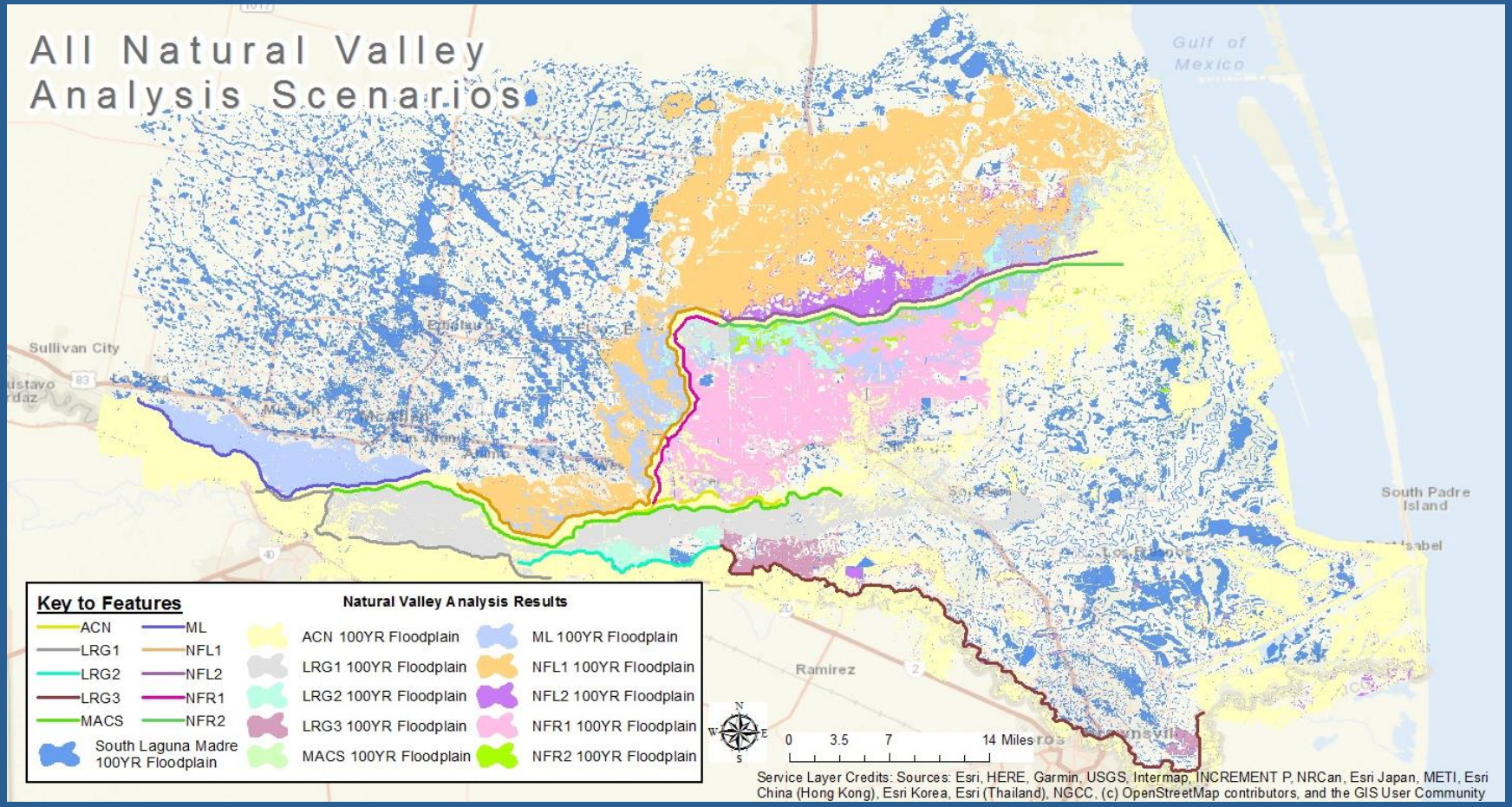
South Laguna Madre Levee Systems



Natural Valley Procedure Model Run



Levee Summary

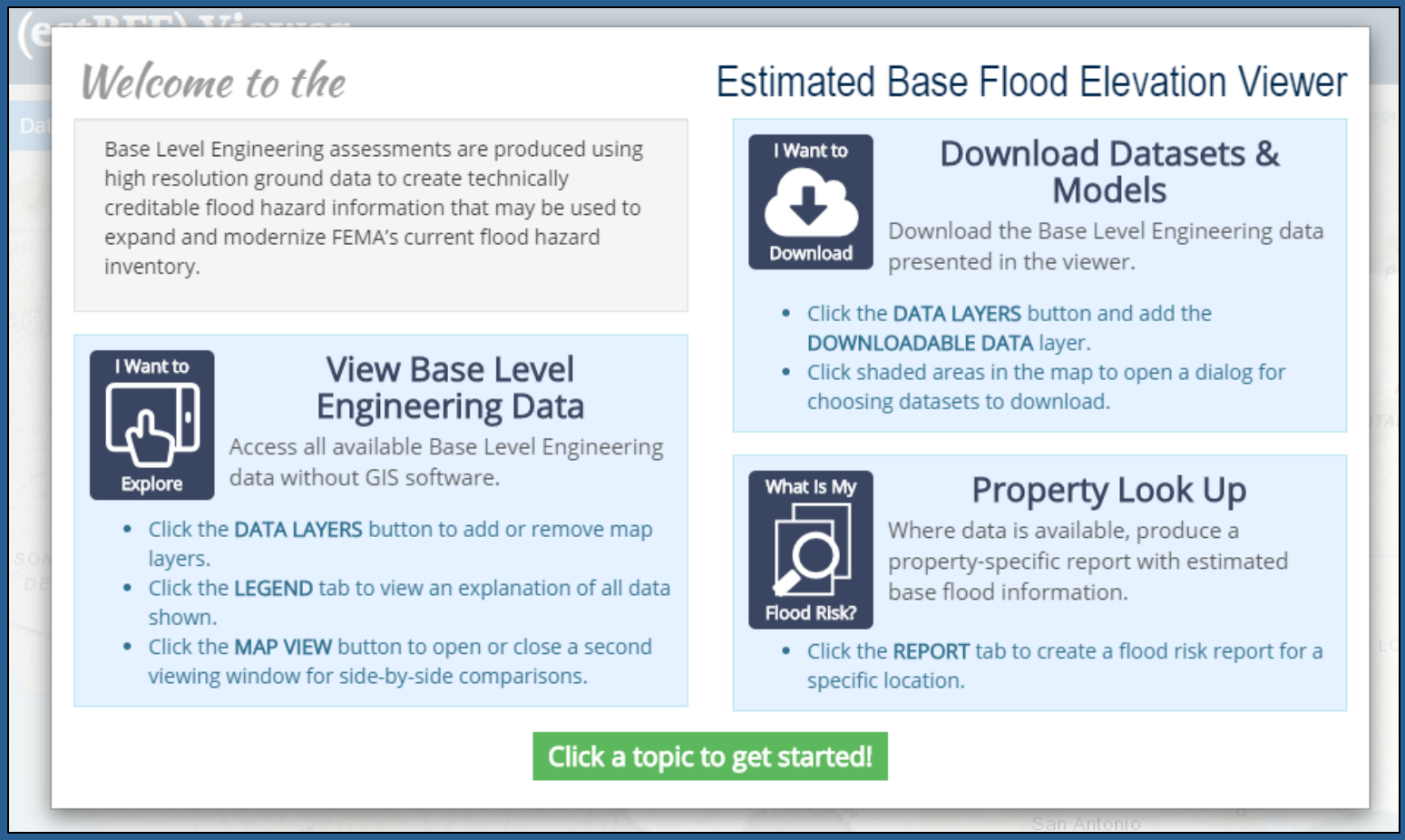


BLE & Levee Analysis Summary

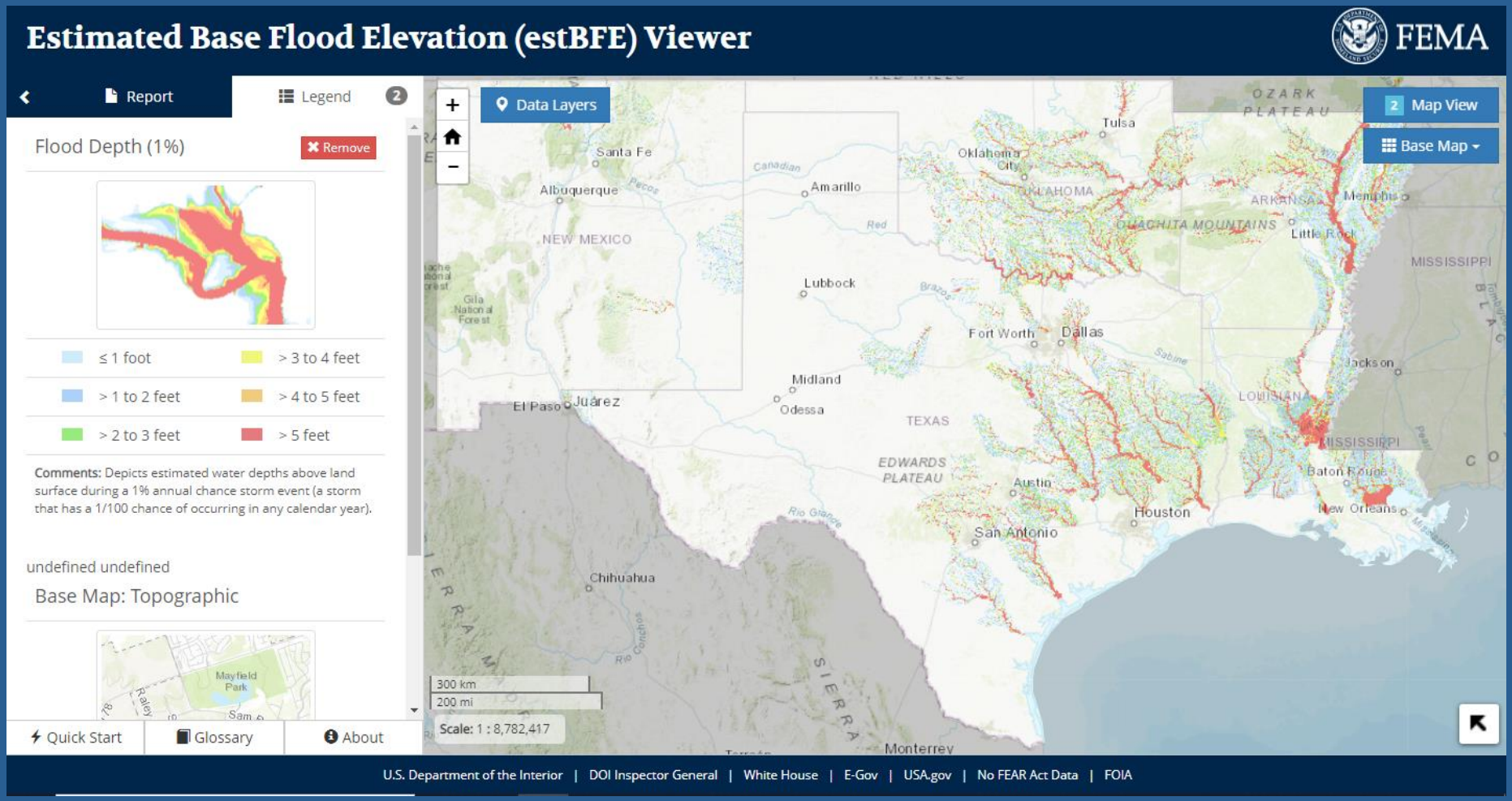
- BLE Results
  - Rain on Mesh Interior Drainage Model
  - Rio Grande Inflow Model (With Levees in place)
- Levee Analysis
  - Natural Valley Model
    - Each Levee Reach Modeled Independently
    - Entire Levee System Modeled

Using the viewer

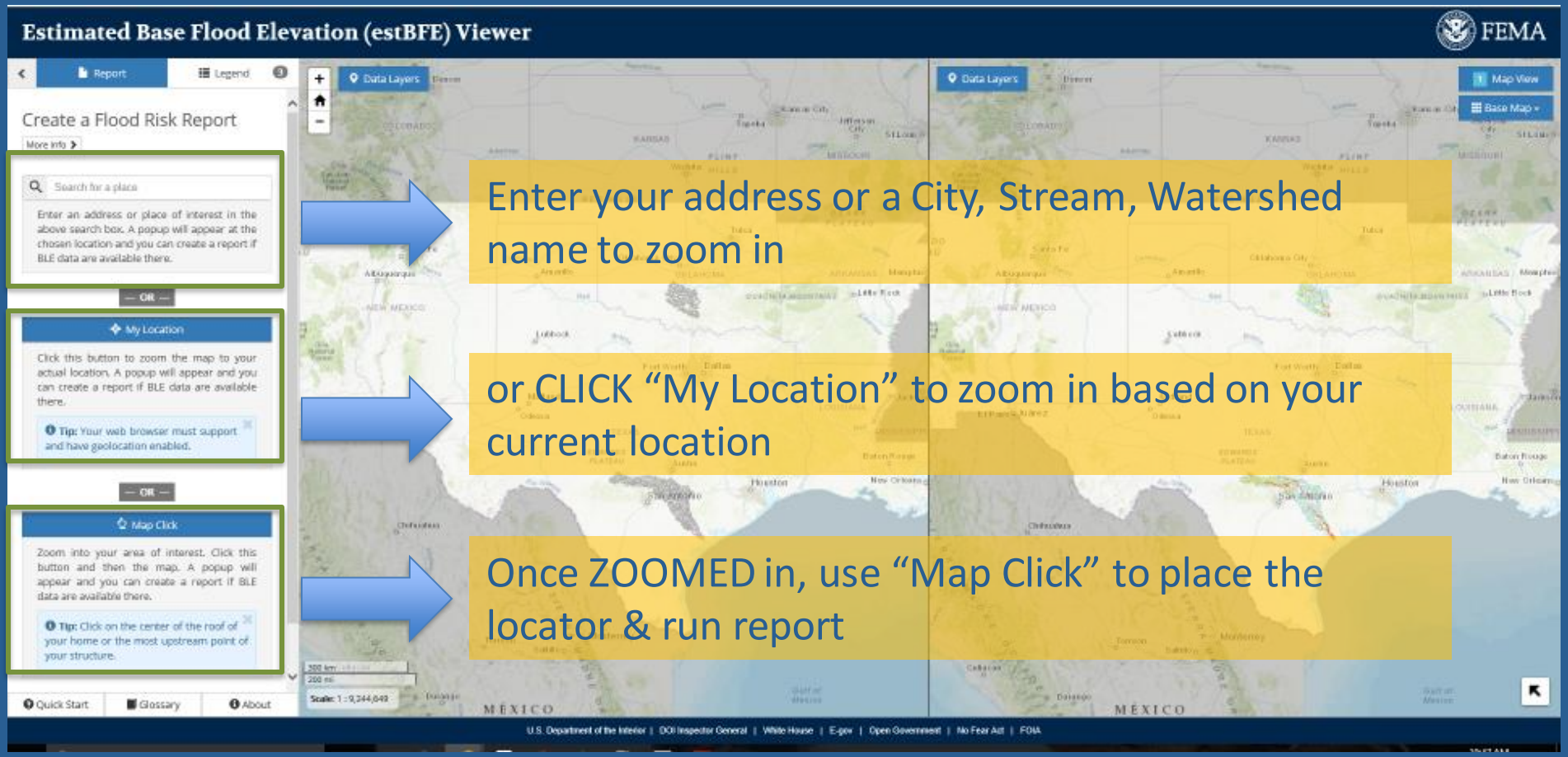
https://webapps.usgs.gov/infrm/estBFE/



Estimated Base Flood Elevation Viewer

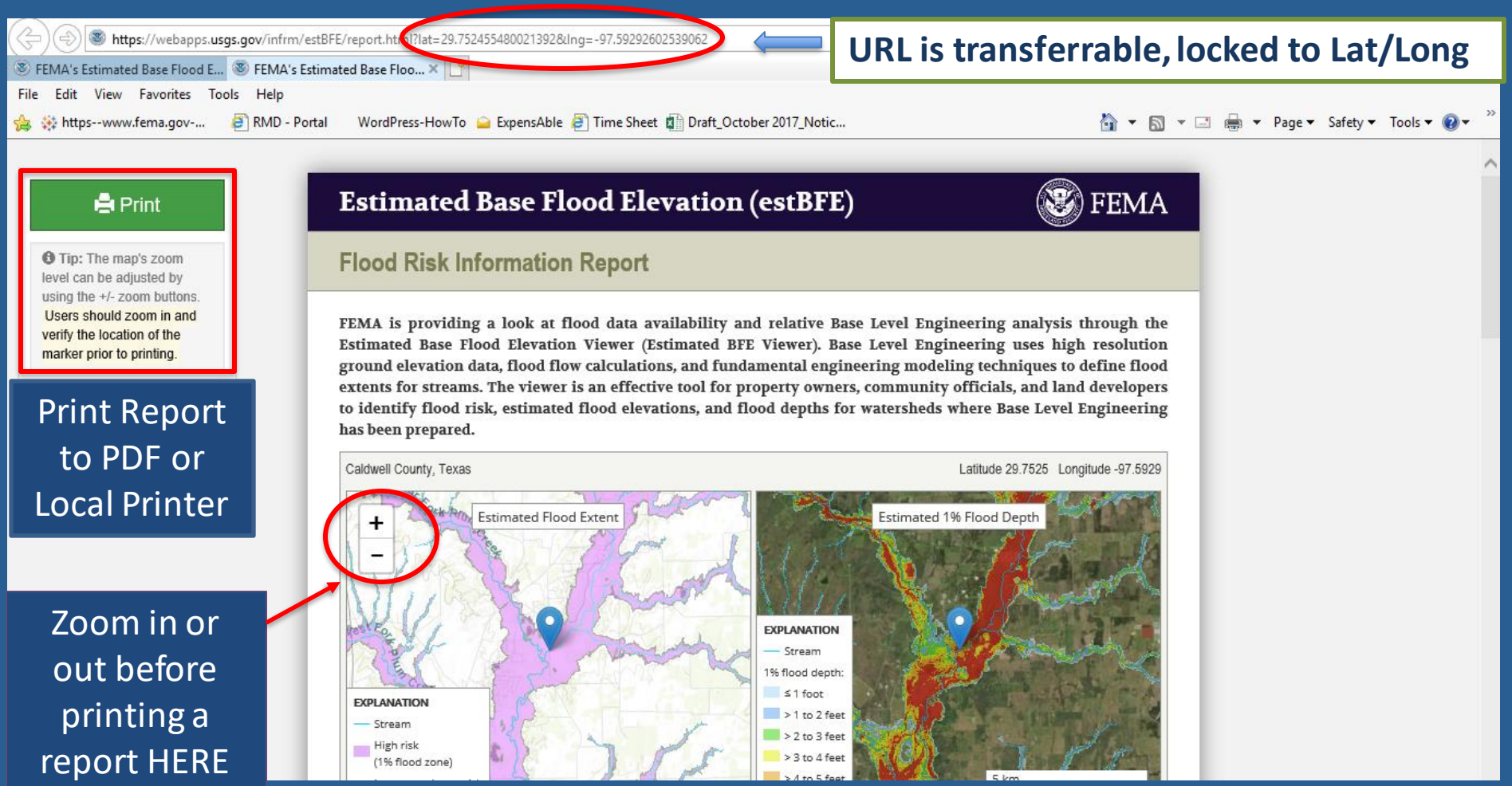


Run a Site Specific Report



Run a Site Specific Report

Run a Site Specific Report



Report Features

5/23/2018 FEMA's Estimated Base Flood Elevation (BFE) Report

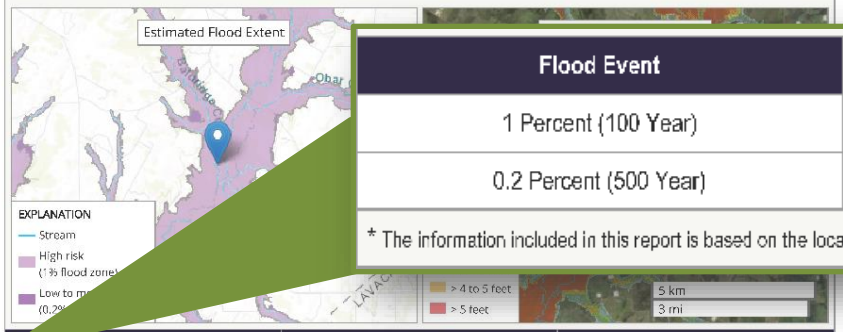
Estimated Base Flood Elevation (estBFE)

FEMA

Flood Risk Information Report

FEMA is providing a look at flood data availability and relative Base Level Engineering analysis through the Estimated Base Flood Elevation Viewer (Estimated BFE Viewer). Base Level Engineering uses high resolution ground elevation data, flood flow calculations, and fundamental engineering modeling techniques to define flood extents for streams. The viewer is an effective tool for property owners, community officials, and land developers to identify flood risk, estimated flood elevations, and flood depths for watersheds where Base Level Engineering has been prepared.

Gonzales County, Texas Latitude 29.6200 Longitude -97.2407



Flood Event	Estimated Flood Depth*	Estimated Base Flood Elevation*
1 Percent (100 Year)	3.7 feet above land surface	288.9 feet NAVD 1988
0.2 Percent (500 Year)	6.4 feet above land surface	291.6 feet NAVD 1988

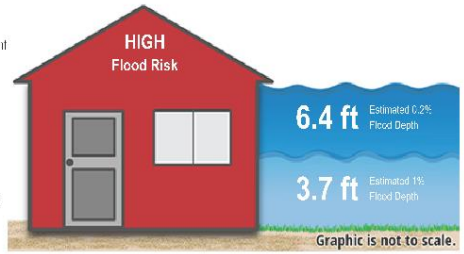
* The information included in this report is based on the location marker shown in the map. Results are not considered an official determination.

Information made available from the Estimated BFE Viewer needs to be accepted by local community officials to be used for insurance rating purposes.

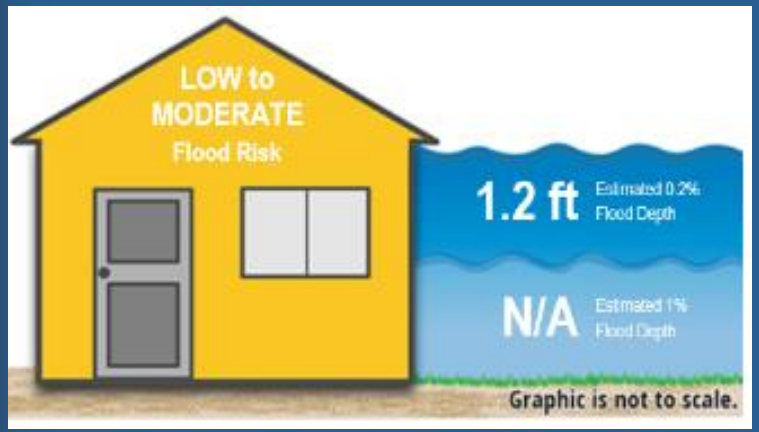
Knowing Your Risk

Base Level Engineering data availability and analysis information is important because it can be used to:

- Inform floodplain management decisions and ordinance administration;
- Identify significant floodplain changes;
- Serve as base modeling for map revisions; and
- Support the Zone A BFE information for a Letter of Map Amendment (LOMA) request.



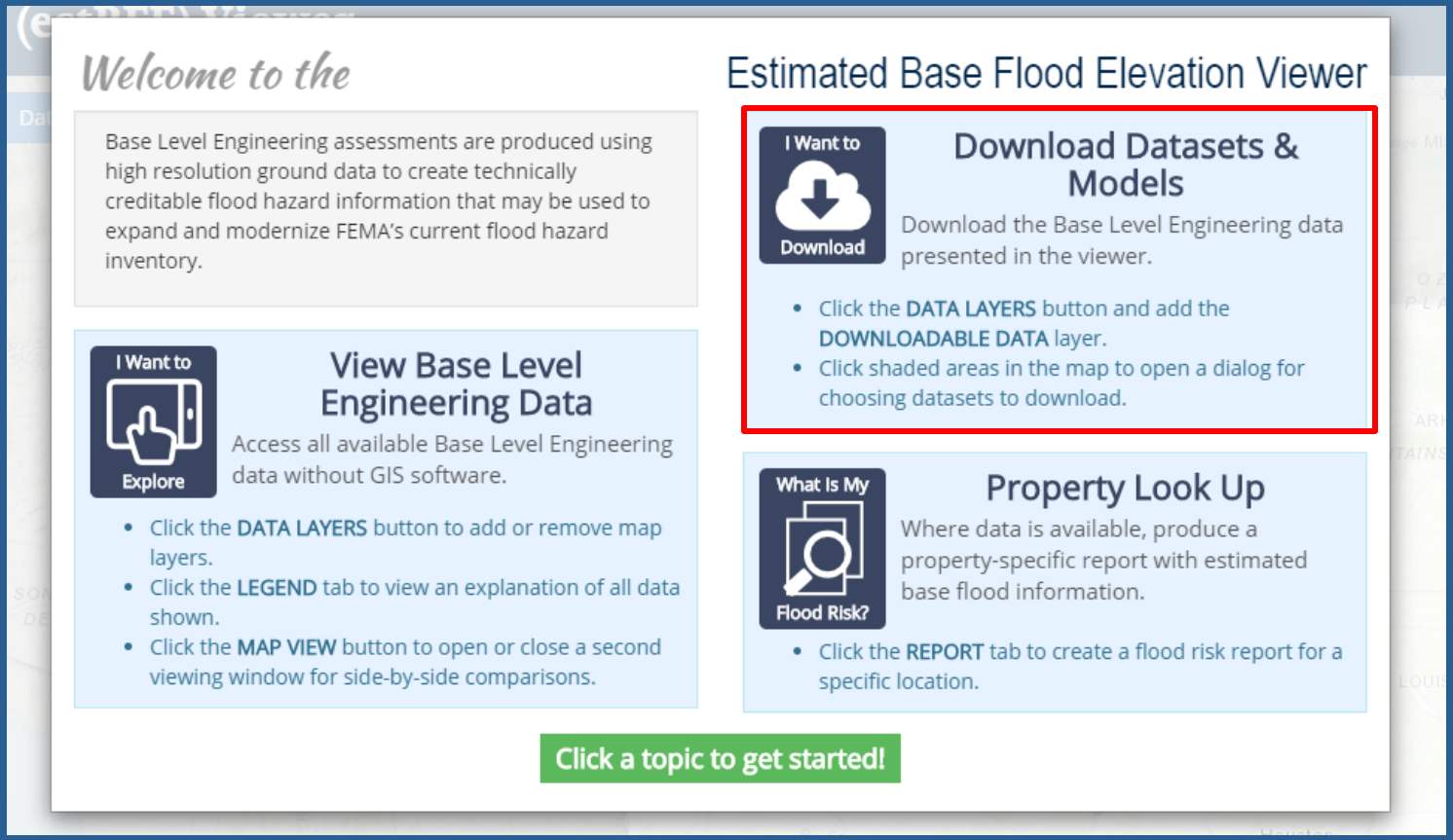
https://webapps.usgs.gov/infrm/estBFE/report.html?lat=29.6200272884574&lng=-97.24067687988283 1/2



BLE Deliverables

Name of Data Set	File Name	Description
HECRAS models	HUC8#_Models.zip	HEC-RAS hydraulic models for all streams studied in Base Level Engineering assessment. Use **HOW2 Find the Right HEC-RAS Model** for tips to find the model you need. Detailed models from FIRMs are not included.
1% event depths, raster	HUC8#_Depth01.zip	**Flood depth elevations** in a gridded format for the **1% storm event.**
0.2% event depths, raster	HUC8#_Depth002.zip	**Flood depth elevations** in a gridded format for the **0.2% storm event.**
1% event elevations, raster	HUC8#_Elev01.zip	**Top of water surface elevations** in a gridded format for the **1% storm event.**
0.2% event elevations, raster	HUC8#_Elev002.zip	**Top of water surface elevations** in a gridded format for the **0.2% storm event.**
Vector spatial data, file geodatabase	HUC8_VectorData.zip	This database is a **collection of spatial data** used and created during Base Level Engineering assessment. **Use HOW2 Find the Spatial Files** for more details.
Reports and Documents	HUC8#_Documents.zip	This download element included the **BLE Report** to detail terrain, hydrology and other modeling details. This file may also include work maps and/or kmz (Google Earth) files if created.

Accessing Deliverables



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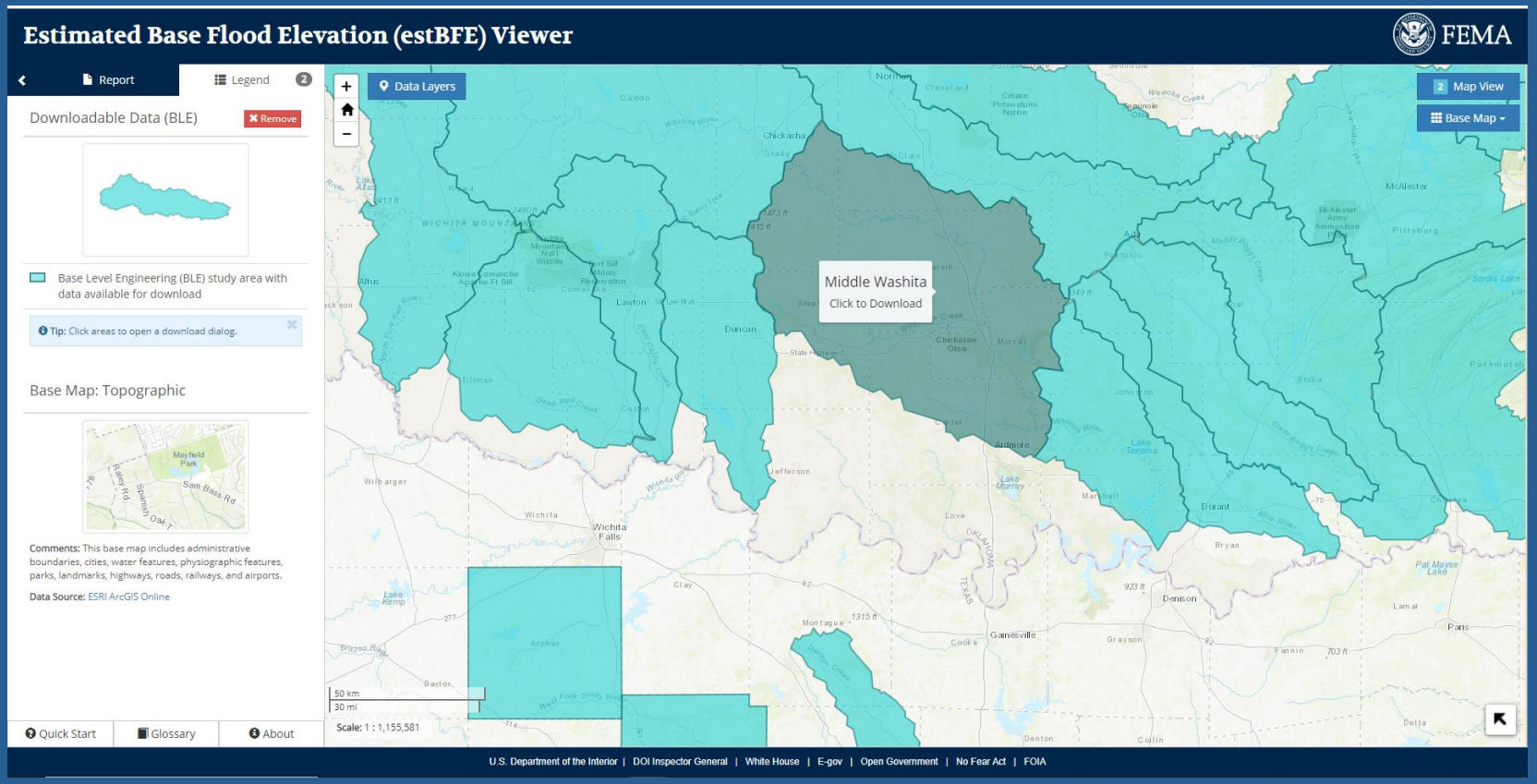

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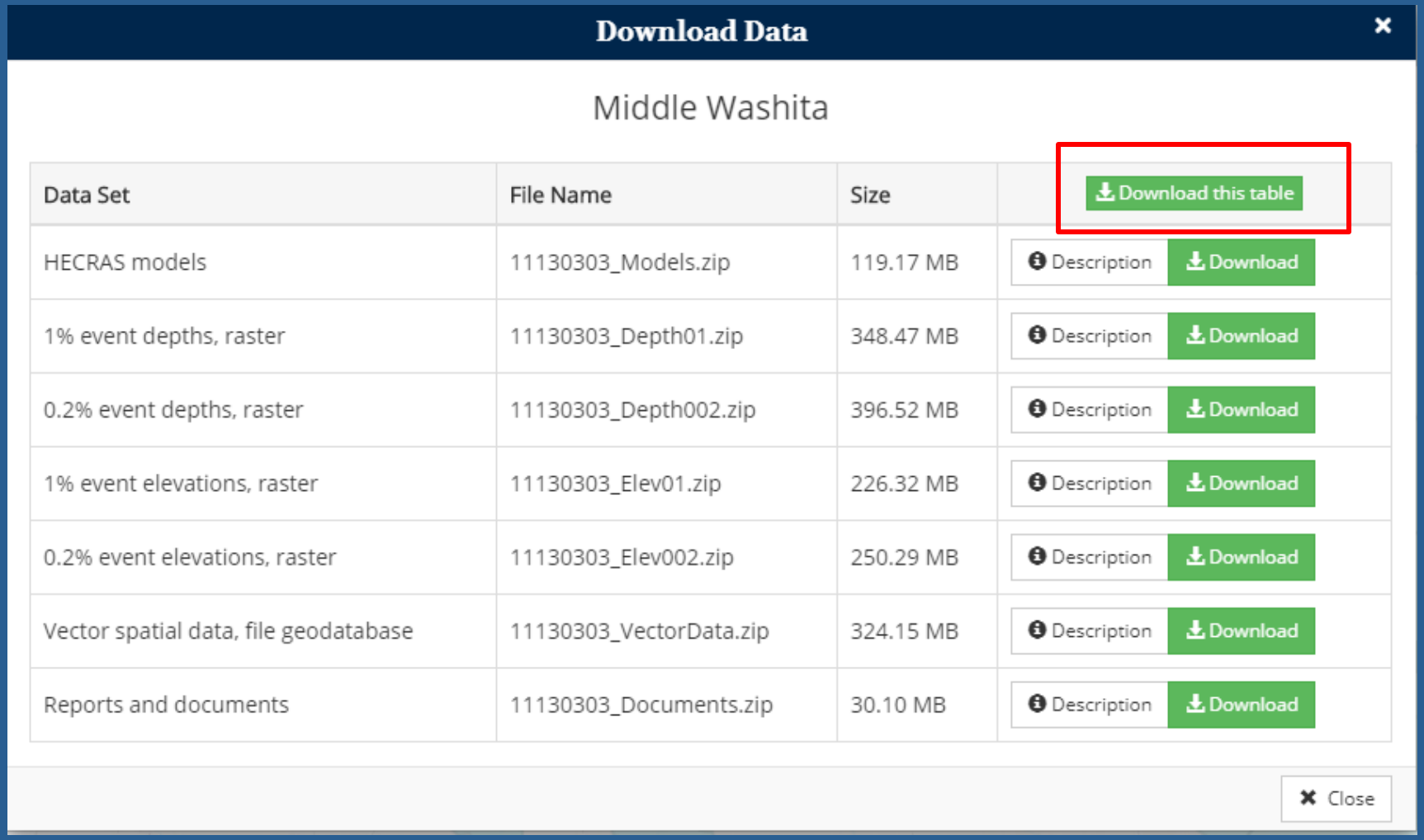


Download Data

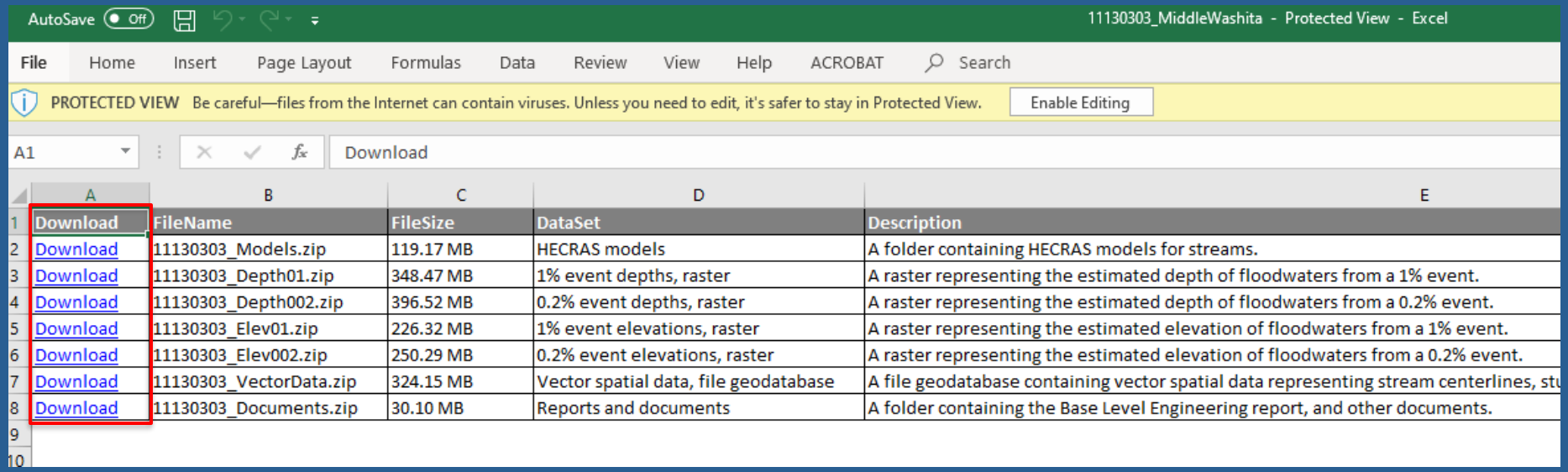
Middle Washita

Download this table

Data Set	File Name	Size	
HECRAS models	11130303_Models.zip	119.17 MB	Description Download
1% event depths, raster	11130303_Depth01.zip	348.47 MB	Description Download
0.2% event depths, raster	11130303_Depth002.zip	396.52 MB	Description Download
1% event elevations, raster	11130303_Elev01.zip	226.32 MB	Description Download
0.2% event elevations, raster	11130303_Elev002.zip	250.29 MB	Description Download
Vector spatial data, file geodatabase	11130303_VectorData.zip	324.15 MB	Description Download
Reports and documents	11130303_Documents.zip	30.10 MB	Description Download

Close

Accessing Deliverables



Download	FileName	FileSize	DataSet	Description
Download	11130303_Models.zip	119.17 MB	HECRAS models	A folder containing HECRAS models for streams.
Download	11130303_Depth01.zip	348.47 MB	1% event depths, raster	A raster representing the estimated depth of floodwaters from a 1% event.
Download	11130303_Depth002.zip	396.52 MB	0.2% event depths, raster	A raster representing the estimated depth of floodwaters from a 0.2% event.
Download	11130303_Elev01.zip	226.32 MB	1% event elevations, raster	A raster representing the estimated elevation of floodwaters from a 1% event.
Download	11130303_Elev002.zip	250.29 MB	0.2% event elevations, raster	A raster representing the estimated elevation of floodwaters from a 0.2% event.
Download	11130303_VectorData.zip	324.15 MB	Vector spatial data, file geodatabase	A file geodatabase containing vector spatial data representing stream centerlines, st
Download	11130303_Documents.zip	30.10 MB	Reports and documents	A folder containing the Base Level Engineering report, and other documents.

Downloads an excel file with hyperlinks for the available datasets for the watershed.

FEMA BLE Guidance and Resources

- https://www.fema.gov/media-collection/base-level-engineering-ble-tools-and-resources
  - BLE Vector Geodatabase Flash Card
  - BLE and Letters of Map Amendment
  - LOMA Documentation and Submittal Process
  - BLE Data Download Reference Flash Card
  - How to Use BLE Data for Local Permitting
  - State Quick Guide
  - Water Surface Elevation Grids
  - Flood Depth Grids
  - BLE, Social Media, and Flood Risk Awareness
  - How to Use the Estimated BFE Viewer
  - How to Find the Right Spatial Data Files
  - Base Level Engineering Overview
  - Using the Estimated BFE Viewer
  - How to Find the Right HEC-RAS Model

Contact Information

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