De-Mystifying the DFIRMs: Analysis & Re-Modeling Process by St Tammany Parish

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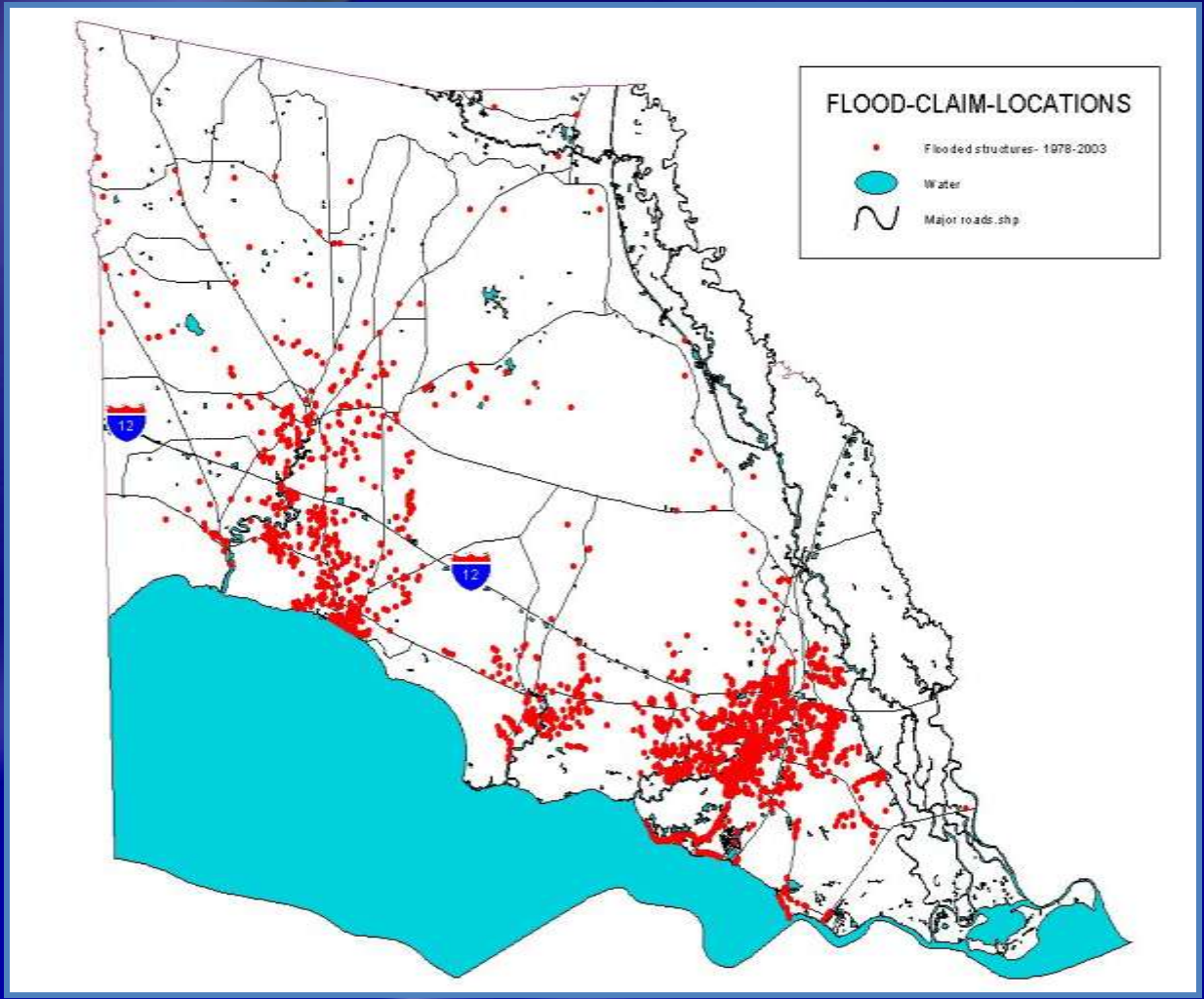
History of Storms in STP (1969-2012)

19 tropical storms and hurricanes from 1969-2012

Date	Year	Event
August	1969	Hurricane Camille
April	1979	Heavy Rainfall
April	1980	Heavy Rainfall
December	1982	Heavy Rainfall
January	1983	Heavy Rainfall
March	1983	Heavy Rainfall
April	1983	Heavy Rainfall
August	1985	Hurricane Danny
November	1985	Hurricane Juan
February	1988	Heavy Rainfall
April	1988	Heavy Rainfall
June	1989	Heavy Rainfall
May	1991	Heavy Rainfall
August	1992	Hurricane Andrew
April	1995	Heavy Rainfall
May	1995	Heavy Rainfall
October	1995	Hurricane Opal
August	1996	Heavy Rainfall
October	1996	Coastal Flooding
January	1998	Heavy Rainfall
March	1998	Heavy Rainfall
September	1998	Tropical Storm Frances
September	1998	Hurricane Georges
June	2001	Heavy Rainfall
June	2001	Tropical Storm Allison
August	2002	Tropical Storm Bertha
September	2002	Tropical Storm Isidore
October	2002	Hurricane Lili
September	2004	Hurricane Ivan
August	2005	Hurricane Katrina
January	2006	Heavy Rainfall
October	2007	Heavy Rainfall
May	2008	Heavy Rainfall
August	2008	Tropical Storm Fay
September	2008	Hurricane Ike
September	2008	Hurricane Gustav
April	2009	Heavy Rainfall
October	2009	Heavy Rainfall
November	2009	Heavy Rainfall
November	2009	Tropical Storm Ida
December	2009	Heavy Rainfall
August	2012	Hurricane Isaac
September	2011	Tropical Storm Lee

>20,000 Reported Flood Claims Since 1971 (>$1.5 Billion)



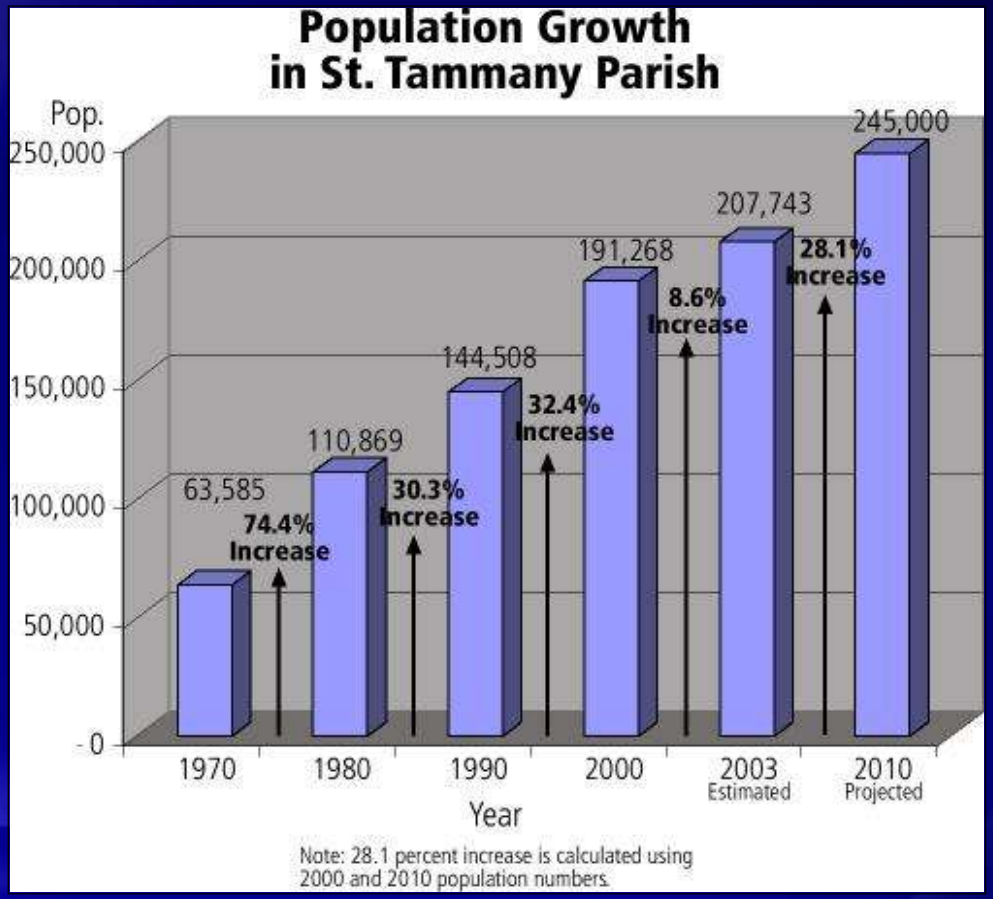
"St. Tammany has had more disaster declarations than any other parish in the state"

(STP Natural Hazards Plan , 2009)

Increased Vulnerability to Flooding

St. Tammany Parish is the fastest growing parish in Louisiana (approximately 10% annually since 1960 and 20% annually since 2000)

- Increased Population
- Densely populated in flood prone areas
- Combined risk of riverine and coastal flooding
- Increasing numbers of Coastal & Riverine structures



FEMA National Flood Insurance Program (NFIP)

NFIP has 2 primary goals:

- To provide an insurance mechanism for those at risk from flooding
- To reduce flood losses through sound floodplain management practices

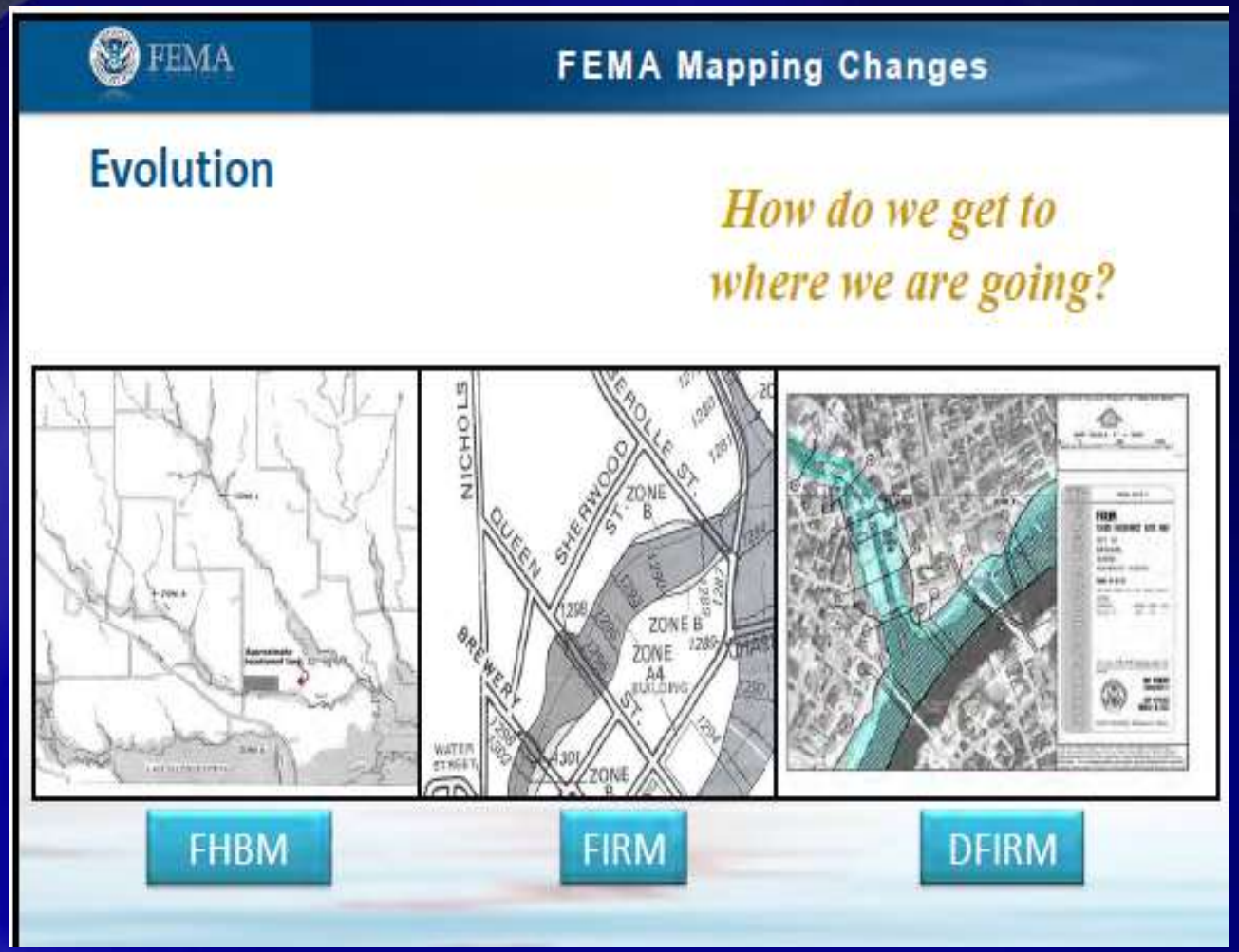
To achieve these goals, FEMA produces and maintains Flood Maps

Evolution of Flood Maps

FHBM Flood Hazard Boundary Map

FIRM Flood Insurance Rate Map

DFIRMs Digital Flood Insurance Rate map

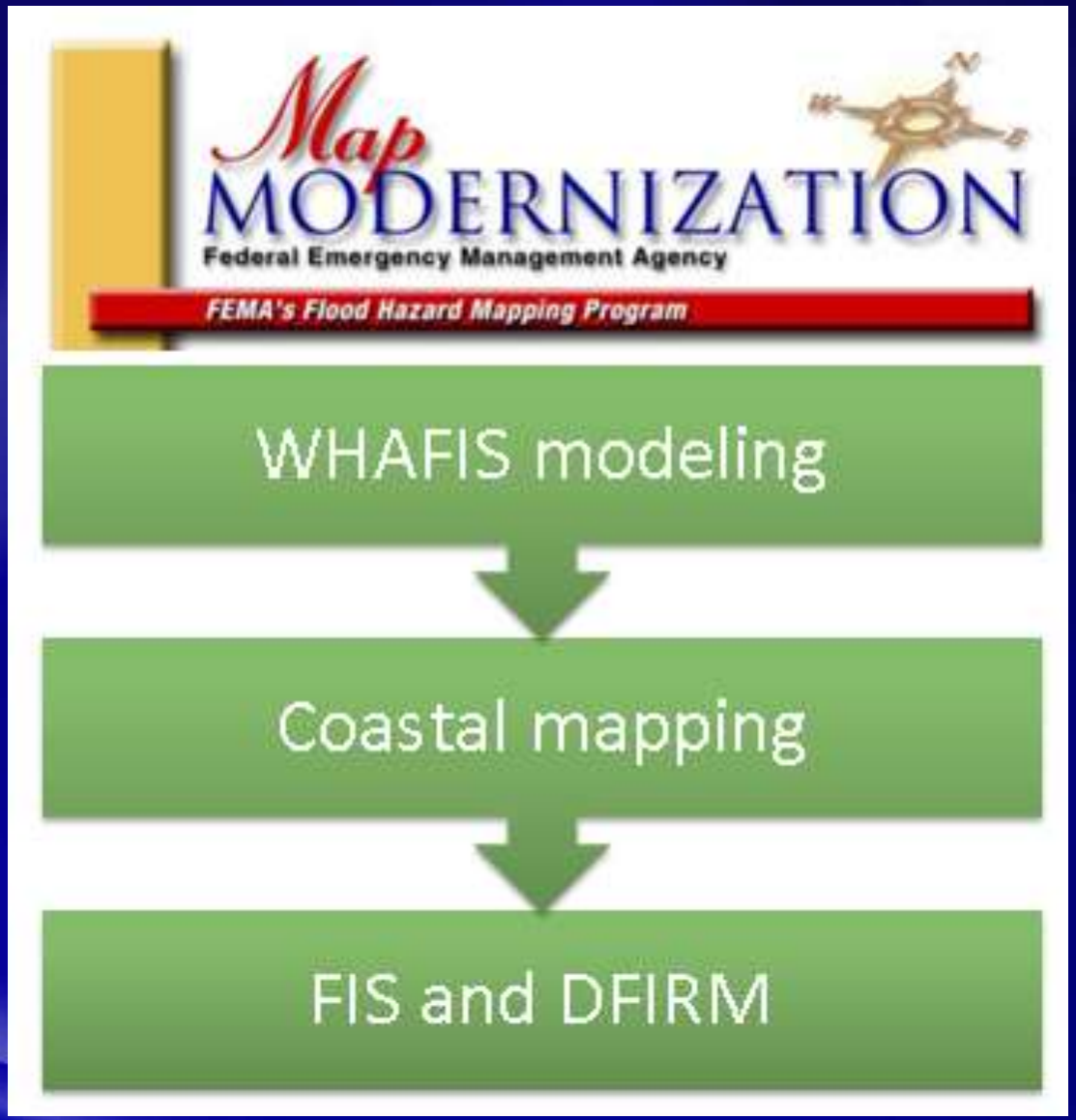


DFIRMs: Latest Generation of Flood Maps

DFIRMs consist of :

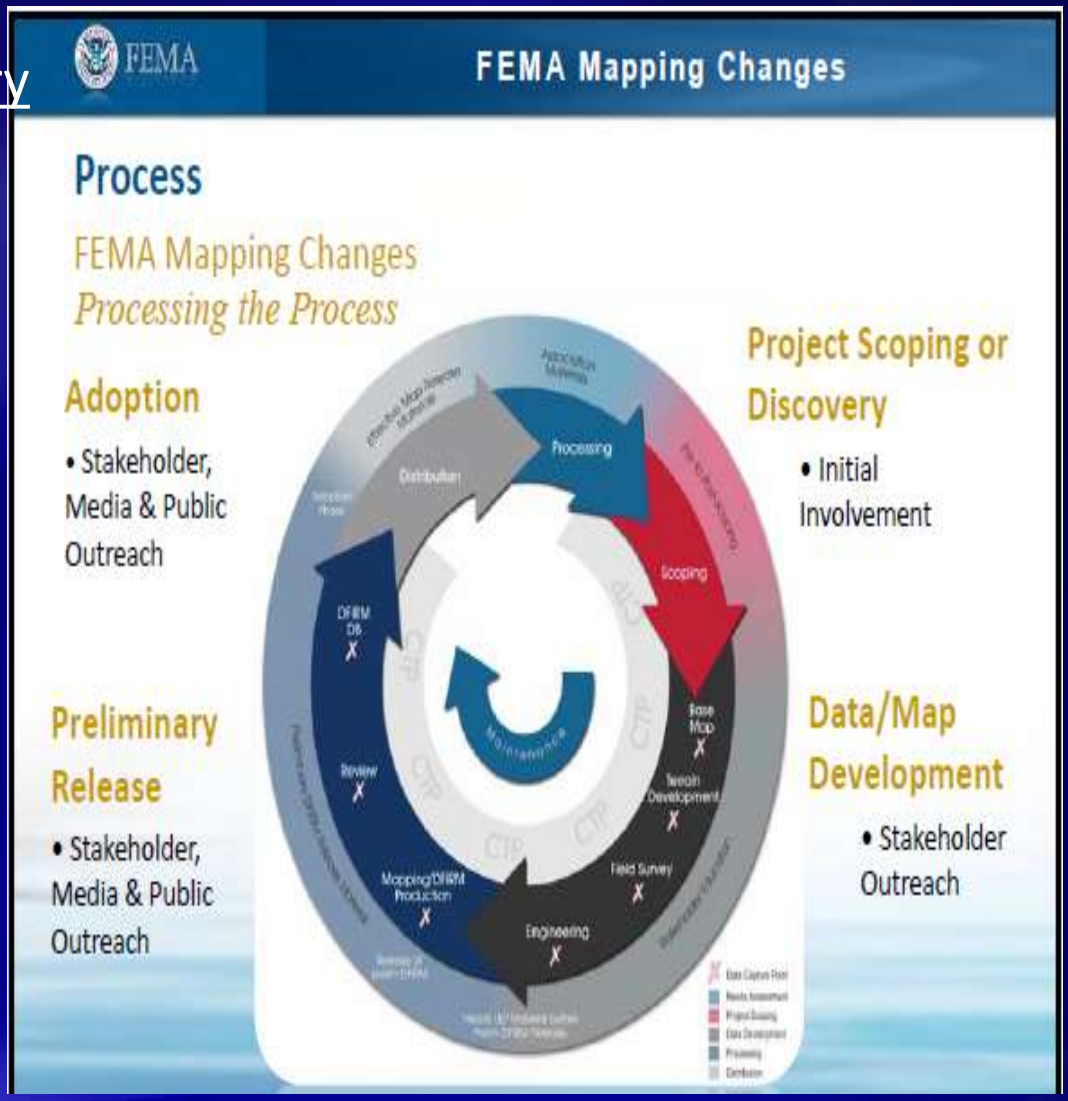
- *riverine & coastal modeling with*
- *aerial overlays*

to make the Special Flood Hazard Areas (SFHA) more easily identified by users



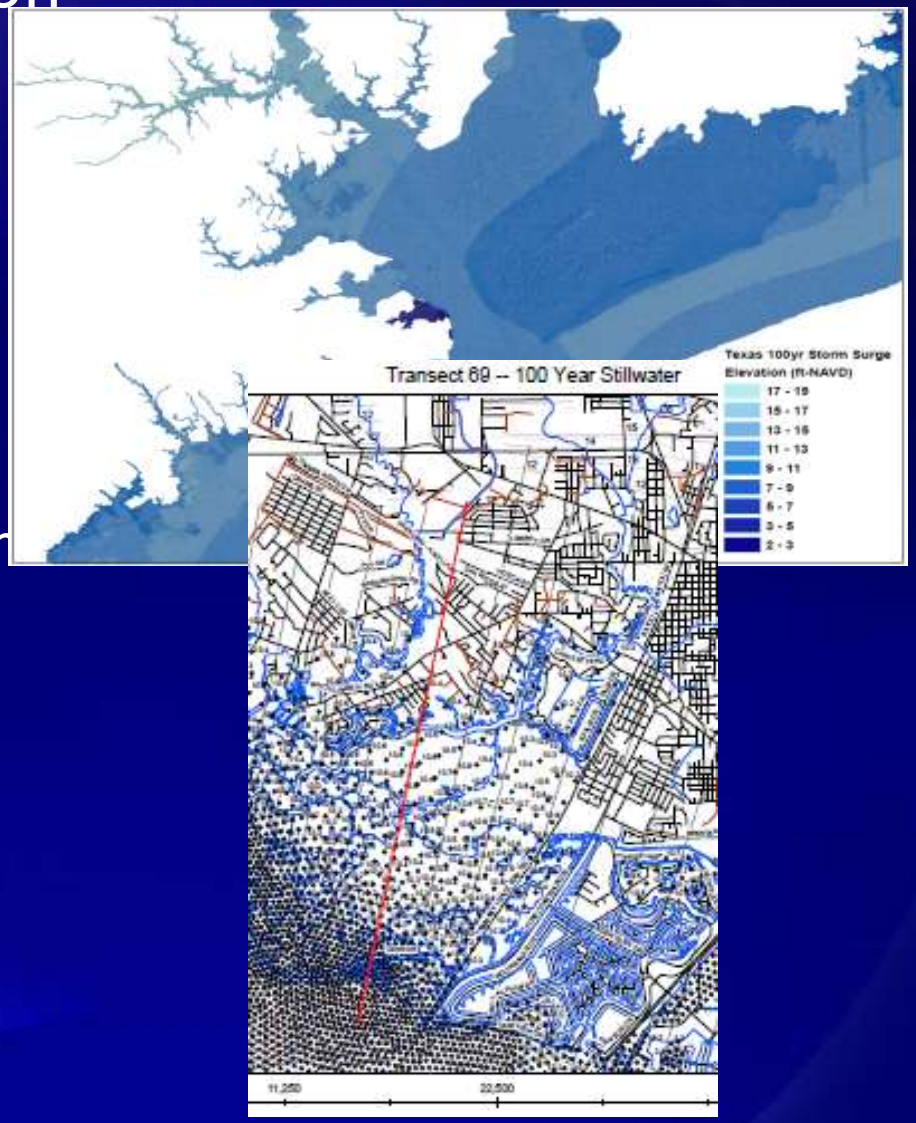
FEMA MAP Change Process is Lengthy

- Project Scoping & Discovery
- Data/Map Development
  - *takes > >1 year*
- Preliminary Release
  - Outreach
  - ***90-day Appeal period***
  - FEMA considers & modifies
- Adoption
  - Letter of Final Determination
  - Community must adopt w/in 6 months



Coastal Modeling Software

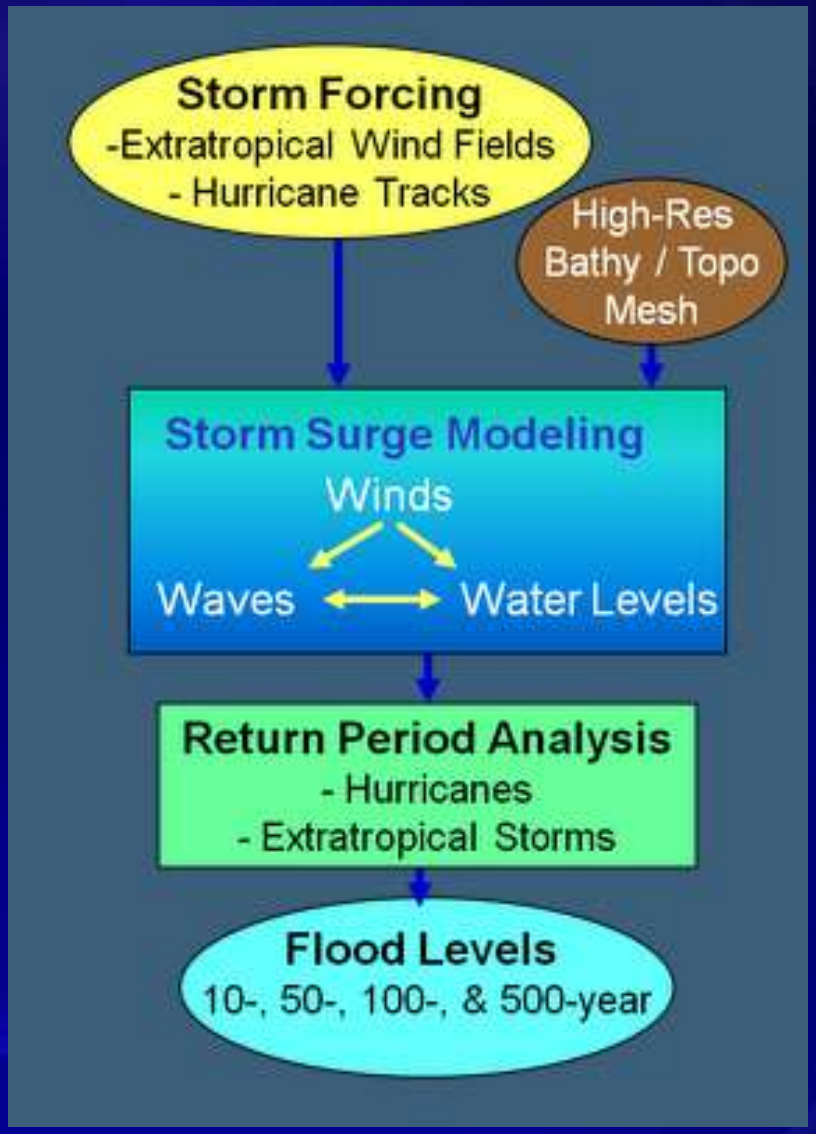
- ADCIRC: ADvanced CIRCulation
  - Coastal Surge Model
  - Determines Stillwater Elevation (SWEL)
- WHAFIS
  - Wave height model
  - Computes wave crest elevation based on SWELs from ADCIRC
  - Determines the Flood Hazard Zone & Floodplain MAP Elevations based on WAVE Heights



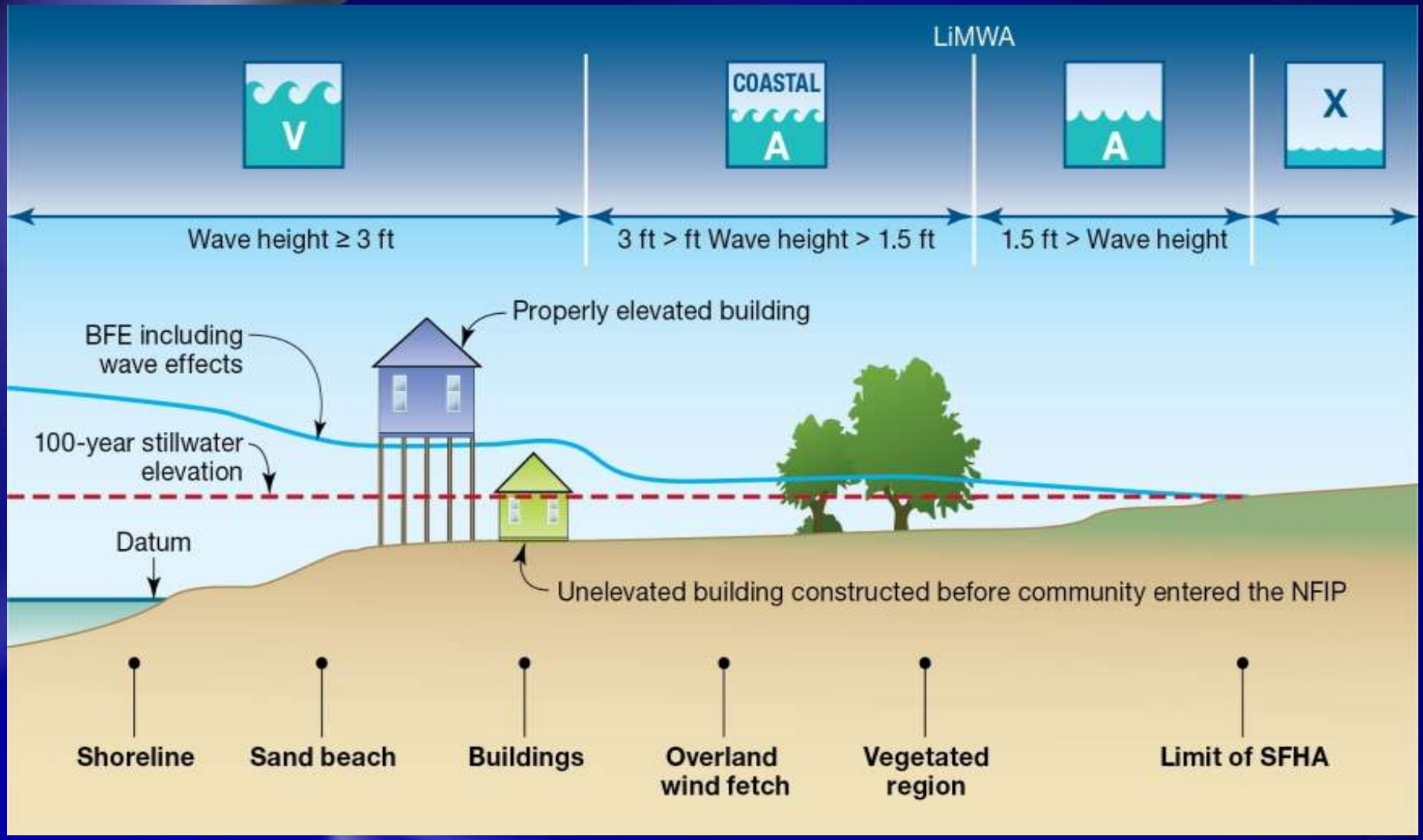
FEMA Storm Surge Study Based Upon USACE Grids & Studies

AdCirc Storm Surge Modeling is a complex, dynamic process requiring significant data inputs that are not usually available to small entities

ADCirc Surface Water ELevations (SWEL) are not usually challenged due to intensity of data & complexity of modeling



Coastal Flood Hazards Overview



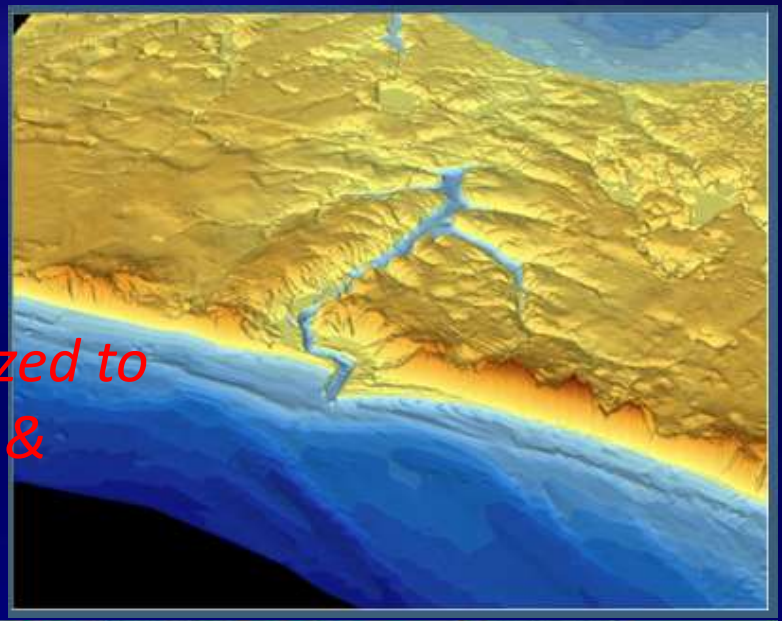
FEMA Coastal Transects for WHAFIS Wave Models

FEMA Transect Layout

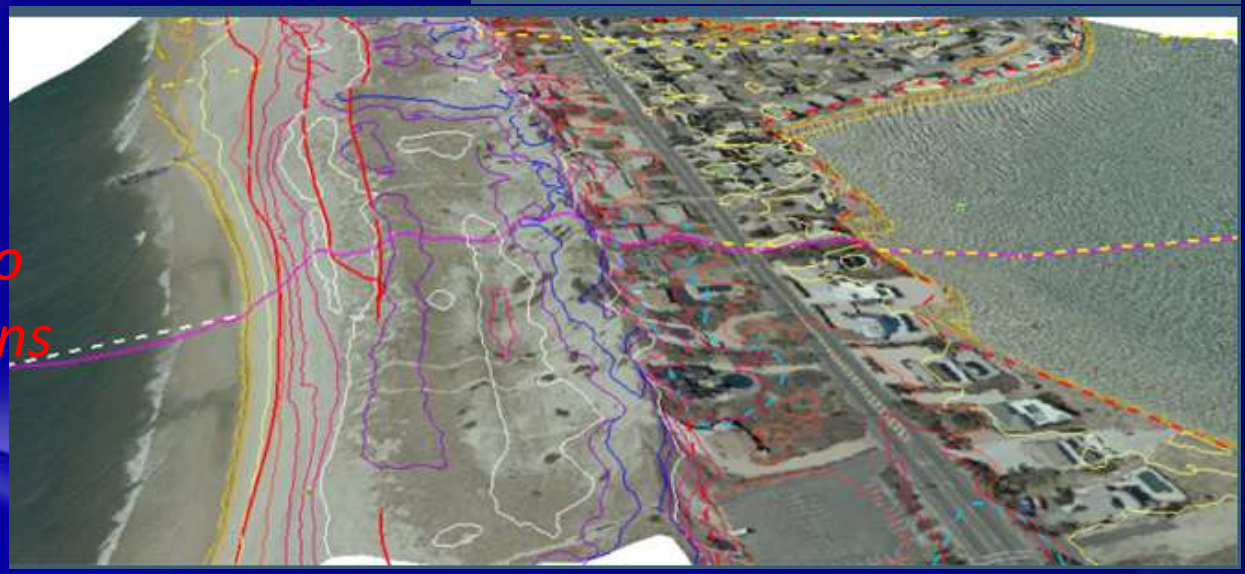
Transect Layout

- Topography (Aerial, LIDAR & survey)
- Bathymetry
- Vegetation

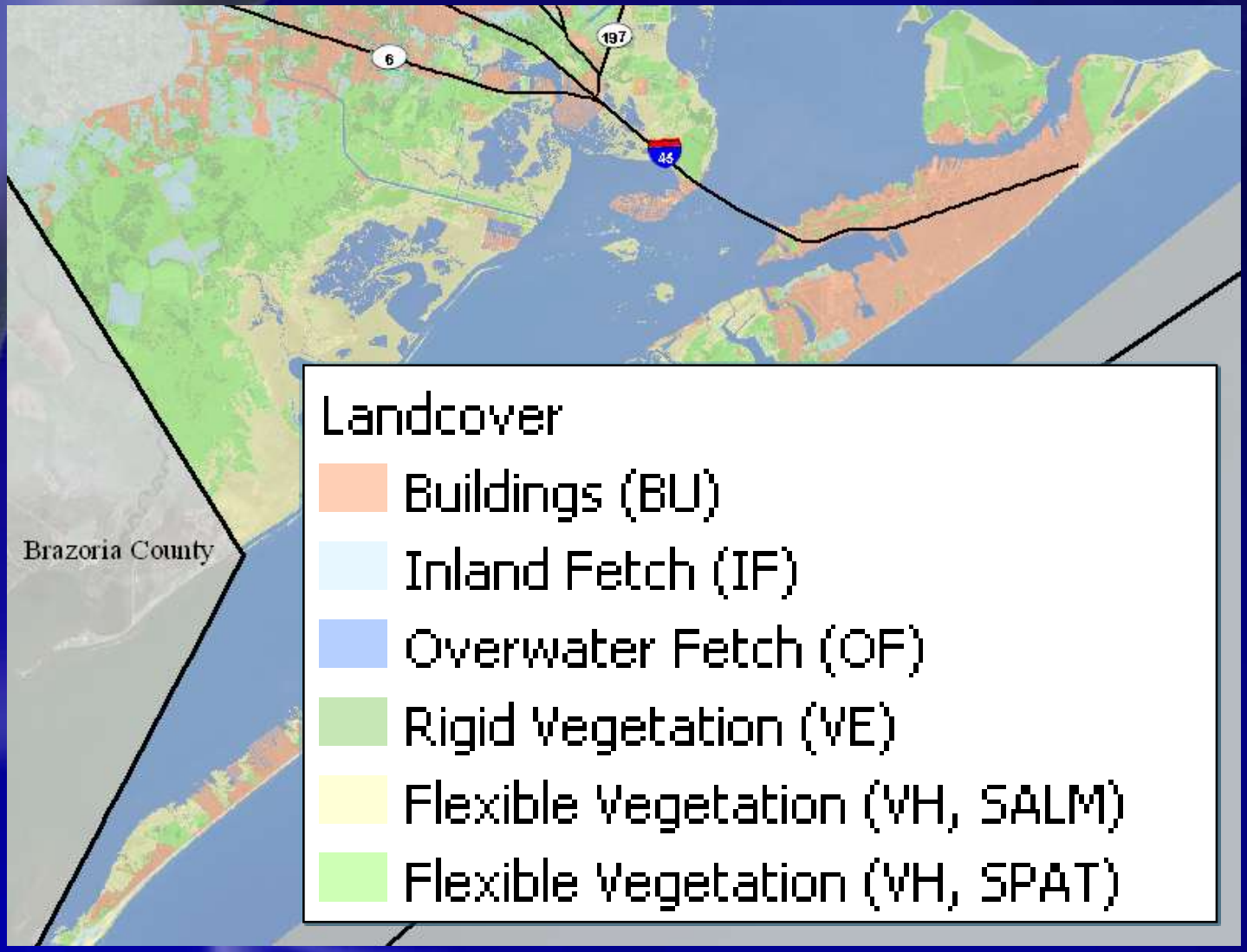
Aerials are utilized to locate features & structures



LIDAR is utilized to estimate elevations



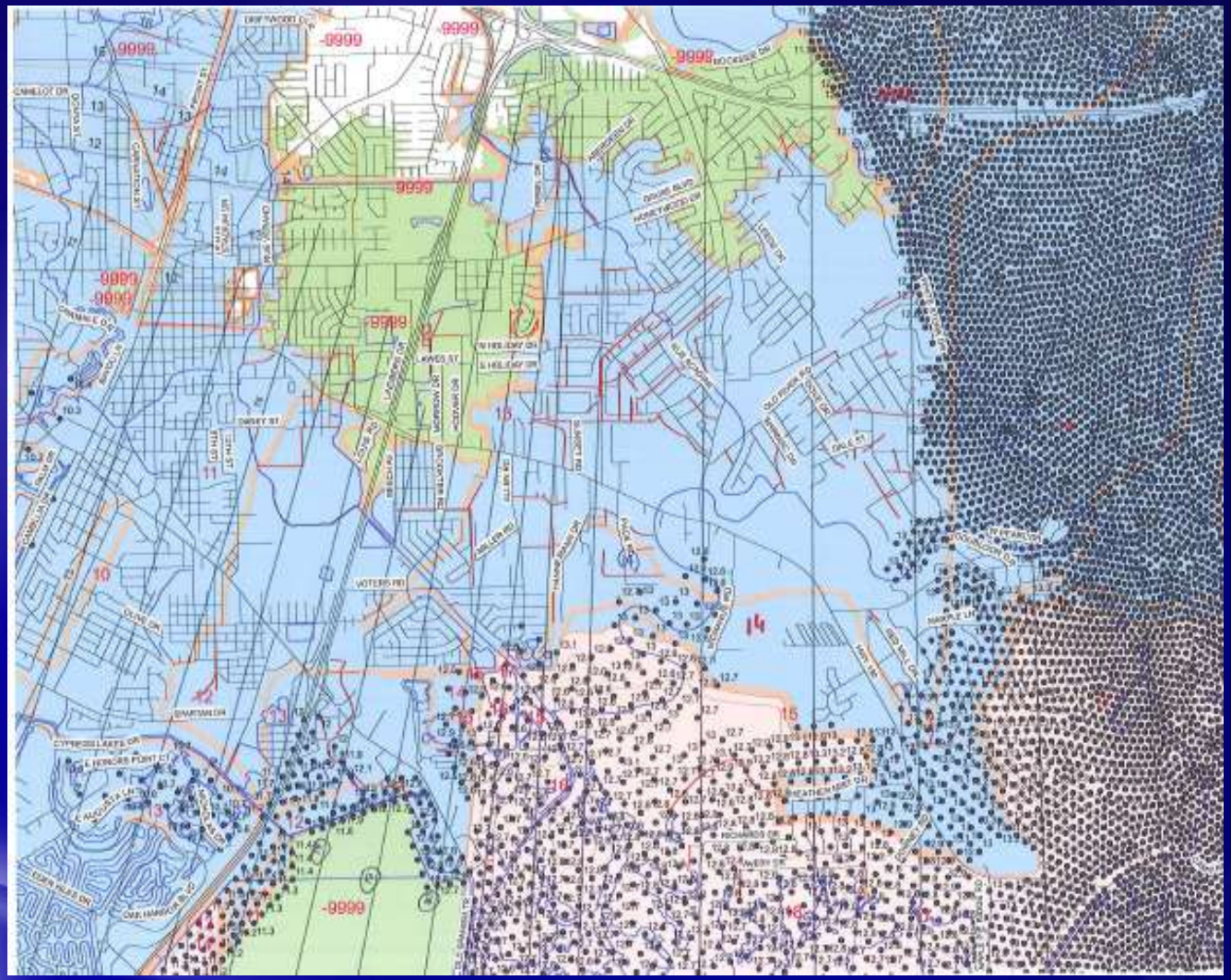
WHAFIS Land Cover Parameters



DFIRM Transects with Flood Zones

Integrating the MAP features

- Stillwater (black dots)
- Transects (lines from Lake inland)
- Flood Zones (**VE**, **AE**, **X**)



FEMA Preliminary Digital Flood Insurance Rate Maps (DFIRMS) for St Tammany Parish

DFIRMS vs Effective FIRMs: More Structures in SFHA

- 37% DFIRMs
- 31% Effective FIRMS

STP Structures in SFHA (DFIRMS vs FIRMs)

Additional 4325 Structures in SFHA with DFIRMS (5% increase)

	Addresses FZV & FZA	%	Net Increase in Affected Structures FZV & FZA (FIRM-->DFIRM)	%
FEMA 100 YR (Effective FIRMS)	27,642	31		
FEMA 100 YR Prelim (DFIRMS)	31,967	36	4325	5
Addresses in STP	88,793			

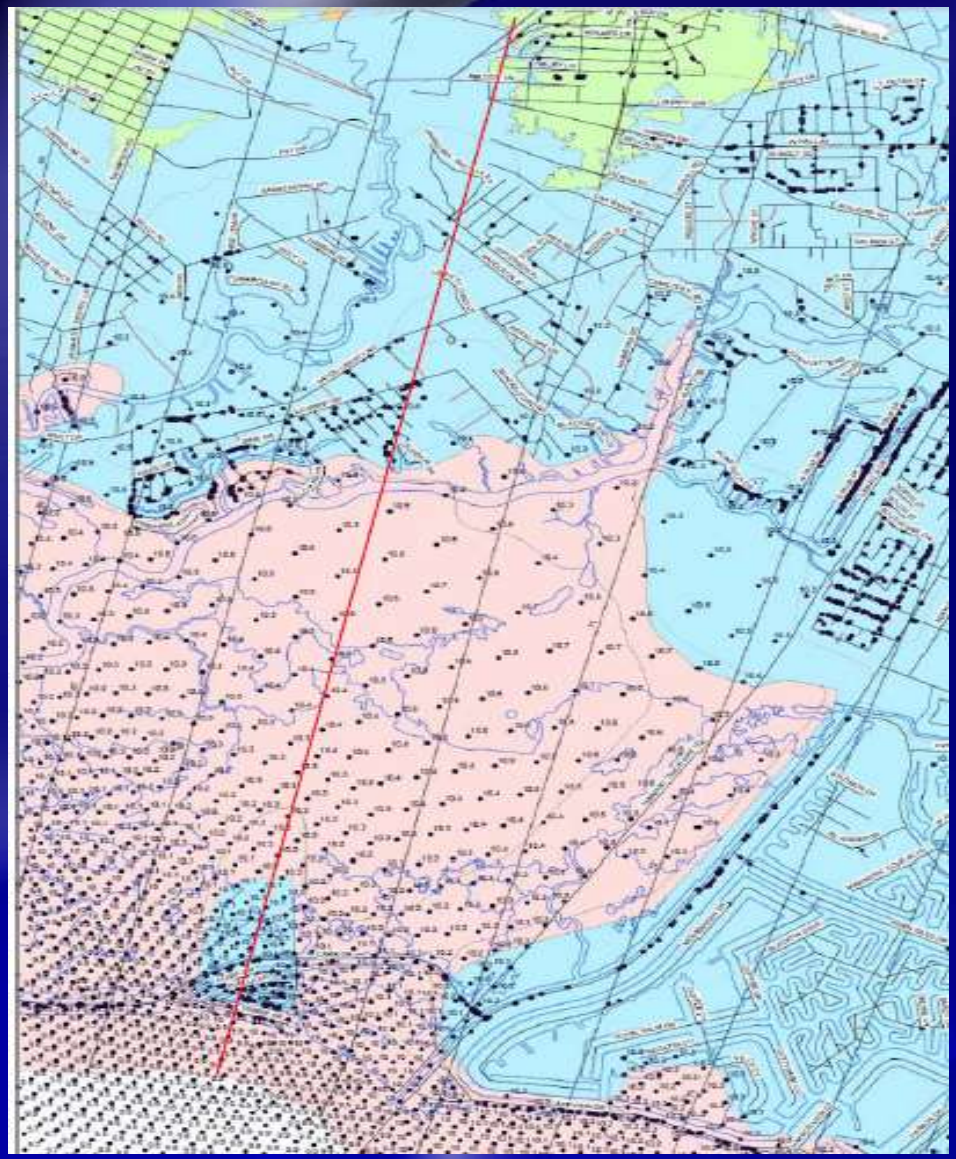
Drivers for Appealing FEMA Digital Flood Insurance Rate Maps

- The 2008 Preliminary DFIRMS result in a significant conversion of A Zones to V zones *(4325 new structures now within the SFHA… net gain of 5% for a total of 36% of STP)*
- Building within V Zones results in increased construction Costs with many restrictions – Retrofitting may Not be possible
- Federal Assistance may be unavailable in V Zones
- With Removal of federal subsidies under BW12, accurate FZ designations and BFE becomes critical to residents

Justification For DFIRM Re-Evaluation by St Tammany Parish

- WHAFIS errors are present due to mis-representation of topographic features (such as vegetation) along transects
- LIDAR may mis-represent ground elevations in areas with dense canopy
- Predicted High Water Marks (HWM) compared to measured HWM are frequently low (as much as - *4.5 feet in STP)*
- Preliminary ADCirc Grid revealed major ridges, levees, manmade features, and other topographic data were omitted from the model as well as mis-represented vegetation

St Tammany Analysis
(Transect #69 Carr Drive, Slidell)



Transect Stations extend much further inland that Stillwater data supports

This means that FEMA assumed there would be more inland flooding events than the Corps has data for

WHAFIS Transect Numbering & Stations

WHAFIS Discrepancies:

- Map Transect Numbering and WHAFIS Output file Numbers
- Station lengths

Transect Number		WHAFIS End Station	
Preliminary DFIRM Map	WHAFIS Output File	Preliminary DFIRM Map	St Tammany Analysis
70	69	26135	24727

Fetch Fetch

Consequences:

- Inconsistent numbering lead to confusion about assessments
- Shorter station lengths means fewer structures within the coastal SFHA

St Tammany Analysis (Transect #69)

LIDAR was utilized by FEMA in DFIRMS to estimate elevations

- *Survey of area shows significantly higher elevations on roads than LIDAR*

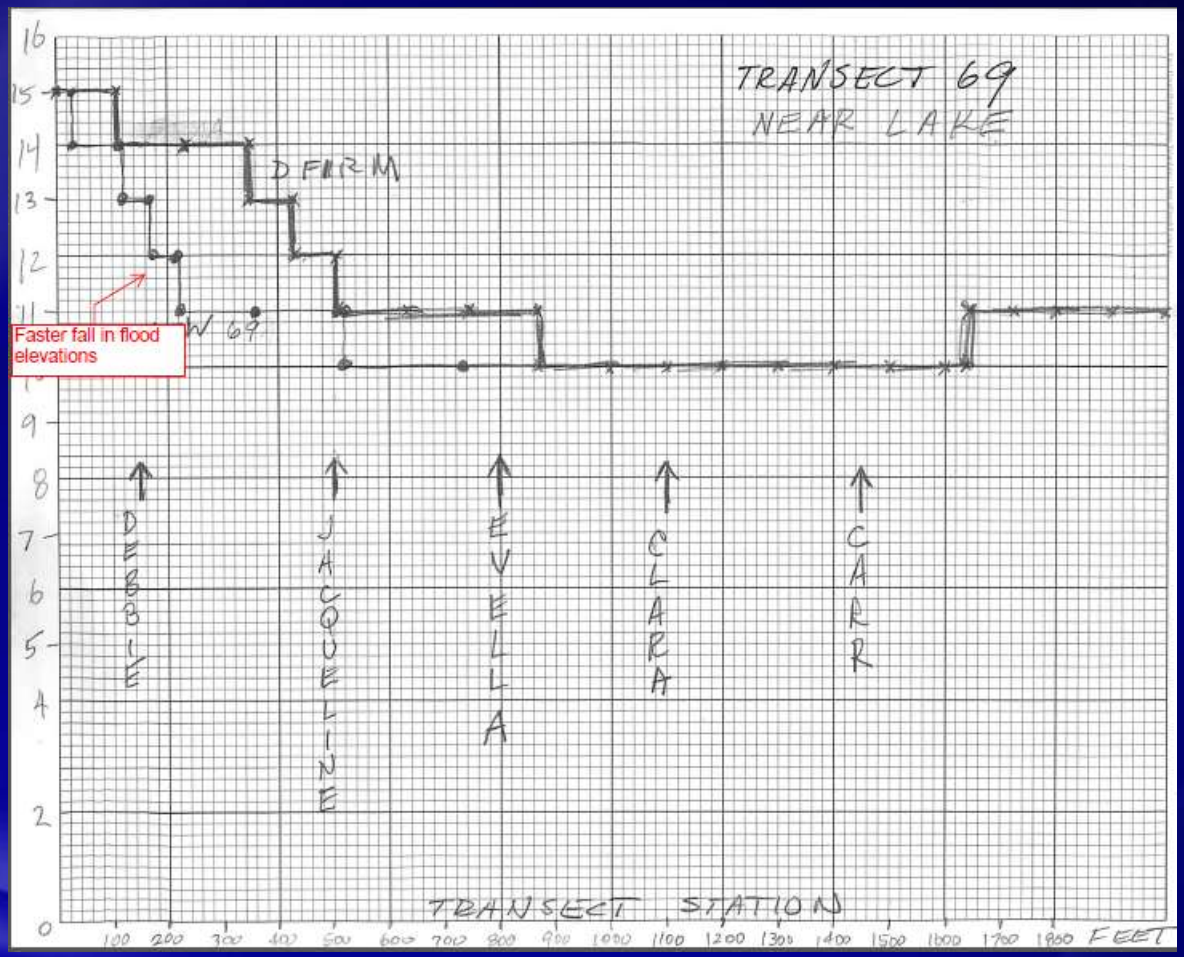
Higher elevations result in lower BFE and fewer structures within the FZ

St Tammany Analysis vs Preliminary DFIRM Elevations (Transect #69)

More accurate model results from survey rather than LIDAR

Utilizing Survey Elevations along T#69, WHAFIS output results:

- Flood elevations fall faster near the coast than DFIRM
- Results in Lower BFEs
- Many structures will be pulled out of the V Zone (where insurance will be expensive)



St Tammany Analysis vs Preliminary DFIRM Transect #69 Extent

Re-Analysis shortens transect → fewer structures

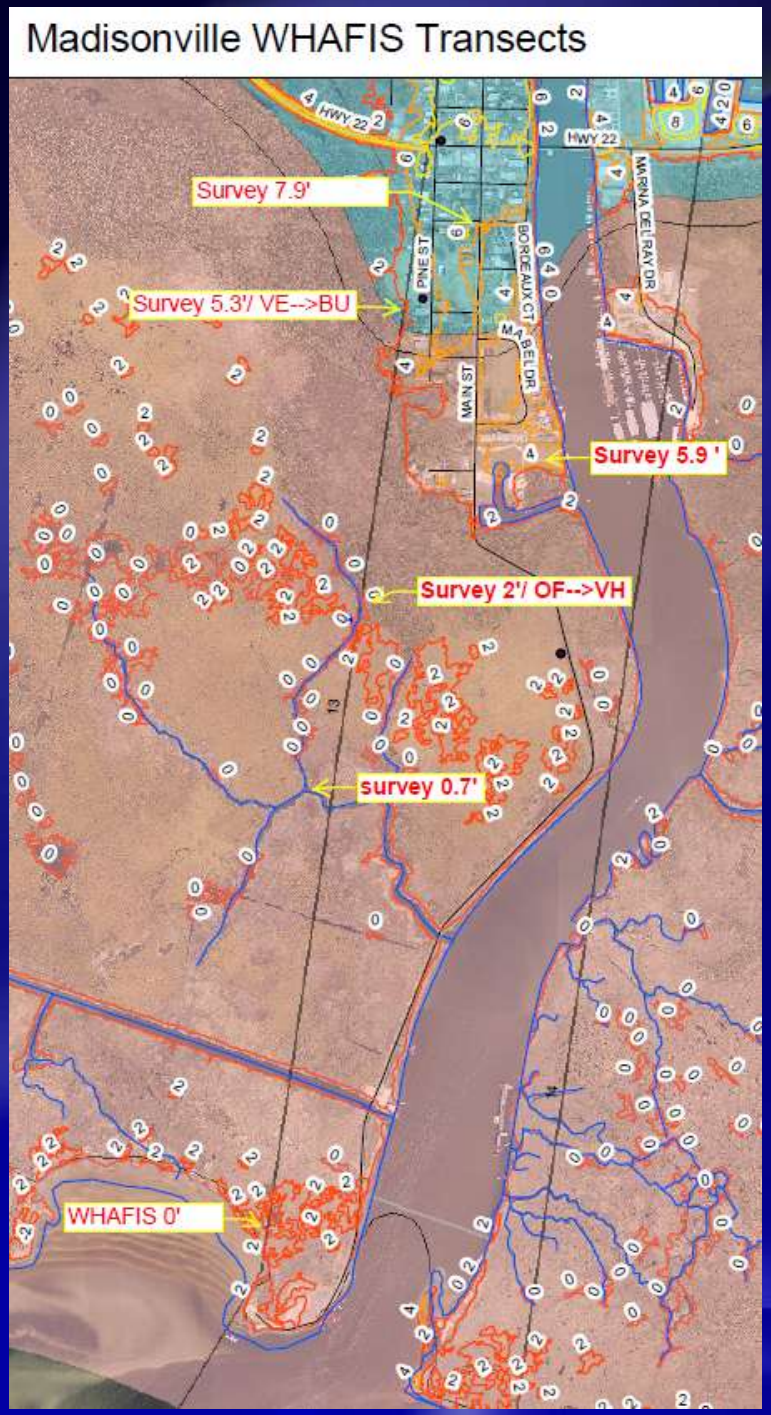
<u>EXAMPLE:</u>

- Far northern extent of T#69
- Re-Analysis length of Transect #69 26,135 → 24,727
- **> 100 homes transition AE→ X**

WHAFIS Input Discrepancies: Transect #13 Madisonville

- ADCirc WSELs increase inland where surge should be attenuated
- LIDAR shows higher ground elevations than WHAFIS input

>40 homes transition V→A
BFE lowered



WHAFIS Input Discrepancies: Transect #13 Madisonville

- Survey data shows land elevations >>WHAFIS OR LIDAR
- Marsh Grass vegetation (OF card) used in area of dense Cypress trees (VE card)
- OF card used in main street of town where buildings would attenuate surge (BU card)
- Transects #13 & #14 drawn directly over a waterbody… skewing results

WHAFIS Re-Modeling:

Transect #13 Madisonville

- *> 40 homes V → A*
- *BFE lowered 1' minimum for the entire transect*

DFIRM Path Forward

- FEMA will complete review of St Tammany Analysis (Test Case Transect #69)
- St Tammany will submit coastal analysis for Transects #12-15 (Madisonville) & #67 – 87 (Slidell & Pearl River)
- FEMA will complete Mapping with improved *ground truthing* & WHAFIS modeling

Questions?