

City of Mandeville, LA

SHORELINE PROTECTION & RESTORATION PROGRAM



June 8, 2017

Pre-Budget Background Presentation

Prepared by:





Overview

Background Context: *RSLR, Rigolets Closure*
City Program & Project Concepts





1. Tchefuncte Marsh Shoreline

Tchefuncte Marsh Introduction

Shoreline Analysis

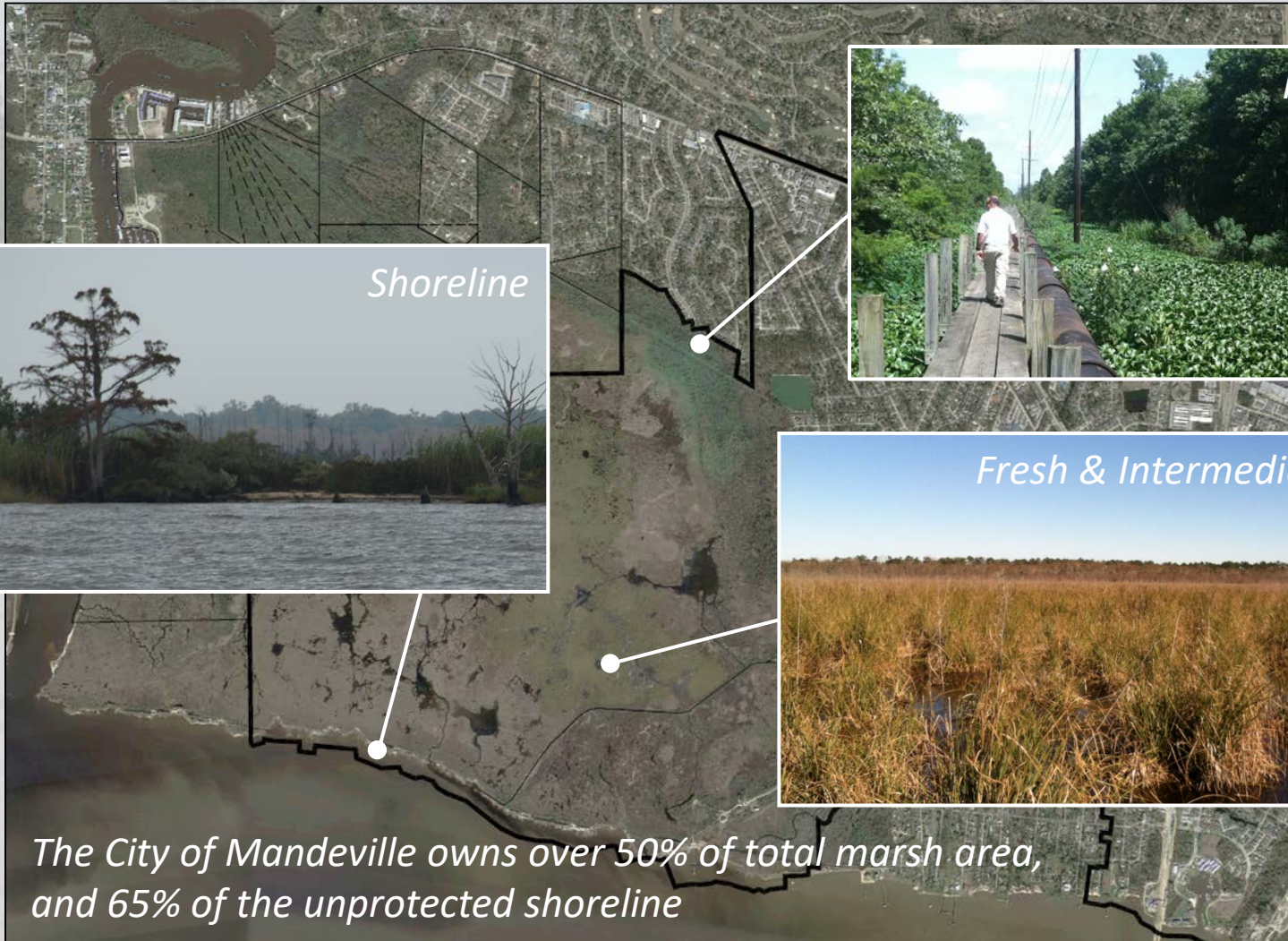
Project Summary



Land Loss, 1952 – Present



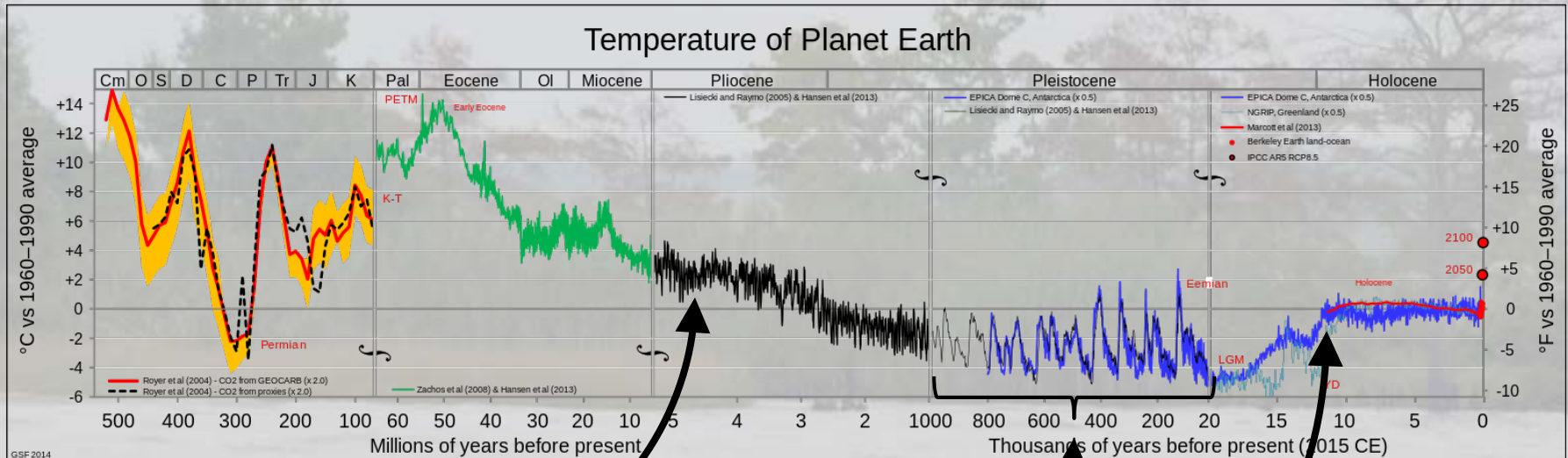
Marsh Introduction



The City of Mandeville owns over 50% of total marsh area, and 65% of the unprotected shoreline



Climate History



*Mandeville is sea floor
under 200 feet of water*

*Repeated warm/ice age cycles deposit,
expose, and consolidate sea floor into
Mandeville ground we now know*

*Latest ice age thaw; Miss. River
mouth flooded to Baton Rouge,
begins building modern Louisiana
coast south of Mandeville*



Climate History



Pliocene and Intermittent Warm
Pleistocene Shoreline

Minimal Ice, High Sea Level



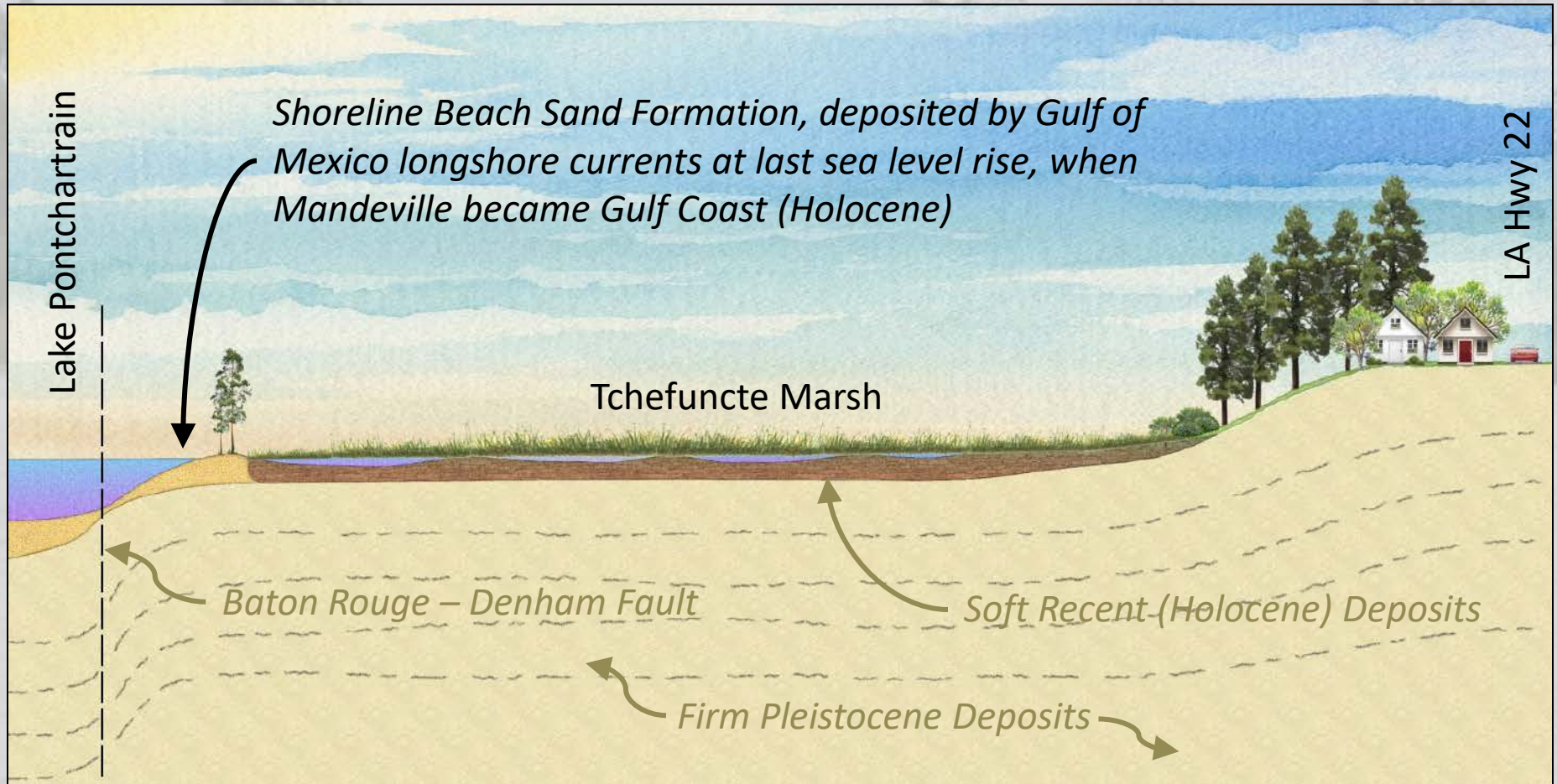
Ice Sheet Extent
Intermittent Ice Age Pleistocene
Shoreline

Expansive Ice, Low Sea Level

Repeated rise and retreat of ocean built the firm clays and sands under Mandeville



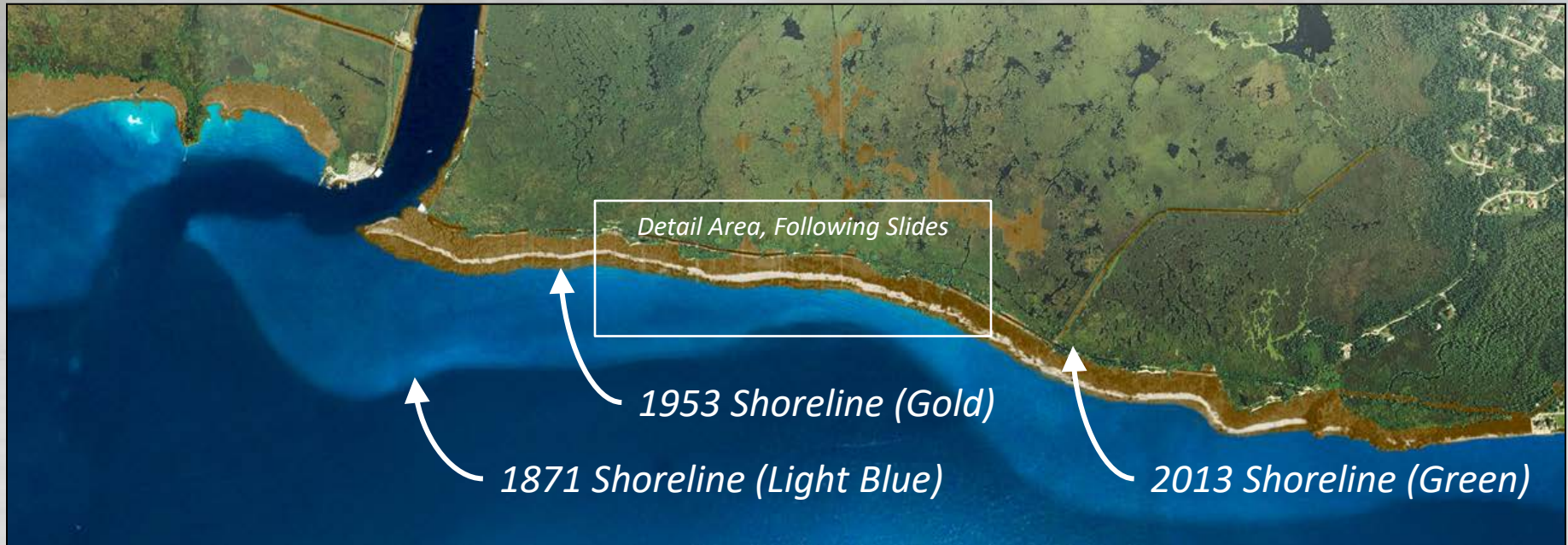
Marsh Geology





Marsh Shoreline Analysis

SITUATION: Natural coastal process is eroding Tchefuncte Marsh shoreline at 10 ft/year. Protective longshore sand bank is thinning; where bank is lost, accelerated loss of unprotected marsh occurs.



Unprotected, wave and current action “scrape” soft Holocene marsh off of the firm, shallow Pleistocene platform.



Marsh Shoreline Analysis



Uniform, well defined sand beach. Offshore cypress swamp apparent. Note location of canal parallel to shore.



Uniform, well defined sand beach. Shoreline loss apparent.



Marsh Shoreline Analysis



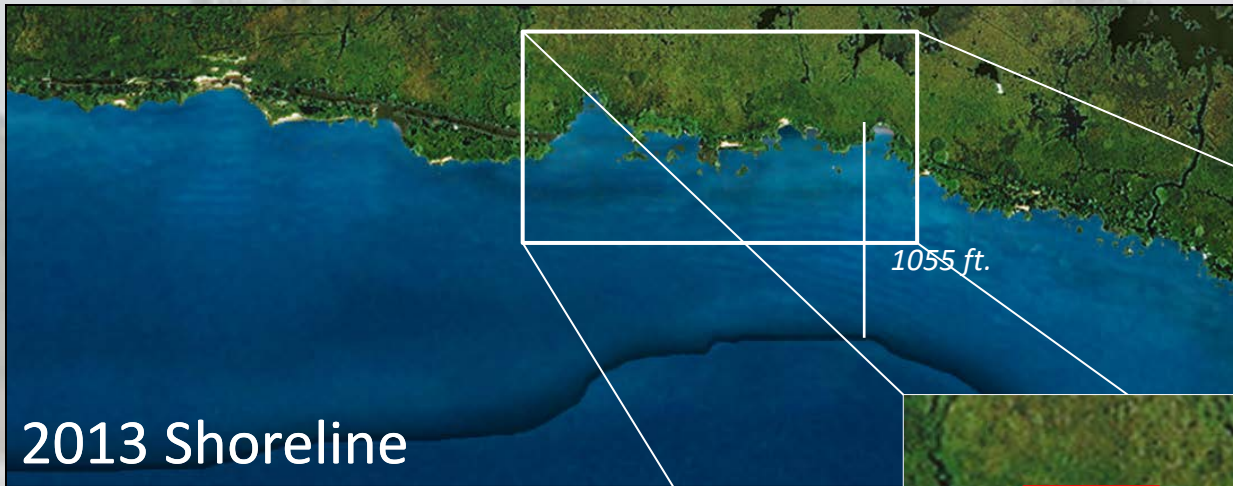
Irregular loss pattern, canal spoil bank breached in a single location. Interior ponds developing.



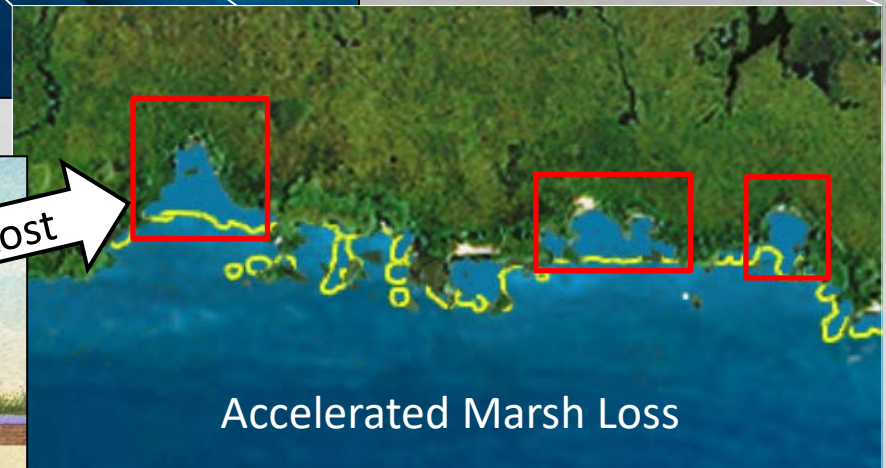
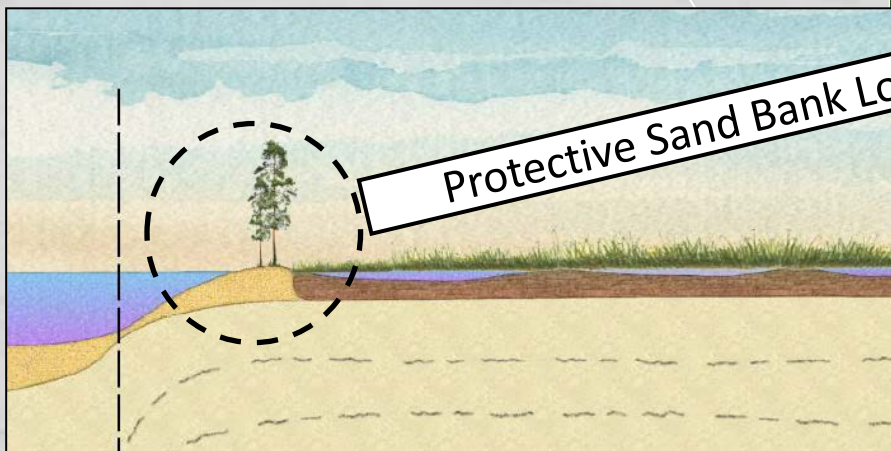
Sand bank remains across breadth of shoreline. Erosion has breached both canal banks.



Marsh Shoreline Analysis



Long segments of canal completely breached. Sand bank erosion is total; localized accelerated marsh hollowing apparent.





Marsh Shoreline Analysis

Right: Tchefuncte Marsh shoreline with sand bank and upland vegetation remaining

Below: Area of unprotected marsh grasses exhibiting accelerated shoreline erosion





Marsh Shoreline Protection Rationale

Tchefuncte Marsh Value

- City WWTP Effluent Wetland Assimilation

DIRECT BENEFIT: Low Cost Wastewater Treatment

- Storm Surge Protection

*DIRECT BENEFIT: Avoid Private and Public Property Damage, Costly
HSDRRS Structure or Home Elevations*

- Wildlife Habitat Preservation
- Recreation

If unprotected, the routine coastal process, sea level rise, subsidence, and periodic storm surge effect will continue to erode, inundate, and scour Tchefuncte marsh at an accelerated rate.



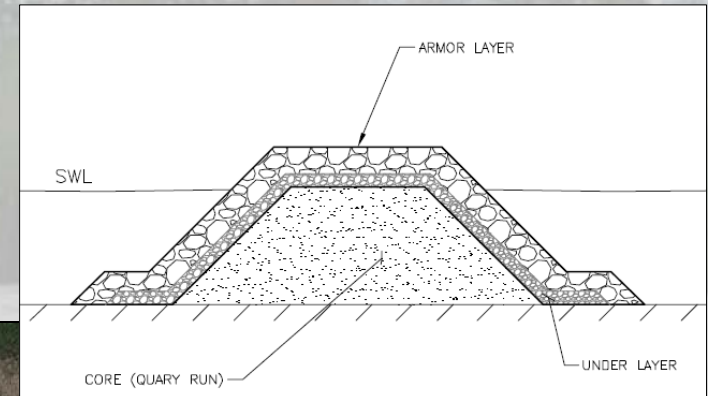
Tchefuncte Marsh Shoreline Summary

Scope: 2.8 mile Breakwater, Potential Marsh Creation

Status: Project Development, Seeking Execution Under USACE CAP

Est. Const. Cost: \$12M (65% Federal)

City Strategy: Develop strong engineering & environmental feasibility document, to make the project attractive & competitive for funding.



Above: Typical rubble mound breakwater section

Left: Project constructed by Tangipahoa Parish in Lake Pontchartrain south of Pass Manchac



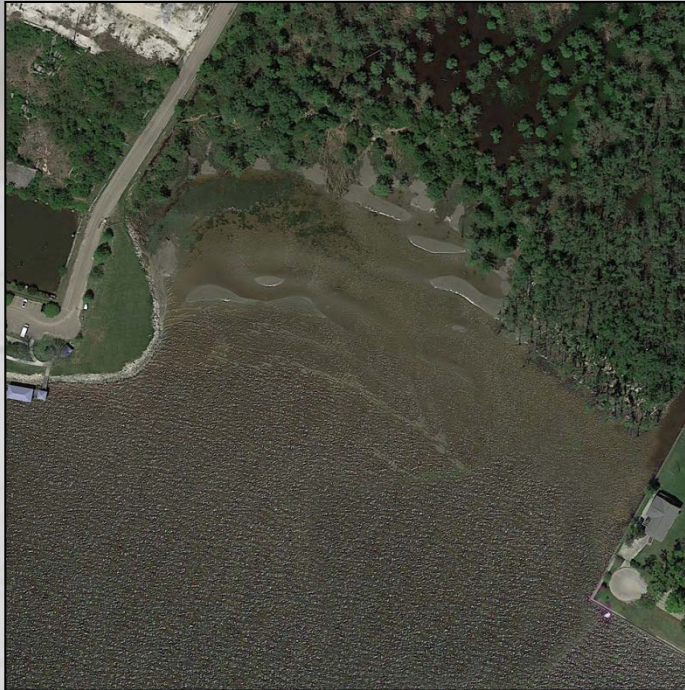


2. Wetland Restoration & Flood Mitigation

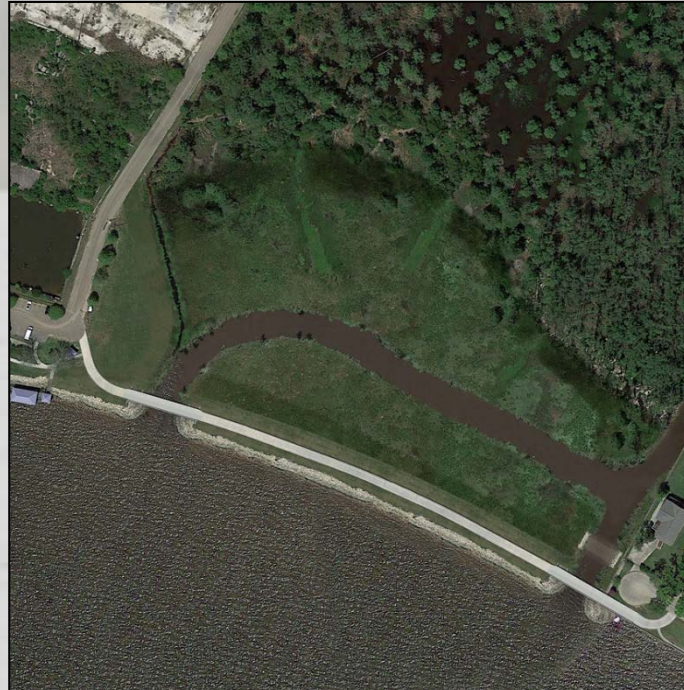
KEY PROJECT FEATURES:

Shoreline Protection – Wetland Restoration

Flood Hazard Reduction – Pedestrian Connectivity



Existing Condition



Post-Project Rendering

Based on flood hazard reduction to NFIP and favorable c/b ratio, project may compete favorably for GOHSEP HMGP funds.



Wetland Restoration & Flood Mitigation Summary

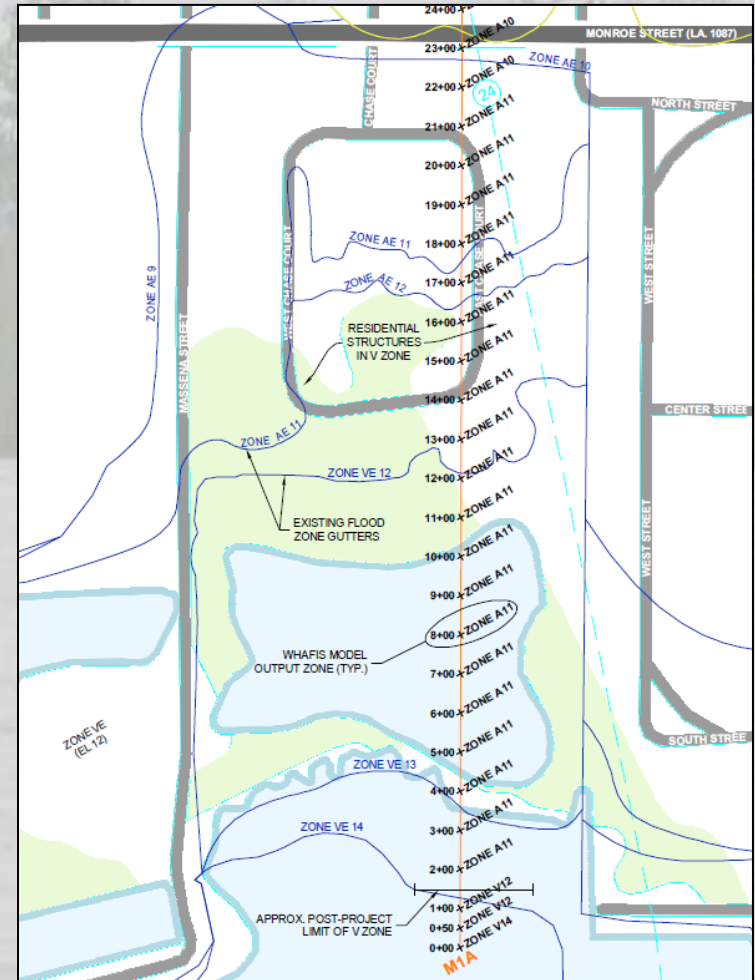
Scope: 1000 LF Breakwater, 5 acre Wetland Restoration, Velocity Flood Hazard Reduction

Status: Design Complete, Permitting and Funding in Progress

Est. Const. Cost: \$2.8M



Right: WHAFIS transect with post-project output, overlaid on effective FIRM. Elimination of velocity effects for 13 Hermitage lots





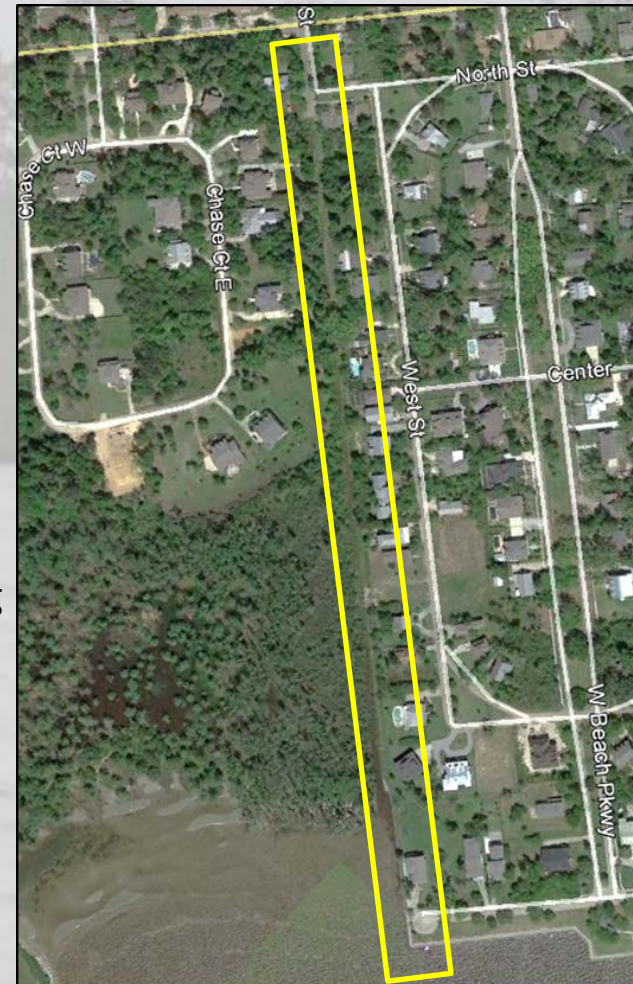
3. Galvez St. Drainage Summary

Scope: 1310 LF Canal Bank Stabilization, 5.3/7.3 Flood Protection (elevation to match seawall)
Status: 95% Design, Permits Complete
Est. Const. Cost: \$1.8M



Left: Sloughing canal bank

Right: Project Limits





4. Seawall Replacement Summary

Scope: *Replace 1.7 mile Concrete-capped Steel Sheetpile Seawall*

Status: *Future Requirement (10-15 yrs)*

Est. Const. Cost: *\$15M*

Right: Deterioration visible at 24 yrs of age includes corrosion at wet/dry line, reinforcing steel corrosion causing concrete cracks, and backfill loss from corner joint



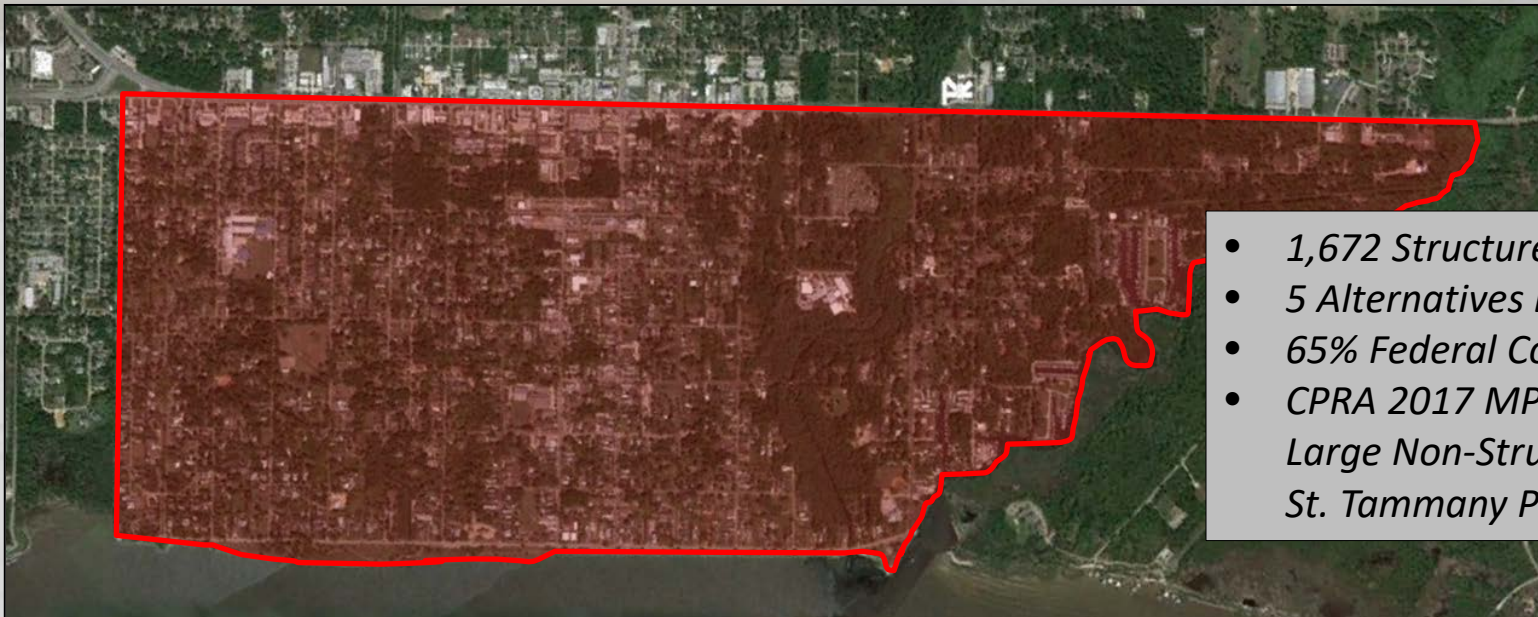


5. Non-Structural Pilot Project Summary

Scope: *Elevate Structures At/Below Selected Design Elevation (el. 7.3 identified in July 2016 Silver Jackets economic study as highest b/c; ~20 yr event)*

Status: *In Competition at USACE HQ for Feasibility Funding*

Est. Const. Cost: *\$22M (\$12M most advantageous structures only)*



- 1,672 Structures in Study Area
- 5 Alternatives Evaluated
- 65% Federal Cost Share
- CPRA 2017 MP Identifies Large Non-Structural Effort in St. Tammany Parish



6. Old Mandeville Tidal Protection

Background

Alternatives

Project Summary



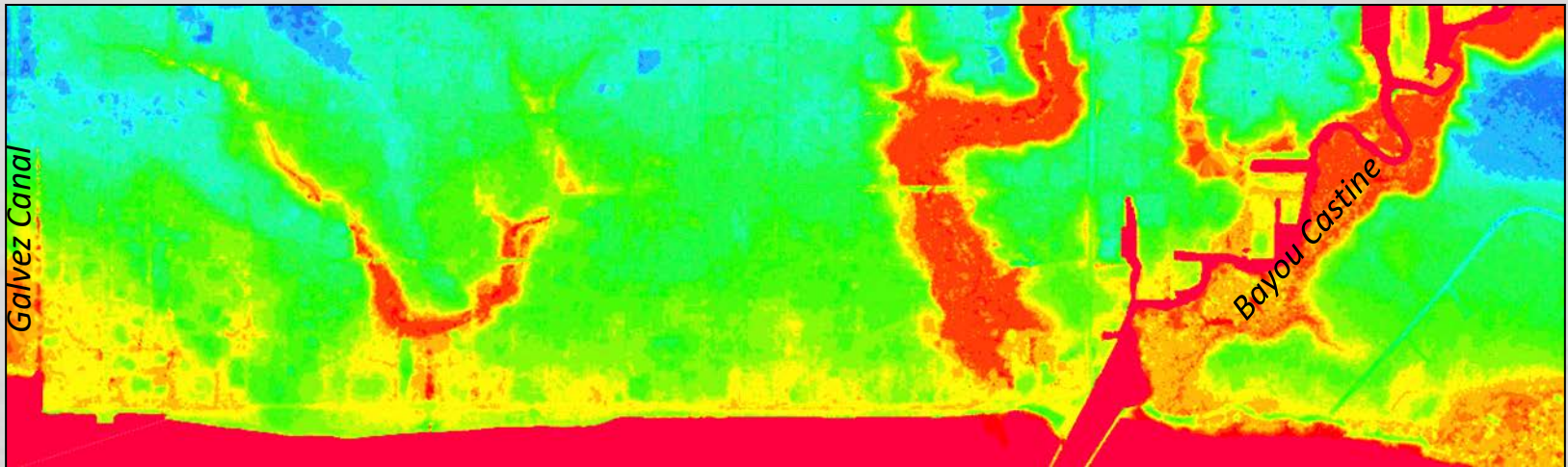


Background

WHAT: *Continuation of City's Old Mandeville Tidal Protection Effort, Building on 2014 Report*

WHY: *Prevent Community Disruption by Repeated Tidal Inundation and Minor Tropical Events (not 100-yr Storm)*

WHERE:

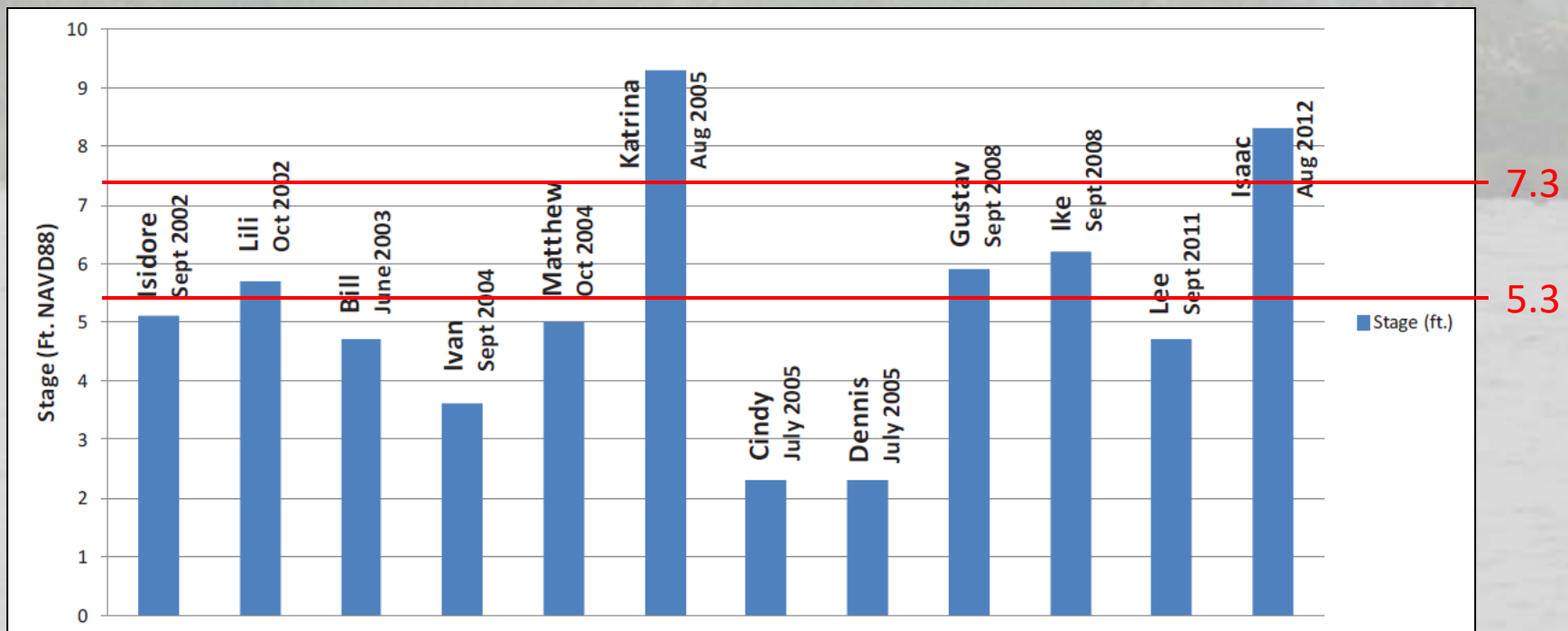


Above: *Old Mandeville shaded for elevation relief*



Background: 2014 Shoreline Protection Study

Recurrence & rainfall/surge interaction analysis; collation of costs & requirements for water surface reduction at lake levels of 3.0, 5.3, & 7.3 ft



Above: Charted Storm Surge Stages, 2002 – 2012, by GEC



Background: 2014 Shoreline Protection Study

2014 DEVELOPED ALTERNATIVES:

Gate Closure at Ravine au Coquilles & L. Bayou Castine, Pump Stations, Flood Barrier along Jackson St.

- El. 5.3: Study Cost Est: \$31.9M
- El. 7.3: Study Cost Est: \$34.5M (*seawall replacement neglected*)



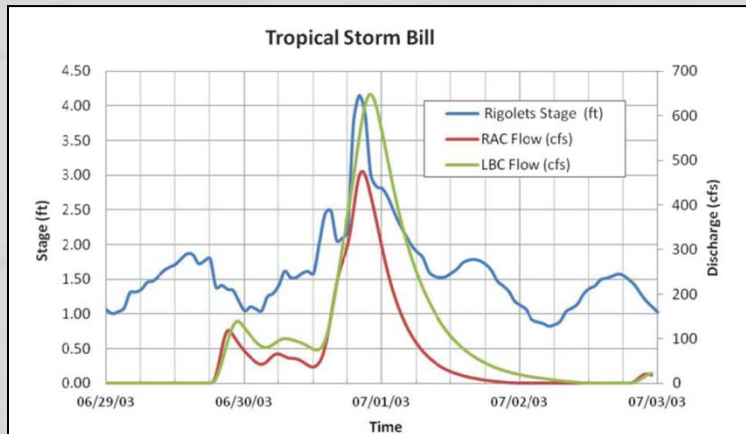
Above: Depiction of El. 7.3 Protected Condition, by GEC



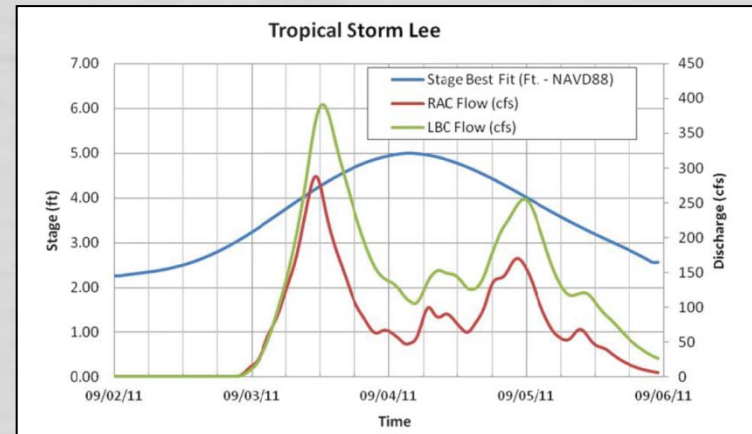
Background: 2014 Shoreline Protection Study

2014 DEVELOPED ALTERNATIVES (NOTES ON COST):

- *70% of Cost is Pumping, and pumps are required*
- Pumping Capacities set by complex analysis, but conservative criteria and assumptions adopted
 - 100% dry streets
 - 10-yr rainfall event peak coincides with peak lake surge



Coincidence of peak flows and peak stages

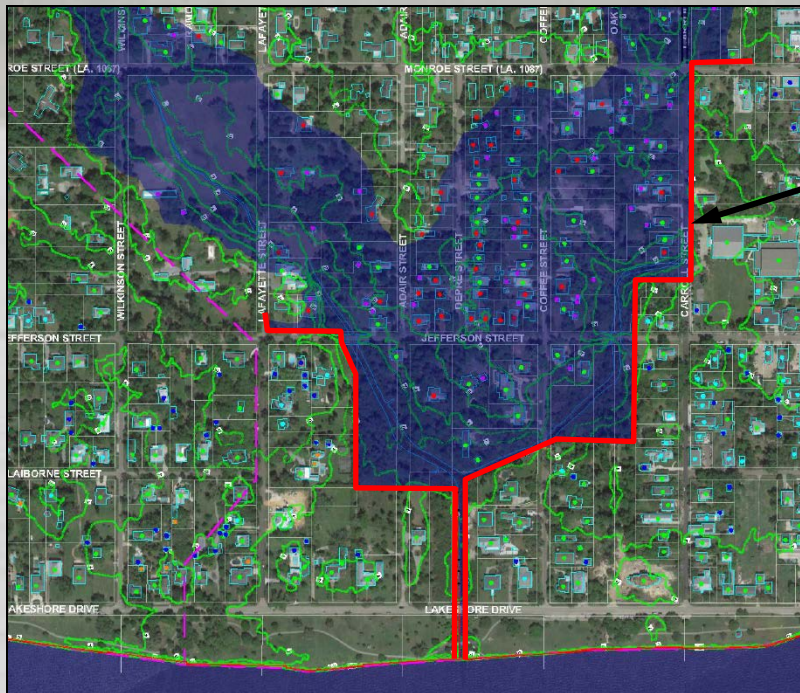


Non-coincidence of peak flows and peak stages



Cost Reduction Alternatives

1. Less Stringent Pumping Criteria
e.g. Temporary Stormwater Ponding Permitted , "Partial Pump"
2. Passive Barrier "Cut-off" to Eliminate Seawall Closure
Pumping Requirement Drastically Reduced



Floodwall Maintaining Design El. of 5.3 or 7.3, plus Hydraulic Gradient (Height of wall: 1ft – 5ft+)

Pumping Basin Reduced by 88%:
From 2330 to 275 Acres

Left: Ravine au Coquilles Passive Barrier Alignment and inundation limit

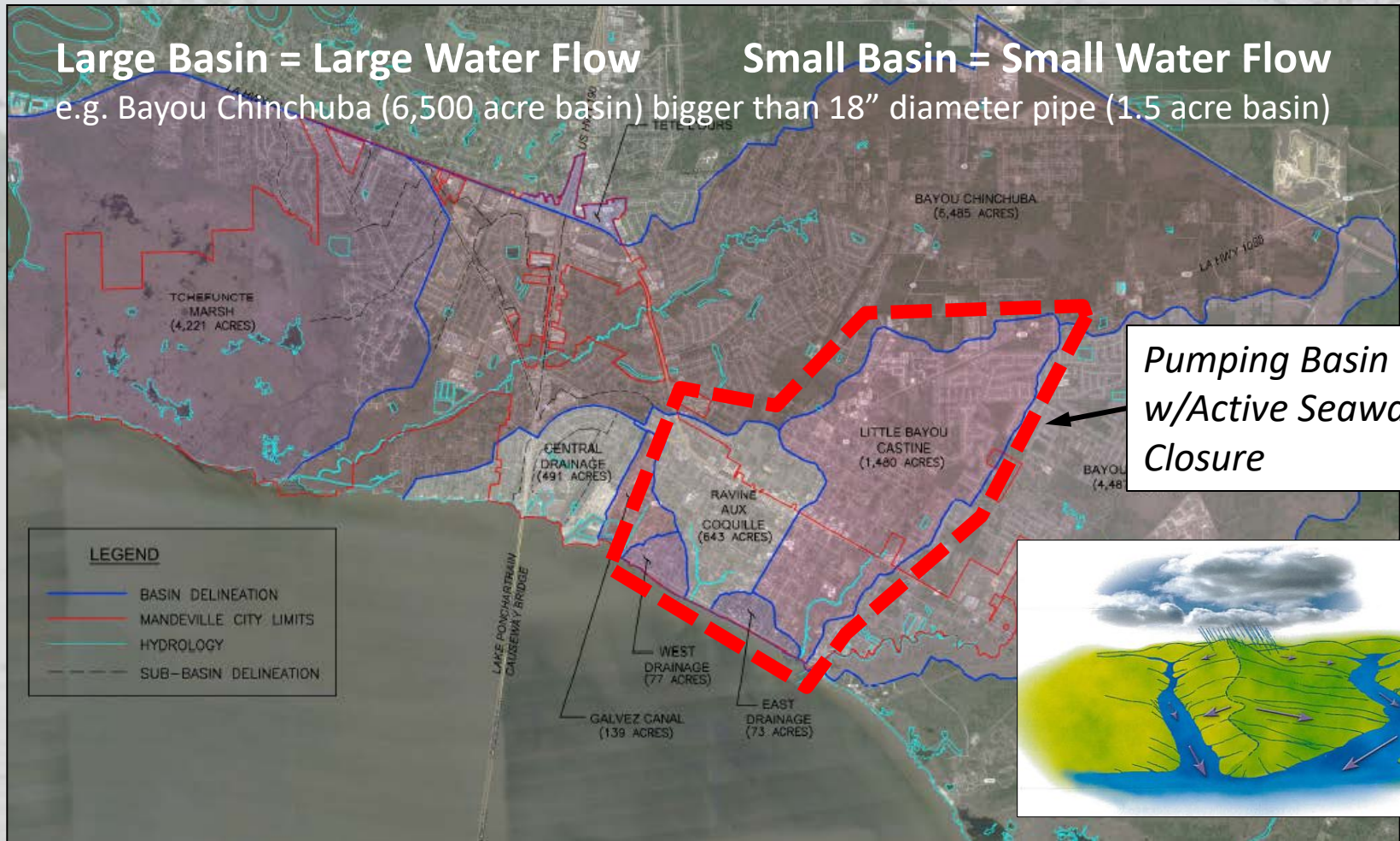


Storm Drainage Basins

Large Basin = Large Water Flow

Small Basin = Small Water Flow

e.g. Bayou Chinchuba (6,500 acre basin) bigger than 18" diameter pipe (1.5 acre basin)

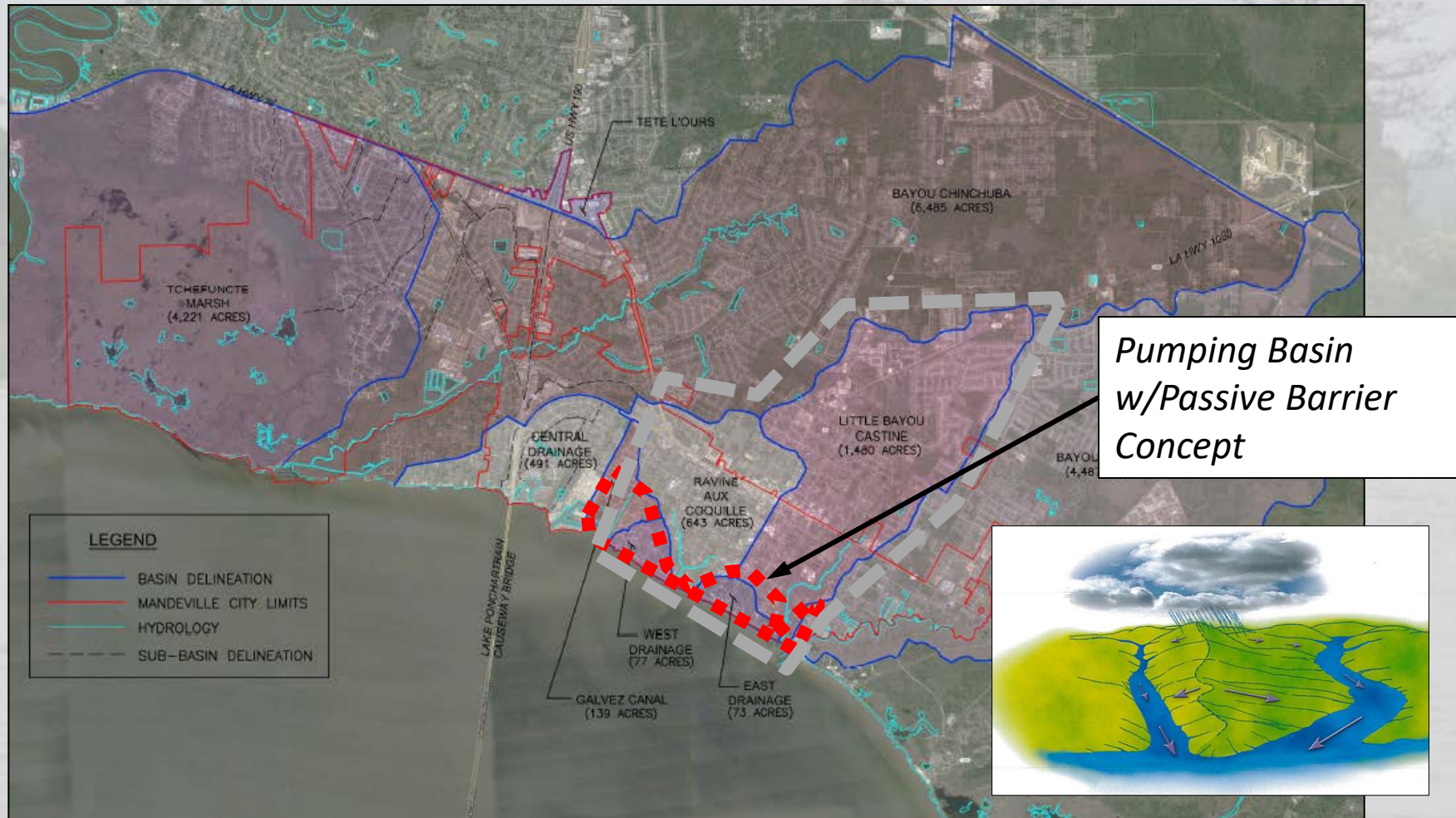


Pumping Basin w/Active Seawall Closure



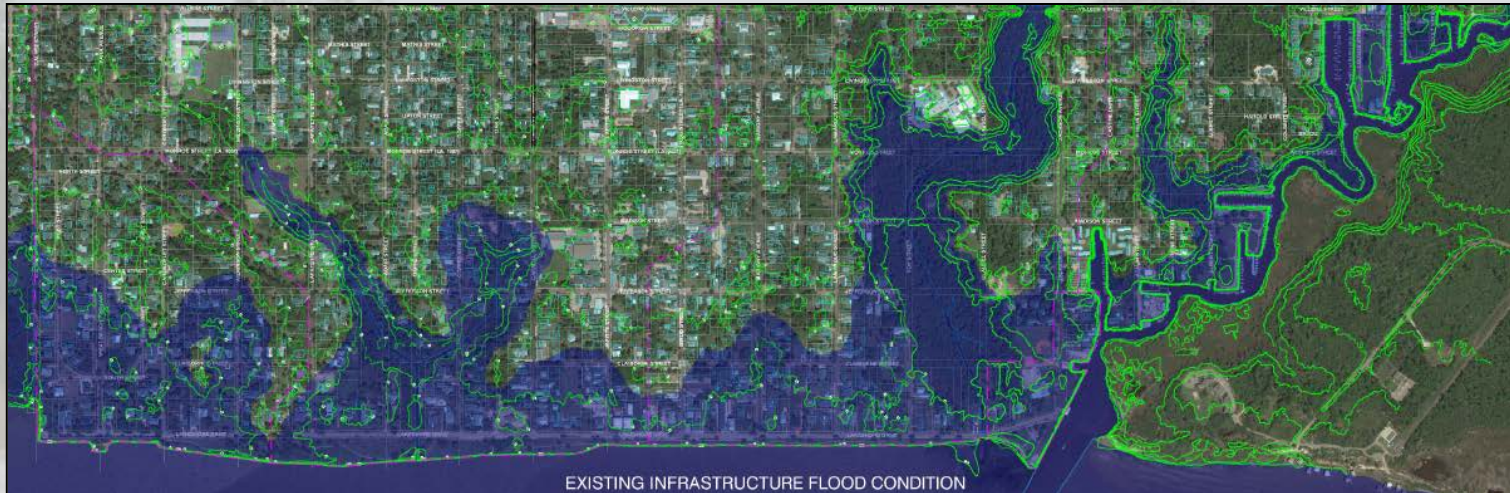


Storm Drainage Basins

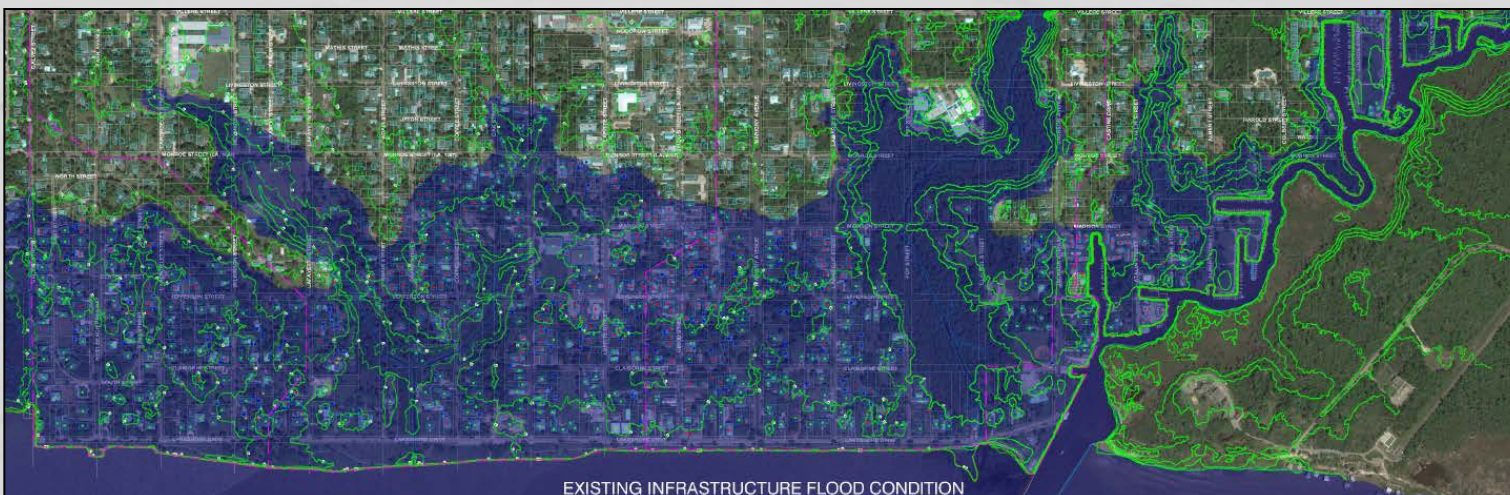




Inundation (Existing Condition)



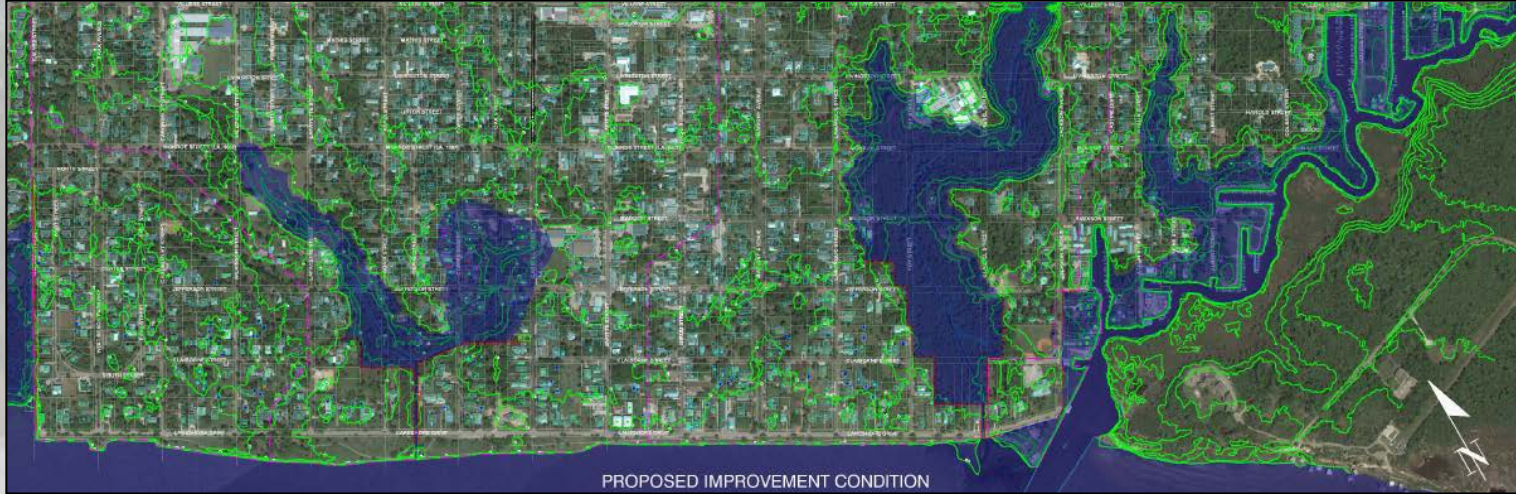
*Lake Elevation:
5.3 ft*



*Lake Elevation:
7.3 ft*

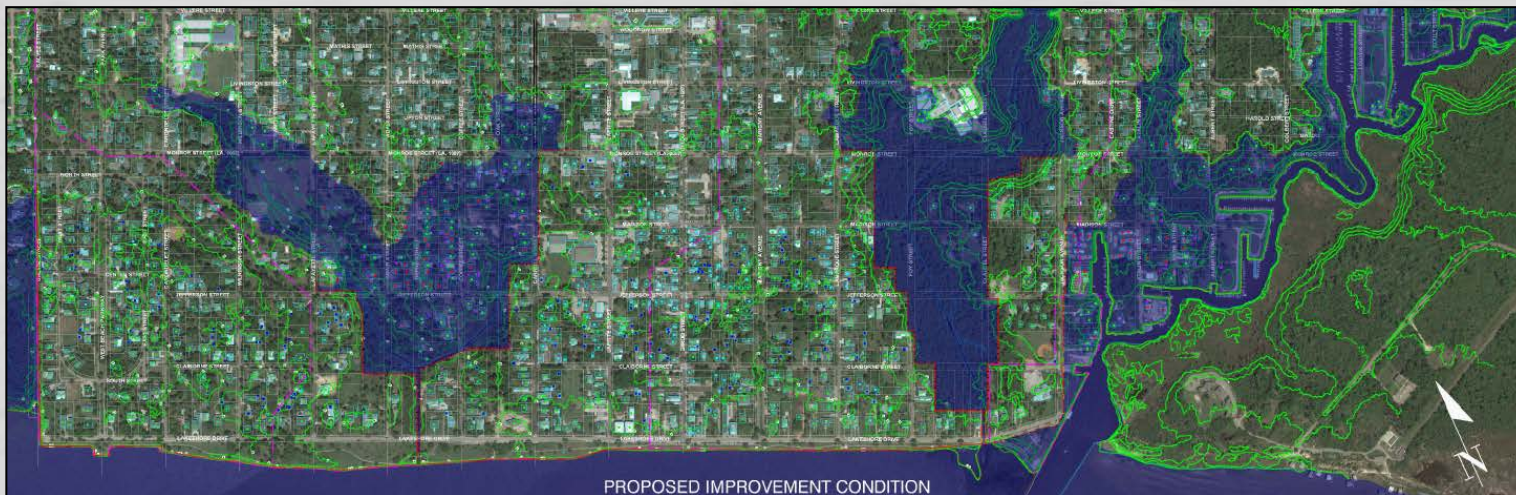


Inundation (w/Passive Barrier Concept)



*Lake Elevation:
5.3 ft*

*Barrier Alignment
Set to Property
Lines, and/or at
Wetland/Wooded
Boundaries*



*Lake Elevation:
7.3 ft*



Tidal Protection Alternative Cost Collation

GATED AT SEAWALL (ACTIVE):

	<u>EI. 5.3</u>	<u>EI. 7.3</u>
• Dry Street Pumped	\$42.8M	\$45.6M
• Partial Pumped*	\$23.7M	\$26.5M
• Non-Pump Portion (info only)	\$ 5.8M	\$ 8.6M

PASSIVE BARRIER:

	<u>EI. 5.3</u>	<u>EI. 7.3</u>
• Dry Street Pumped	\$15.2M	\$26.2M
• Partial Pumped*	\$12.5M	\$23.5M
• Non-Pump Portion (info only)	\$ 8.1M	\$19.1M

Notes:

1. *Criteria for Partial Pumped Not Yet Established
2. Pumping infrastructure will require increased PW O&M staff

FIGURES ABOVE ARE NOT BUDGET REQUESTS
Next Step is Feasibility and Environmental Impact Document



Tidal Protection Summary

Scope: *Prevent Tidal Inundation of Old Mandeville*

Status: *Alternative Development*

Est. Const. Cost: *\$11M to \$40M*

Note: Any alternative may prove environmentally difficult.

City Strategy: Develop strong engineering & environmental feasibility document, to make the project attractive & competitive for funding.



View of Existing Seawall, El. 5.3



Rendering of Seawall at El. 7.3



Questions?