MOBILE RIVER BRIDGE & BAYWAY

Baldwin and Mobile Counties Delegations

ALDOT Procurement Team

August 21, 2019

ALABAMA DEPARTMENT OF TRANSPORTATION

Today's Agenda

- Introductions
- EIS and History
- Bayway
- Mobile River Bridge (Main Span)
- Estimates
- Financing
- Legal

Procurement Advisory Team

thompson ENGINEERING

HDR

MOTT MACDONALD

KPMG

CDM Smith

Shumer Consulting, LLC

PRAG

PRR

AMES & GOUGH

MAYER | BROWN

MAYNARD COOPER GALE

Environmental Impact Statement

Project History/Timeline

1997
Feasibility Study

2003
EIS Notice of Intent
Public Hearings
EA Signed
(June 9, 2003)

2005
Alternatives Screening Evaluation
(14 alternatives)

2010
Public Involvement

2014
Draft EIS Signed
(July 22, 2014)
Public Hearings

2015
Preliminary Design

2016
Public Workshop

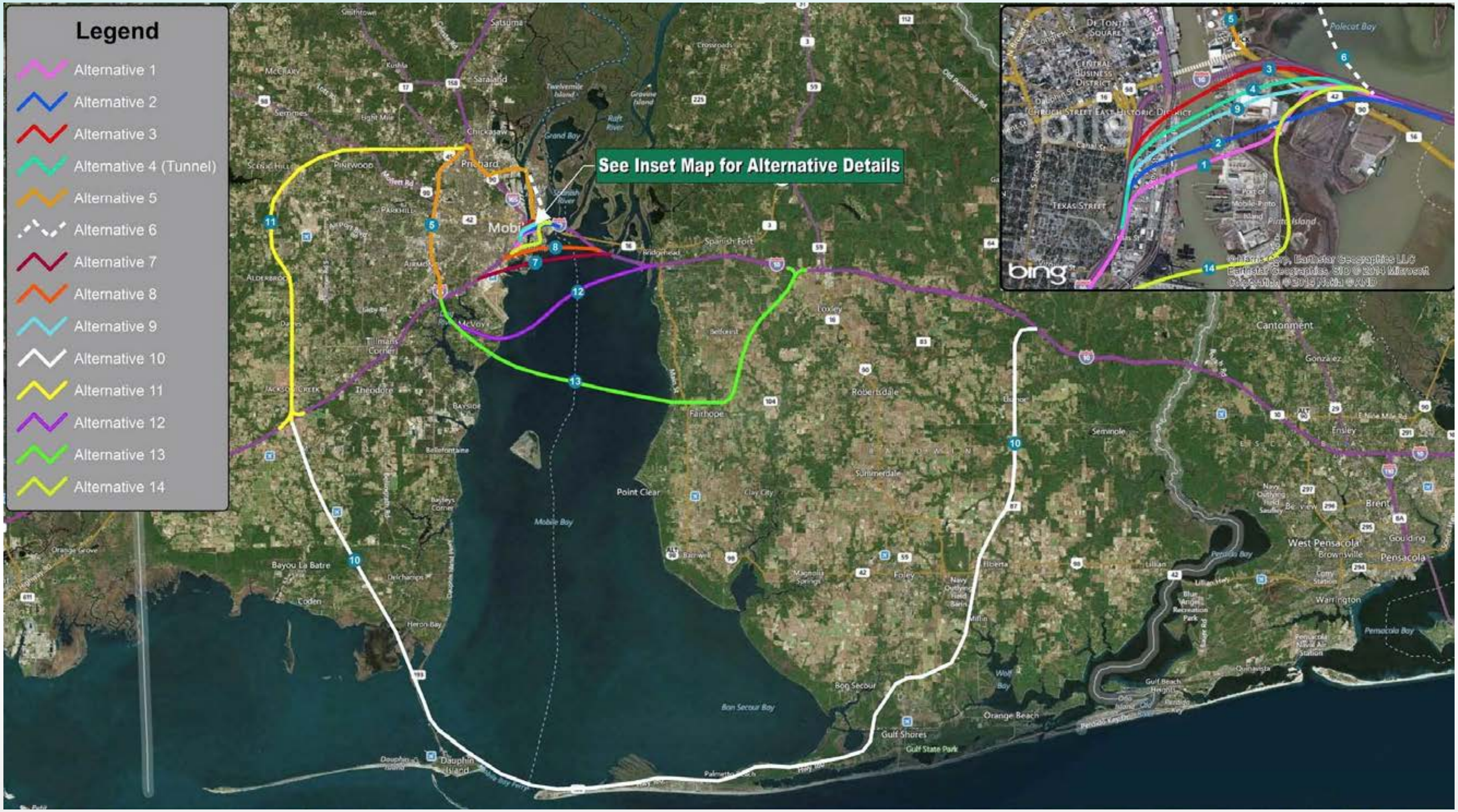
2017
Bayway & Storm Surge Analyses

2019
SDEIS Signed
(March 26, 2019)
Public Hearings
FEIS/ROD Approved
(August 15, 2019)

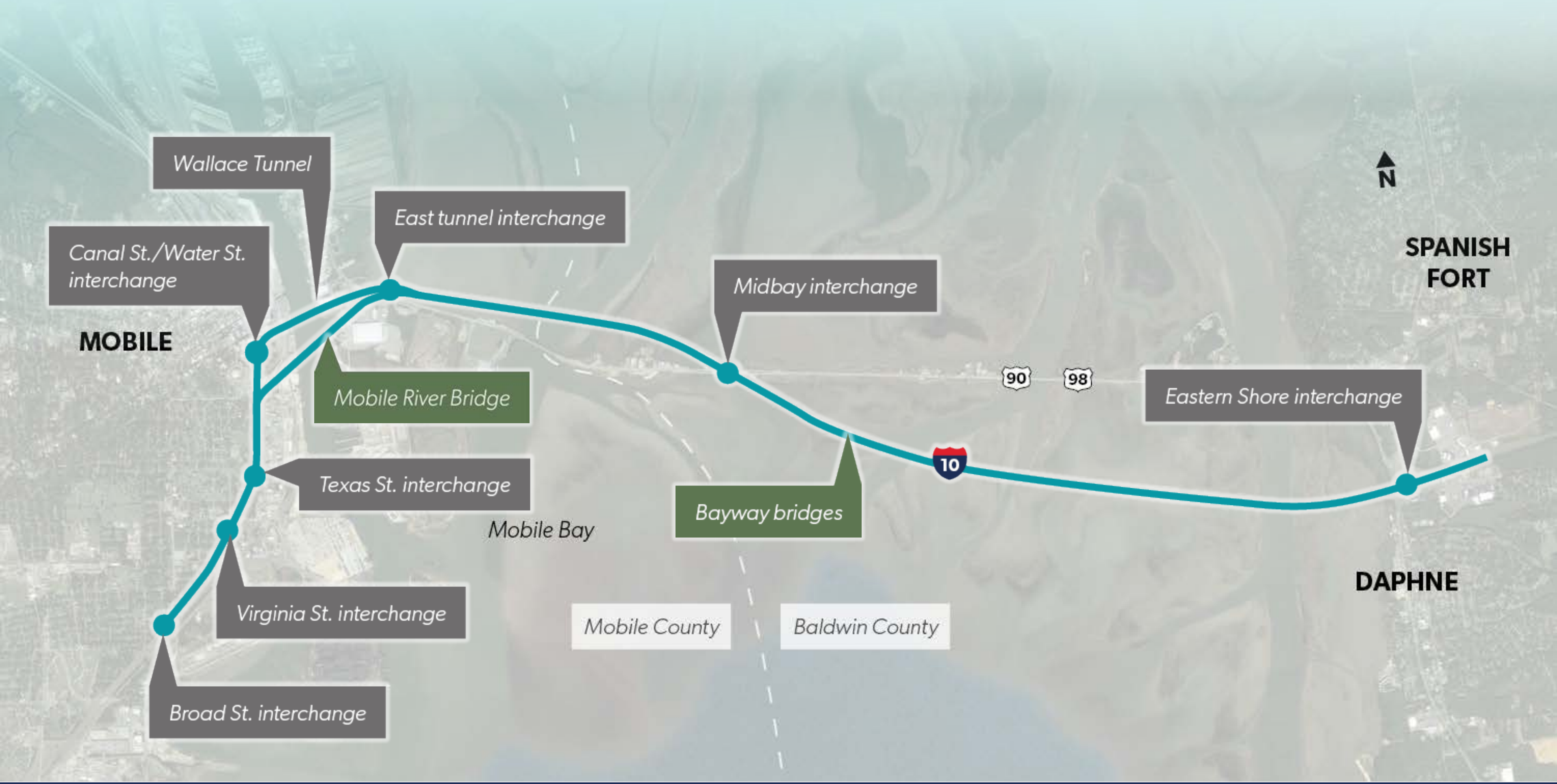
2020
P3 Procurement
Begin Construction

2025
Estimated Construction Completion

Original Alternatives



Selected Alternative



MOBILE RIVER BRIDGE & BAYWAY

Tolled and Toll-Free Routes

MOBILE RIVER
BRIDGE & BAYWAY

Public Comments

- Majority of people who commented believe the project is needed but do not want locals to pay a toll or want tolls to be lower
- Suggested other funding sources (GOMESA, Rebuild Alabama, RESTORE Act)
- How we responded:
  - Improved frequent user discount program
  - Evaluated suggested funding sources
  - Incorporated buy down clause into toll policy
  - Continuing to pursue all available funding sources

What does the ROD mean?

- Federal environmental clearance for project
- Explains basis for Selected Alternative
- Formalizes environmental commitments and mitigation measures
- Allows ALDOT to move forward to next step in process – releasing Request for Proposals to three shortlisted teams
  - Note: If project is not in TIP, FHWA will not approve release of RFP
- Allows ALDOT to continue to pursuing Federal funds

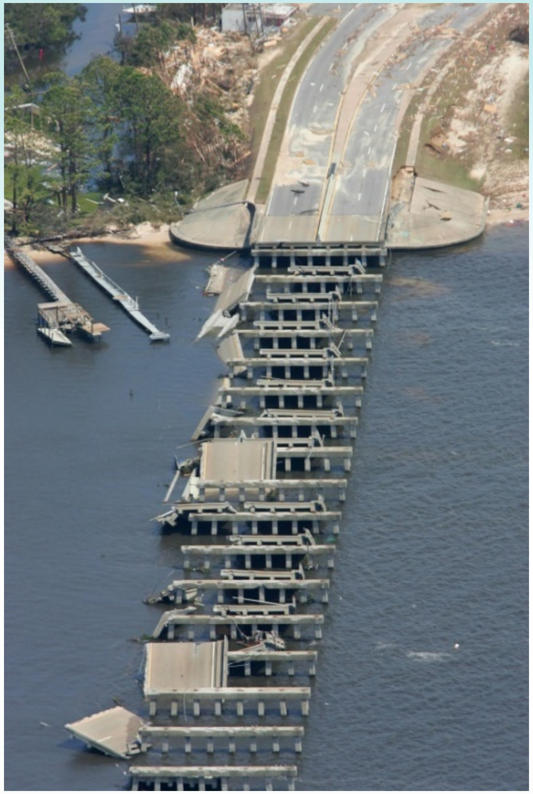
Bicycle/Pedestrian Facilities

Conceptual – for discussion purposes only

MOBILE RIVER BRIDGE & BAYWAY

Bayway

Storm Surge Bridge Impacts



Hwy 90
Pass Christian, MS
Post-Katrina
100-yr. = 24′
Katrina = 23′-24′

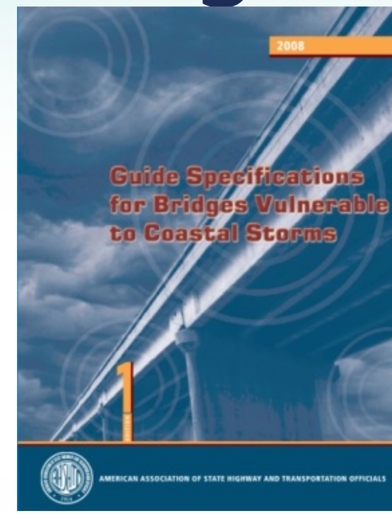
Hwy 90
Biloxi, MS
Post-Katrina
100-yr. = 23′
Katrina = 20′-22′

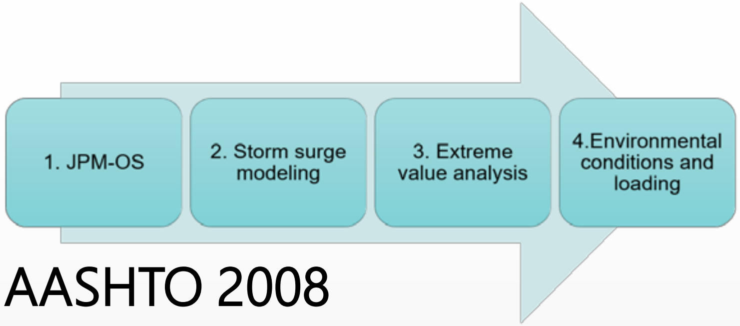
I-10 Twin Spans
New Orleans, LA
Post-Katrina
100-yr. = 18′
Katrina = 13′-15′

Design Guidance for Coastal Bridges

HEC-25 Vol2

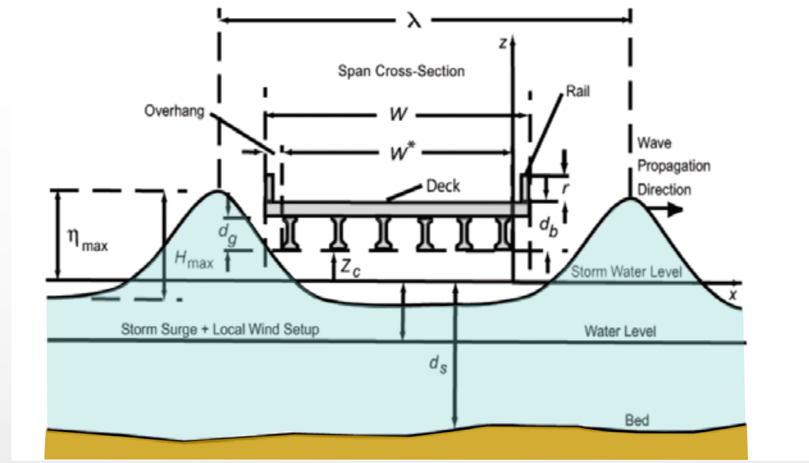
- Tiered level of evaluation
    - Level 1 - Existing data
    - Level 2 - Modeling
    - Level 3 - Modeling, probabilistic risk framework (JPM-OS)
- Need to consider Sea Level Rise over lifetime



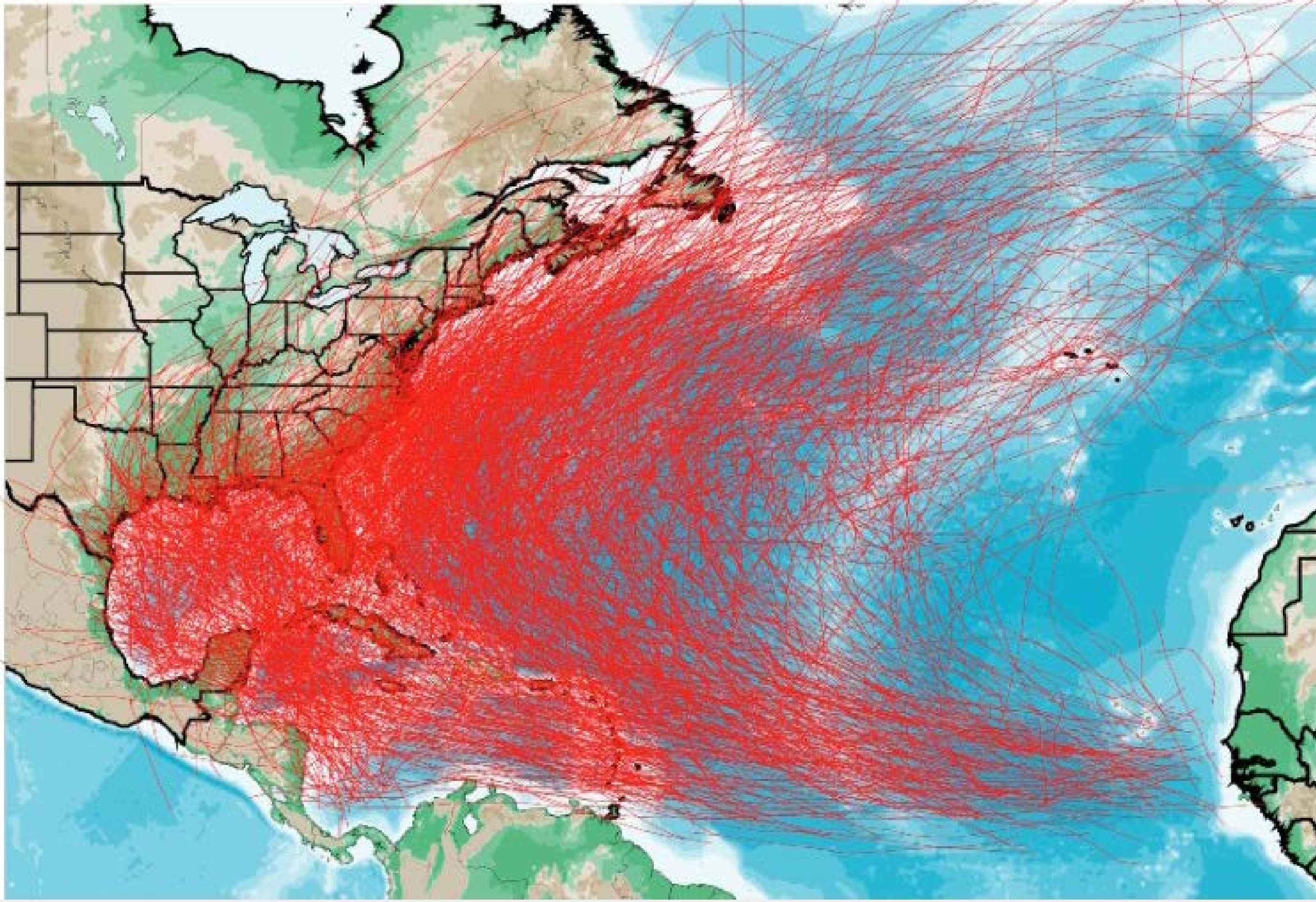


AASHTO 2008

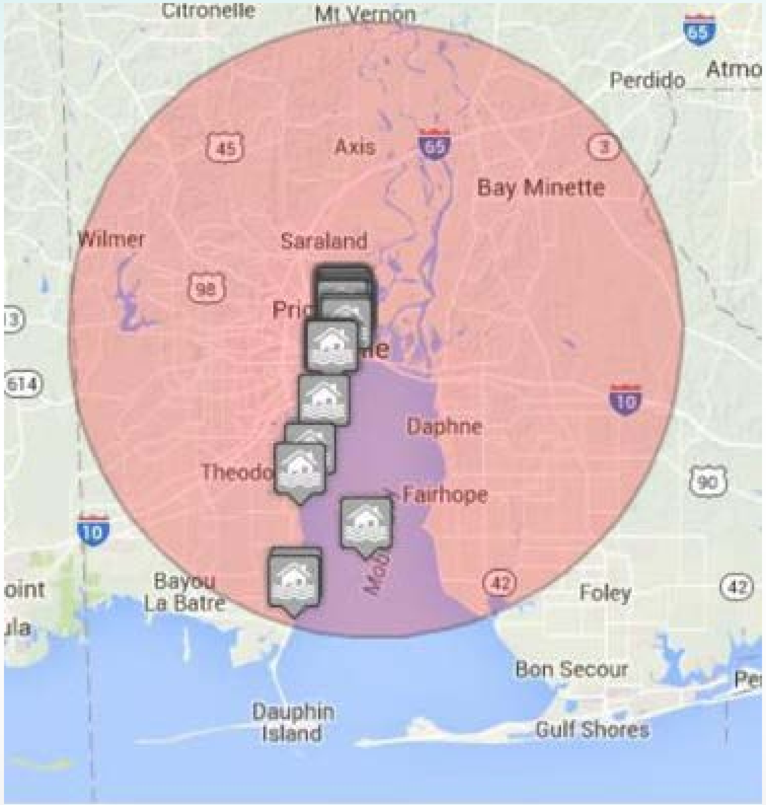
- Design parameters
- Bridge geometry
- Force calculations



Catalog Storm Tracks 1851-2009

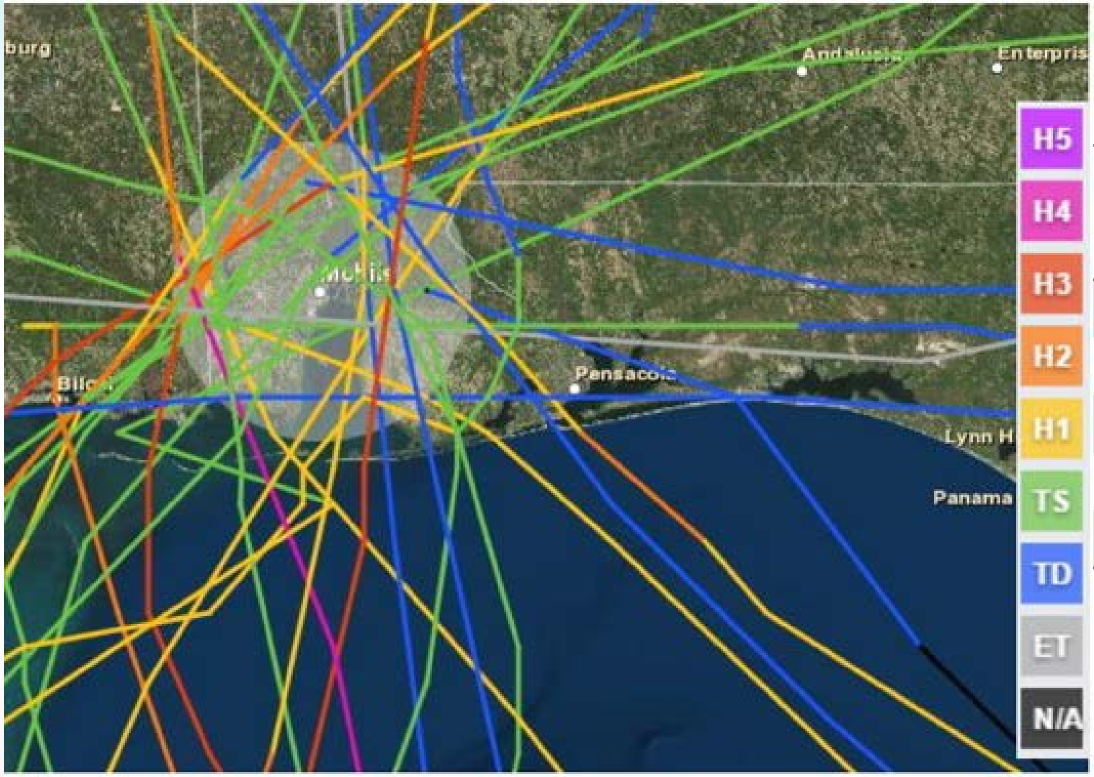


Hurricane Statistics



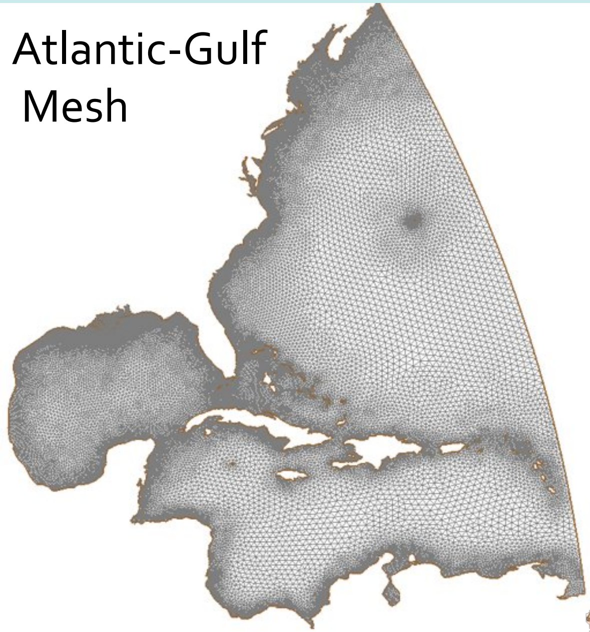
High Water Marks [ft NAVD88]	Storm	Year
14.0	Frederic	1979
12.5	Katrina	2005
11.2	Unnamed	1916
9.5	Unnamed	1906
7.8	Unnamed	1901

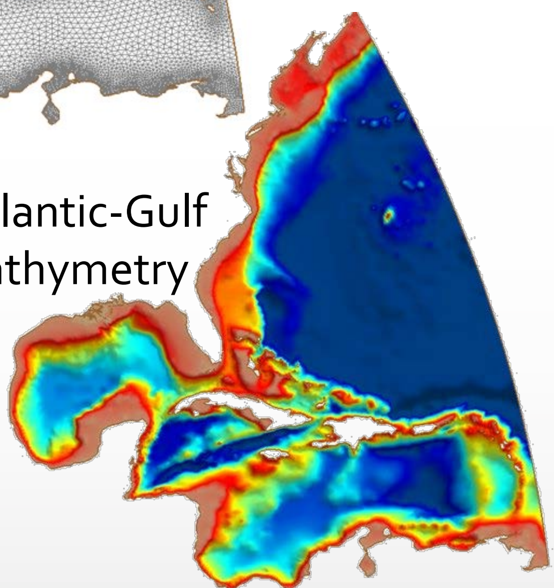
Hurricane Statistics

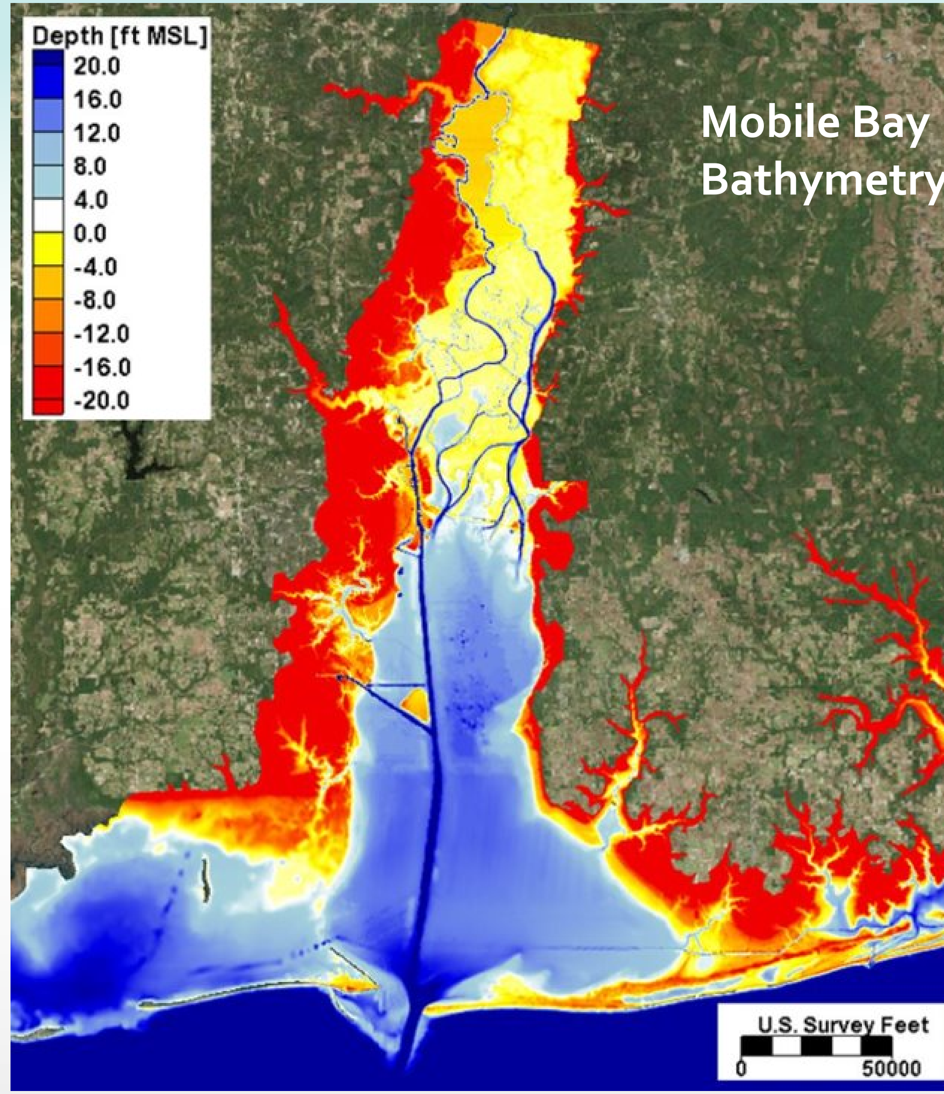


Hurricane Category	Return Period [yr]	Annual Exceedance Probability	Wind speed [mph]
1	9	11.1%	84
2	18	5.6%	103
3	29	3.4%	121
4	55	1.8%	143
5	123	0.8%	156

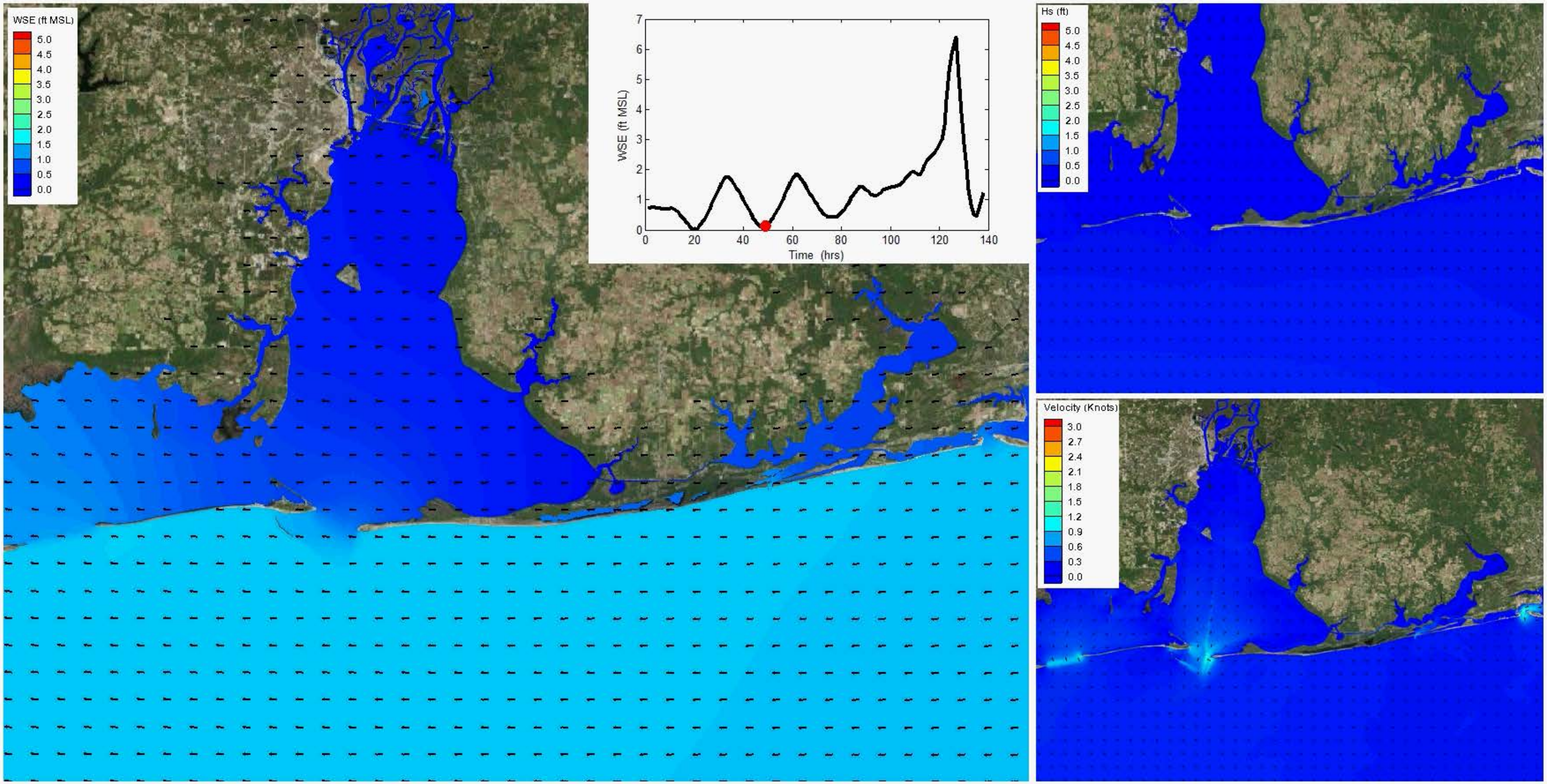
Hurricane Modeling



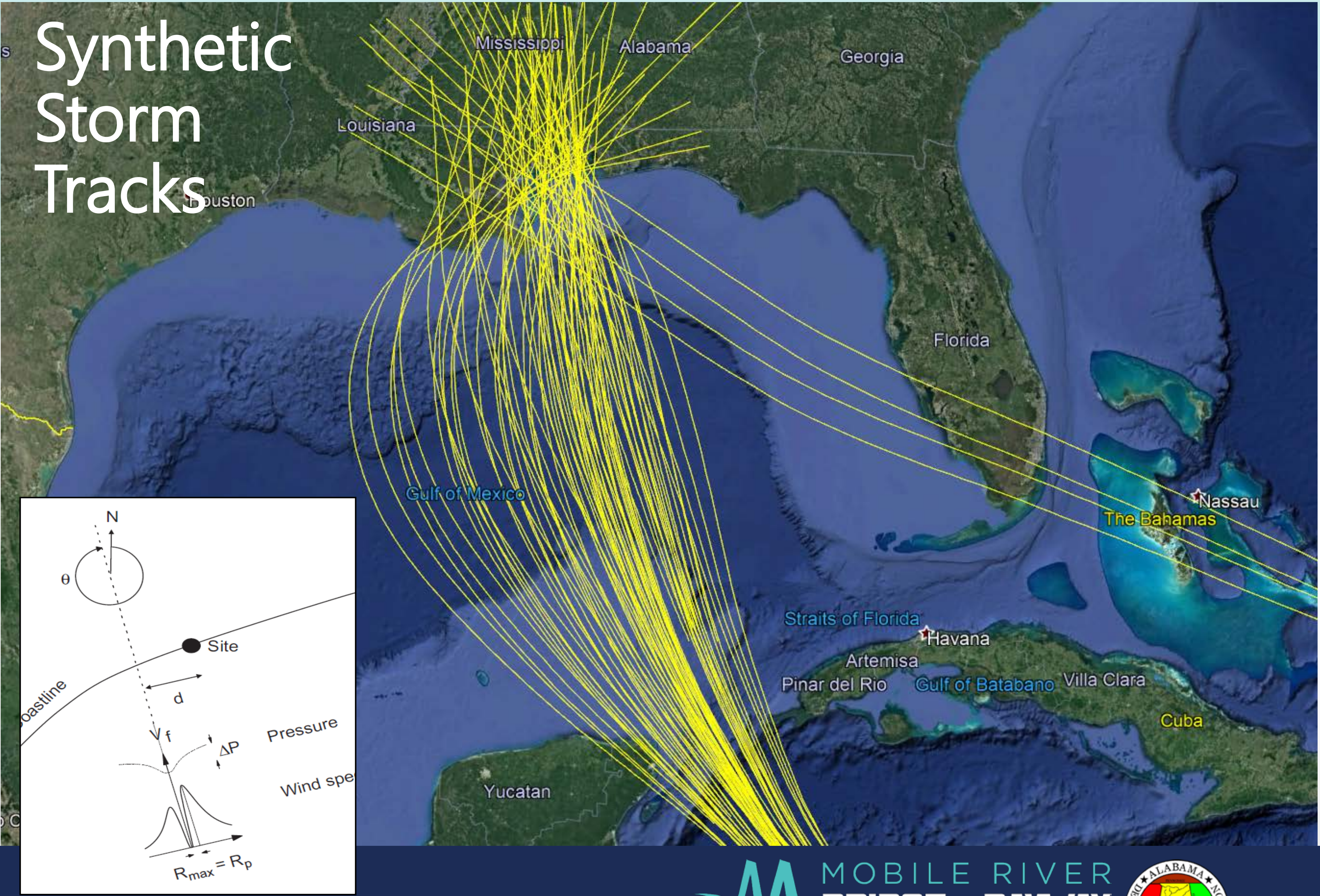




Hurricane Modeling (Ivan)

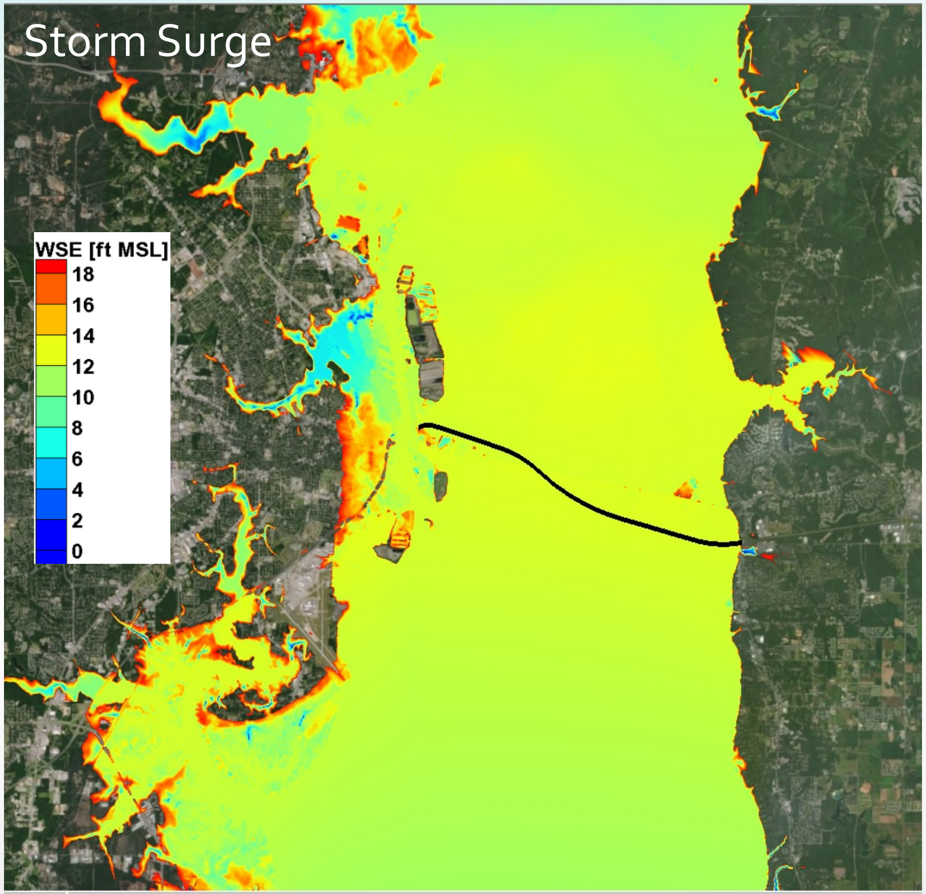


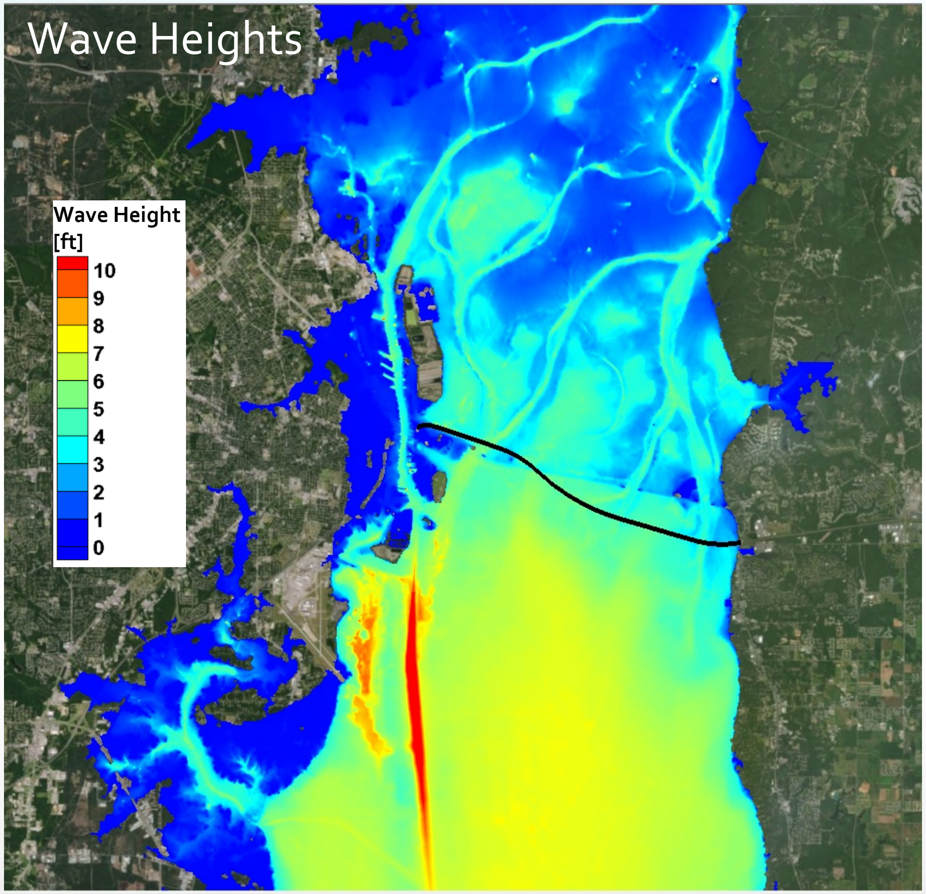
Synthetic Storm Tracks



Extreme Value Analysis

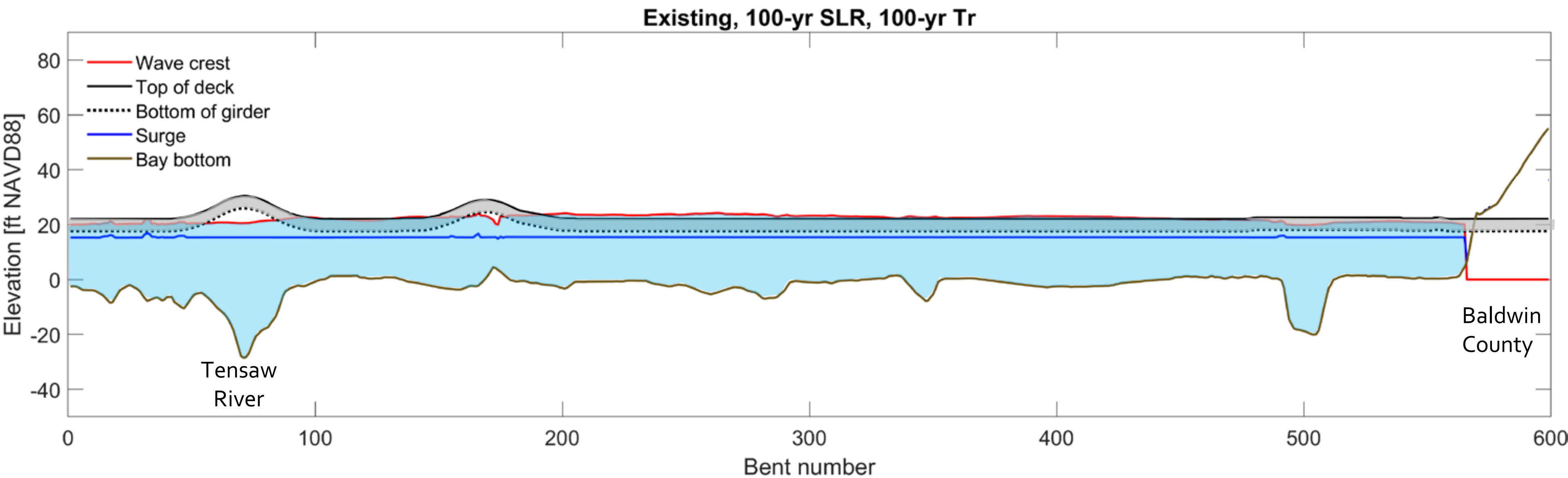
2020 year conditions, 1% Annual Exceedance Probability





MOBILE RIVER BRIDGE & BAYWAY

Conditions Impacting Bayway



FHWA Manual

9.3.6.1 Bridge Deck Elevation

The most common design approach is to avoid superstructure wave forces by elevating the bridge so that the storm waves crests pass under the low-chord of the bridge. This elevation is shown schematically in Figure 9.17.

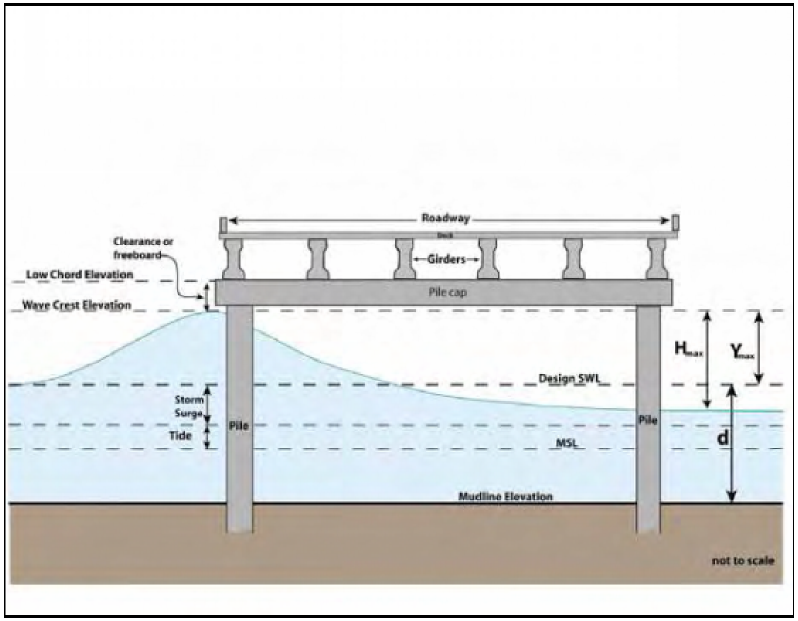


Figure 9.17. Definition sketch of wave parameters and water levels for determining elevation of bridge deck for clearance from wave crests

The elevation can be set by adding some additional clearance or freeboard above the crest of the largest wave in the design sea state:

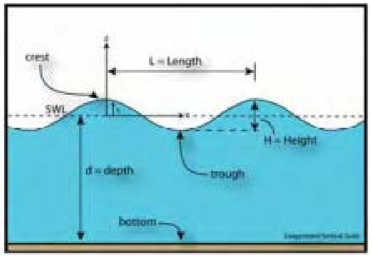
$$(\text{low chord elevation}) = (\text{wave crest elevation})_{max} + \text{freeboard} \quad (9.1)$$

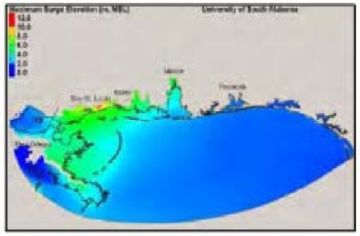
The low chord elevation is taken as the elevation of the bottom of the girders (see Figure 9.17). The maximum wave crest elevation can be calculated as:

U.S. Department of Transportation Federal Highway Administration

Publication No. FHWA-NHI-07-096
June 2008

Hydraulic Engineering Circular No. 25





Highways in the Coastal Environment

Second Edition

MOBILE RIVER BRIDGE & BAYWAY

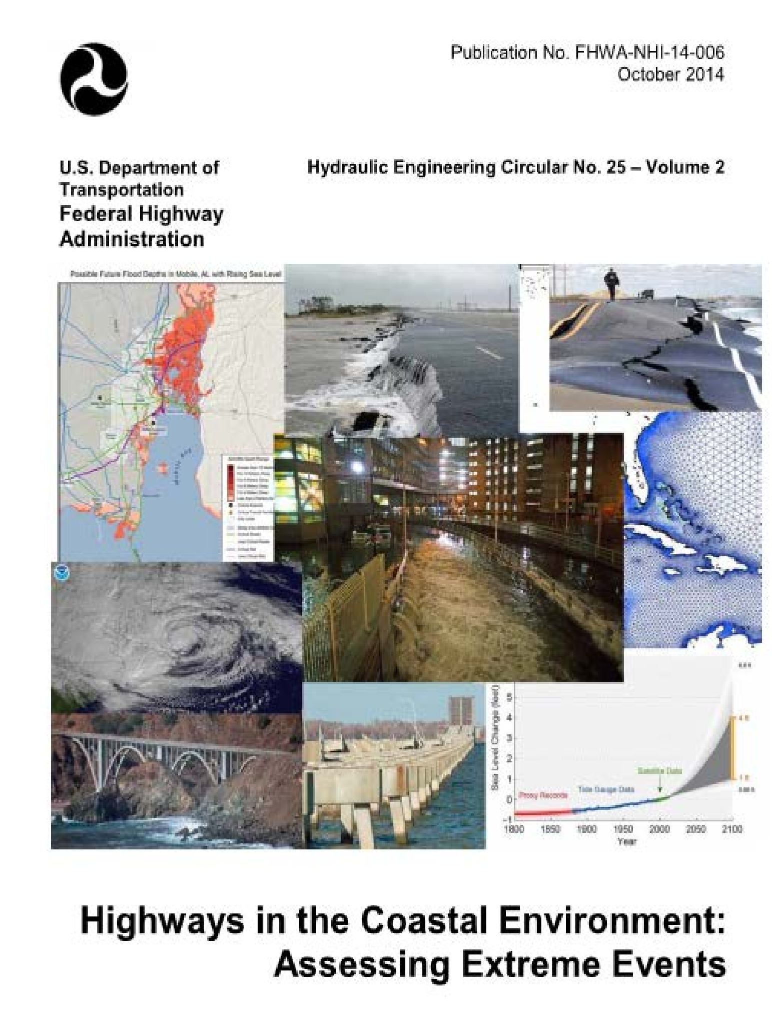
FHWA Manual

The sensitivity of bridge decks to extreme events and climate change can be evaluated by estimating the effect of storm surge, wave heights and sea level rise on the wave loads. Sensitivity of specific bridges to wave-induced loads can be evaluated using available methods for estimating those loads (e.g. HEC-25 Appendix E, A Method for Estimating Wave Forces on Bridge Decks or AASHTO 2008) and comparing those loads with the structural resistance (weight and connections) to those loads. Sea level rise related to climate change will increase the vulnerability of many existing coastal bridges and more research is needed into the methods for estimating and reducing wave-induced loads for vulnerability assessment and adaptation planning. Wave loads on bridge decks are extremely sensitive to the storm surge elevation and thus extremely sensitive to sea level rise.

Increased elevation is an adaptation option for coastal bridges subject to wave attack during extreme events. Several of the major bridges destroyed by hurricanes in the southeastern US were replaced with new bridges elevated much higher to avoid those wave loads in extreme events. These included:

- I-10 bridge over Escambia Bay near Pensacola, FL
- I-10 bridge over Lake Pontchartrain near Slidell, LA
- US-90 bridge over Bay Saint Louis, MS
- US-90 bridge over Biloxi Bay, MS

Another option is to increase the connection strength to the bridge substructure. This approach, however, will transfer those loads to the substructure and foundation, so care must be taken to evaluate wave-induced load failure mechanisms such as pile bending or shear failure, failure of the pile to bent cap connections, and possible soil failure around the foundation (Robertson et al. *2011*; Douglass *et al.* 2006).


Publication No. FHWA-NHI-14-006
October 2014

U.S. Department of Transportation
Federal Highway Administration

Hydraulic Engineering Circular No. 25 – Volume 2

Highways in the Coastal Environment: Assessing Extreme Events

MOBILE RIVER
BRIDGE & BAYWAY

ALDOT Regulations

ALDOT Structural Design Manual

SECTION 3. LOADS AND LOAD FACTORS

The requirements of *AASHTO LRFD* Section 3 shall apply to this section unless noted and/or excepted below.

3.1 PERMANENT LOADS

The following loads shall be used:

- Metal stay-in-place forms for bridge decks (as applicable) – Allow 15 psf dead load (this includes the dead weight concrete in the forms).
- Barrier rail load – The barrier rail dead load shall be considered equally distributed across all girders. However, the dead load for girder design shall not be less than 25% of a single barrier rail weight.

3.2 WATER AND WIND LOADS

- Bridges exposed to coastal influences shall be designed in accordance with the latest *AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms*.

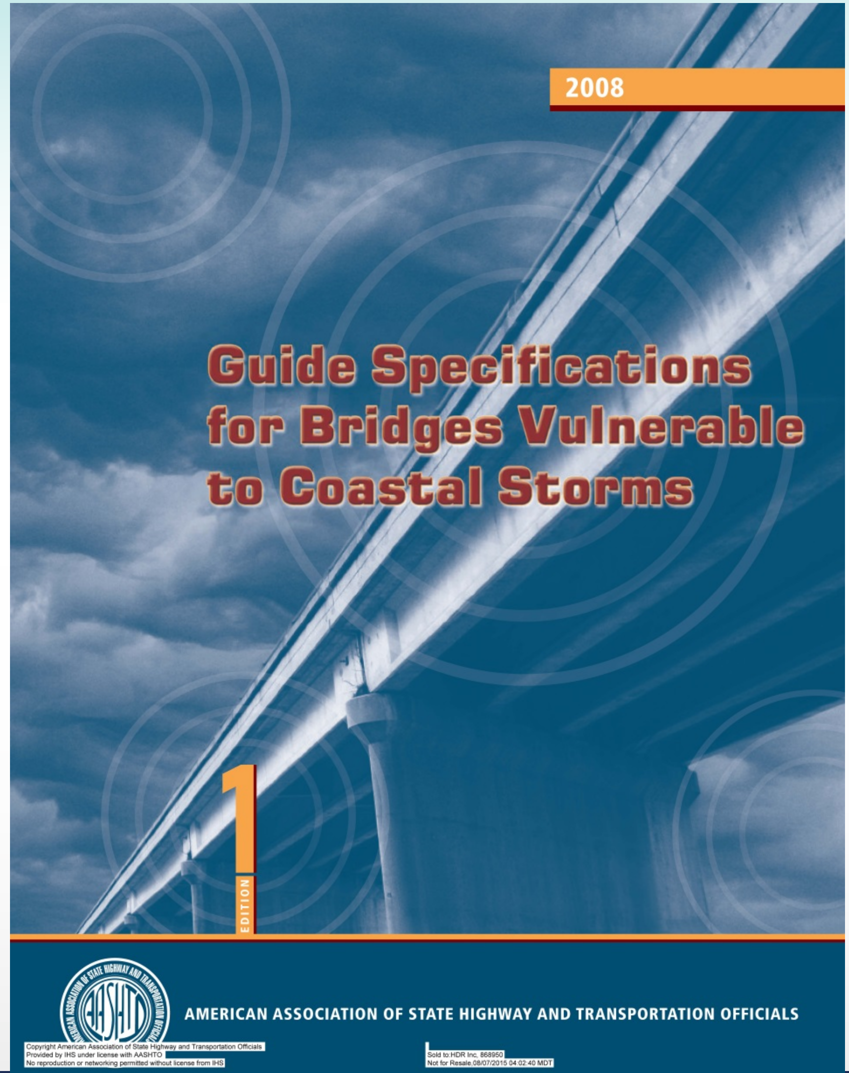
Structural Design Manual

ALDOT Bridge Bureau

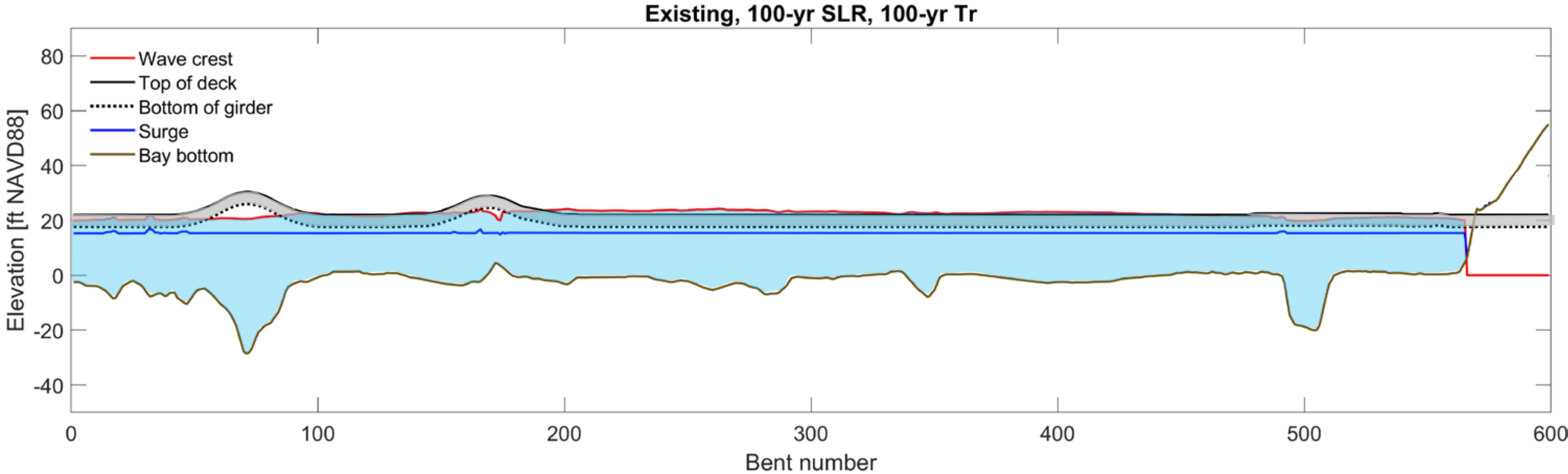
February 2019

AASHTO Guide Specifications

- Contains Specifications for the Design of Bridges Vulnerable to Coastal Storms
- In 2004 and 2005, Hurricanes Ivan and Rita Caused Significant damage to Numerous Bridges in the Gulf Coast
- FHWA initiated a Pooled Fund Contract for the Development of the Guide Specifications

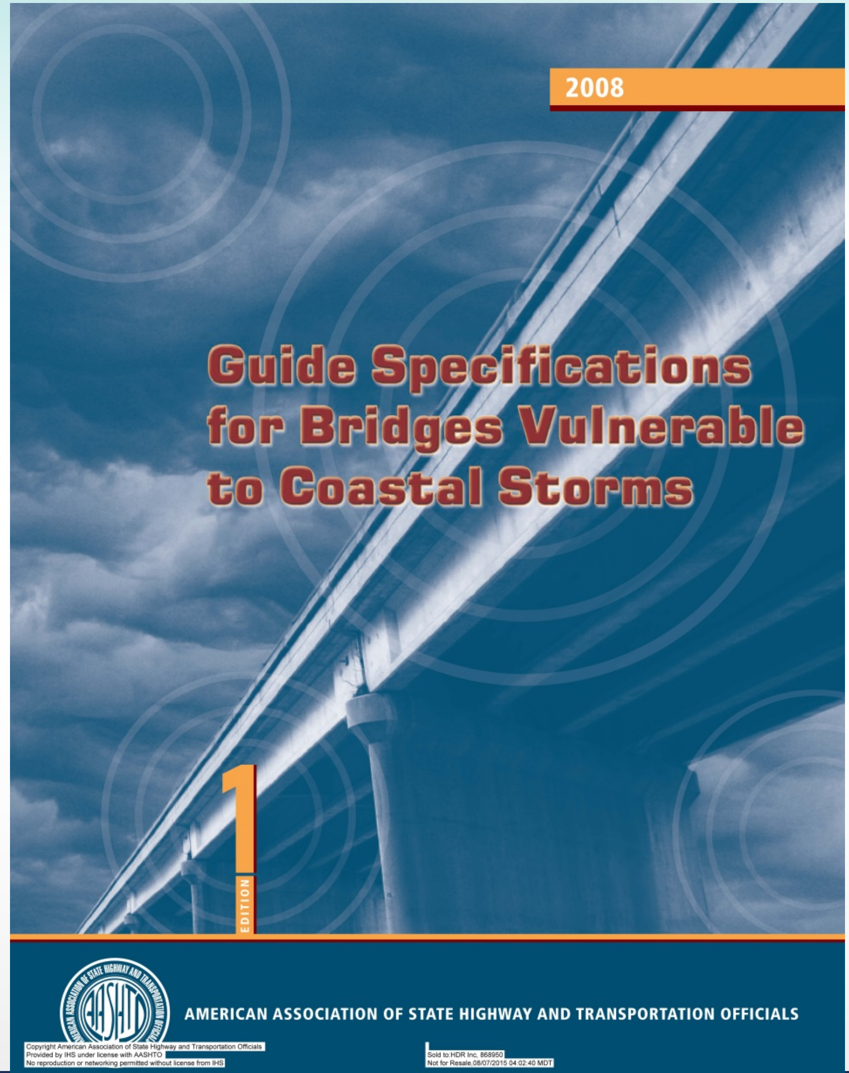


Storm Surge Loads – Level III Results



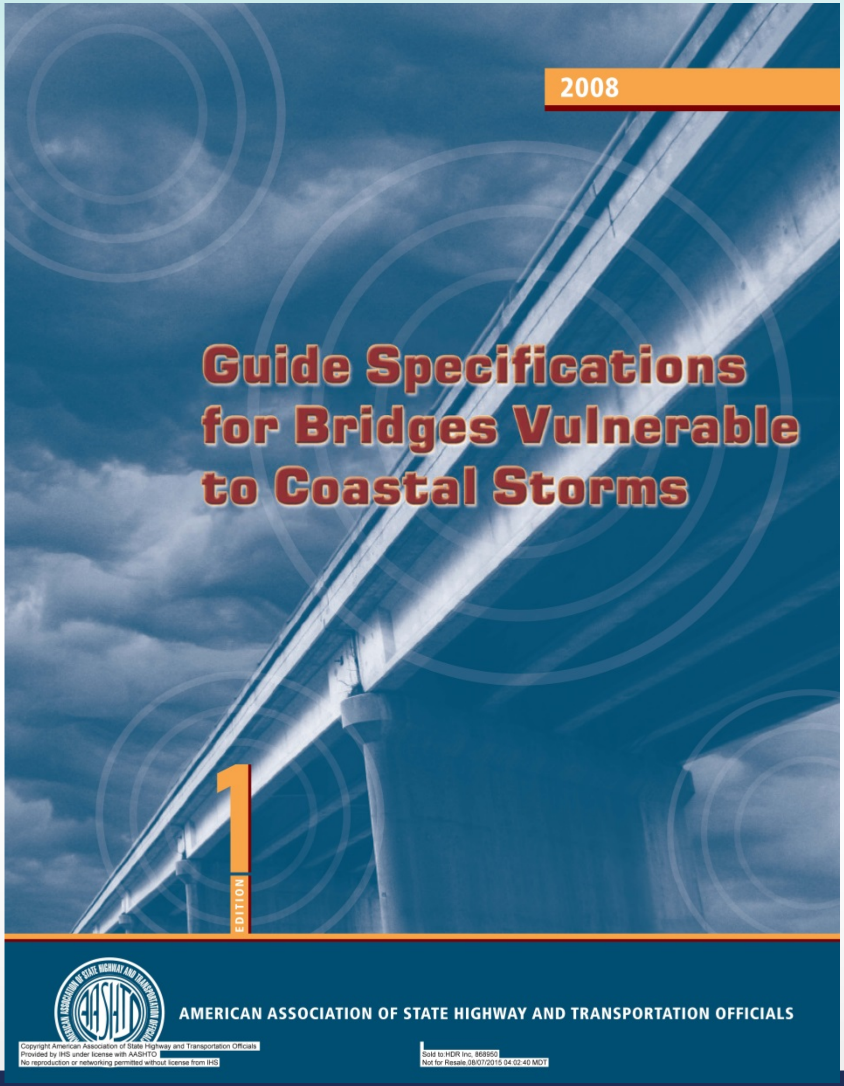
AASHTO Guide Specifications

- Clearance required – Superstructure to have 1ft. Clearance over 100-year design wave crest
- When not possible to Provide Clearance required:
  - Force mitigation Strategies
  - Design for Full Wave Load



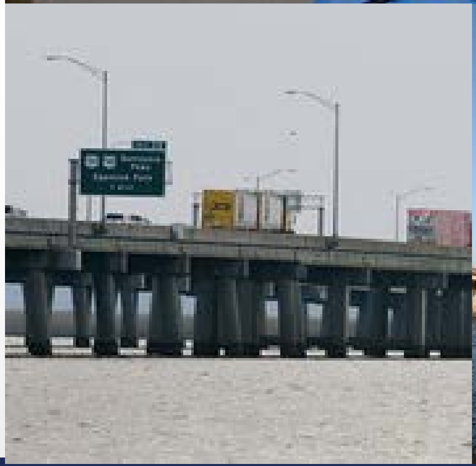
AASHTO Guide Specifications

- Bridge Designated a "Critical/Essential", (Service Immediate) – Use strength Load Combinations in AASHTO
- Service Immediate – sufficiently undamaged, stable and aligned for rescue and recovery after cursory inspection



Storm Surge Modeling Results

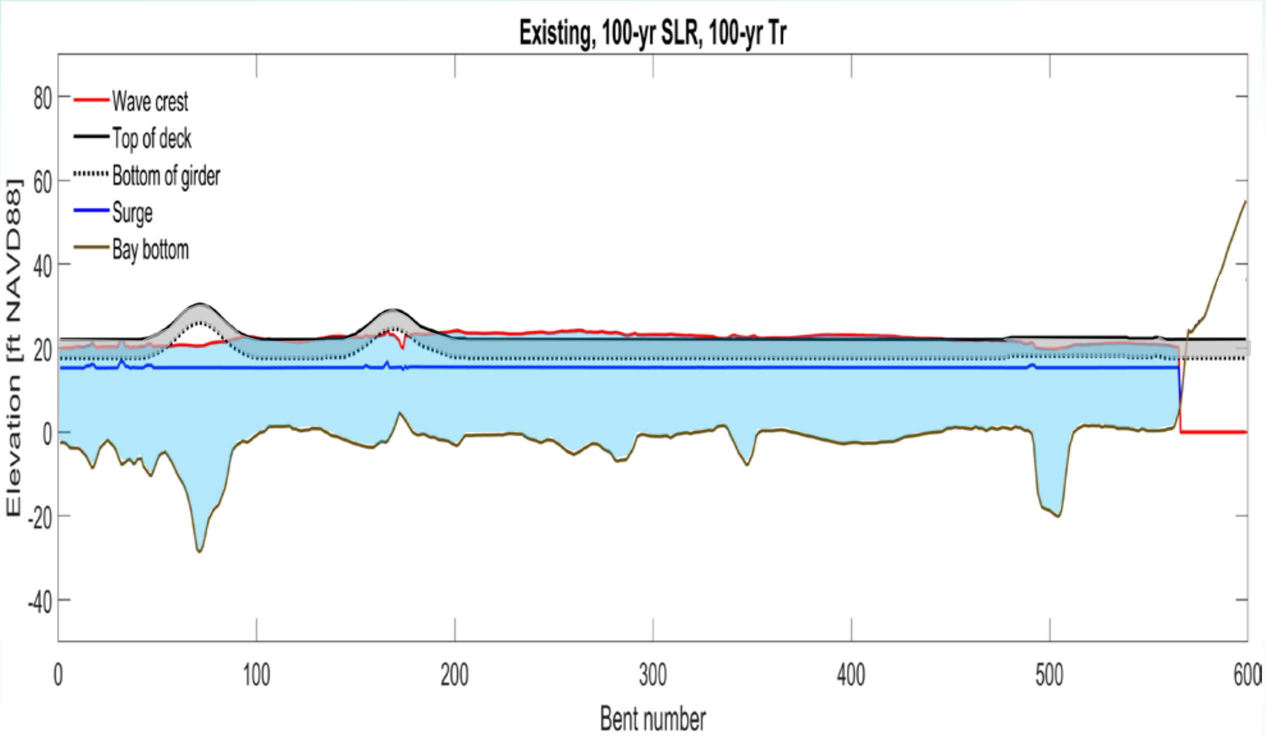
- Piles experience substantial loads over all 12 cases
- Deck elements experience substantial horizontal and vertical loads when the maximum water level reaches the superstructure
- For the 2017 100yr Storm 2017 SLR for Instance:
    - The wave crest elevation is impacting the deck for almost the entire length of the bridge

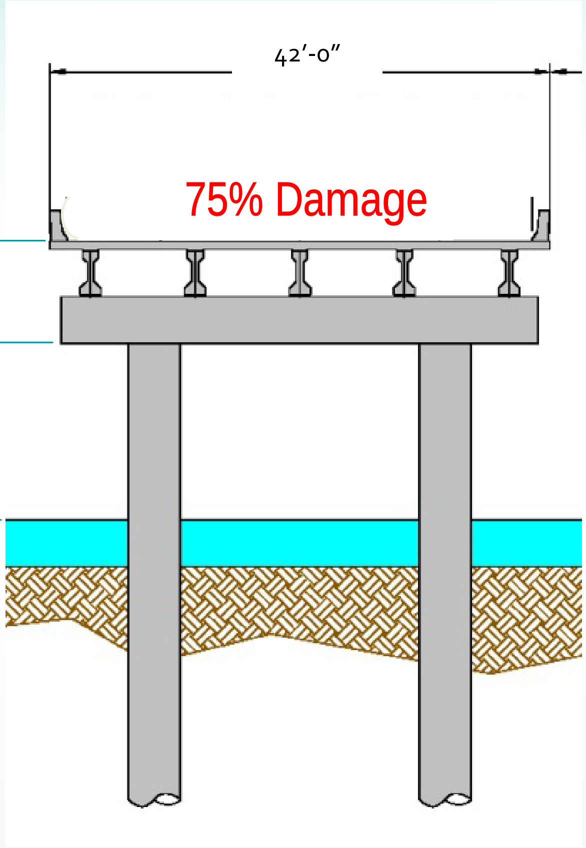


Structural Evaluations

- The analysis confirmed that a 100-year storm event would catastrophically damage a major portion of the <u>existing</u> I-10 Bayway structure beyond repair
- Past performance of Large Coastal Events on Bridges can be Broadly Grouped into three Categories:
  - Shifting of Spans on the Bent Caps
  - Damage to Girder Ends and Bent Caps from Impact of Superstructure on Substructure
  - Damage to bents from Lateral Loads Transferred to Them

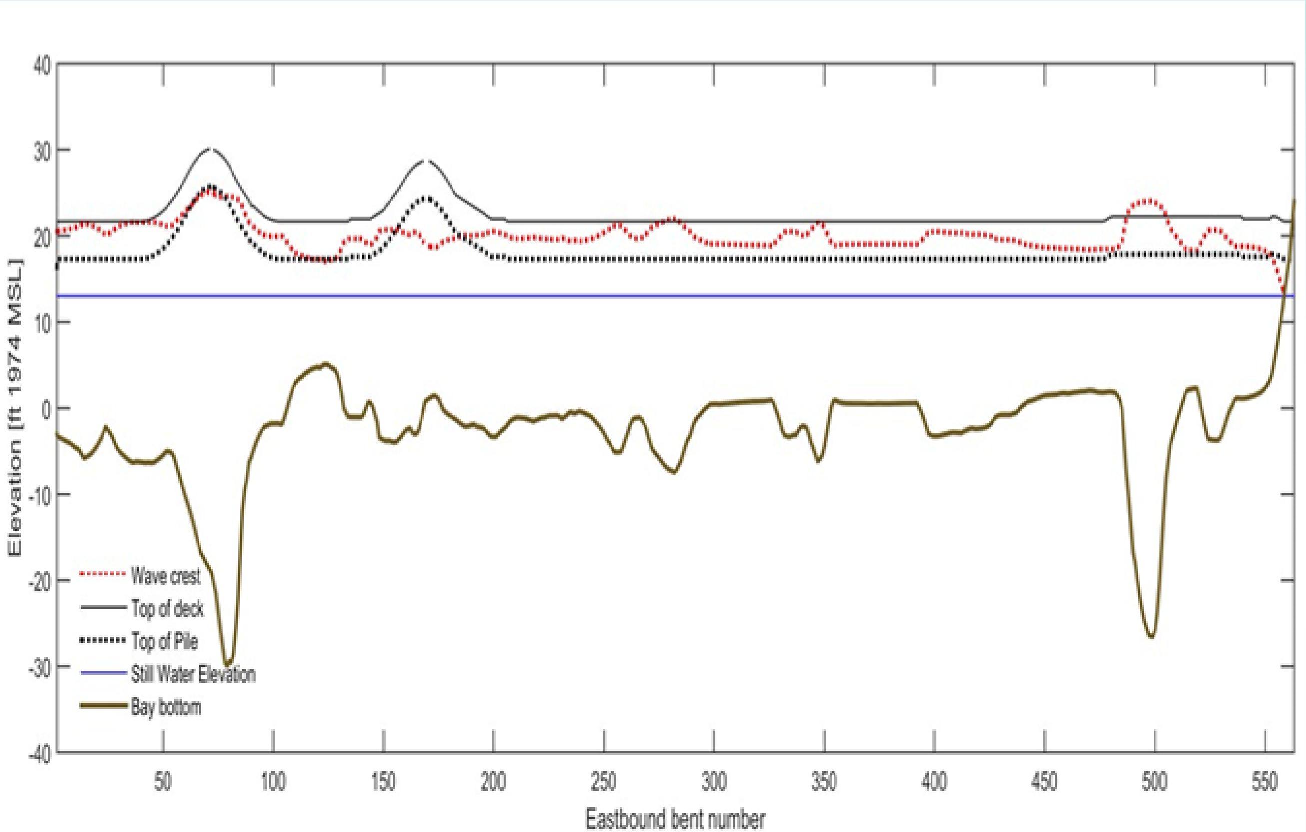
	Max Crest [ft NAVD]	Top of Deck [ft NAVD88]	Bottom of Girder [ft NAVD88]	Max Crest - Bottom of Girder
min	19.80	22.01	17.63	-5.47
max	24.28	30.40	26.02	6.60
average	22.19	22.85	18.47	3.72

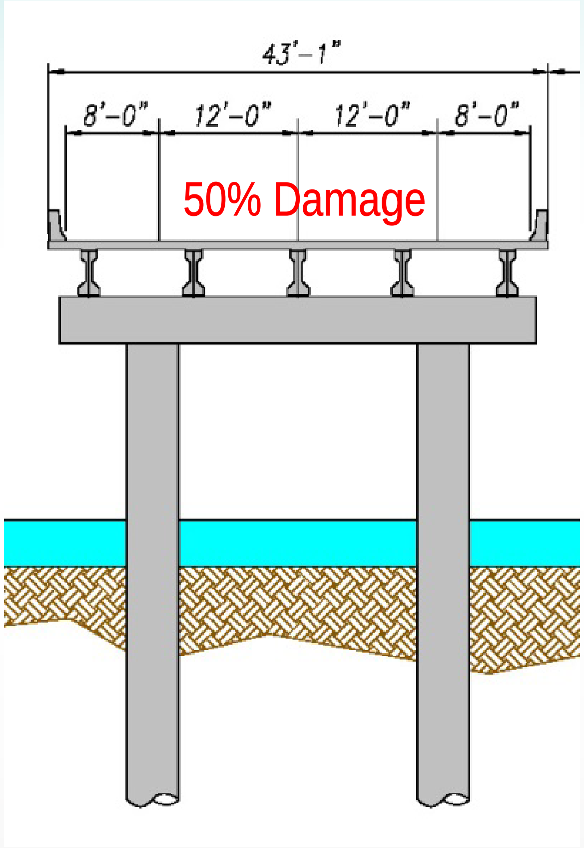




Bayway Analysis

100 yr Storm, 100 year SLR



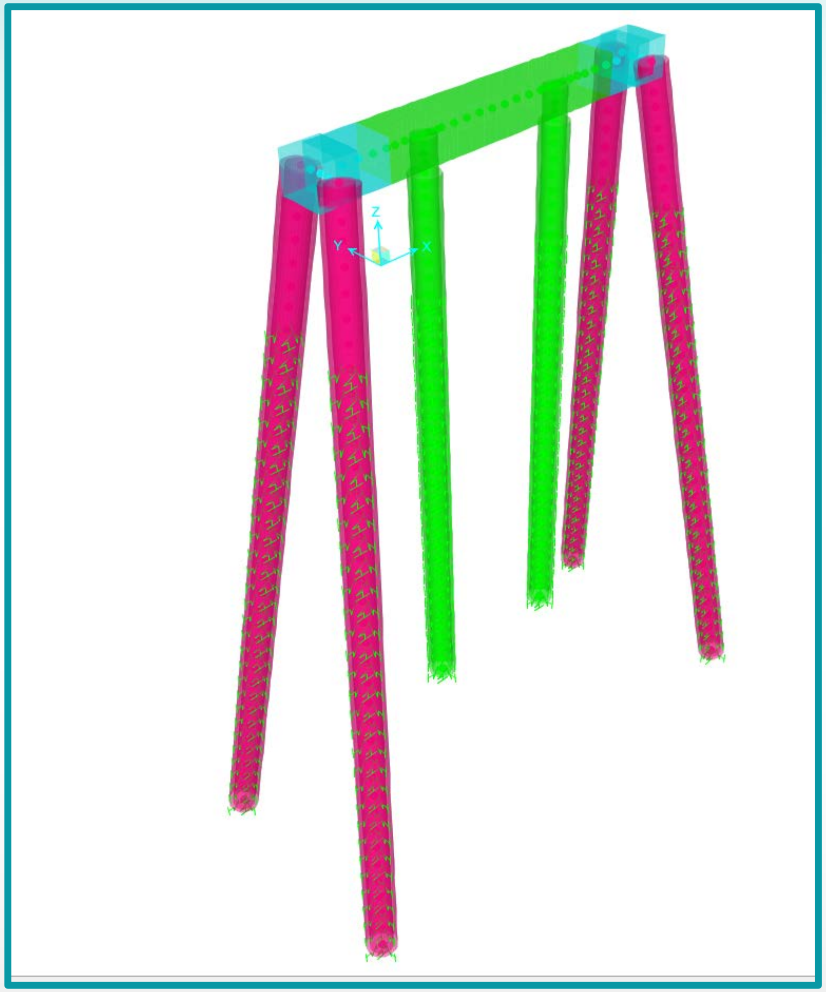


Bayway Analysis

50 yr Storm, 50 year SLR

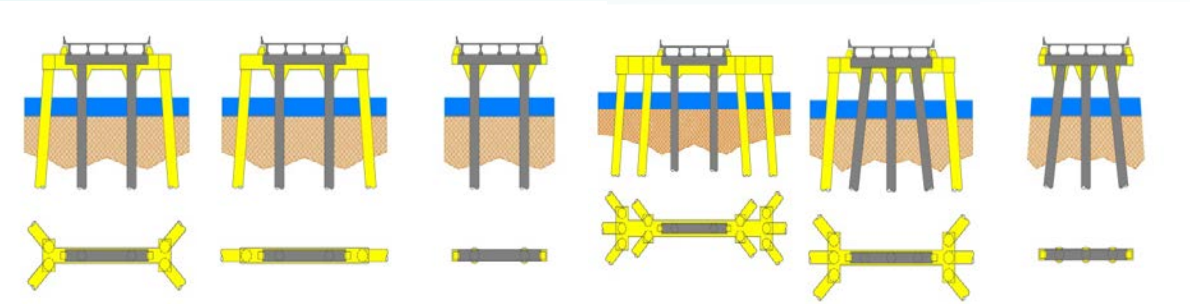
Analytical Approach

- Diagnostic models of the existing Design with the Proposed retrofits were Developed.
- This procedure was repeated until an optimal, or "preferred", retrofit strategy was obtained
- 23 Alternatives evaluated.



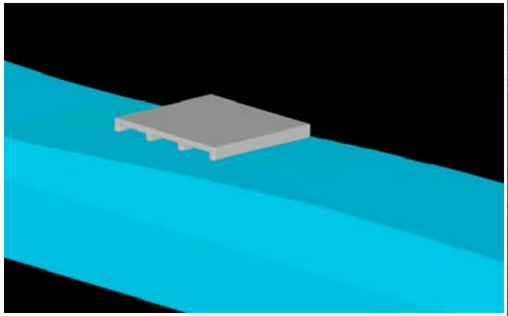
Summary of Retrofits

Substructure

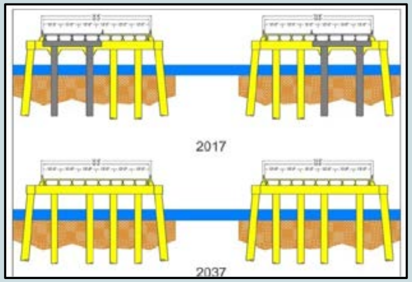
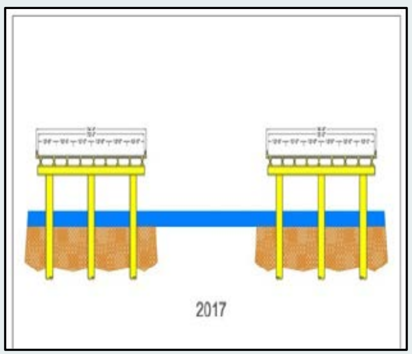
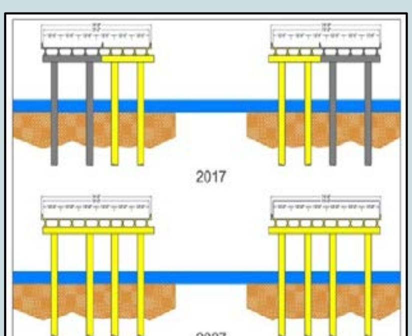


Superstructure

- Buoyant force lifts spans
- Fixing spans to substructure places force into bridge deck causing 75% to completely fail



Final Alternatives Considered - Bayway

Alternative	2017 $M (storm yr.)	2037 $M (storm yr.)	Total Cost $M
1 – Widen, strengthen and future replace 	$528M (50 yr.) $1,032M (100 yr.)	$1,092M (50 yr.) $1,330M (100 yr.)	$1,620M (50 yr.) $2,362M (100 yr.)
2 – All new 	$886M ($100 yr.)	$0M ($100 yr.)	$886M ($100 yr.)
3 – Raise existing, widen and future replace 	$577M (50 yr.) $696M (100 yr.)	$1,014M (50 yr.) $1,014M (100 yr.)	$1,591M (50 yr.) $1,710M (100 yr.)

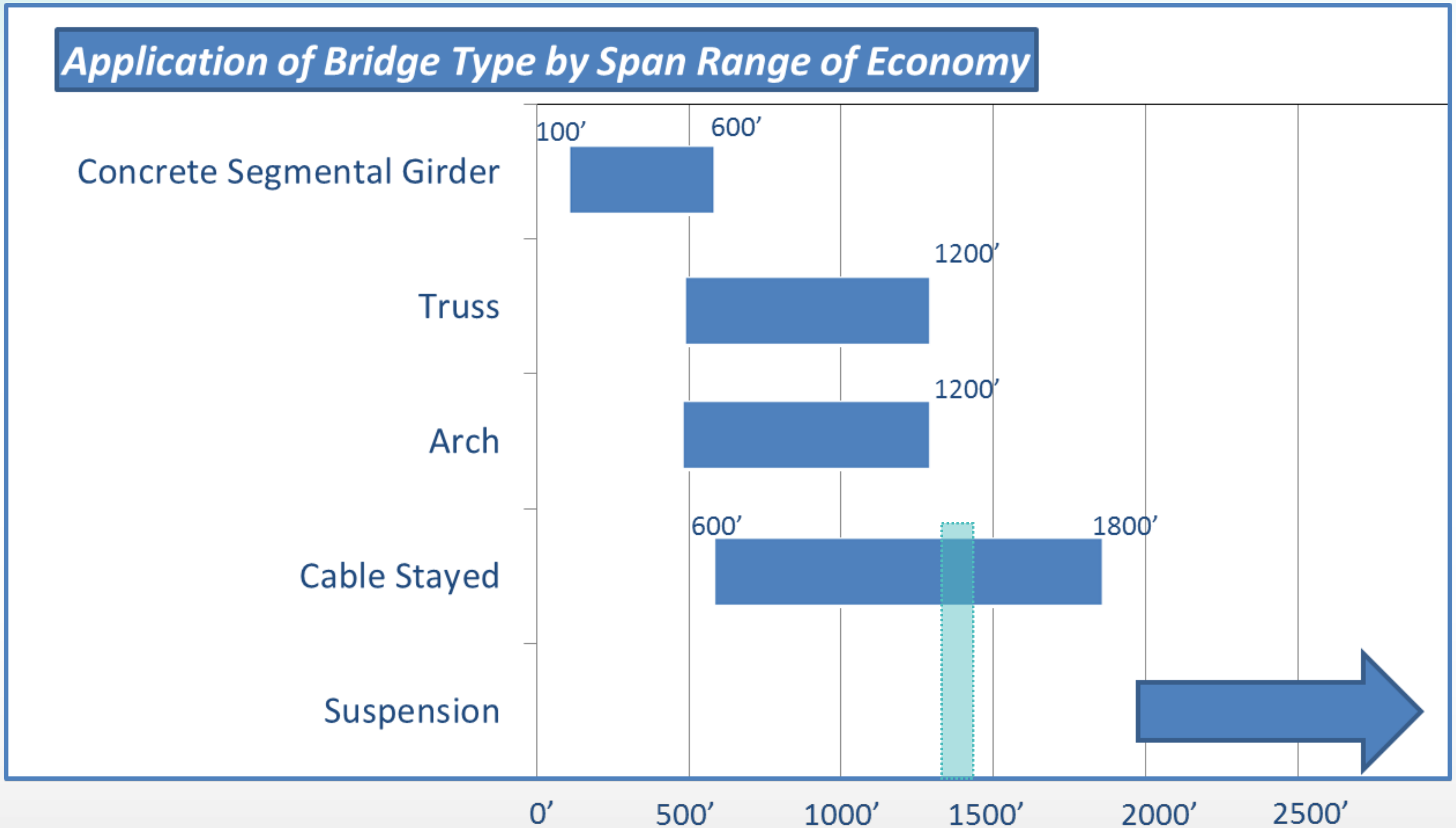
Main Span River Crossing

Main Span River Crossing

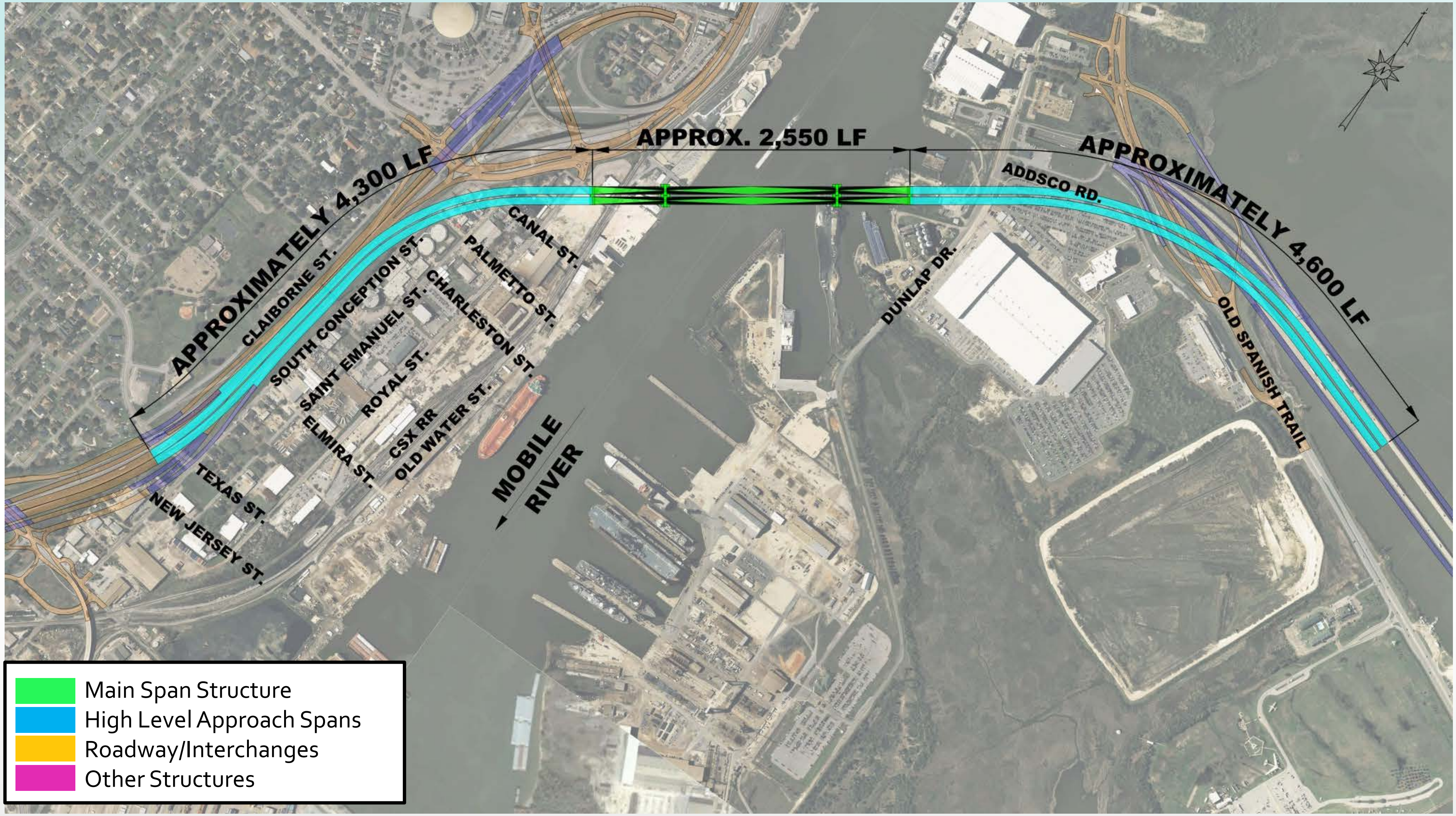
- Structure Type
- Navigational Clearances
- Costs vs ADC

Structure Type Selection

- Main Span



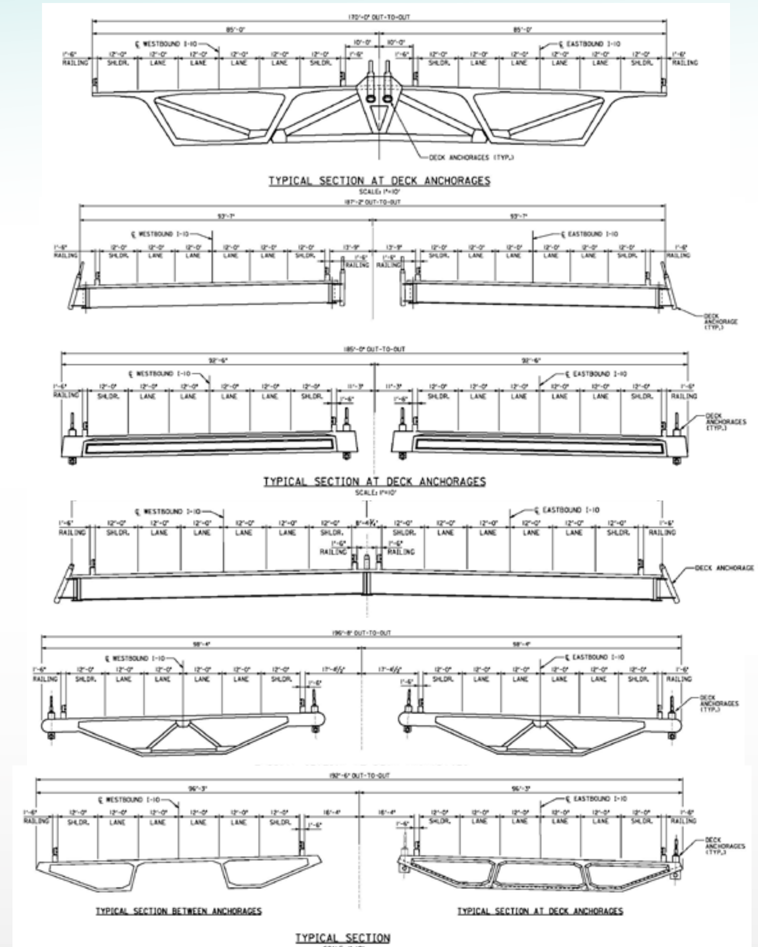
High Level Approaches & Main Span Unit Limits



MOBILE RIVER BRIDGE & BAYWAY

Main Span Bridge Alternatives

1. Precast Concrete Segmental
2. Steel Edge Girder – Split Deck
3. Cast-in-Place Concrete Edge Girder – Split Deck
4. Steel Edge Girder
5. Steel Double Deck
6. Precast Concrete Segmental – Split Deck
7. Cast-in-Place Segmental – Split Deck



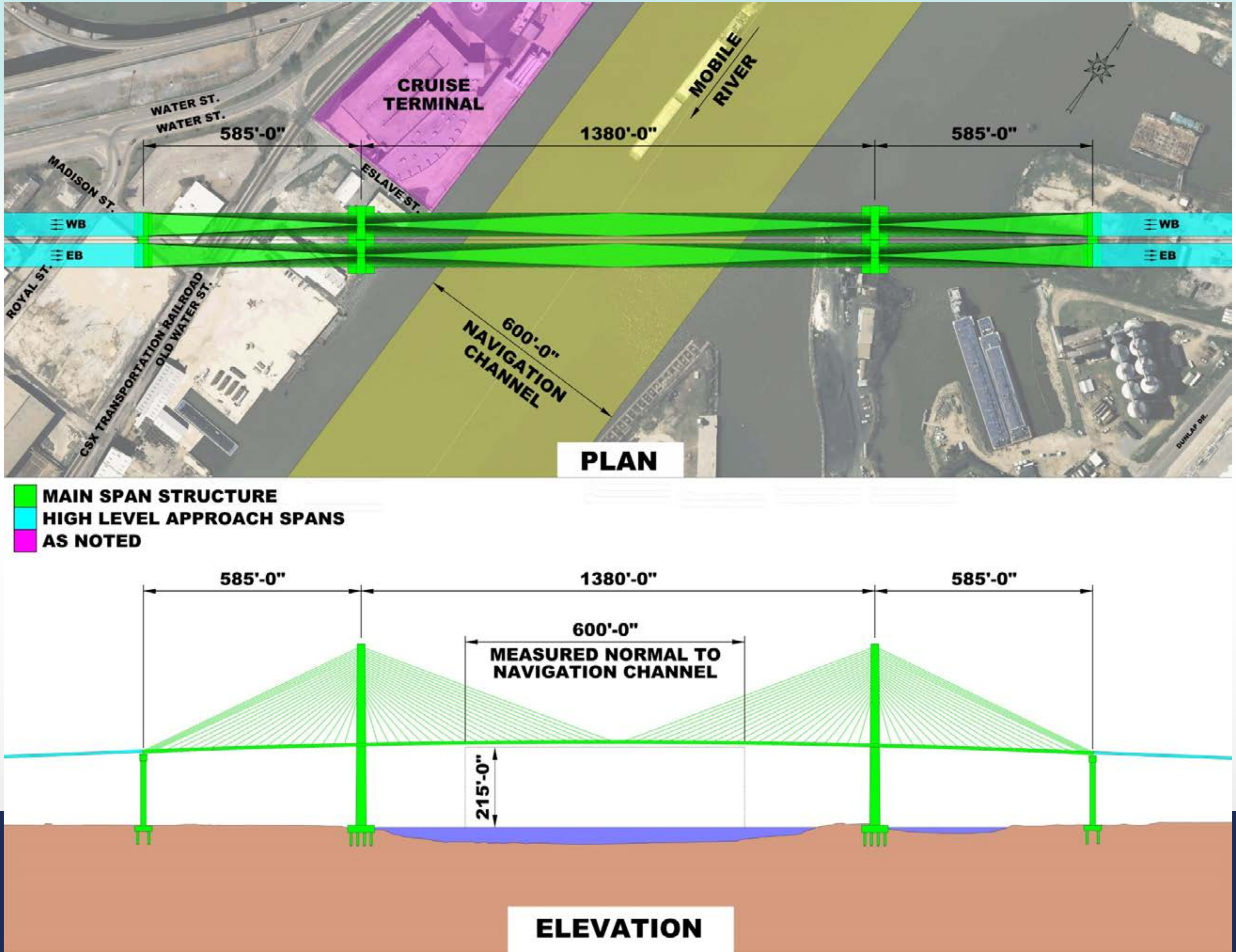
MOBILE RIVER BRIDGE & BAYWAY

2. Main Span Concepts Evaluation – Recommendations

Good = ● Fair = ◒ Poor = ○

Criteria	Main Span Bridge Alternatives: 1. Precast Concrete Segmental	2. Steel Edge Girder – Split Deck	3. CIP Concrete Edge Girder – Split Deck	4. Steel Edge Girder	5. Steel Double Deck	6. Precast Concrete Segmental – Split Deck	7. CIP Concrete Segmental – Split Deck
Initial Construction Cost ($) M	Good	Good	Good	Good	Poor	Fair	Good
Construction Schedule (Mos.)	40-45	40-45	40-45	40-45	42-50	40-45	40-45
Constructability	Good	Good	Good	Fair	Poor	Good	Good
Maintenance and Durability	Good	Fair	Good	Fair	Poor	Good	Good
Environmental Commitments	Good	Good	Good	Fair	Fair	Good	Good
Design Considerations	Fair	Good	Good	Good	Poor	Fair	Good
Overall	Good	Fair	Good	Fair	Poor	Good	Good

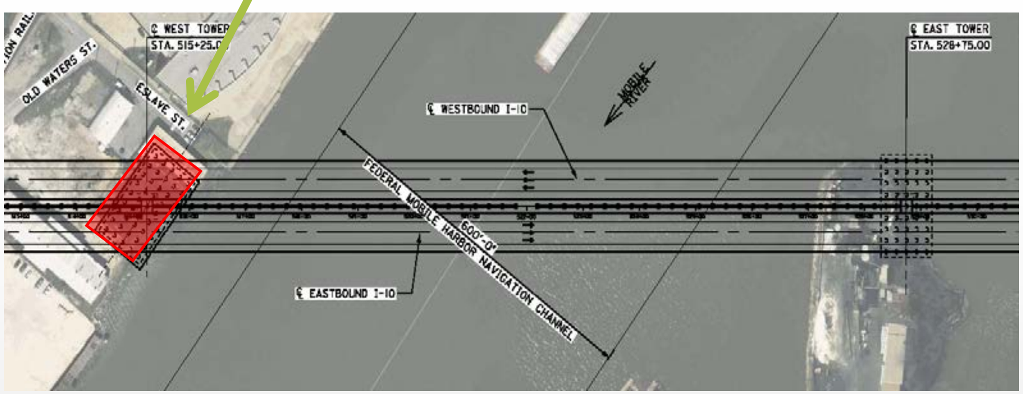
Main Span Bridge - Proposed Structure

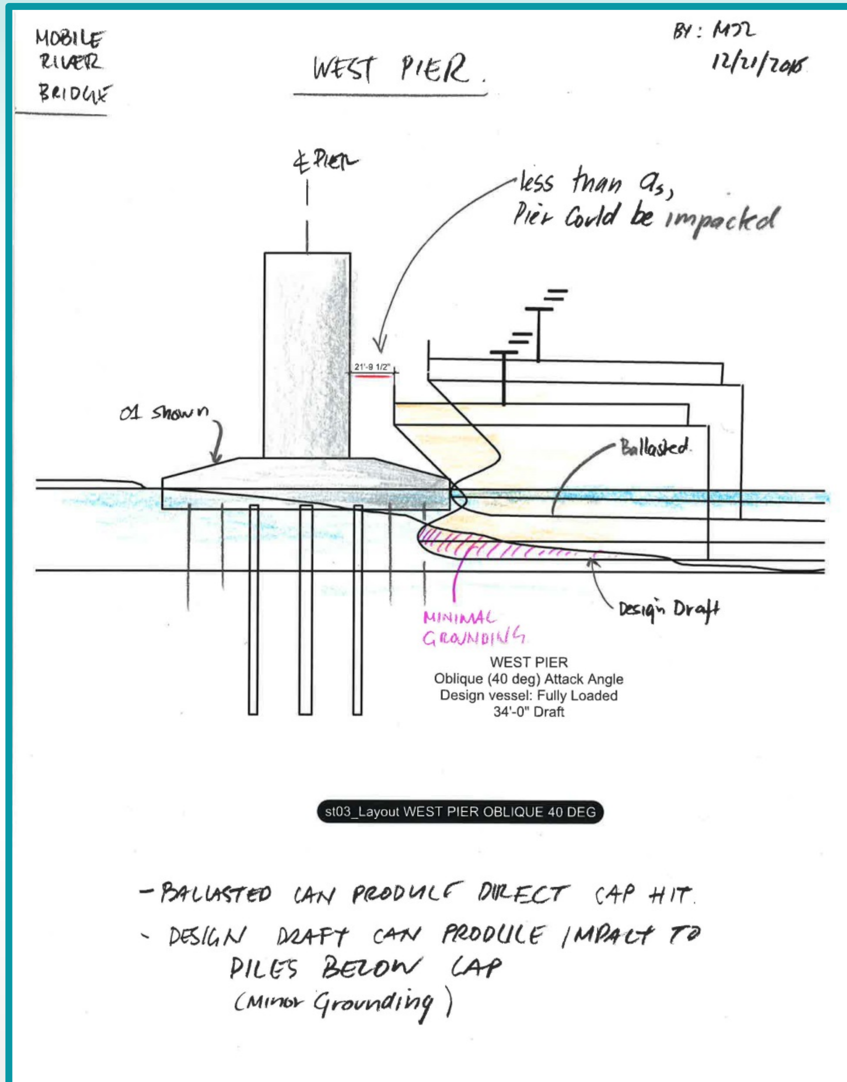


Vessel Collision Review

- West Tower:
  - Evaluated Design Vessel's Ballasted Draft and Design Draft

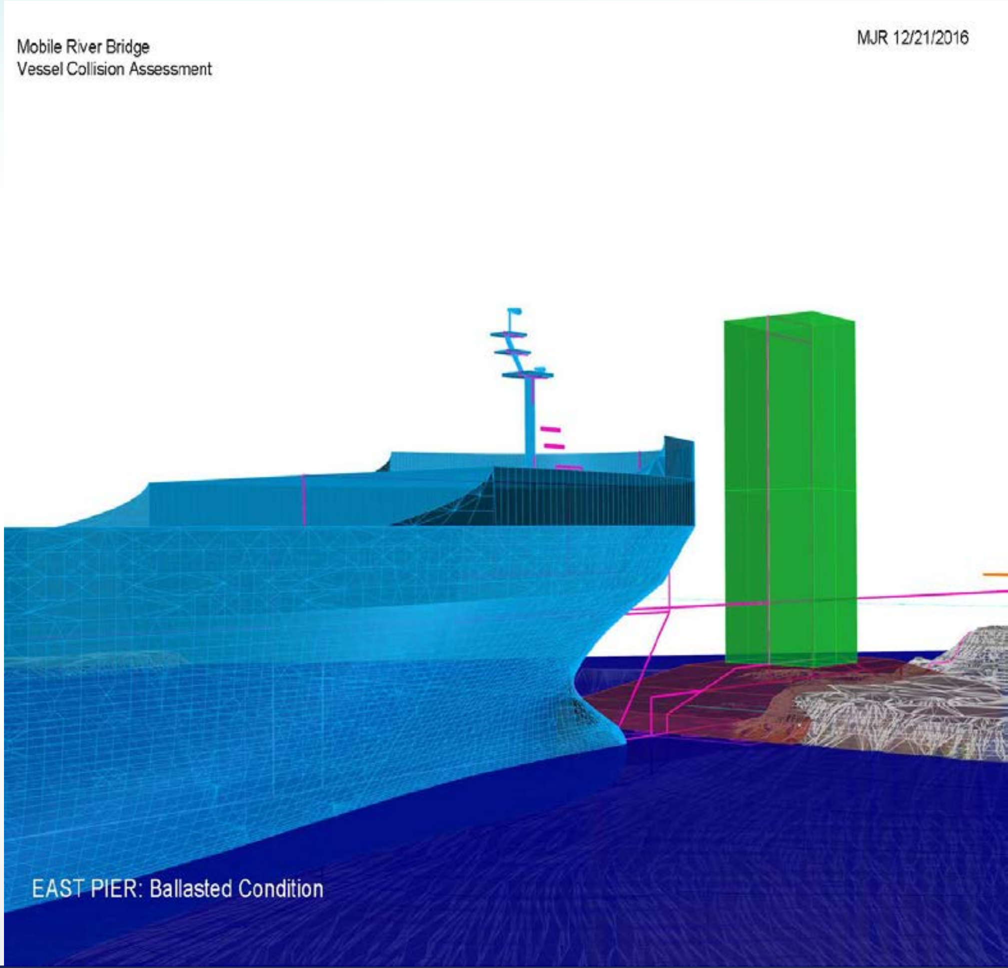
West Tower Foundation



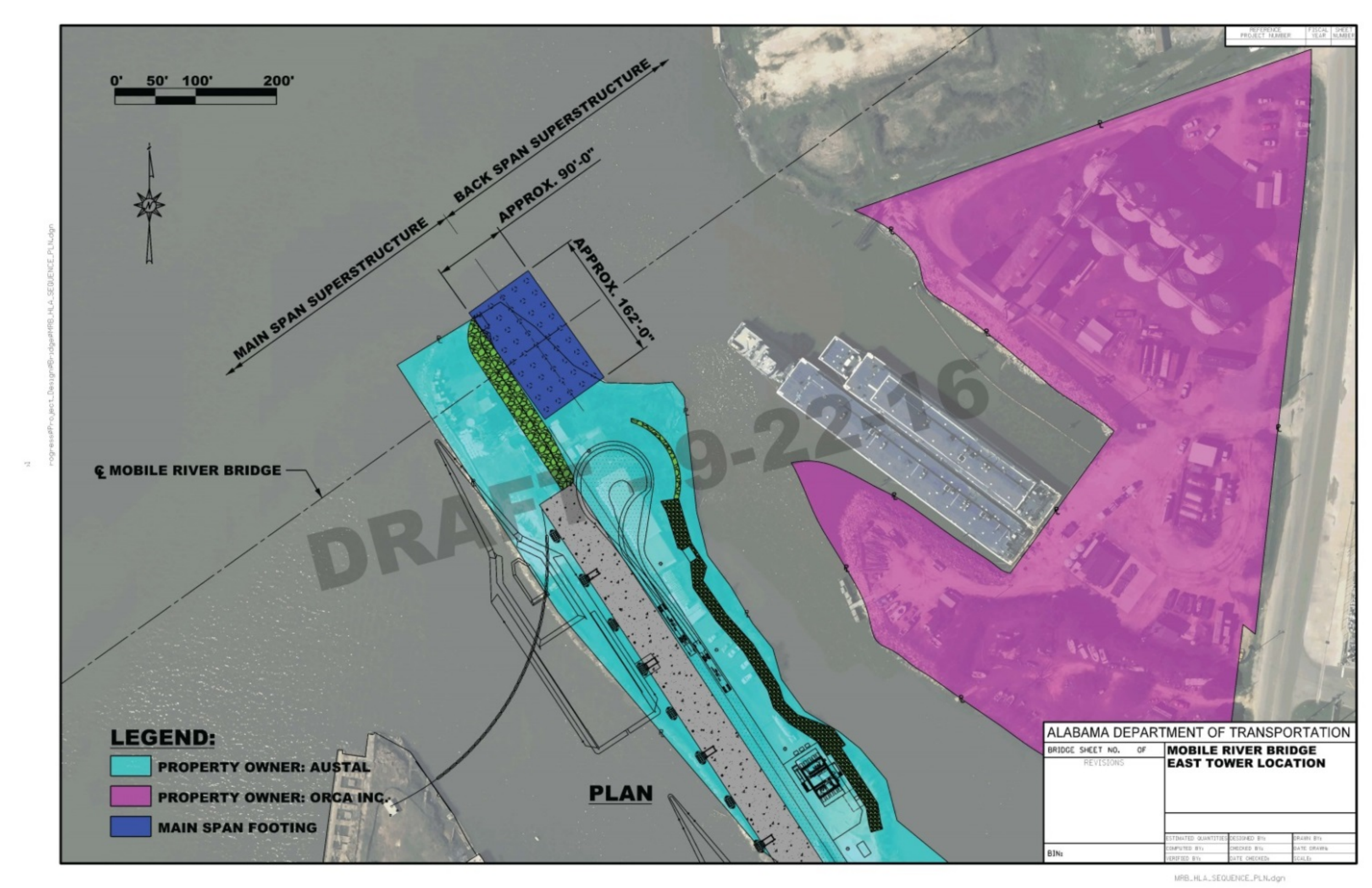


Main Span Bridge - Proposed Structure

- Location of tower foundations outside of navigational channel
- Foundations to be designed according to AASHTO including ship impact
- Rubber fenders will placed around foundations to minimize damage from incidental impacts



East Tower Location



Vessel Collision Review

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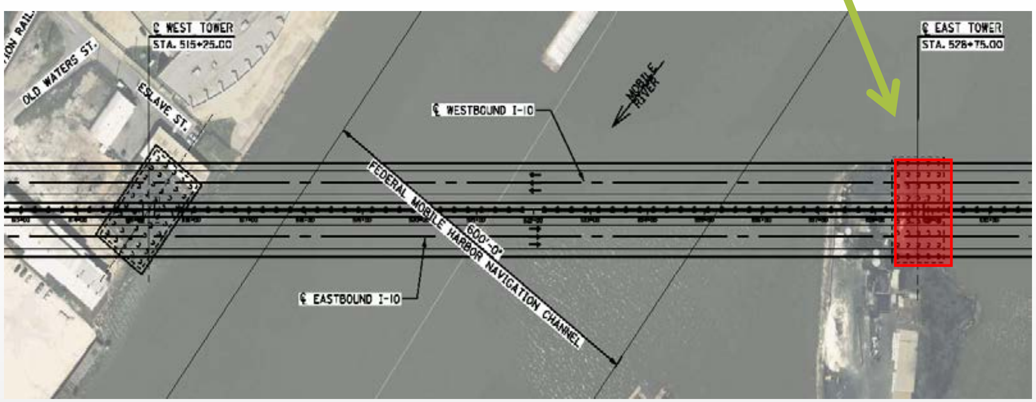
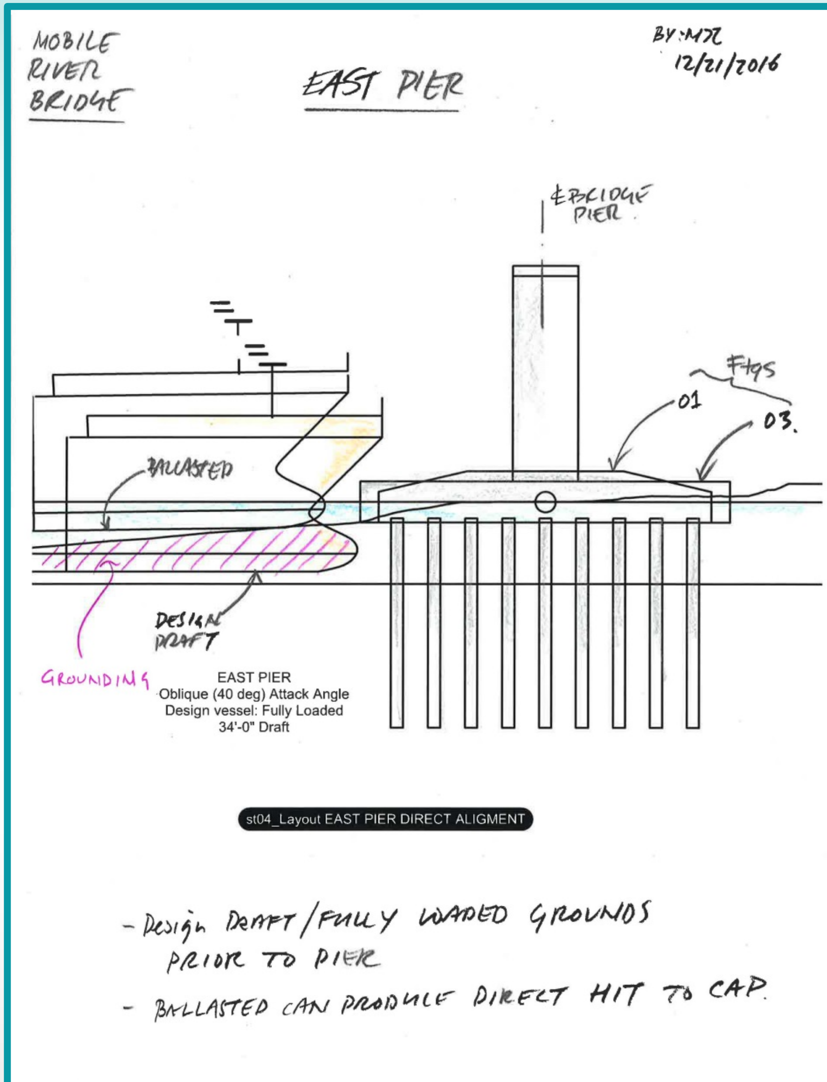
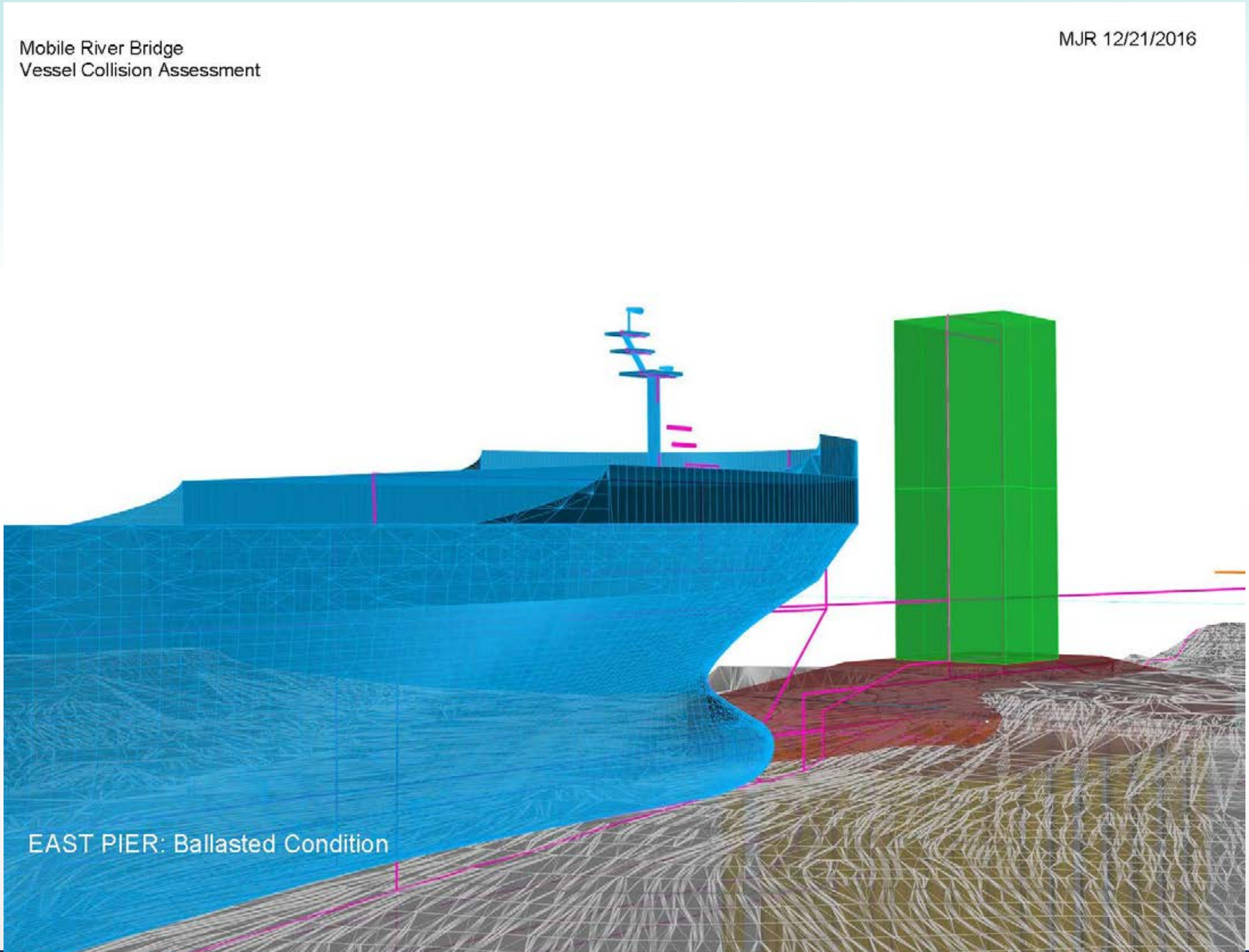
East Tower Foundation





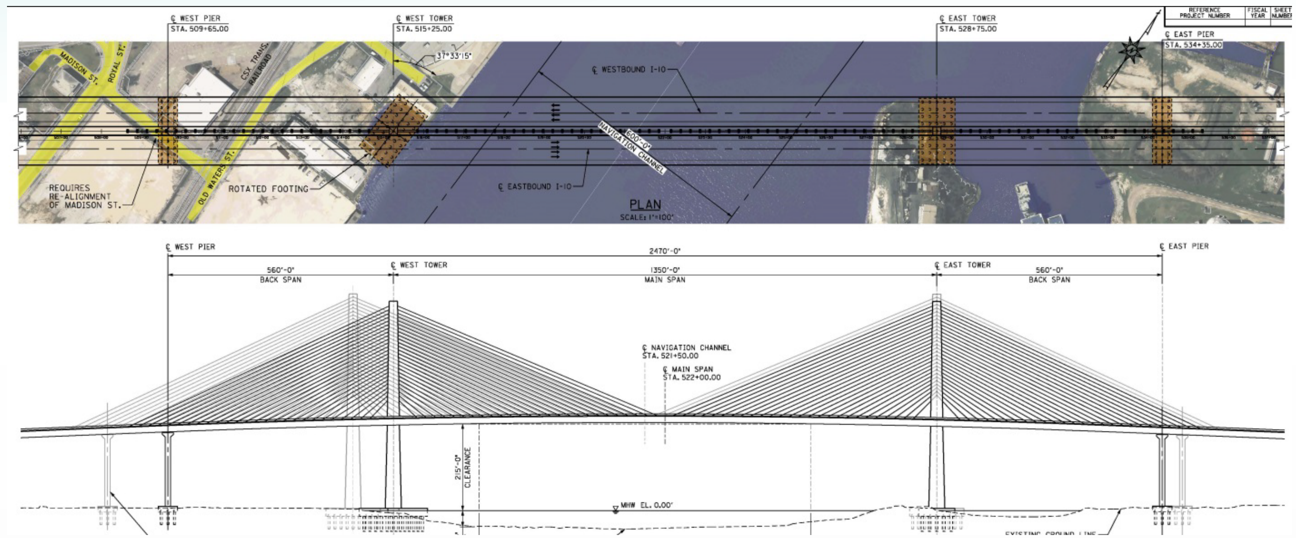
MOBILE RIVER BRIDGE & BAYWAY

East Pier – Ballasted



Optimized Main Span Length

- Received approval to place Pier on Madison Street:
  - Allows shortening of Back Span and Main Span
  - Places West Tower Closer to the Bulkhead
  - East Tower Location Unchanged



Navigational Clearances

- 600 ft. horizontal, 215 ft. vertical
- Established in Air Draft Clearance (ADC) report – Dec 2012 and included in DEIS
    - Increase in ADC in other ports
    - City of Mobile pursuing Conquest-class cruise ship (Freedom – 207 ft. of air draft)
    - Trend for larger vessels in the future
    - Various vessel types upstream of bridge
- Formally requested by Alabama State Port Authority, City of Mobile and Harbor Master

I-10 MOBILE RIVER BRIDGE
215 FEET AIR DRAFT CLEARANCE FOR TWO CARNIVAL CRUISELINE SHIPS

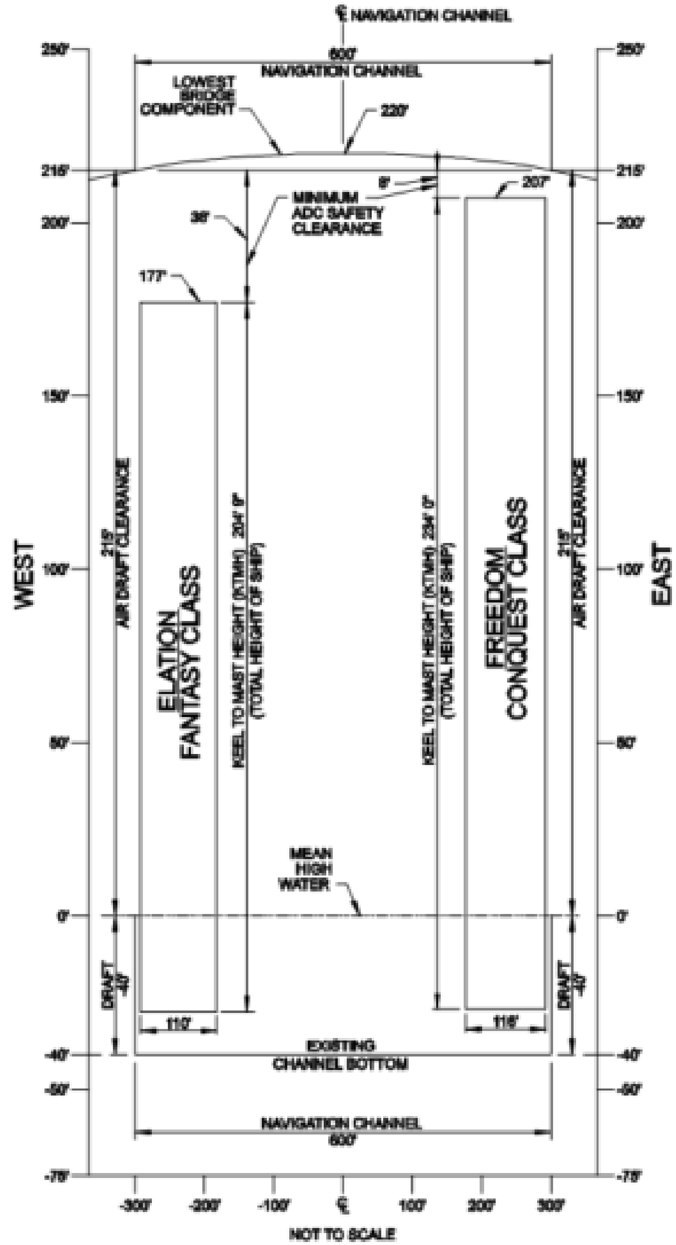


FIGURE 3

VOLKERT

RIVER BAYWAY

Costs – ADC Reduction

Construction cost savings for reduced vertical clearance

200 ft Air Draft	
Section	Reduction ($M)
West HLA	13.23
East HLA	3.78
Main Span	1.54
TOTAL	18.55
190 ft. Air Draft	
Section	Reduction ($M)
West HLA	21.96
East HLA	6.30
Main Span	2.70
TOTAL	30.96

Benefit to Cost Ratio with Increase in ADC from 190 to 215 ft. (DEIS)

Table 6: Benefit to Cost Ratio (BCR) for a Bridge with an Increase in ADC from 190 Feet to 215 Feet

Alternative	Incremental Construction Cost ($M)	Average Annual Cost ($M)	Average Annual Benefits ($M)[1]	BCR	Net Benefits ($M)[2]
A	21.1	1.00	8.0	8.0	7.0
B	23.1	1.10	8.0	7.3	6.9
B’	23.3	1.11	8.0	7.2	6.9
C	18.9	0.90	8.0	8.9	7.1

[1] See **Table 2**

[2] Average Annual Benefits minus Average Annual Cost

Procurement

Procurement Timeline

- Began in June 2017
- Latter Stage of RFP Phase
- Significant Milestones
  - Final RFP (August 2019)
  - Final Proposals (December 2019)
  - Conditional Award (March 2020)
  - Financial Close (2020)

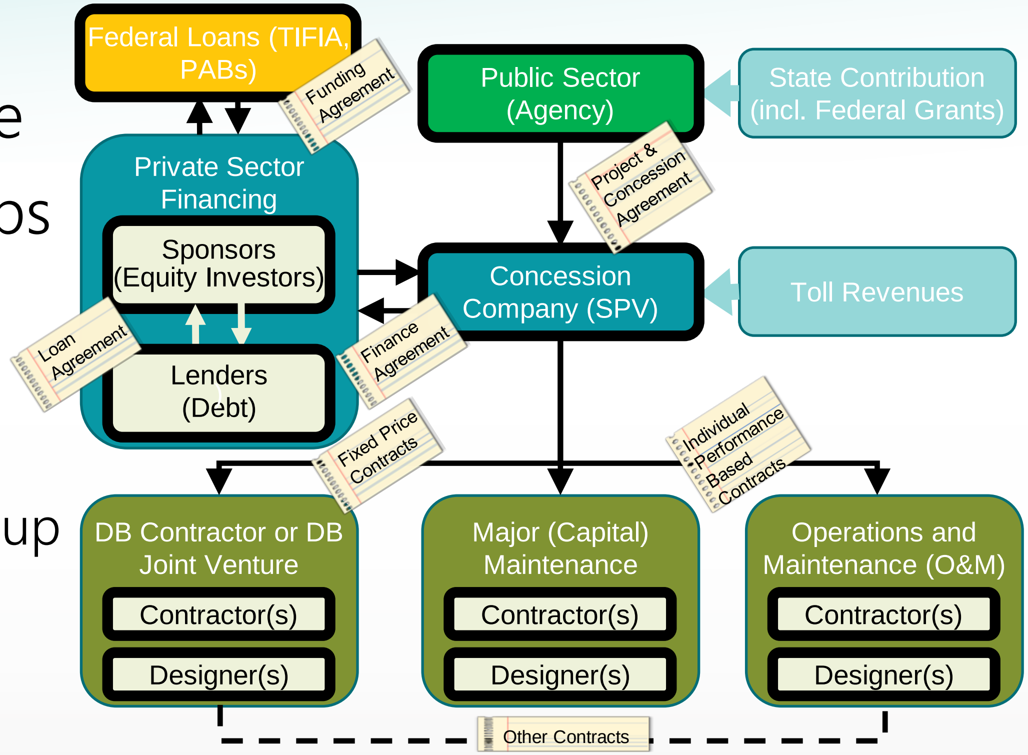
RFP

1Q - 2020

Strategy & Planning	Industry Outreach	RFQ	RFP	Award	Commercial Close	Financial Close
2017	3Q - 2017	1Q - 2018	1Q -2020	1Q - 2020	2Q - 2020	2020

DBFOM Structure (Typical)

- Representative Structure
- Contractual Relationships
- For MRB, Three Teams
  - I-10 Mobility Partners
  - Gulf Coast Connectors
  - Mobile River Bridge Group



Short-Listed Teams

	I-10 Mobility Partners	Gulf Coast Connectors	Mobile River Bridge Group
Equity	Cintra Meridiam	ACS Infrastructure Macquarie HOCHTIEF John Laing	InfraRed Capital Partners Shikun & Binui Southland Holdings
Contractor	Ferrovial Agroman Parsons	Dragados Lane Flatiron SICE, Traylor, Massman	FCC Shikun & Binui Johnson Brothers
Engineering	Parsons AECOM Arcadis	T.Y. Lin Volkert	FIGG Bridge Engineers Stantec Consulting
Operations & Maintenance (O&M)	Cintra Meridiam	ACS Infrastructure Macquarie, HOCHTIEF John Laing	InfraRed Capital Partners Shikun & Binui
Toll System Integrator & Operator	Cintra Meridiam	SICE	InfraRed Capital Partners Shikun & Binui

Capital Construction Cost Estimate

- Based on Reference Design
- Capital Construction and Related Costs Only

Project Component	Cost
Bridges	
Main Span Bridge & High Level Approaches	$518,866,000
Bayway	$909,854,000
Subtotal (Bridges)	*$1,428,720,000*
Interchanges	
Virginia Street	$45,692,000
West Tunnel	$38,467,000
East Tunnel	$62,209,000
Mid-Bay	$18,572,000
US 90/98 Eastern Shore	$30,399,000
Subtotal (Interchanges)	*$195,339,000*
Additional	
Bicycle / Pedestrian	$13,272,000
ITS / Traffic Management Center	$28,181,000
Aesthetic Lighting	$10,145,000
Other	$29,389,000
Design / Construction Engineering /Quality Control	$204,605,520
Subtotal (Additional)	*$285,592,520*
ALDOT	
Change Orders / Added Features	$34,100,920
Project Oversight	$69,279,886
Other	$53,120,000
Subtotal (ALDOT)	*$156,500,806*
Total (Capital Construction Cost):	**$2,066,152,326**

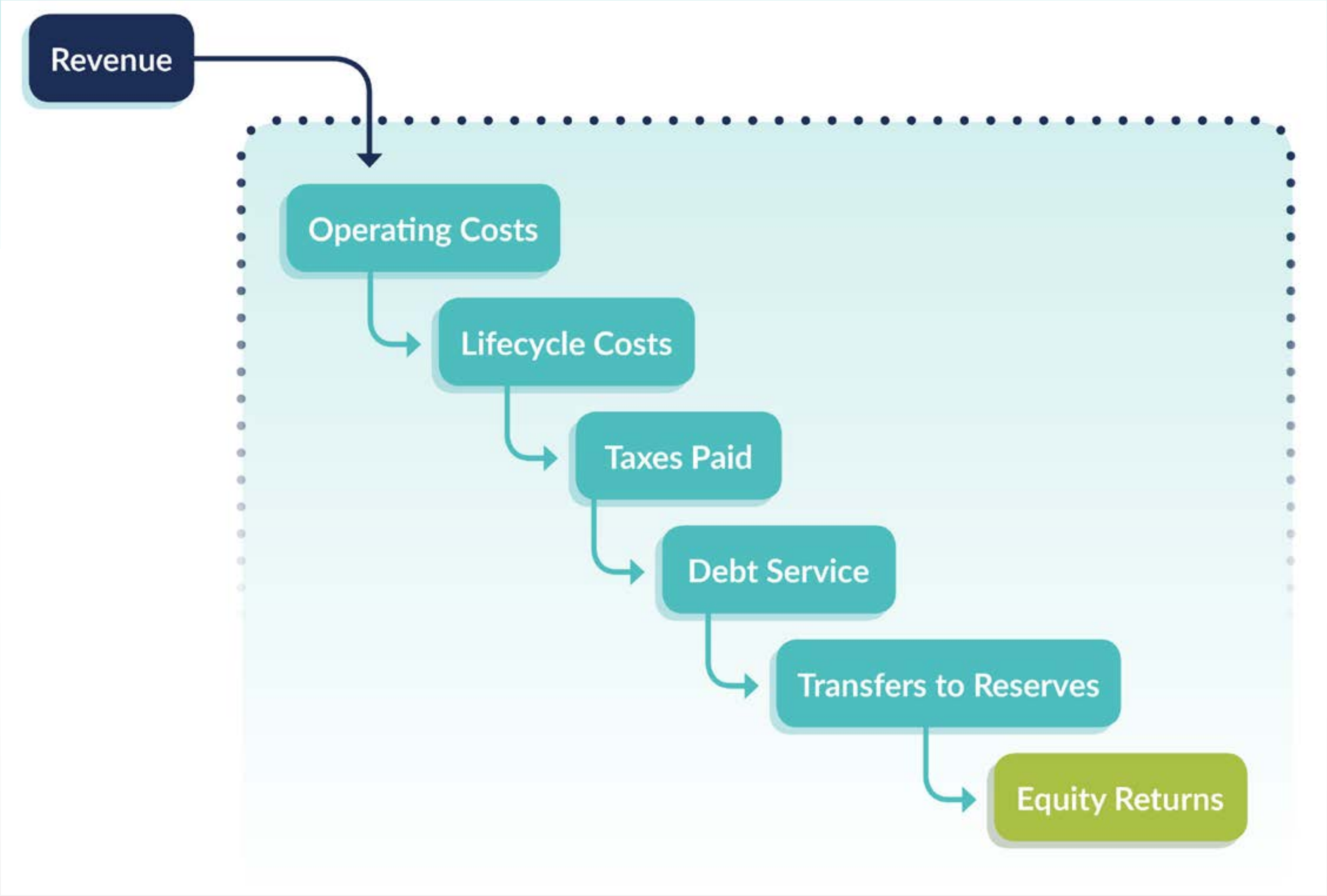
Financing

Conceptual Financing Structure

Expected Sources of Funds during construction:

- Senior Debt (Private Activity Bonds; PABs)
- Subordinated Debt (Transportation Infrastructure Finance and Innovation Act; TIFIA)
- Infra Grant
- Equity

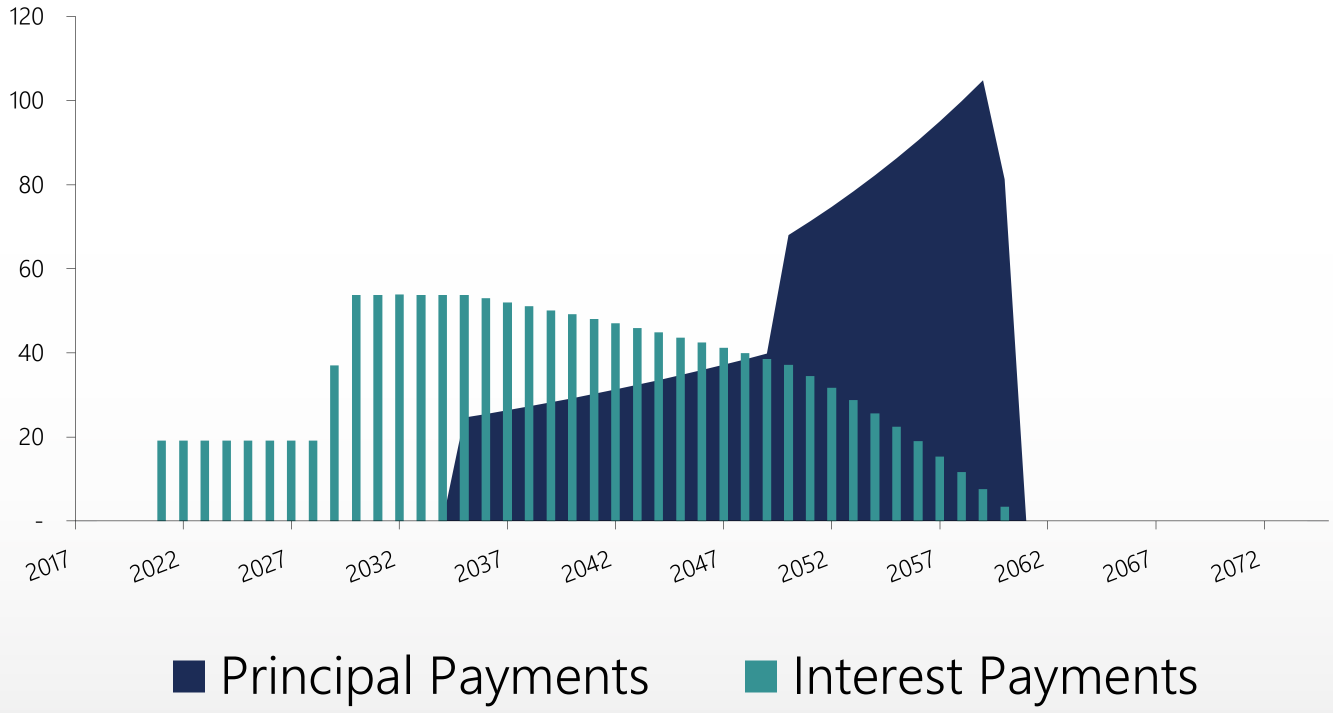
Conceptual Financing Structure



Conceptual Financing Structure

Debt Service Structure

(Millions; $)



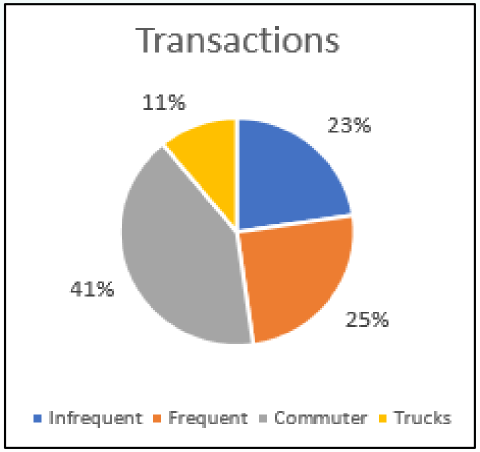
Toll Policy

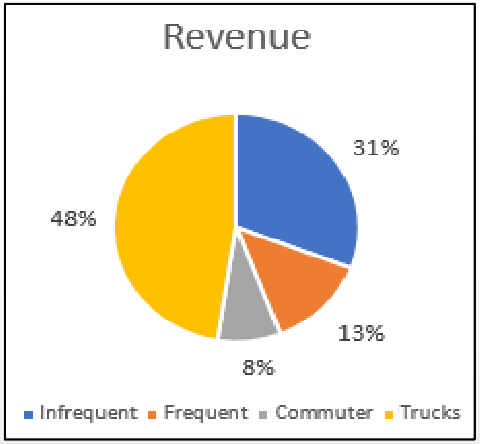
ALDOT Toll Policy Development

- The initial range of toll rates considered for the project was $2 -$10
- After considering Mobile and Baldwin Counties users economic circumstances, precedent projects and rates required to make the Project feasible the range was narrowed to $3 - $6
- ALDOT hosted Public Hearings in May 2019 to get feedback from the public on the project
- In response to this feedback, ALDOT developed a new toll policy that minimizes toll rates for Mobile and Baldwin Counties users and Alabama tax payers

New Toll Policy

- New toll policy offers 2 discount programs with the main objective to benefit local users:
  - Frequent users (16-to-40 trips per month) would pay an average of **$3.74** per trip
  - Commuters and high frequency users (more than 40 trips month) would pay $**2.25** or an average of **$1.41** per trip respectively
- In contrast infrequent users would pay a higher rate per trip
- Only 21% of the Project's Revenue is expected to come from local users even though they will make up 66% of the trips
- ALDOT has shifted the majority of the cost of the project away from Alabama tax payers





MOBILE RIVER BRIDGE & BAYWAY

Legal

Toll Buy-Down Program

- Under ALDOT's contract with the Concessionaire, ALDOT is allowed to provide funds to implement a "Toll Buy-Down" program
- Allows ALDOT to reduce tolls charged to users of the project
- Funds committed to the program by ALDOT will be placed into an account and be paid to the Concessionaire to subsidize the buy down of the toll rates
- ALDOT will work with the Concessionaire to determine the portion of toll charges that will be reduced, the period of implementation, the classes of vehicles that will be affected or any other parameter
- Once the program is implemented, eligible users will pay only the reduced toll rate and ALDOT will pay the remaining portion of that toll rate
- The Concessionaire will collaborate with ALDOT to publicly advertise the program
- Any funds remaining in the account after the completion of the program will be returned to ALDOT