



# Hillsborough MPO Surface Transportation Resiliency Planning

Allison Yeh, AICP, LEED GA

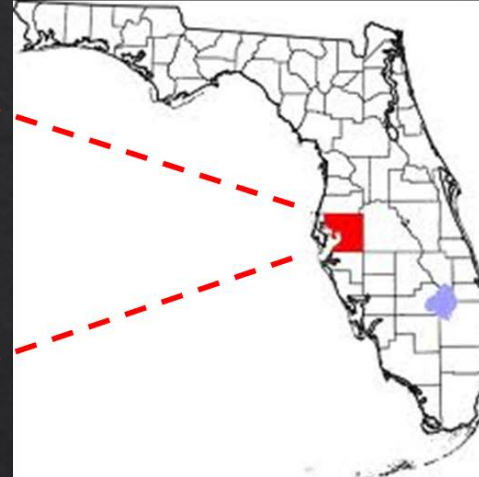
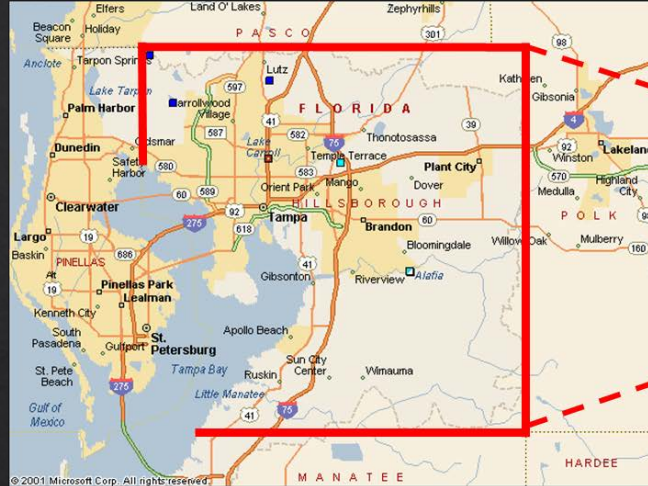
NASEM\_TRB Listening Session  
March 27, 2017



[planhillsborough.org](http://planhillsborough.org)



# Hillsborough County, Florida



- 158 miles of coastline
- 4<sup>th</sup> Largest Population in Florida (1.3 Million)
- 25% of the population inside the FEMA floodplain
- Economic Hub of Tampa Bay Metropolitan Region
- Largest seaport in Florida
- Major cruise homeport
- Home to US Central Command & Special Operations Command Center
- Tampa General Hospital – Regional Burn Center

# Surface Transportation Assets

- 800 Freeways & Toll Road Lane Miles
- 3,300 Arterial & Collector Lane Miles
- 3 Major Bridges Across Tampa Bay /Evacuation Routes
- Tampa International Airport
- Container, Bulk Cargo & Cruise Ship Terminals
- 9 Transit Centers & 243 Vehicle Fleet
- Heritage Streetcar System
- Class I Rail Lines & Intermodal Yard





# Let's Design Hillsborough's Future

A collaboration of the Planning Commission and the Metropolitan Planning Organization for Transportation



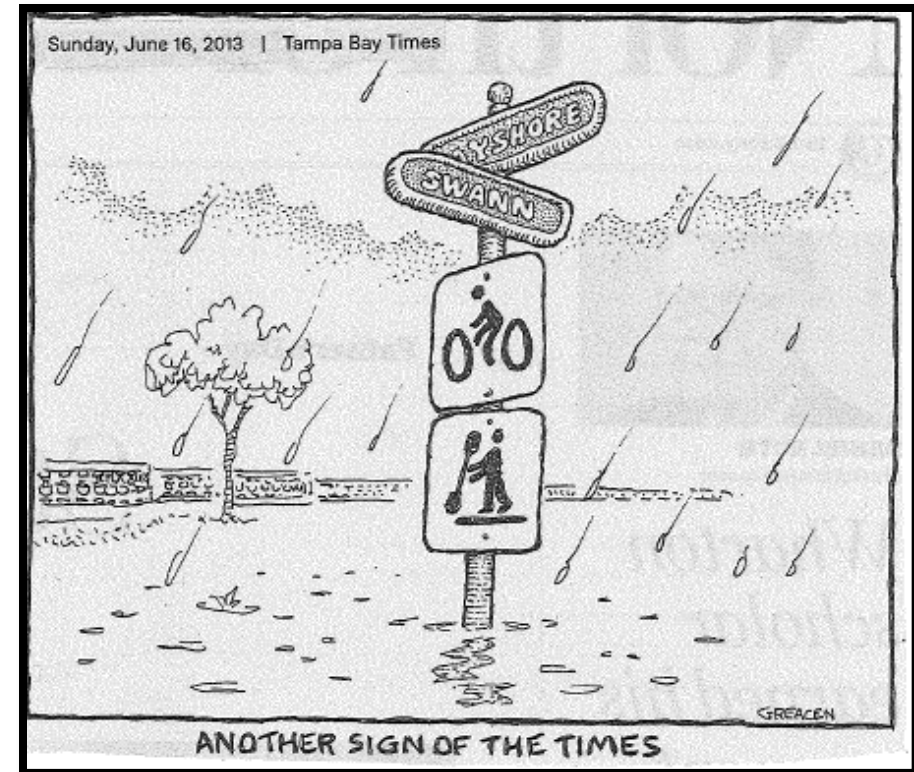
# Debbie 2012



# Hermine 2016



What do we mean by *Reducing Vulnerability?*





# Performance Measures



## Preserve the System

- Road resurfacing schedule
- Bridge repair schedule
- Vehicle replacement schedule



## Reduce Crashes & Vulnerability

- Total crashes, fatal crashes, and walk/bike crashes
- Economic impact of a major storm



## Manage Traffic for Drivers & Shippers

- Peak-hour travel time reliability
- Affected truck trips



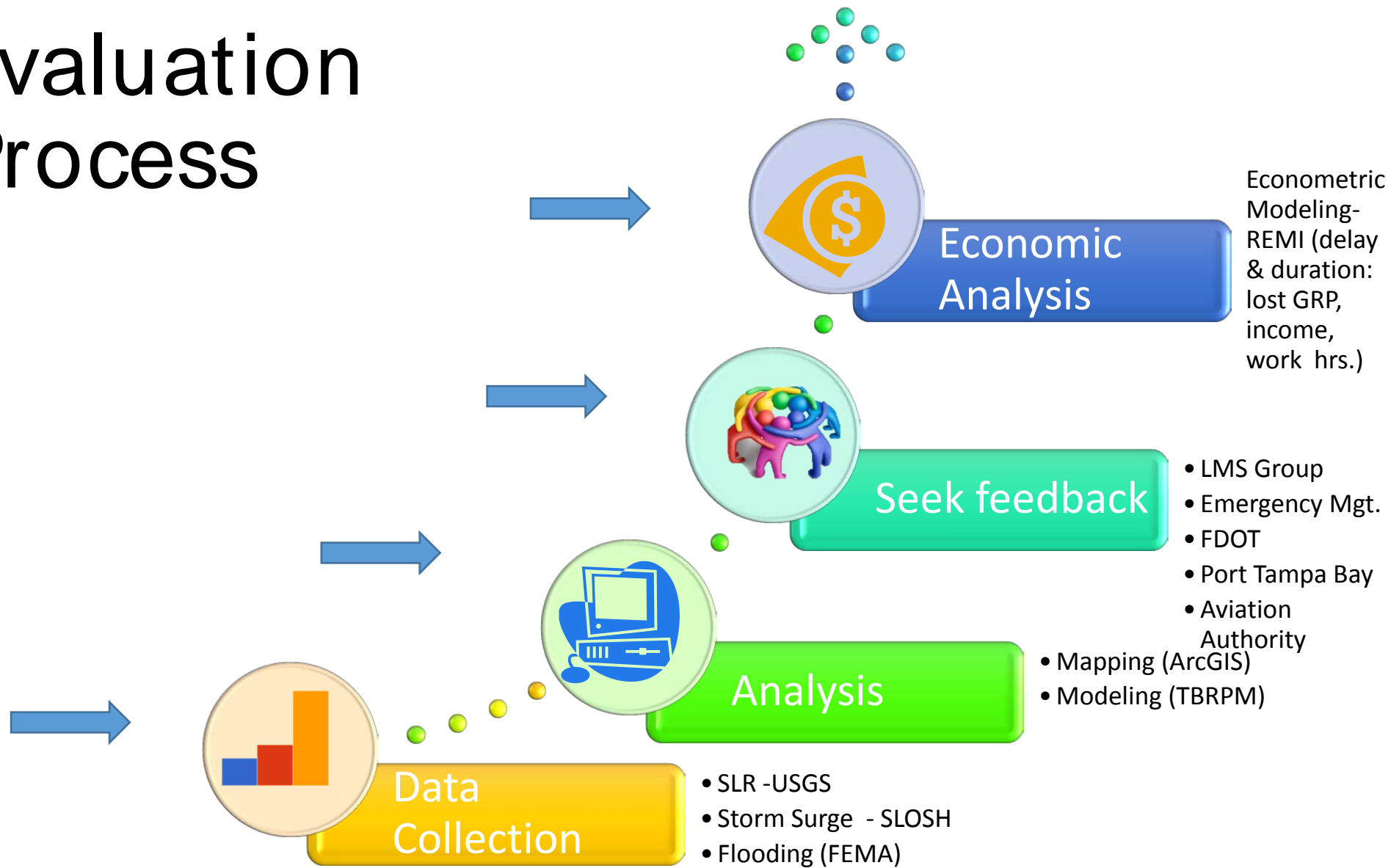
## Real Choices for Non-Drivers

- People & jobs served by the bus system and trail/sidepath network

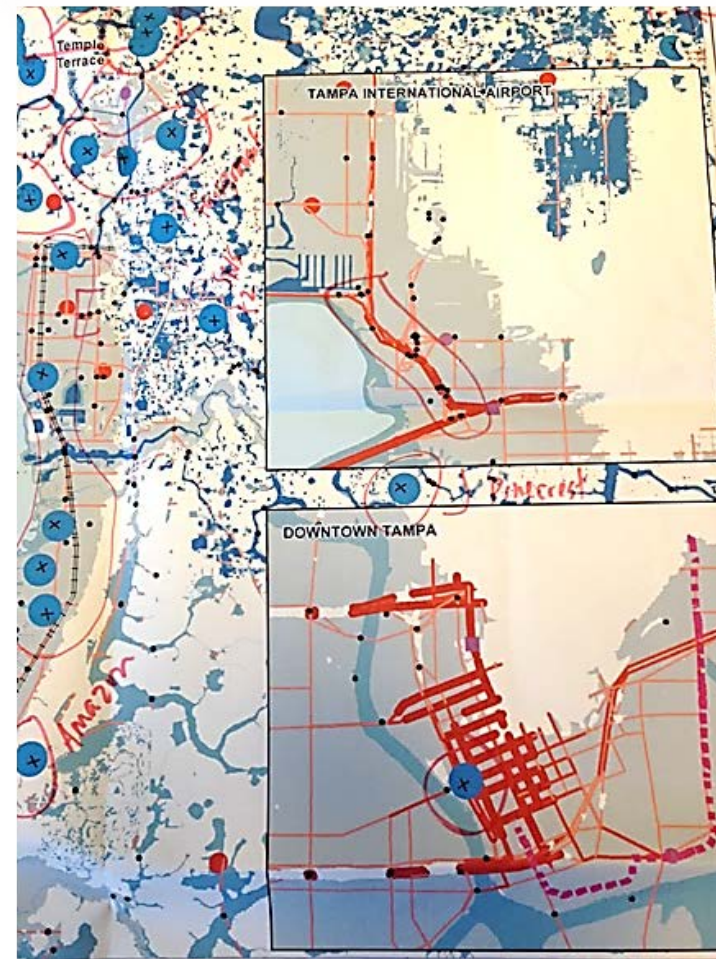
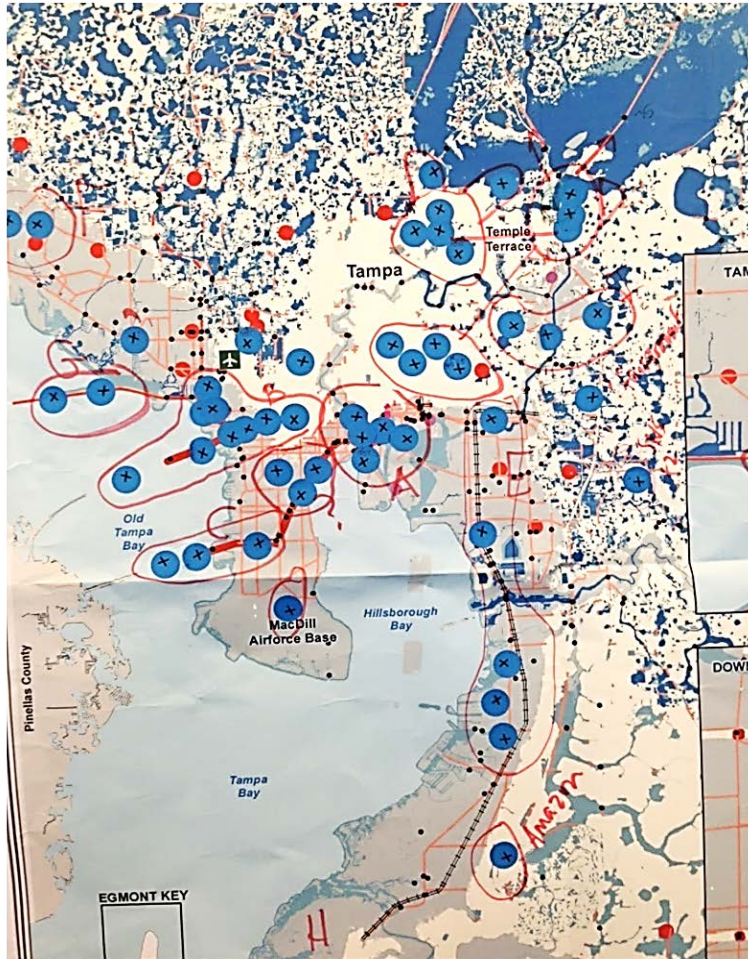




# Evaluation Process

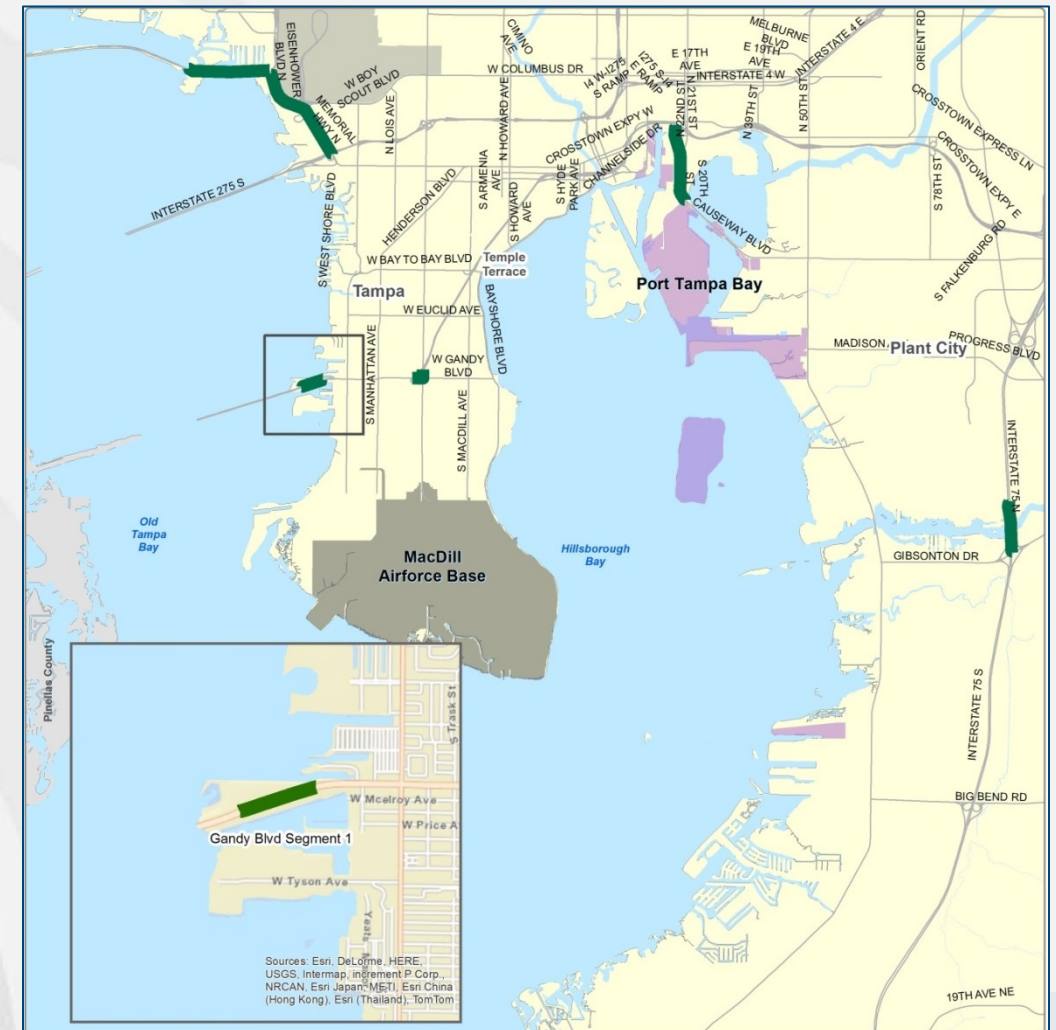


# Local Mitigation Strategy Working Group- Prioritization of Assets



# Assets Studied

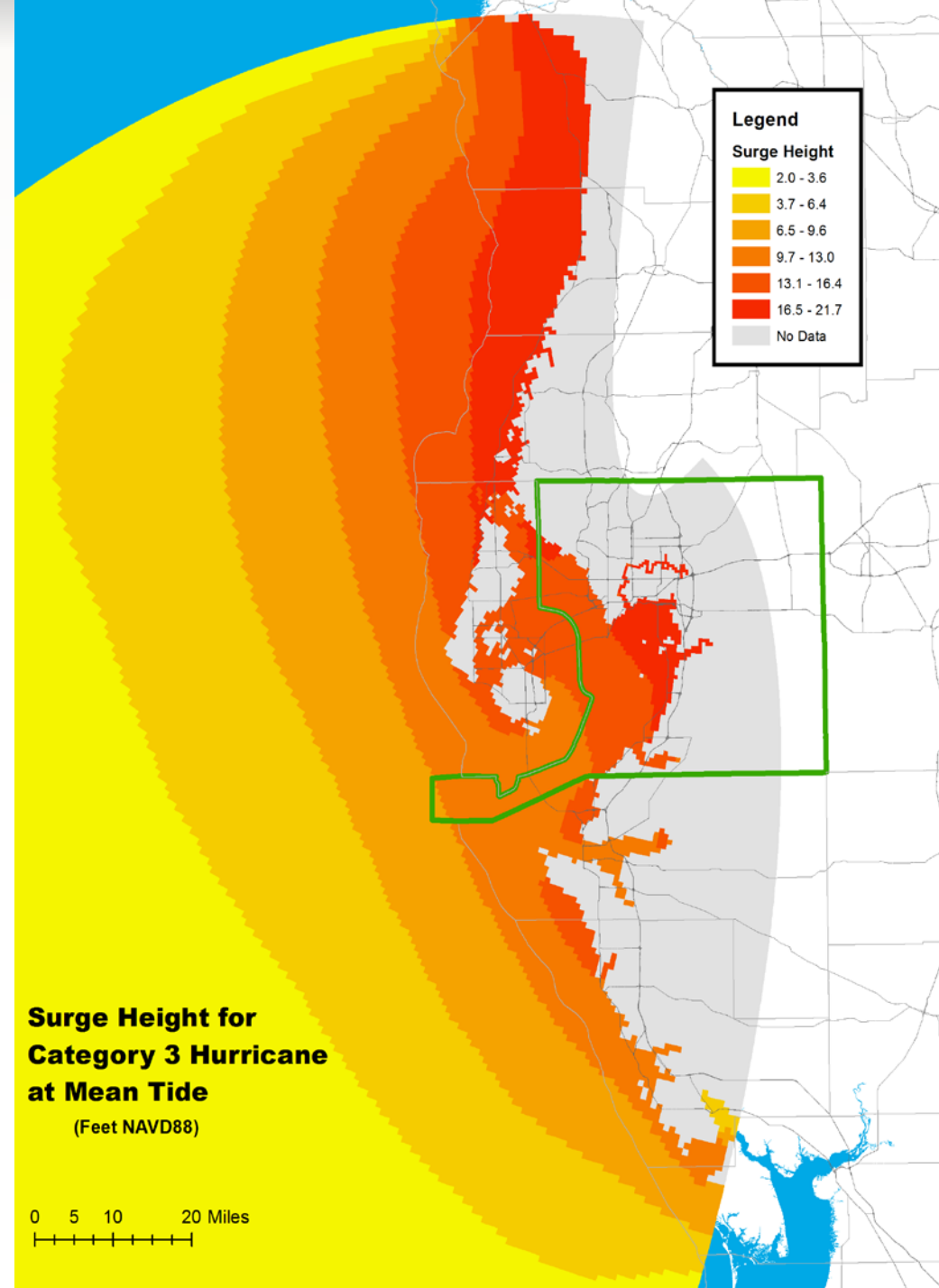
- Memorial Highway (Segment)
- South 20th/22nd (Segment)
- Selmon Expressway (Ramps)
- Gandy Boulevard (Segment)
- Courtney Campbell Causeway (Segment)
- I-75 over Alafia River (Bridge)



# Risk Scenario

## – Simulated Category 3 storm surge

- Same category, trajectory as 1921 Tarpon Springs storm
- High tide
- Addition of sea level rise (2040)

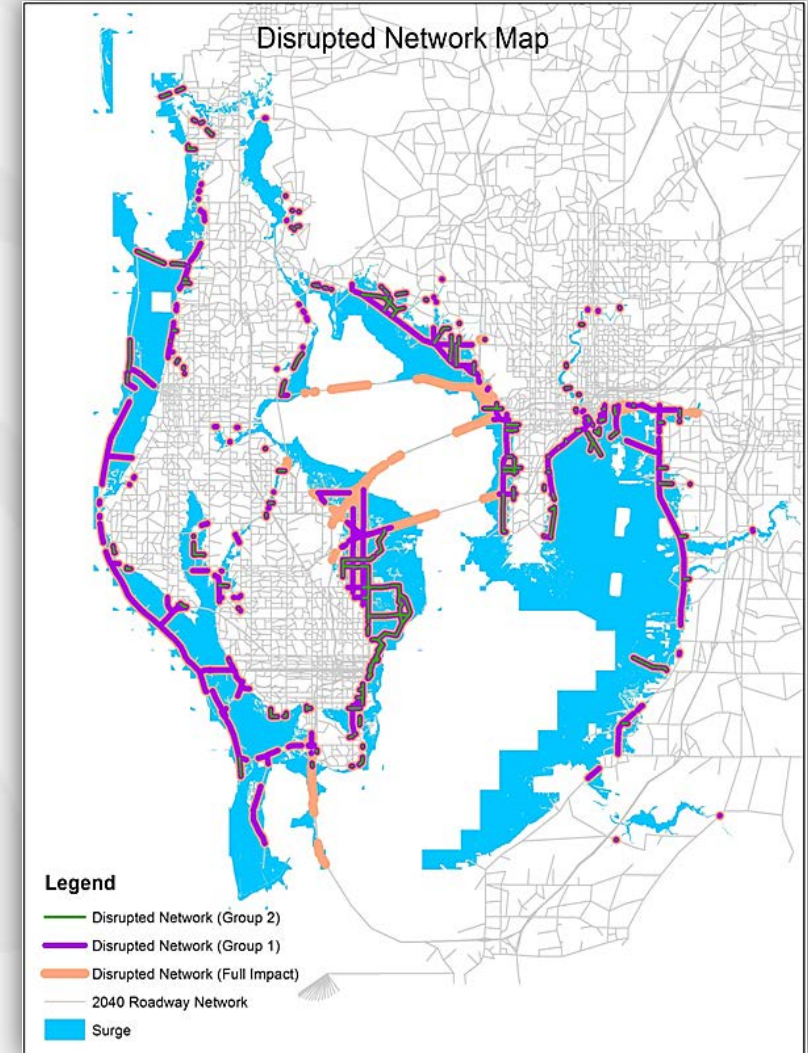




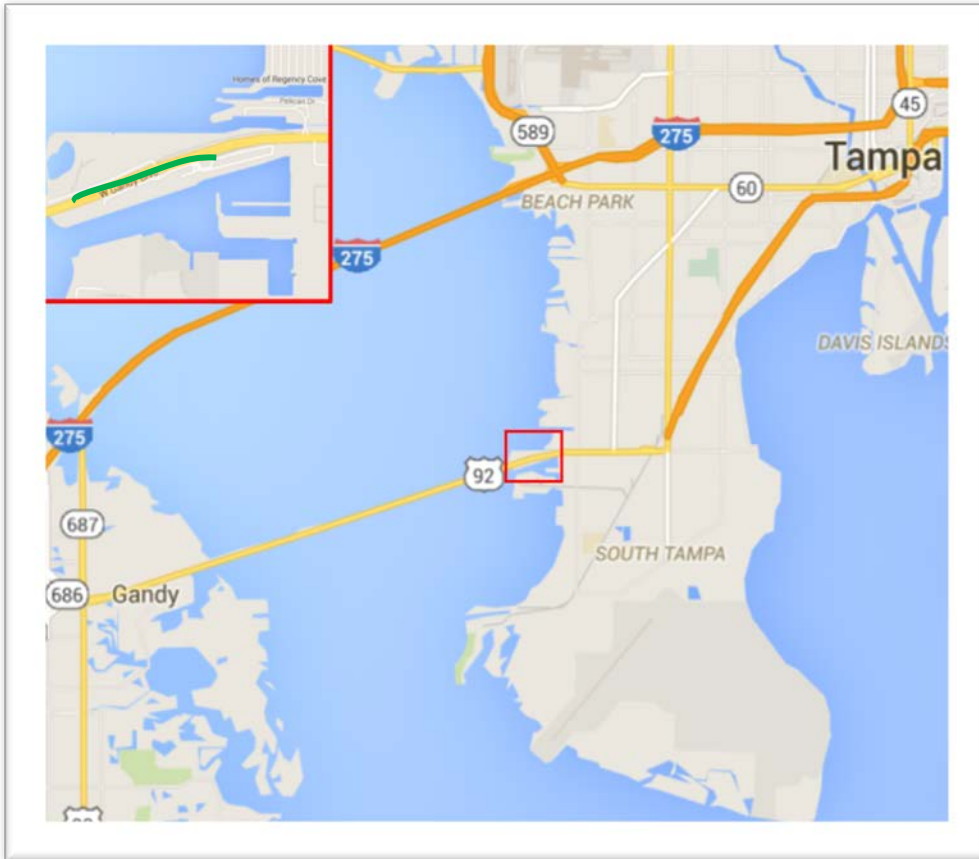
# Vulnerability Reduction Investment Assumed in 2040 Plan

Investment Level	Benefits and Costs
<b>Scenario 1</b> <b>Level 1</b>	<b>\$31 Million per year</b> Continue today's stormwater drainage improvement programs Category 3 storm impacts: - 8 weeks major roads may be unusable - \$266 million economic loss
<b>Scenario 8b</b> <b>Level 3</b>	<b>\$39 Million per year</b> Continue today's stormwater drainage, plus: raise road profiles, enhance base, protect shorelines from wave damage Category 3 storm impacts: - 3 weeks major roads may be unusable - \$119 million economic loss (cut in half!)

**Economic losses cut in half**



# Pilot Project Follow-Up Study (2016)



- Gandy Boulevard critical segment in 2014 Vulnerability Assessment
  - 1/3-mile segment connecting bridge to planned expressway
  - \$1.9M estimated for strategies





North



**Selmon Extension**



W Gandy Blvd

W Gandy Blvd

S Dale Mabry Hwy

**Selmon  
Expressway**

# West End



Marines

Culbreath Key

Begin/End Extension

Boat Ramp

Fish & Wildlife

US Marine Corps Reserve Center

Fish & Wildlife Conservation...

Gandy Boat Ramp

Friendship Florida Bridge (Planned)  
Florida Time Clock

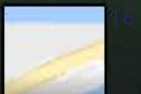
Sailor M  
Bait & T

W Gandy Blvd

W Gar

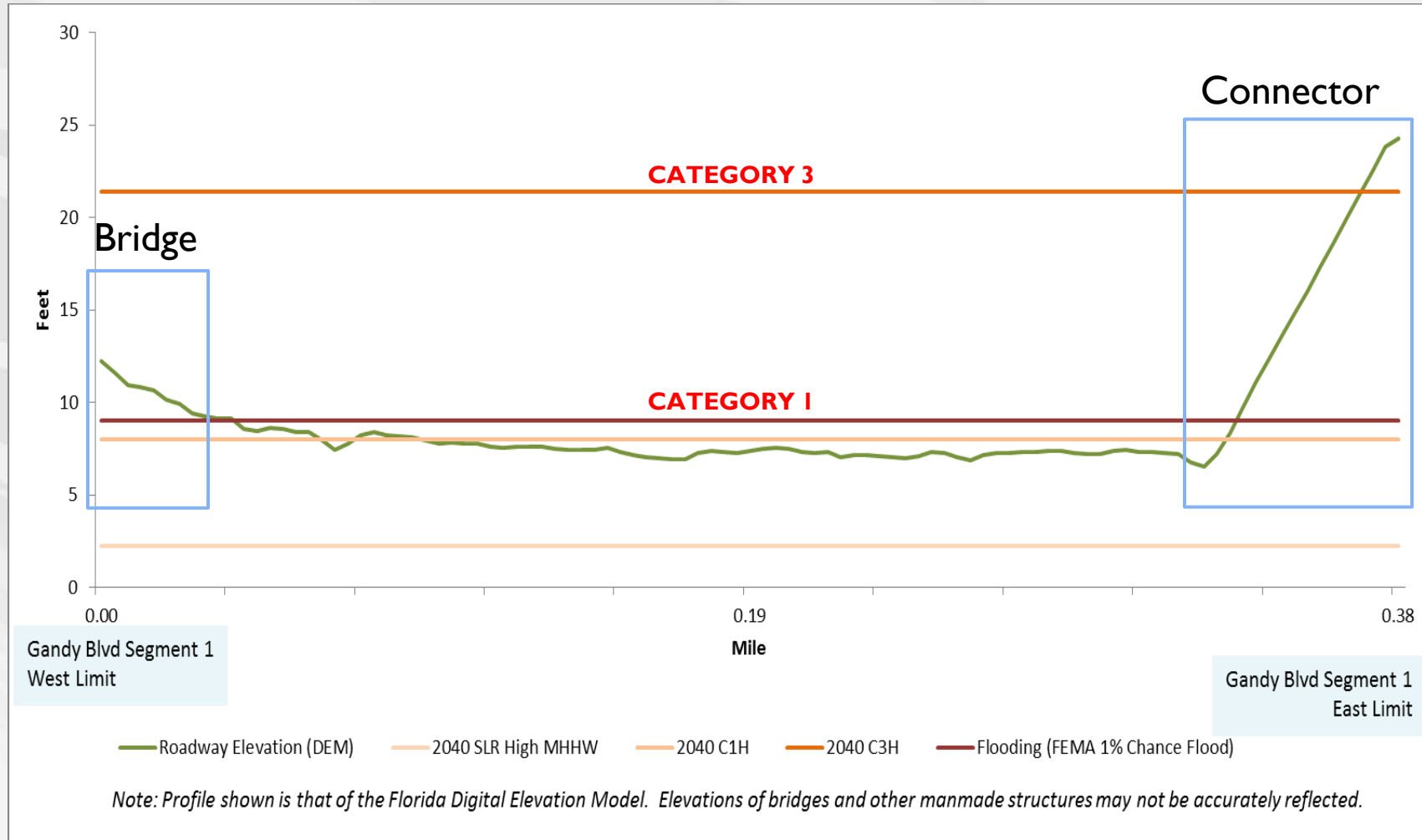
W Gandy Blvd

W Gandy Blvd



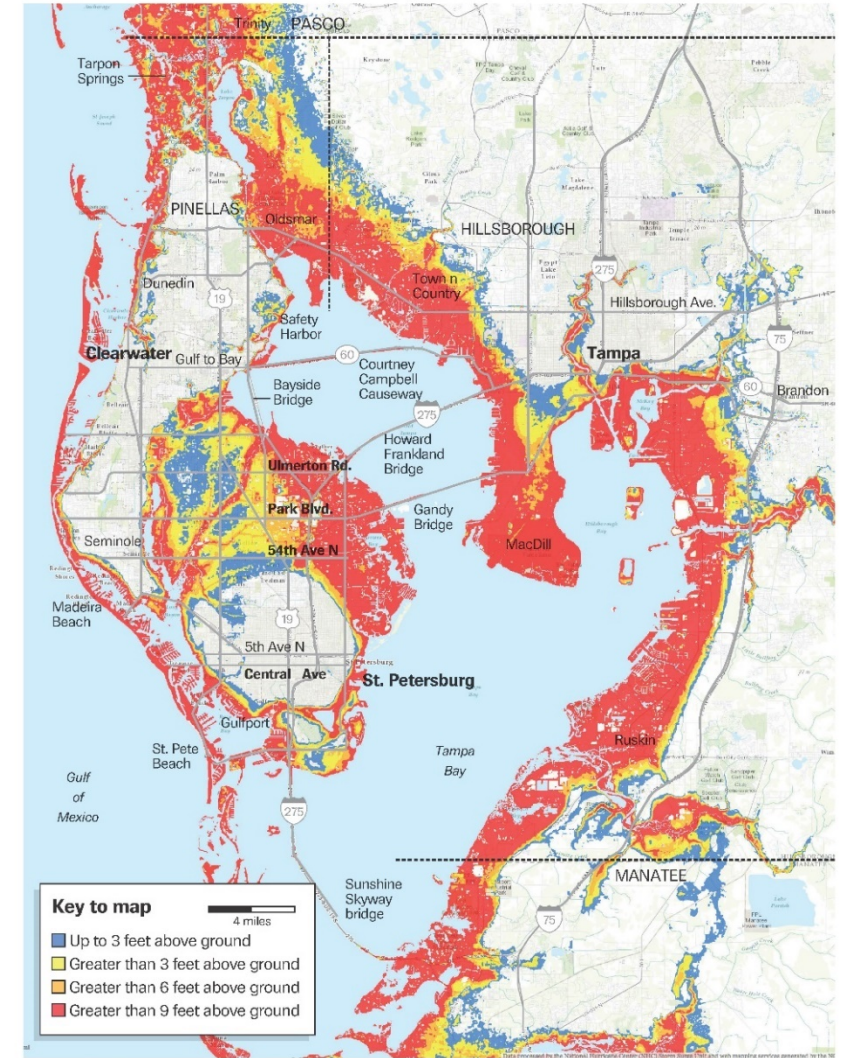


# Inundation Profile – Gandy Blvd (segment)



# Evacuation

- Total travel delay across all bridge crossings decreases
- Evacuation times improve for Tampa Bay overall
- Congestion and delays are reduced on Gandy Boulevard
- Total travel delay for Gandy Boulevard Area residences reduces by approximately 33%



National Hurricane Center, Times



# Strategy Refinement for Implementation



- Refined strategies appropriate Selmon Elevated extension at Gandy Blvd.
- Developed conceptual designs & specific pre-engineering cost estimates
  - Within limit of \$1.9M budget
  - Assume strategy mainstreaming as part of a project
- Offer low-risk, high benefit solutions to incorporate into elevated expressway extension PD&E proposal.



# Adaptation Options



Treatment	Cost Differential	Level of Risk
<b>Do nothing</b>	None initially. Reconstruction cost is \$3,312,000	Highest Risk. Required if roadway is destroyed.
<b>Upgrade to full-depth concrete pavement</b>	\$676,000	Medium Risk. Road damage possible if inundation occurs.
<b>Raise Profile</b>	\$1,119,000	Low Risk. Inundation from storm surge, rain or tide related flooding.
<b>Erosion control via vegetation</b>	\$104,544	Low Risk. Embankment damage or washout if inundation occurs.
<b>Pier protection via vegetation</b>	\$30 per pier (total depends on design)	Low Risk. Pier scour or damage possible if surge occurs.





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# Rising sea levels require unified effort

**Times editorials**

For a state surrounded by water, Florida should be leading the nation in preparing to adapt to climate change. Yet with Gov. Rick Scott a self-proclaimed skeptic of man-made warming, the state is offering virtually no direction to local communities despite the impact already being felt from increase their efforts before rising sea levels pose even greater dangers to public safety, property and the drinking water supply.

An Associated Press review of thousands of documents and emails shows the state has yet to offer a clear plan or coordination on addressing rising sea levels, despite chronic flooding along Florida's coastline from storm surges and higher tides. It has yet to address the increasing problem of saltwater intrusion into drinking water wells, which has cities and counties scrambling to find new sources of fresh drinking water. And the AP review blamed this not merely on indifference but on the mandated and culture change that took root after Scott took office. The governor downsized and cut the budgets of the regional water management agencies, and he put sea level rise and planning on the back burner.

This is in keeping with a governor who has shown no appreciation for Florida's fragile ecosystem. It comes years after a state inter-agency report found that sea levels are rising and "likely to rise faster as each decade passes" requiring much of the infrastructure of coastal Florida to be replaced. In Miami, high tides push floodwaters onto Biscayne Boulevard and Ocean Drive. In St. Augustine, as the AP reports, the city's old town floods nearly once a month on average, putting historic landmarks and the tourism industry at risk.

"If I were governor, I'd be out there talking about it (sea rise) every day," Eric Fuernmann, a former general counsel to the state Republican Party who also chaired the South Florida

Water Management District, told the AP. "He's really got to grab a hold of this, set a vision (and) rally the people behind it." Miami and other communities are doing what they can. For the first time, Hillsborough County's planning commission is looking to consider climate change in its review of long-term growth. In a nod to the politically charged dispute over climate change to "climate adaptation." This is a silly word game, rather than include climate adaptation, commissioners should start thinking seriously about how to better protect a county where 40,000 properties already are covered by flood insurance.

Local governments have a role. But they should not be forced to act in a vacuum. These efforts need to be coordinated through a statewide strategy. That's why it's imperative that the governor quit denying reality and wisely accept science. He needs to give the state effort greater urgency. Local communities cannot afford to storm-proof projects by themselves, and the state and local governments need to agree on a more responsible and unified approach for managing growth. As most Floridians live within 60 miles of the Atlantic Ocean or the Gulf of Mexico, sea level rise is hardly a hypothetical problem, and not one this governor should slough off to his successor.

**POLITICS**



## Hillsborough governments building sea-level rise into development plans

BY CHRISTOPHER O'DONNELL  
 Tribune staff  
 Published: March 26, 2015

## 'Climate adaptation' on planners' radar

By Steve Contorno  
 scontorno@tampabay.com

For the first time, the Hillsborough County Planning Commission might ask local governments to consider the effects of climate change when strategizing for future growth and development.

The shift in approach would not be seismic. It's just one proposed line in the massive comprehensive land-use plans for Hillsborough, Tampa, Temple Terrace and Plant City that are up for review this year.

And it wouldn't reference "climate change," but rather the less politically charged phrase "climate adaptation."

Here's what the Planning Commission's draft language for the section on coastal management in local comprehensive plans says: "Develop strategies to identify and address issues related to climate adaptation in cooperation with the (Environmental Protection Commission), the Planning Commission and other agencies."

However vague and open-ended, it still would be a notable step for the county, which faces rising sea levels. Scientists attribute that rise to increasing global temperatures from

greenhouse gases. By comparison, Pinellas County has included several direct instructions for addressing climate change and its effects in the county's comprehensive plan since 2008.

The decision whether to acknowledge "climate adaptation" is part of the Planning Commission's periodic review of the comprehensive plans, which guide development county-wide. The Planning Commission is an independent body created by the Legislature to oversee growth in Hillsborough with appointees representing all four local jurisdictions. Its recommendations are weighed but are not binding.

The commission on Monday listened to a presentation from Charles Paxton of the National Weather Service on the potential affects of climate change on the region. While sea levels rise and fall constantly, the peaks are higher and levels are more frequently above where they were even 50 years ago.

As a result, "systems engineered in the '70s may not accommodate events in the 2000s," Paxton told commissioners.

TBT 05-13-2015

# Addressing Climate Issues Regionally

## **Tampa Bay Climate Science Advisory Panel (CSAP)**

Unified Projection of Sea-Level Rise in Tampa Bay Region



## **TBRPC ONE BAY Resilient Communities**



# Local Comprehensive Plans



**TA CM Policy 1.3.7:** Develop strategies to identify and address issues related to climate adaptation in cooperation with the EPC, the Planning Commission, and other agencies.



**TT LU Policy 1.4.3:** The City shall develop strategies to identify and address issues related to climate adaptation in cooperation with the EPC, the Planning Commission and other agencies.



**PC LU Policy 6.1.4:** Develop strategies to identify and address issues related to climate adaptation in cooperation with EPC, the Planning Commission and other agencies.

Sea Level Rise Vulnerability  
Assessment for the City of Tampa



In support of compliance with the 2015 Peril of Flood Act (SB 1094)

Fla. Statute 163.3178(2)(f)

# Florida Peril of Flood Act - 2015

Amends s. 163.3178, F.S.; specifying requirements for the coastal management element required for local comprehensive plans.







- Continue work in 2045 LRTP update
- Coordinate with local jurisdictions on mainstreaming adaption options for projects.
- More work to be done...





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detailed back up material



# Estimated Impact of Disruption

Candy Blvd (2040)

Trip Type	Attribute	Daily Change
Leisure Travel	Auto - VMT	80,395
	Auto - VHT	24,474
	Auto - Delay	21,352
	Auto - Lost Trips	0
Commute Auto Travel	Auto - VMT	49,660
	Auto - VHT	10,751
	Auto - Delay	9,153
	Auto - Lost Trips	0
Business/On-the-clock	Auto - VMT	69,495
	Auto - VHT	12,248
	Auto - Delay	10,378
	Auto - Lost Trips	0
Truck	Truck - VMT	10,055
	Truck - VHT	2,994
	Truck - Delay/Idling	2,746
	Truck - Lost Trips	0

**Estimated  
weekly losses**

Gross Regional  
Product:

**\$1.55 MM**

Income:

**\$1.0 MM**

Work Hours:

**29,000**



# What can we get if we invest in Reduced Vulnerability

Based on illustrative Cat 3 storm occurring in next 20 years

## Investment Level 1 – \$988 M (current spending trend x 20 years, in YOE \$)

- Routine drainage improvements
- Up to 8 weeks of road network disruption with sample Cat 3 storm
- Economic loss to Hillsborough County: \$266 M

## Investment Level 2 - \$1,025 M (in YOE \$)

- Interstates only: drainage improvements, shoreline armoring & wave attenuation
- Up to 6 weeks of road network disruption with sample Cat 3 storm
- Economic loss to Hillsborough County: \$153 M or 42% less
- \$31 M investment results in \$113 M benefit

## Investment Level 3 – \$1,159 M (in YOE \$)

- Interstates & arterials: drainage improvements, shoreline armoring & wave attenuation
- 3 weeks of road network disruption with sample Cat 3 storm
- Economic loss to Hillsborough County: \$119 M or 55% less
- \$112 M investment results in \$147 M benefit

Estimated avoided losses are based on making highway segments  
less vulnerable to storm & flood damage

# Typical Costs for Reduced Vulnerability

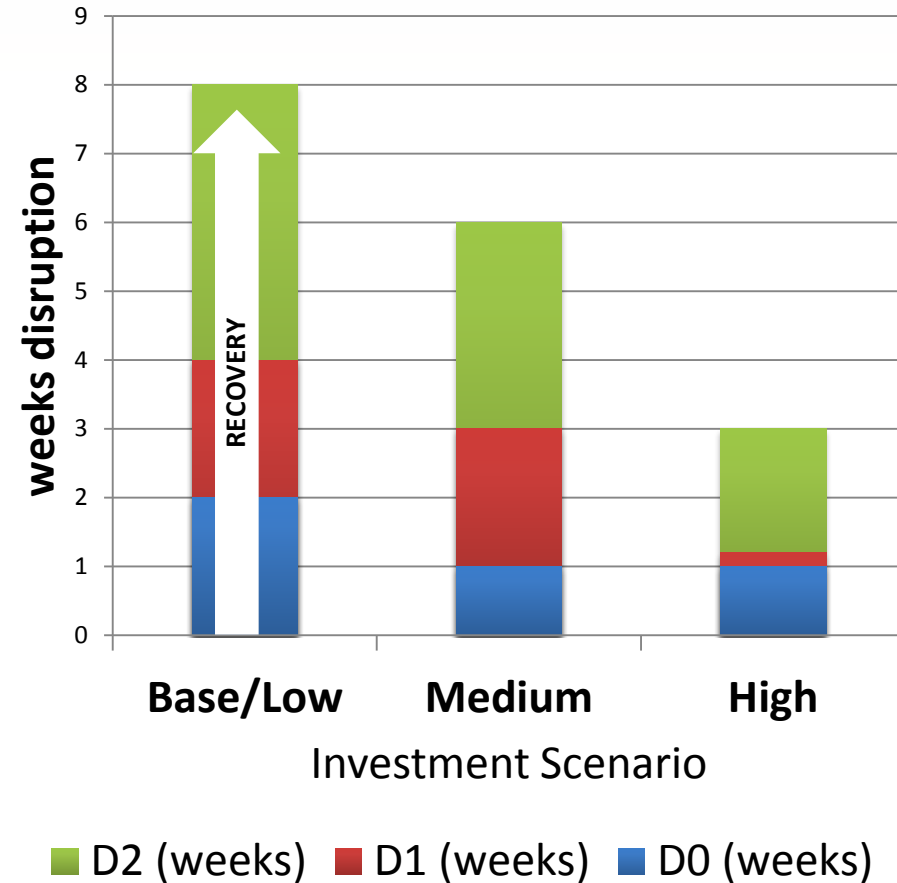
Risk Mgmt. Strategy	Unit	Unit Cost	Base/Low	Medium	High
Raise profile/ strengthen base*	Lane mile	\$268,883	\$268,883	\$20,854,540	\$68,807,075
Wave attenuation (WADs)	1 Unit	\$750	\$750	\$3,887,400	\$17,628,600
Shoreline protection (riprap)	Lin. ft.	\$350	\$350	\$5,442,360	\$24,680,040
Drainage improvements*	CL mile	\$14,737	\$14,737	\$816,566	\$816,566
<b>TOTAL</b>				\$31,000,866	\$111,932,281
<b>TOTAL plus contingency</b>	20%			\$37,201,039	\$134,318,738

\* Counts marginal costs only. All costs are approximate

# Weeks of Disruption in Network, Post-Event

## “Base Case” Investment Scenario Narrative

*Coastal Interstates, particularly Bay crossings, suffer washouts at approaches and experience minor structural damage, yielding the equivalent of 2 weeks of capacity loss (includes debris removal and inspections). Washouts and erosion on coastal arterials are prevalent, a substantial portion of saturated roadway base requires replacement, and some bridges experience severe scouring and approach washouts, yielding the equivalent of 4 weeks of capacity loss. Local facilities experience similar, but more prevalent impacts and are generally designated for repair and clearance last, yielding the equivalent of 8 weeks of capacity loss.*



# Memorial Highway Project

- Cost Feasibility based on FDOT Strategic Intermodal System (SIS) 2040 Plan:
  - Part of SR 60/I-275 interchange reconstruction
  - \$193 M cost (in YOE)
- Vulnerable area: 0.6 – 1.1 mi. based on Cat 1-Cat 3 storm surge
- Replacement cost: \$100 M +
- Protection cost: \$ 4.2 M
- ***Potential to incorporate into SIS project***

## Inundation with Cat 3 Surge

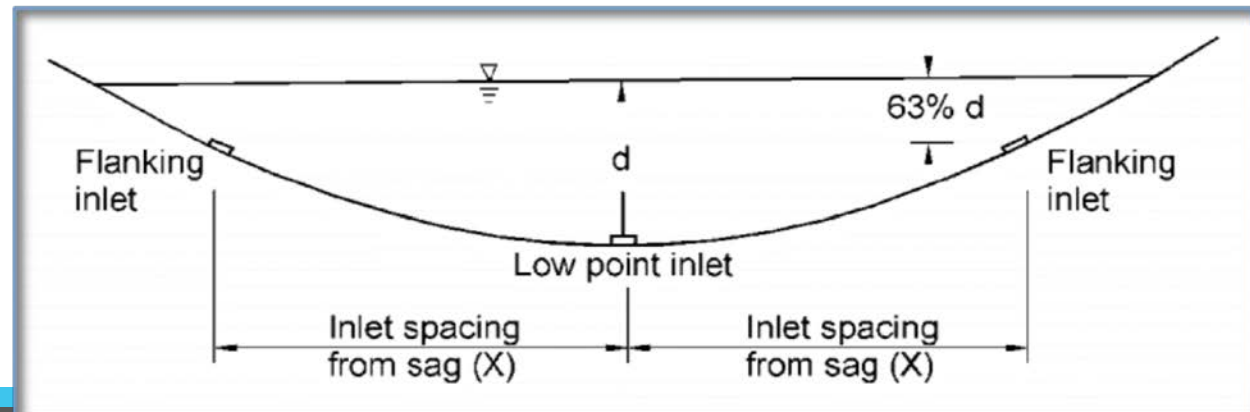


Memorial Highway – 158,000 ADT



# Adaptation Strategies - Drainage

- Permeable Pavement
  - Applicable for low speed and low volume roads
- Enhanced Drainage
  - Gandy Blvd existing constraints
  - Areawide watershed study



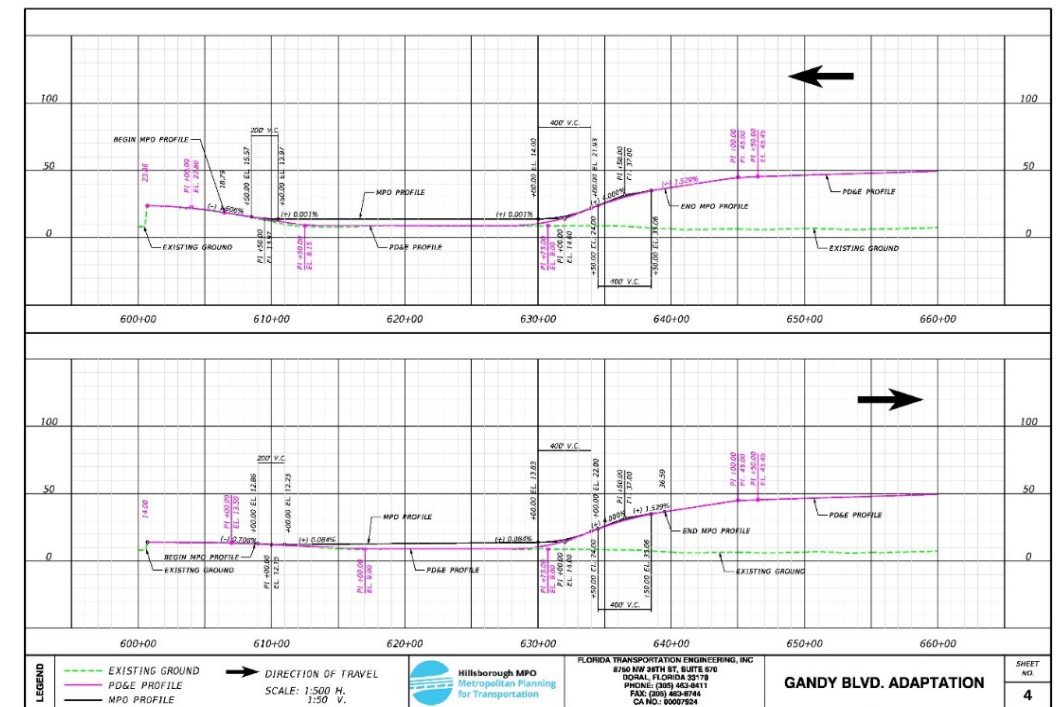
# Adaptation Strategies – Harden Road

- Harden surface or base layers
  - Avoid potential washouts
- Full depth concrete
- New materials and concepts
  - Research underway



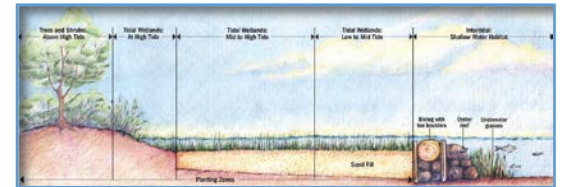
# Adaptation Strategies – Raise Profile

- Gandy Blvd bridge has low elevation
  - Bridge has longer life than road
  - Eastbound/westbound different elevations
- Several options:
  - Raise Gandy Blvd to match lowest elevation
  - Consider raising one side only
  - Consider raising as companion (or after) bridge project



# Adaptation Strategies – Erosion Control

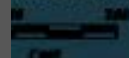
- Wave Attenuation Device
  - Consider in longer term; Protection from Tampa Bay
- Living Shoreline
  - Consider in longer term; Environmental coordination
- Rivetments – Riprap or Vegetation
  - Recommend vegetation (specialty grasses or shrubs)
- Pier / Column Protection
  - Recommend vegetation (specialty grasses or shrubs)
  - Hardened solutions (e.g., concrete, double-wall construction)

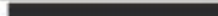





# Gandy Blvd – West End Segment



AERIAL MAPPING DETAINED FROM FDOT



	PROPOSED ROADWAY
	WETLANDS/SURFACE WATERS
	EXISTING LEVEE
	BRIDGE STRUCTURE/RETAINING WALL



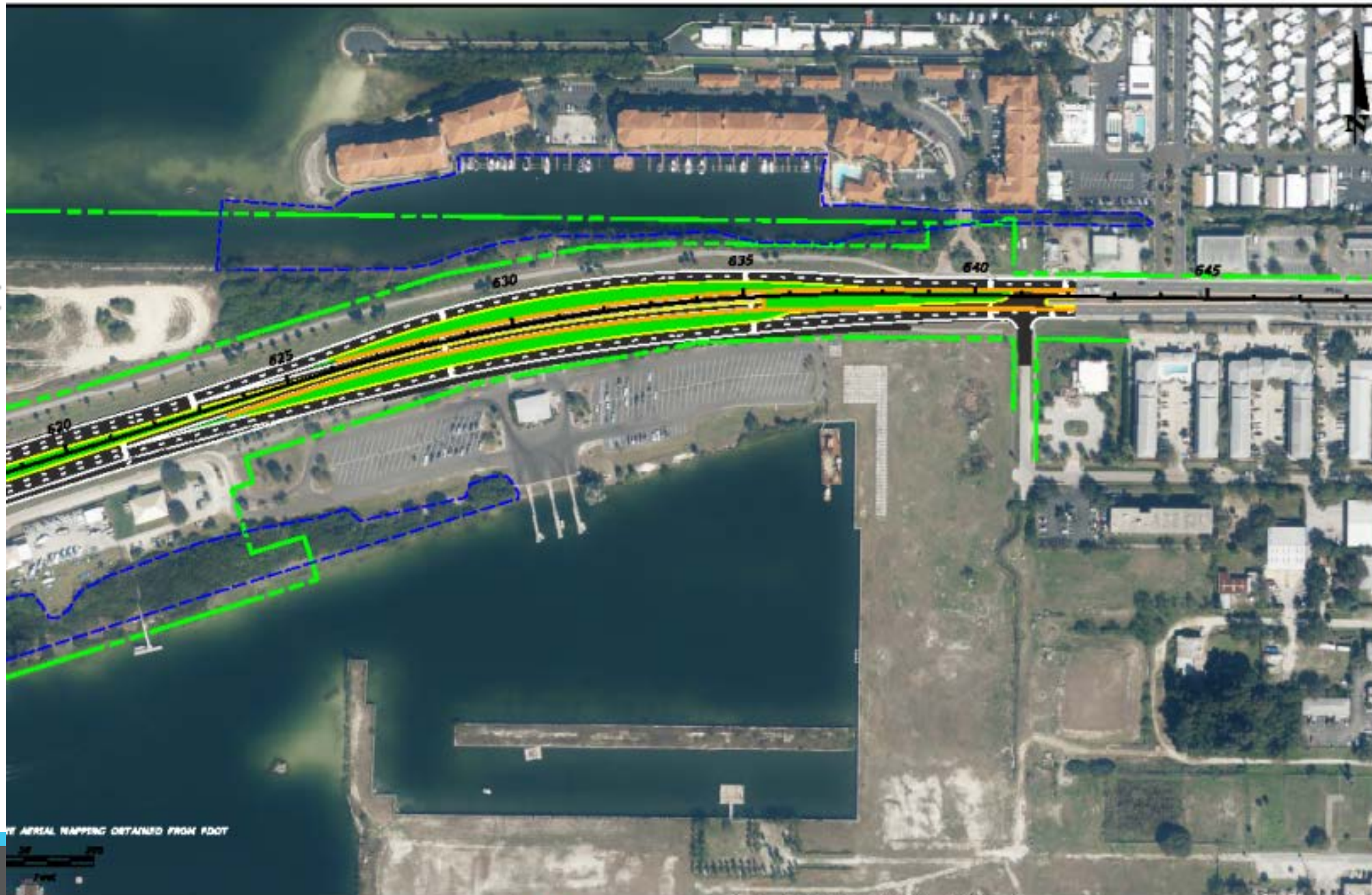
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6780 NW 36TH ST., SUITE 670  
DORAL, FLORIDA 33178  
PHONE: (305) 493-6411  
FAX: (305) 493-6744  
CA NO.: 88087826

**GANDY BLVD. ADAPTATION**



# Gandy Blvd – East End Segment

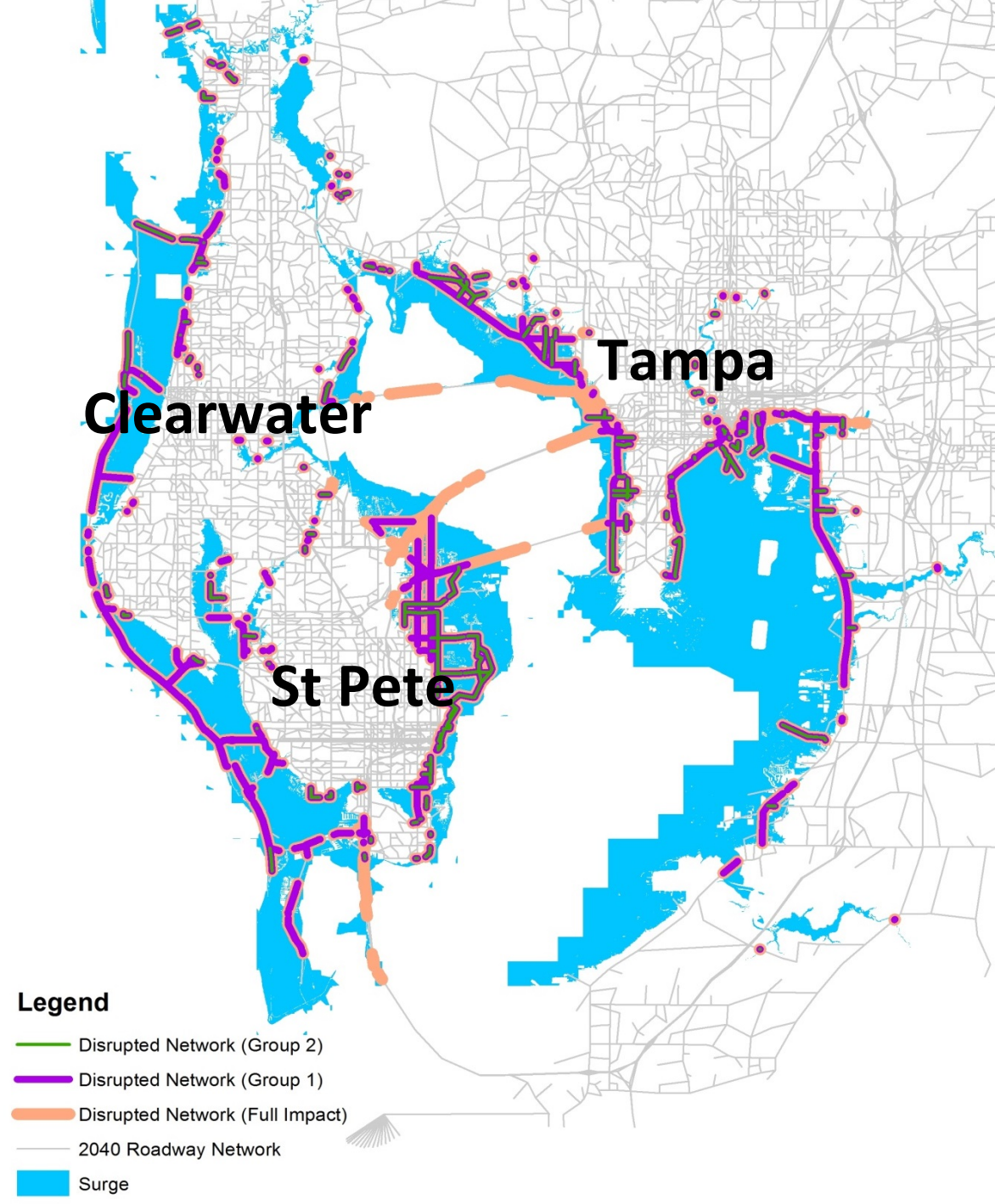


ALL AERIAL MAPPING OBTAINED FROM FDOT

	<p>PROPOSED ROADWAY WETLAND/SURFACE WATERS EXISTING A/W BRIDGE STRUCTURE/RETAINING WALL</p>	<p>Hillsborough MPD Metropolitan Planning for Transportation</p>	<p>FLORIDA TRANSPORTATION ENGINEERING, INC 6709 NW 56TH ST, SUITE 479 DORAL, FLORIDA 33178 PHONE: (305) 480-8411 FAX: (305) 489-8744 CA. NO.: 00007984</p>	<p><b>GANDY BLVD. ADAPTATION</b></p>
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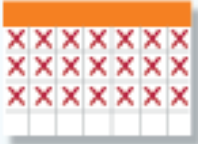

**Simulated  
Cat 3 storm  
surge in  
2040  
and  
inundated  
roadway  
network**





# SAFETY AND SECURITY

Goal: Improve Recovery Reduction

	Annual Stormwater & Flooding Investments	Weeks of Disruption	Economic Loss of a Typical Category 3 Storm
Current Level Since 2014	 \$31 Million	 8 Weeks	 \$266 Million
Target Level	 \$39 Million	 3 Weeks	 \$119 Million

