Hillsborough County MPO Adaptation Pilot

LMS Meeting #4

presented to

Local Mitigation Strategy _ Working Group

presented by

Cambridge Systematics, Inc.

Josh DeFlorio

May 2014

Project recap

- Climate change vulnerability assessment and adaptation pilot, focused on the transportation sector.
  - » *Sponsored by the Federal Highway Administration (competitive grant)*
- Led by Hillsborough County MPO/Planning Commission, with:
  - » *Tampa Bay Regional Planning Commission*
  - » *University of South Florida*
  - » *Hillsborough County Public Works*
- Expected completion: Late summer 2014 (on schedule)
  - » *Started in August 2013*

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Scope/Assessment Process

- *Phase 1: Collect data, identify potential extreme weather vulnerabilities*
- *Phase 2: Identify critical, vulnerable infrastructure (5-10 high-risk assets) for adaptation*
- *Phase 3: Develop adaptation (risk mitigation) strategies for a selection of high-risk assets*
  - » *Complementary activity: Long Range Transportation Plan update*
- Phase 4: Document findings, recommendations, feedback to FHWA

LRTP Resliency Analysis

LRTP Needs Assessment = Investments That …

Preserve Existing Systems

Reduce Crashes & Vulnerability

Minimize Congestion for Drivers & Shippers

Expand Alternatives to Driving

Support Growth of Econ. Activity Centers

How can performance measures help us target limited resources?

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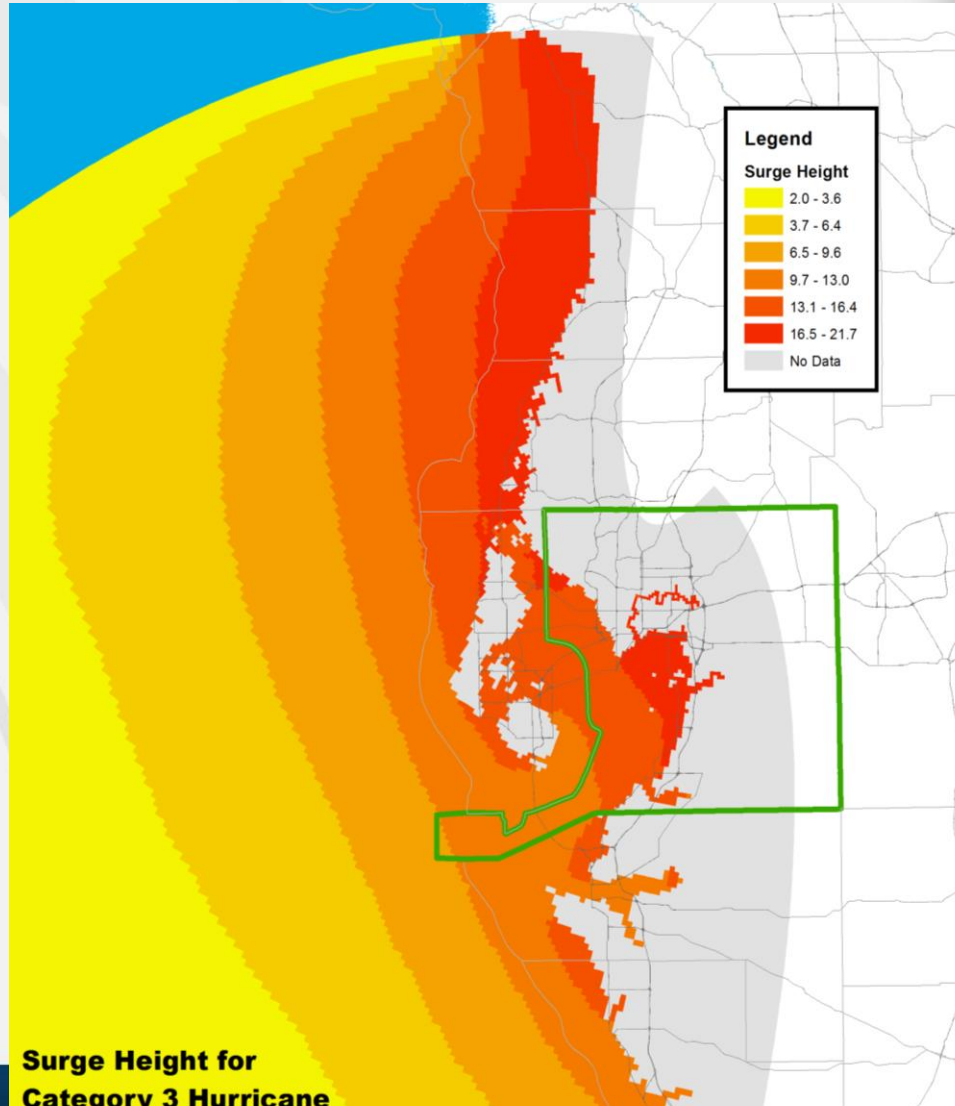
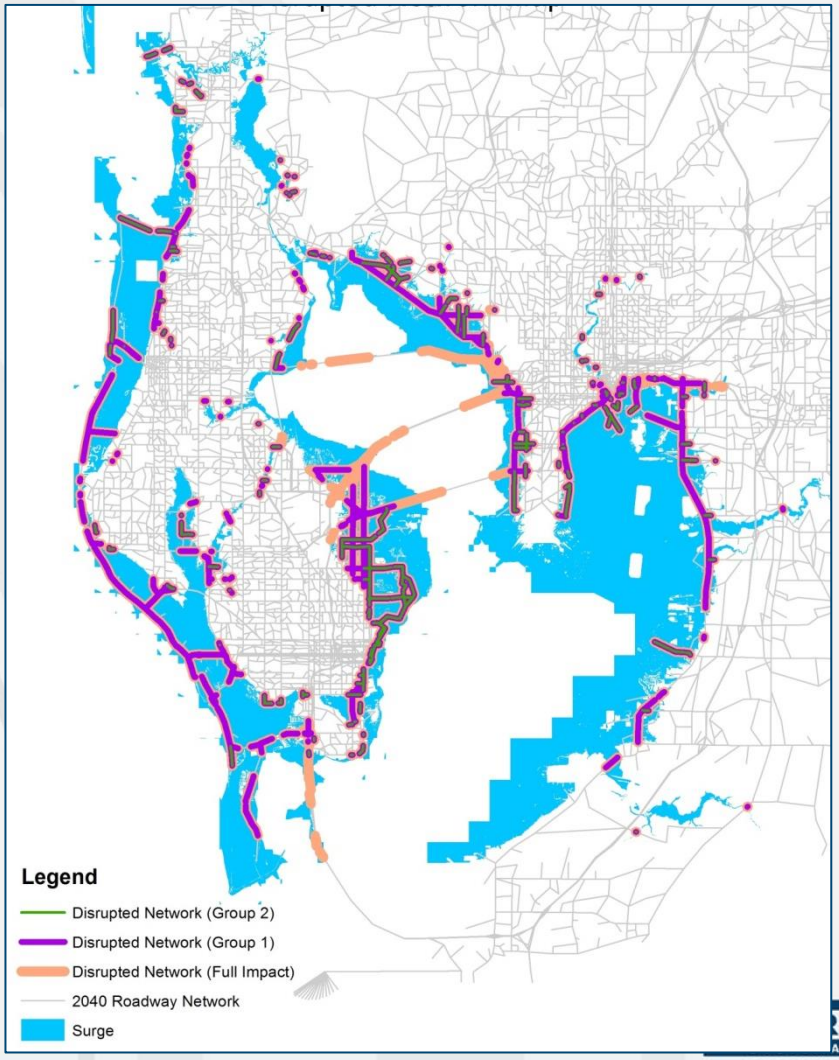
Step 1: Develop Risk Scenario

Parameter	Value
Simpson-Saffir Hurricane Category	3 (111-129 mph winds, up to 21 foot surge depths)
Trajectory	Tarpon Springs Hurricane (1921), observed track
Sea Level Rise	High, 2040 (current Mean Sea Level + 14")
Tidal Datum	Mean Higher High Water (projected MSL + 16")



Step 2: Assess Potential Disruption Impacts

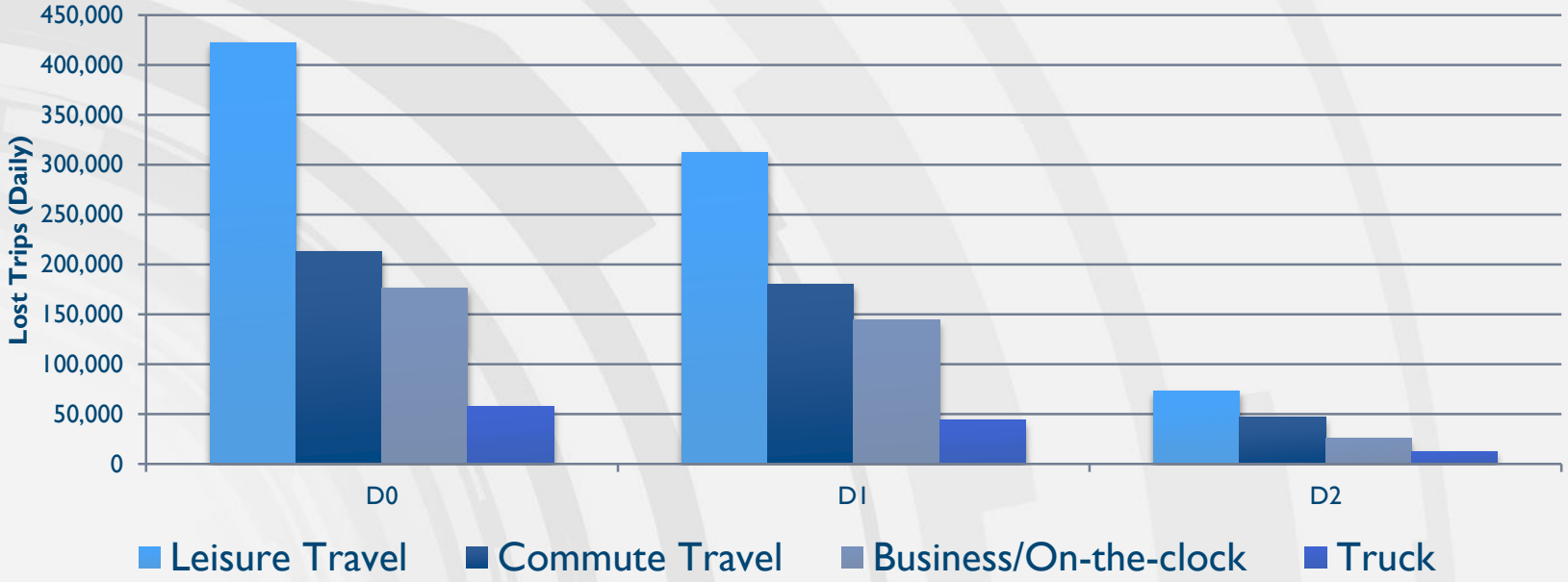
- **Baseline/Fully Recovered**: Congested base case, prior to the surge event AND fully recovered network
- **Full Disruption (D0)**: Disruption/loss of capacity of all inundated links.
- **Phase 1 Recovery (D1)**: Return to service of Interstates/freeways
- **Phase 2 Recovery (D2)**: Return to service of Interstates and arterials



Step 2: Assess Potential Disruption Impacts

Estimated Mobility Losses (Daily)—Full Disruption

- Estimate changes in:
  - » Vehicle miles traveled
  - » Vehicle hours of delay
  - » Trips (focus on trip losses)



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Step 2: Assess Potential Disruption Impacts

REMI Estimates

- REMI considers direct, indirect, and induced impacts of ***transportation disruption scenarios***, using changes in VMT, delay, and trips.
- Impacts are measured in terms of WEEKLY:
  - » Work hours;
  - » Income;
  - » Gross Regional Product.

- DRAFT results (one week's disruption)

	GRP	Work Hours
Full	$215,000,000	4,039,360
Interstates	$16,000,000	361,920
Arterials	$4,000,000	89,440
All values are negative, All $ are Millions of 2014 Dollars		

- NEXT STEP: Estimate range of potential disruption for each scenario

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Sample Menu of Risk Management Strategies

Storm Surge Vulnerability	INVESTMENT LEVEL		
	Low	**Medium**	**High**
Exposure: Reduce exposure to storm surge			
Elevate	-	RAISE PROFILE (low lying interstates)	➔Increase deployment
Protect	-	SEA WALLS/BULKHEADS (low lying interstates)	➔Increase deployment
Shield	-	-	+ STORM GATE
Sensitivity: Reduce the impacts of storm surge			
Maintain	DRAINAGE (culverts, grates, catch basins)	➔Increase deployment	▲ Same as MEDIUM
	ROADWAY (base, shoulder, pavements)	➔Increase deployment	▲ Same as MEDIUM
Strengthen	ROADWAY BASE (upon reconstruction)	BRIDGE APPROACHES/RAMPS (approach plates)	SECURE BRIDGE DECKS (anti-buoyancy measures)
	-	SCOUR COUNTERMEASURES	➔Increase deployment
	-	RENO MATS	➔Increase deployment
Attenuate	FENCING (low lying interstates/major arterials)	BARRIERS/WAVE ATTENUATORS	➔Increase deployment
	RIP RAP	DUNES (selective deployment)	➔Increase deployment
	SALT RESISTANT VEGETATION	CONSTRUCTED WETLANDS (selective deployment)	➔Increase deployment
Adaptive Capacity: Increase the capacity of the network to recover functionality			
Recover	PLAN (increase post disaster response planning/response budgets)	DRAINAGE (upsize during replacement cycle to	➔Increase deployment
	-	STAGING (establish new recovery/supply areas/lifelines)	➔Increase deployment
	PERMIT (blanket debris permits)	SUPPLIES/MATERIALS (stockpile)	➔Increase deployment
Reroute	ESTABLISH EMERGENCY DETOURS	DYNAMIC REROUTING (ITS)	➔Increase deployment
	-	-	BUILD REDUNDANT CRITICAL CONNECTORS

Step 3: Risk Mitigation Investment Scenarios

	Illustrative Mitigation Measures		
Strategy Type	Baseline	Tier 1 (Interstates)	Tier 2 (Interstates & Arterials
Limit **Exposure**	Maintain/manage as usual	Raise roadway profile • Elevate profile, enhance crown	
Mitigate **Sensitivity**		Shoreline protection • Wave attenuating devices Enhance roadway base	
Enhance **Adaptive Capacity** (recovery)		Increase drainage capacity • Upgrade to flanking inlets, increase conveyance capacity	

- NEXT STEP: Estimate disruption mitigation benefits of strategy packages

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Sample Strategy

Wave Attenuating Devices (WADs)

Critical Assets for Pilot Assessment

Assets for Further Study

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

Memorial Highway

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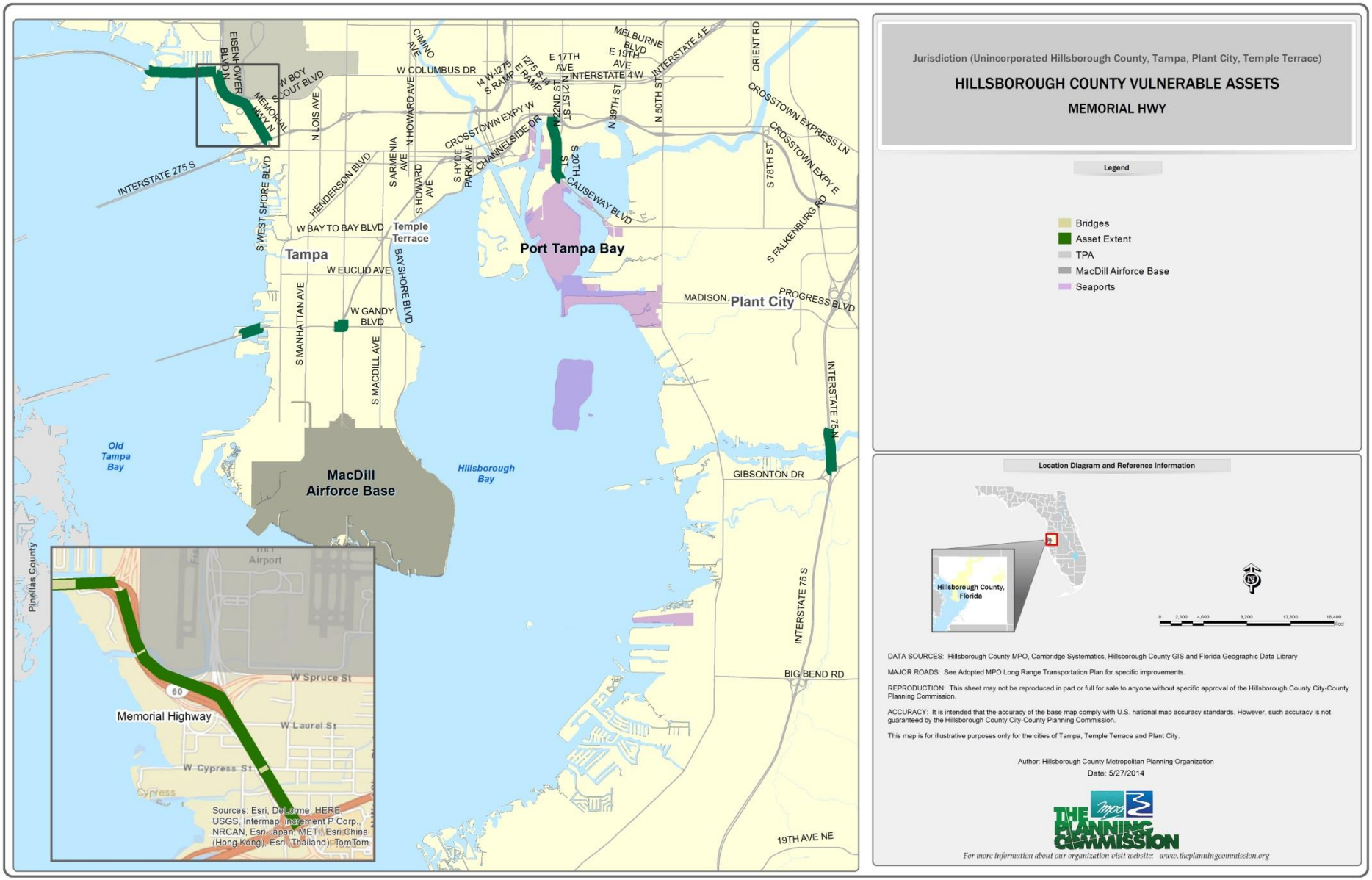
Asset Map


Jurisdiction (Unincorporated Hillsborough County, Tampa, Plant City, Temple Terrace)
HILLSBOROUGH COUNTY VULNERABLE ASSETS
MEMORIAL HWY
Legend
Bridges
Asset Extent
TPA
MacDill Airforce Base
Seaports
Location Diagram and Reference Information
Hillsborough County, Florida
DATA SOURCES: Hillsborough County MPO, Cambridge Systematics, Hillsborough County GIS and Florida Geographic Data Library
MAJOR ROADS: See Adopted MPO Long Range Transportation Plan for specific improvements.
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Date: 5/27/2014
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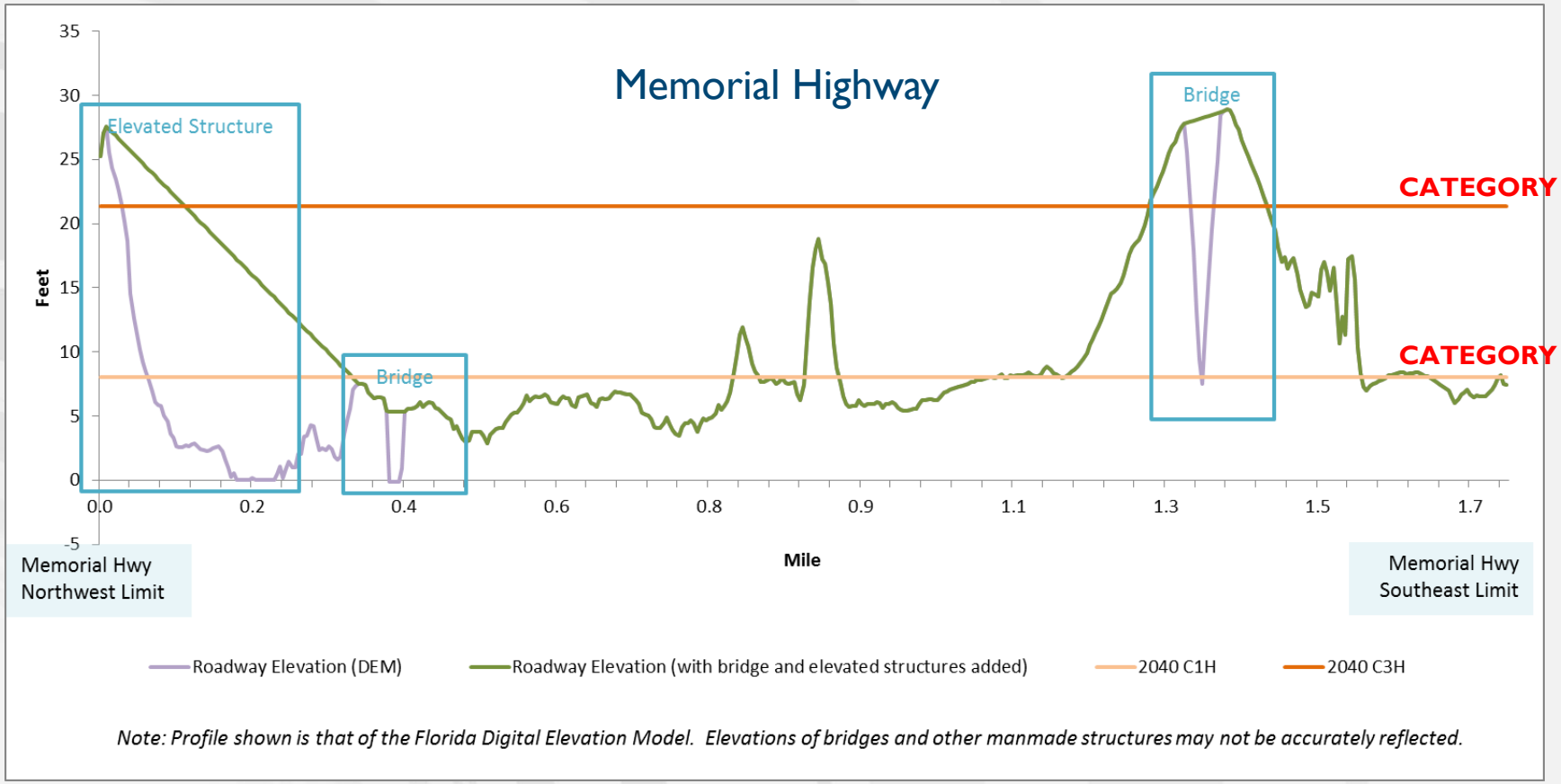
Tampa
Temple Terrace
Port Tampa Bay
Plant City
MacDill Airforce Base
Old Tampa Bay
Hillsborough Bay
Pinellas County
Memorial Highway
W Spruce St
W Laurel St
W Cypress St
Cypress
Airport
Sources: Esri, DeLorme, HERE, USGS, Intermap, Increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom
W COLUMBUS DR
W BAY TO BAY BLVD
W EUCLID AVE
W GANDY BLVD
HENDERSON BLVD
GIBSONTON DR
BIG BEND RD
19TH AVE NE
INTERSTATE 275 S
INTERSTATE 4 W
INTERSTATE 4 E
INTERSTATE 75 S
INTERSTATE 75 N
CROSSTOWN EXPY W
CROSSTOWN EXPY E
CROSSTOWN EXPRESS LN
CHANNELSIDE DR
CAUSEWAY BLVD
PROGRESS BLVD
S FALKENBURG RD
S 78TH ST
ORIENT RD
N 50TH ST
N 39TH ST
N 22ND ST
S 20TH ST
E 17TH AVE
E 19TH AVE
MELBURNE BLVD
CIMINO AVE
N LOIS AVE
N HOWARD AVE
S ARMENIA AVE
S HOWARD AVE
S HYDE PARK AVE
S WEST SHORE BLVD
S MANHATTAN AVE
S MACDILL AVE
BAYSHORE BLVD
EISENHOWER BLVD N
W BOY SCOUT BLVD
MEMORIAL HWY N
MADISON

Asset Profile

Asset Type	Highway from I-275 Interchange to Courtney Campbell Causeway, some elevated and some at grade – 1.76 miles	**Estimated Replacement Cost**	Approx. $164M*
Current Condition	Design to include multi-modal corridor between Pinellas and Hillsborough Counties	**Estimated Recovery Time**	**TBD**
Estimated Age (Lifespan)	1964, 2005, 2010		
Use / Ridership	158,000 AADT		

**Estimated cost is based on a March 2010 project completion, which was larger in scope than the 1.76 miles studied here.*

Inundation Profile



Note: Profile shown is that of the Florida Digital Elevation Model. Elevations of bridges and other manmade structures may not be accurately reflected.

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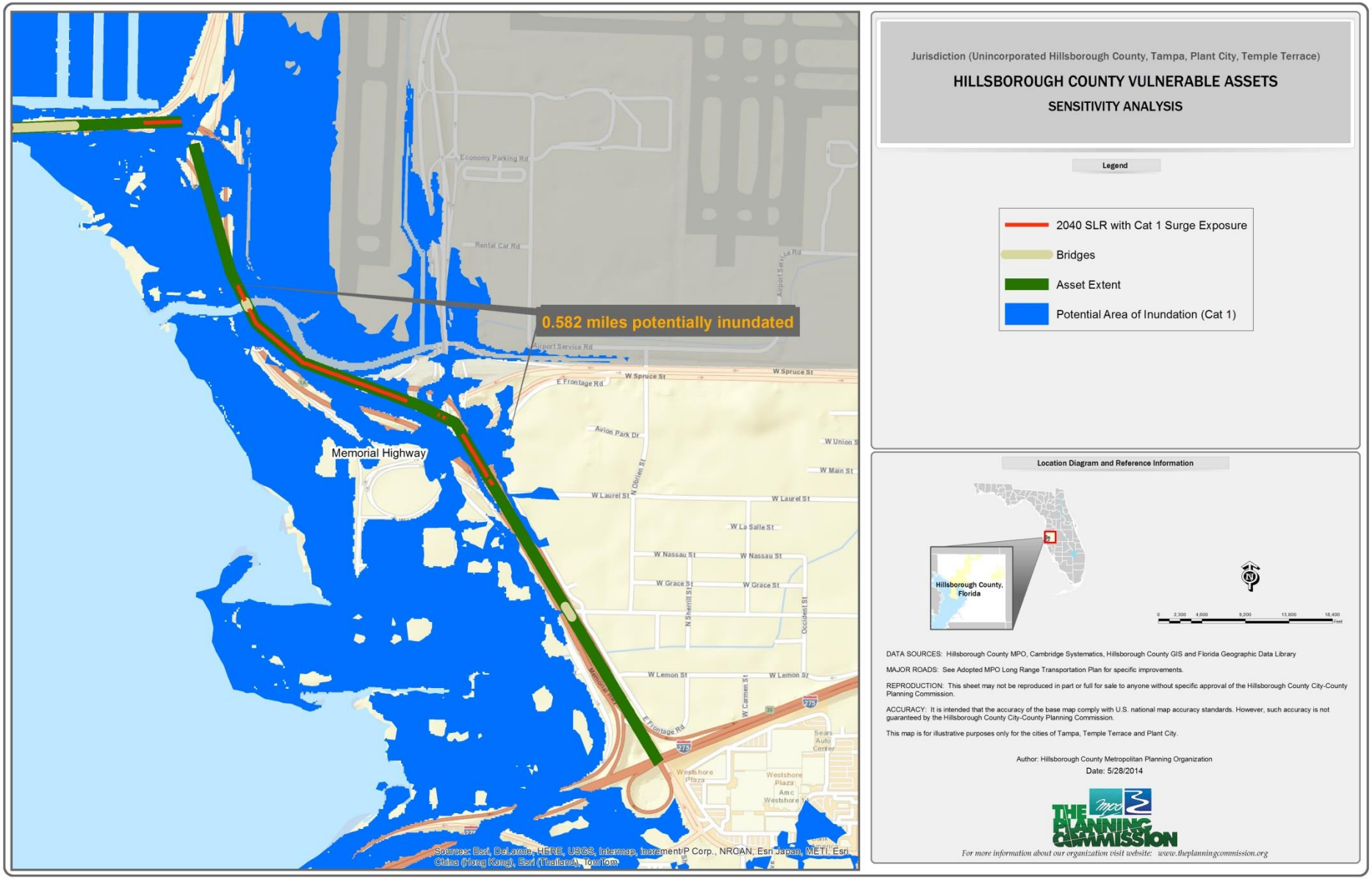
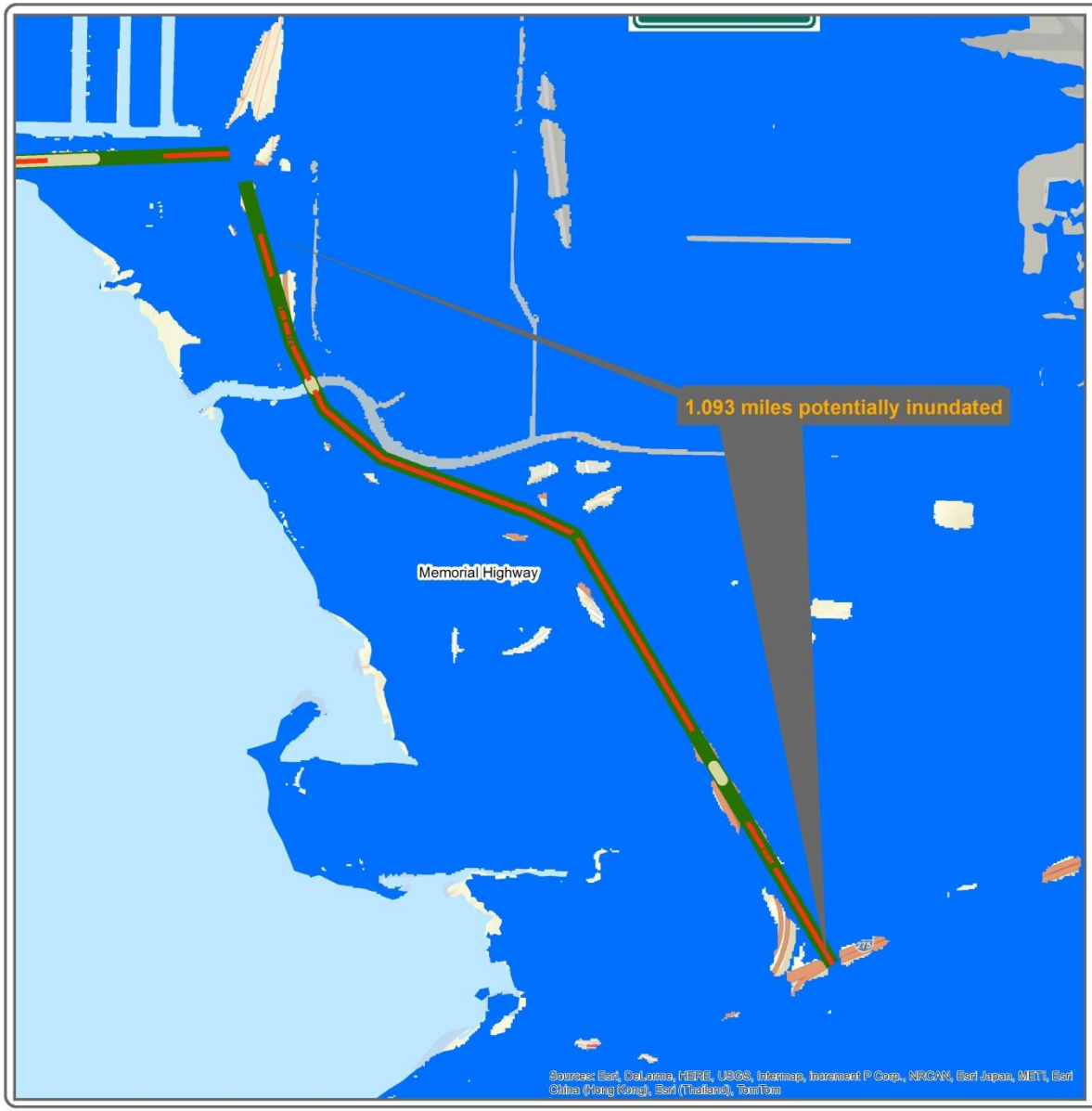
Inundation with Cat 1 Surge



Inundation with Cat 3 Surge



Jurisdiction (Unincorporated Hillsborough County, Tampa, Plant City, Temple Terrace)

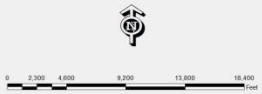
HILLSBOROUGH COUNTY VULNERABLE ASSETS

SENSITIVITY ANALYSIS

Legend

- 2040 SLR with Cat3 Surge Exposure
- Bridges
- Asset Extent
- Potential Area of Inundation (Cat 3)

Location Diagram and Reference Information



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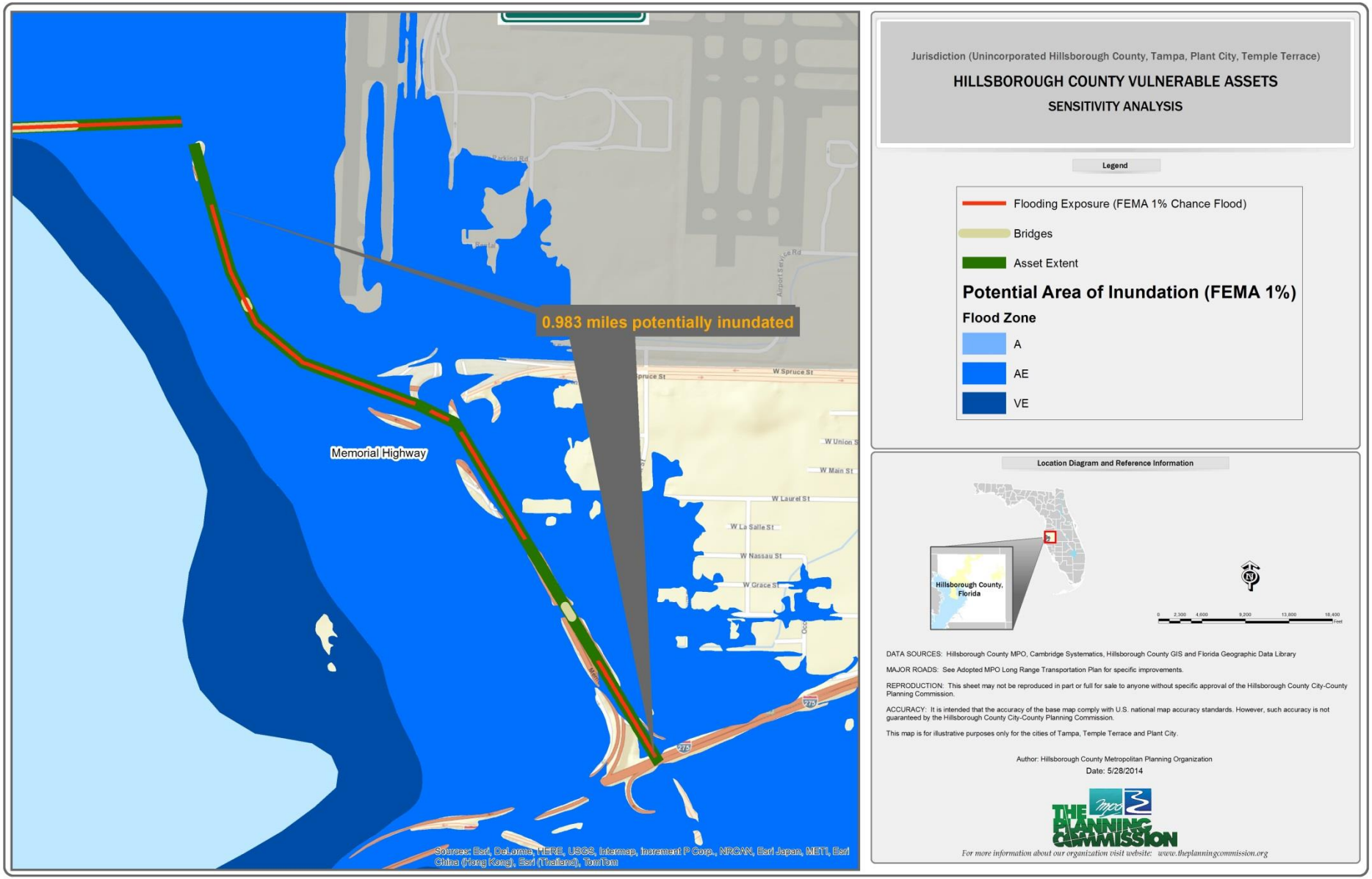
Inundation with FEMA 1% Chance Flood



Estimated Impacts of Disruption

Memorial Highway (Segment)

Trip Type	Attribute	Daily Change
Leisure Travel Data	Auto - VMT	68,409
	Auto - VHT	274,029
	Auto - Delay	266,660
	Auto - Lost Trips	0
Commute Auto Travel Data	Auto - VMT	51,313
	Auto - VHT	104,898
	Auto - Delay	99,977
	Auto - Lost Trips	0
Business/On-the-clock	Auto - VMT	100,049
	Auto - VHT	111,230
	Auto - Delay	106,929
	Auto - Lost Trips	0
Truck	Truck - VMT	7,495
	Truck - VHT	38,641
	Truck - Delay/Idling	37,626
	Truck - Lost Trips	0

DRAFT Estimated weekly losses

Gross Regional Product:

$19.7 MM

Income:

$12.3 MM

Work Hours:

360,000

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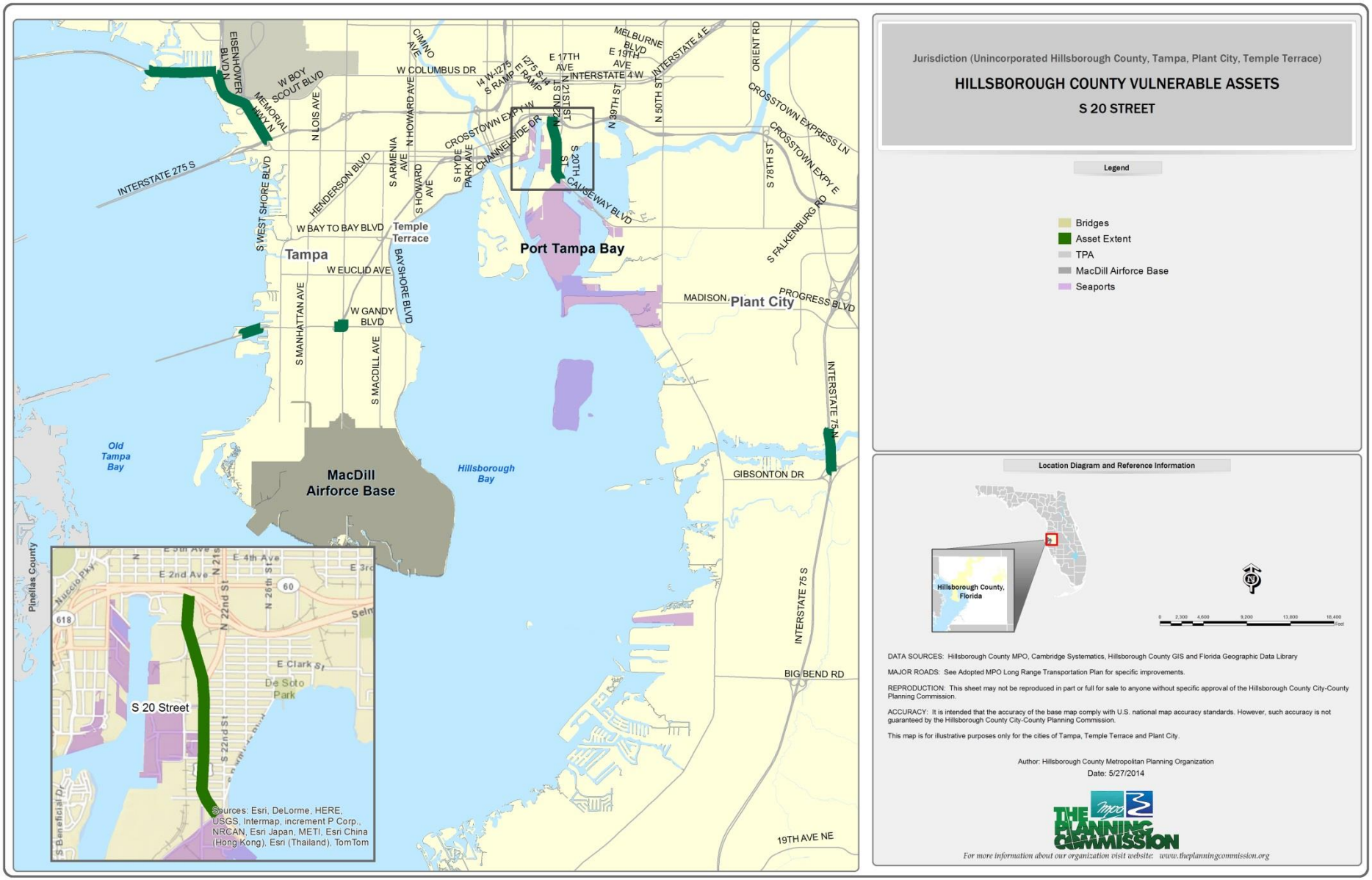
Potential Impacts and Mitigation Strategies

Scenario	Extent (miles)	Potential Impacts	Potential Mitigation Strategies
SLR	0.0	• n/a (unlikely)	• n/a
Cat 1	0.58	• Disruption • Washouts, erosion [moderate]	• Drainage improvements • Raise profile • Force attenuation and soil stabilization (rip-rap, salt tolerant vegetation, WADs)
Cat 3	1.09	• Disruption • Washouts, erosion [severe]	• Sea wall/barrier/WADs (particularly in VE zone), in addition to above
DFIRM (A /AE)	TBD	• TBD	• TBD
DFIRM (V /VE)	0.0	• n/a (unlikely)	• n/a

S 20 Street

CAMBRIDGE SYSTEMATICS

Asset Map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S 20 Street
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Port Tampa Bay
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MacDill Airforce Base
Old Tampa Bay
Hillsborough Bay
Pinellas County
W COLUMBUS DR
W BAY TO BAY BLVD
W EUCLID AVE
W GANDY BLVD
E 17TH AVE
E 19TH AVE
MELBURNE BLVD
INTERSTATE 4 W
INTERSTATE 4 E
INTERSTATE 275 S
CROSSTOWN EXPY W
CROSSTOWN EXPY E
CROSSTOWN EXPRESS LN
CHANNELSIDE DR
S 20TH ST
CAUSEWAY BLVD
HENDERSON BLVD
S WEST SHORE BLVD
BAYSHORE BLVD
S MANHATTAN AVE
S MACDILL AVE
N LOIS AVE
N HOWARD AVE
S HOWARD AVE
S ARMENIA AVE
S HYDE PARK AVE
N 39TH ST
N 50TH ST
S 78TH ST
S FALKENBURG RD
ORIENT RD
PROGRESS BLVD
GIBSONTON DR
BIG BEND RD
INTERSTATE 75 S
INTERSTATE 75 N
19TH AVE NE
EISENHOWER BLVD
W BOY SCOUT BLVD
MEMORIAL HWY N
CIMINO AVE
MADISON
E 4th Ave
E 2nd Ave
N 22nd St
N 26th St
E Clark St
De Soto Park
S 22nd St
Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom
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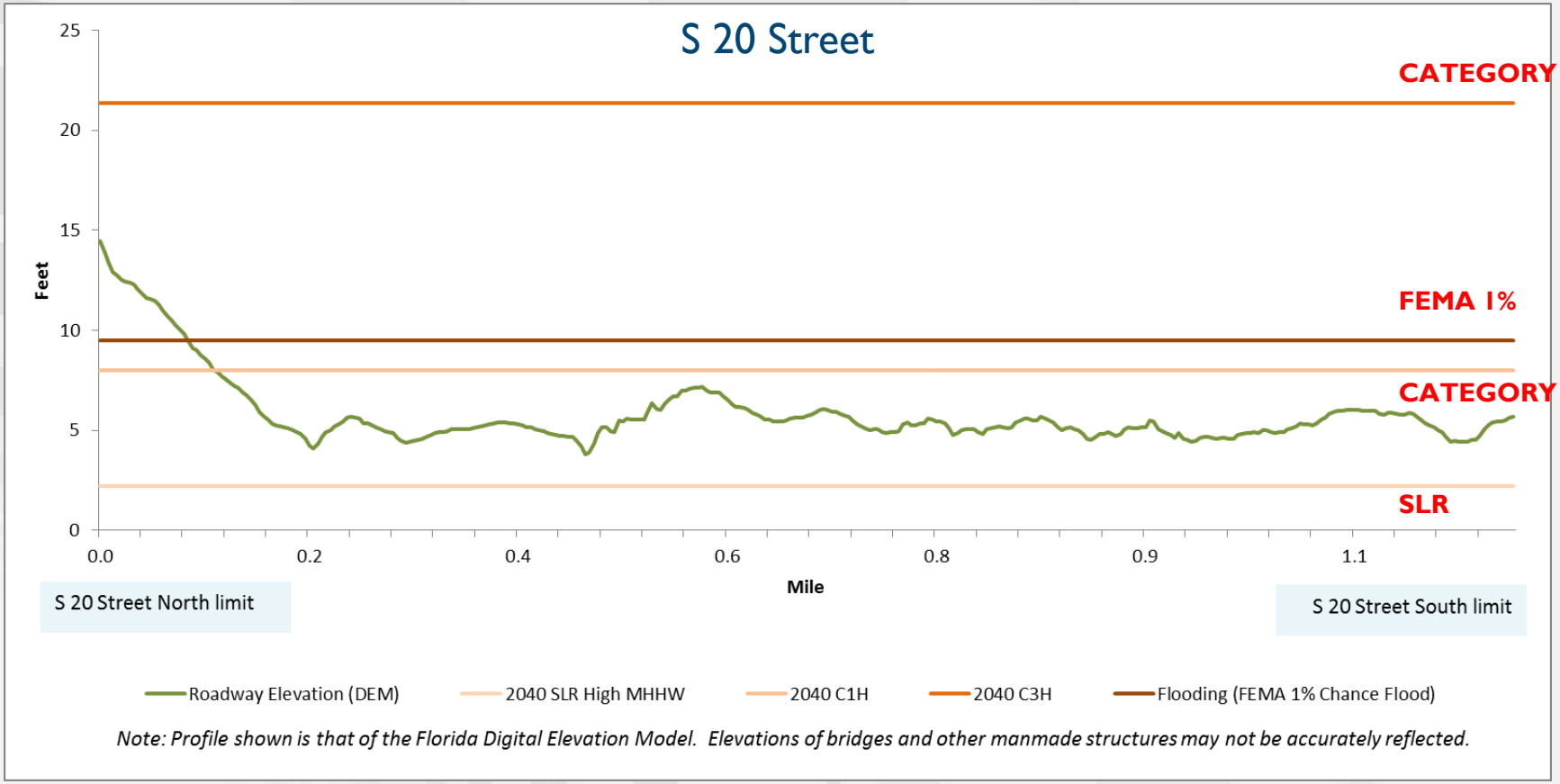
Asset Profile

Asset Type	From Maritime Blvd to Lee Roy Selmon Expressway Eastbound Ramp, all at grade - 1.29 miles	**Estimated Replacement Cost**	$14.7M (with current profile)
Current Condition	Primary connector route Port Tampa Bay's Hookers Point. Designed to accommodate increased truck traffic to port	**Estimated Recovery Time**	**TBD**
Estimated Age (Lifespan)	2001		
Use / Ridership	33,500 AADT		

Inundation Profile



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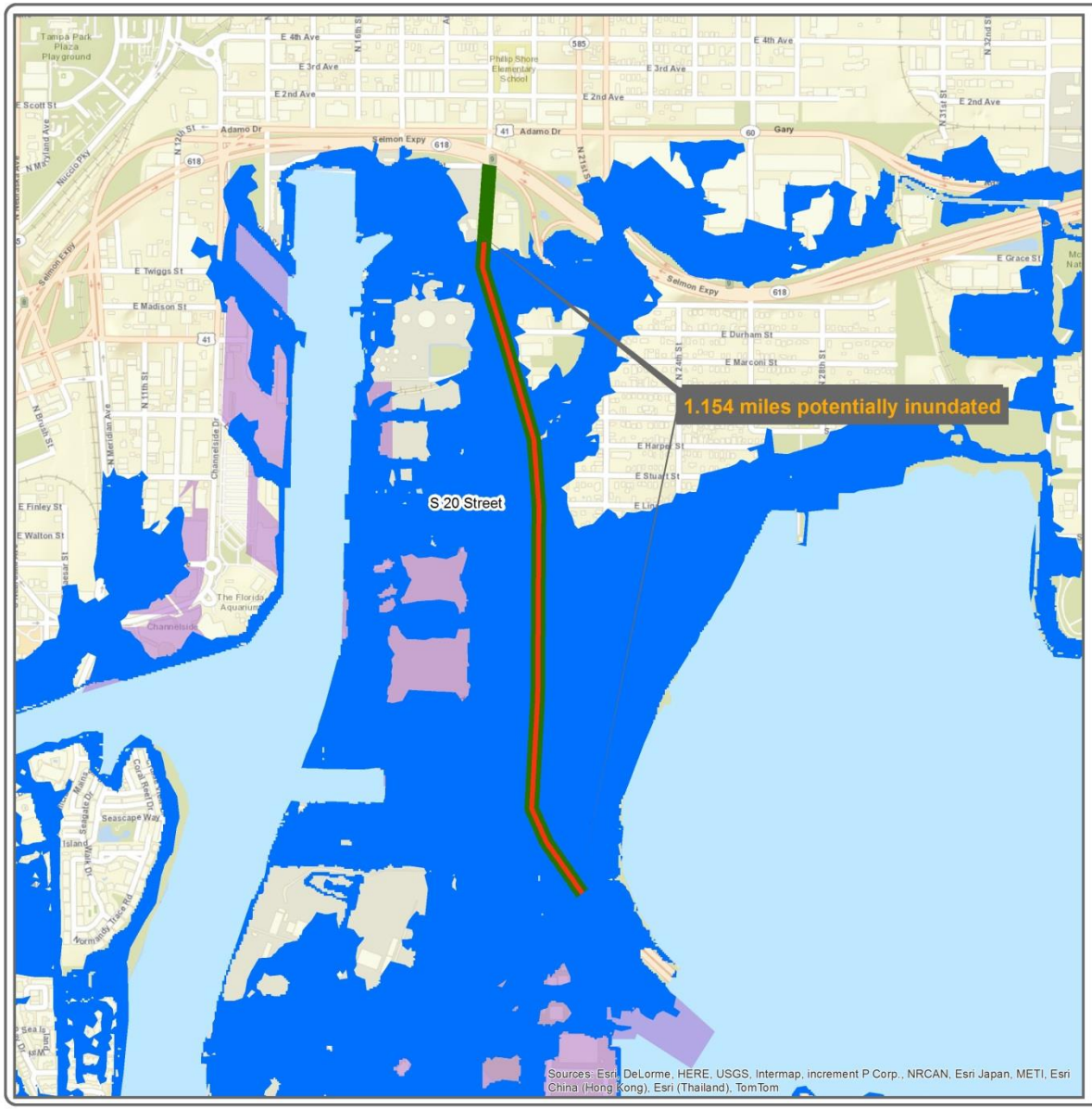
Inundation with Cat 1 Surge



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HILLSBOROUGH COUNTY VULNERABLE ASSETS

SENSITIVITY ANALYSIS

Legend

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- Asset Extent
- Potential Area of Inundation (Cat 1)

Location Diagram and Reference Information

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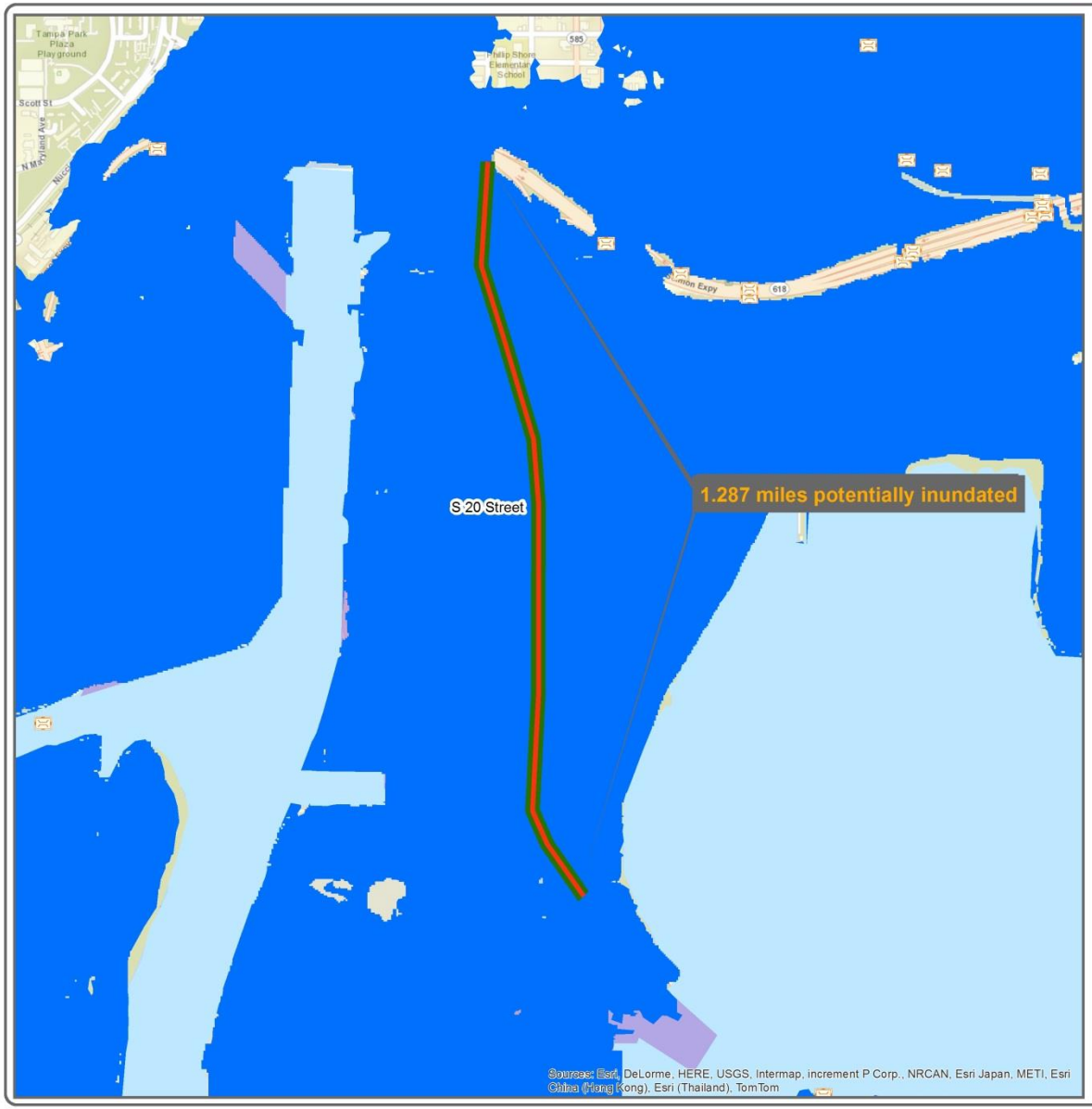

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Legend

- Bridges
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- Asset Extent
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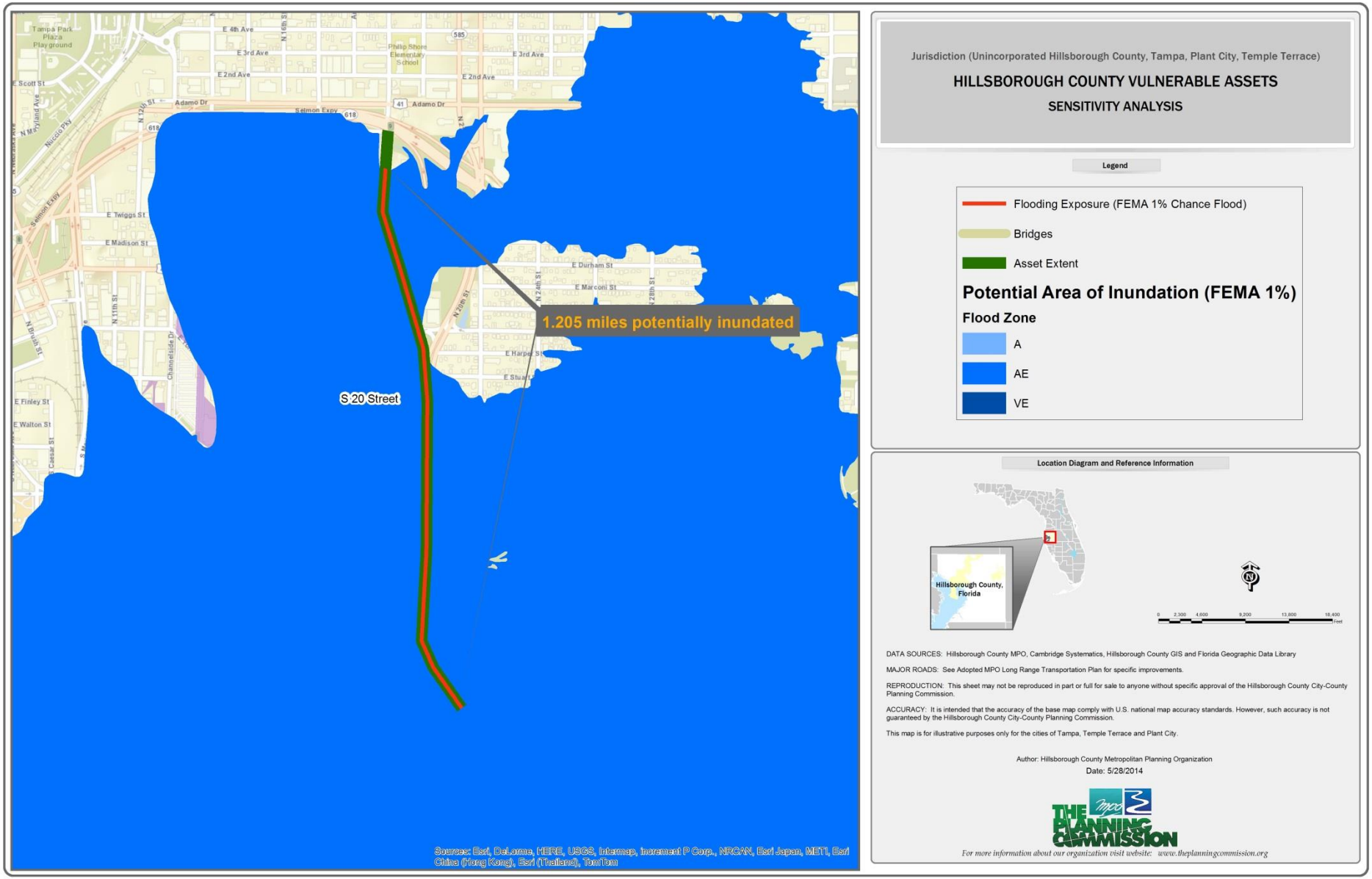

Estimated Impacts of Disruption

South 20th Street

Trip Type	Attribute	Daily Change
Leisure Travel Data	Auto - VMT	102,847
	Auto - VHT	23,575
	Auto - Delay	21,498
	Auto - Lost Trips	800
Commute Auto Travel Data	Auto - VMT	34,512
	Auto - VHT	10,467
	Auto - Delay	9,864
	Auto - Lost Trips	1,133
Business/On-the-clock	Auto - VMT	46,264
	Auto - VHT	9,425
	Auto - Delay	8,290
	Auto - Lost Trips	718
Truck	Truck - VMT	17,880
	Truck - VHT	3,473
	Truck - Delay/Idling	3,066
	Truck - Lost Trips	329

DRAFT Estimated weekly losses

Gross Regional Product:

$4.6 MM

Income:

$2.9 MM

Work Hours:

85,000

Potential Impacts and Mitigation Strategies

Scenario	Extent (miles)	Potential Impacts	Potential Mitigation Strategies
SLR	0	• n/a (unlikely)	• n/a
Cat 1	1.2	• Disruption • Washouts, erosion [moderate]	• Raise roadway profile • Force attenuation and soil stabilization (rip-rap, salt tolerant vegetation, WADs) • Drainage improvements
Cat 3	1.3	• Disruption • Washouts, erosion [severe]	• In addition to above, floodwater channeling measures adjacent or under roadway • Sea wall/barrier
DFIRM (A /AE)	1.2	• Disruption • Deterioration [possible]	• Raise roadway profile • Drainage improvements
DFIRM (V /VE)	0.0	• n/a (unlikely)	• n/a

Thanks!