Addressing Resiliency

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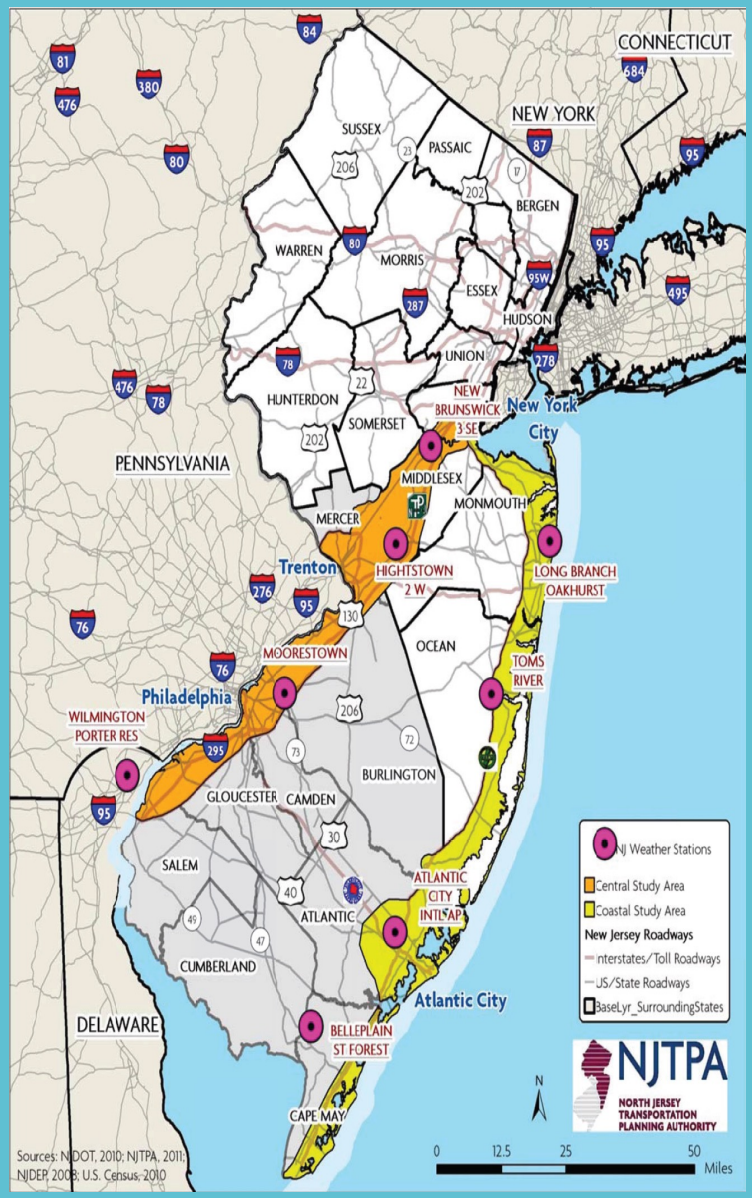
The New Jersey DOT Experience

Assessing Extreme Weather Risks on New Jersey's Transportation Network

Study 1:

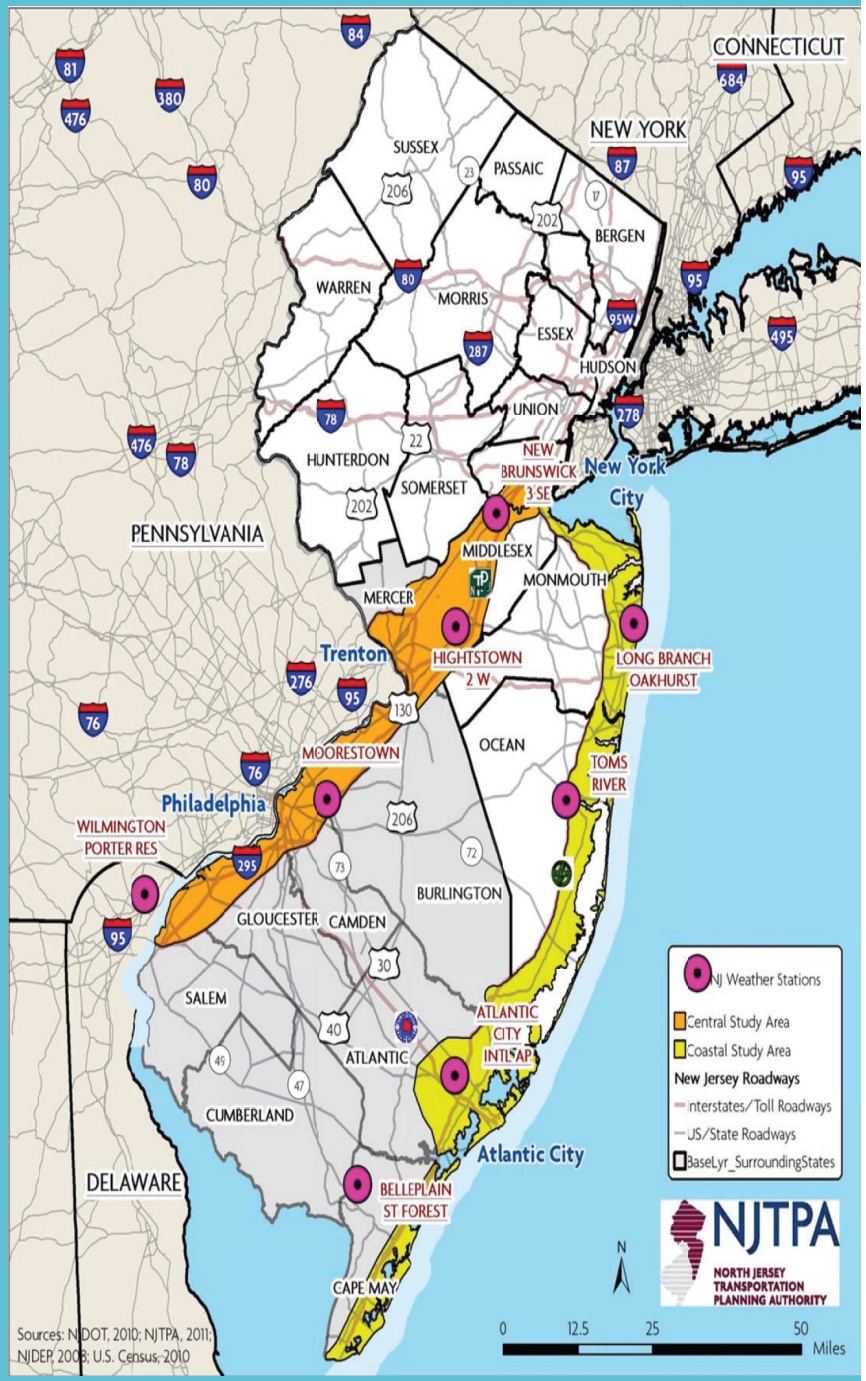
Climate Change Vulnerability and Risk Assessment of New Jersey's Transportation Infrastructure



Purpose:

1) Test FHWA's Vulnerability/Risk Assessment Model.

2) Gather information valuable to NJ.

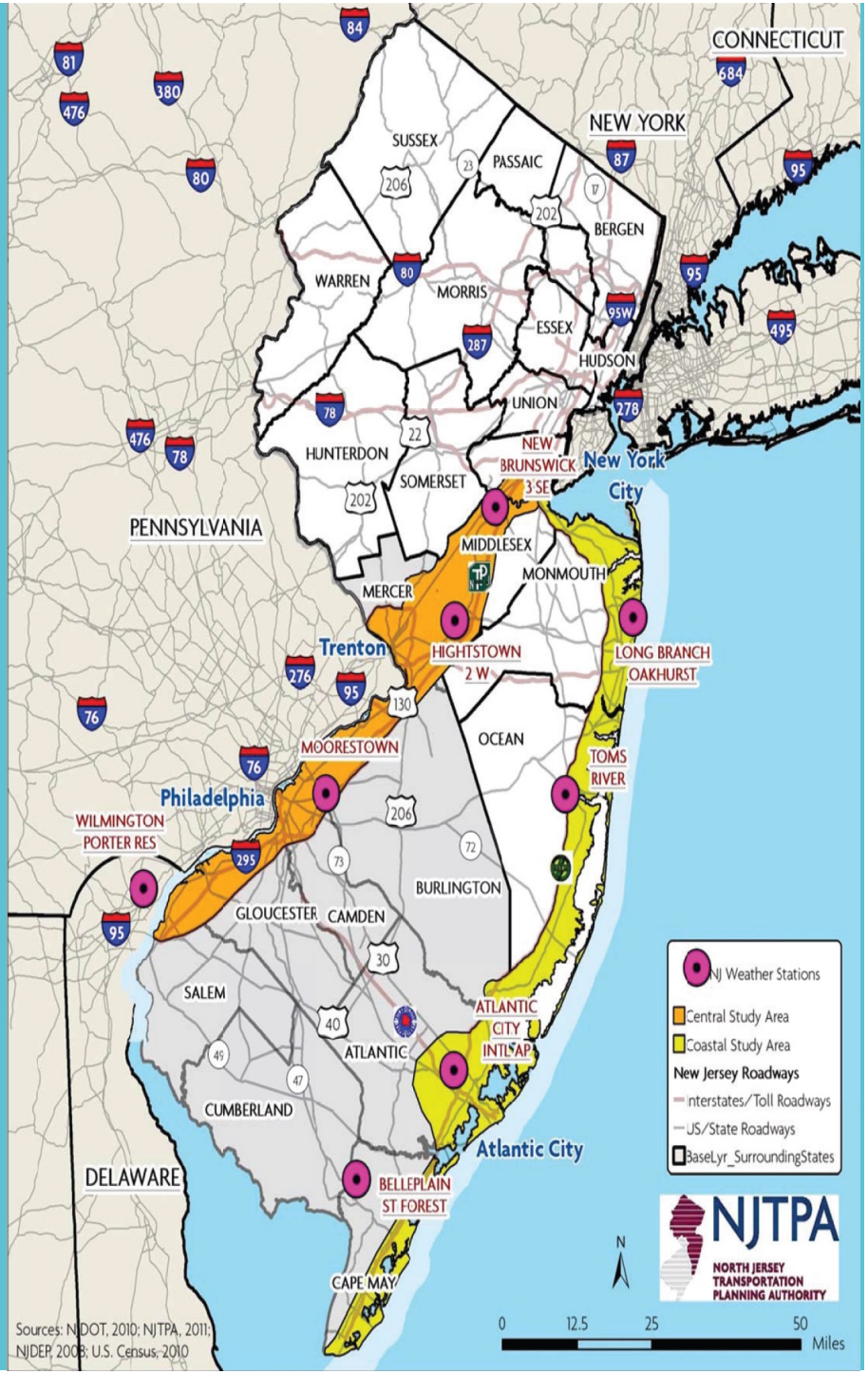


Methodology for Two Study Areas

1. Identify key transportation assets.

2. Develop future climate/ extreme weather scenarios for2050 and 2100.

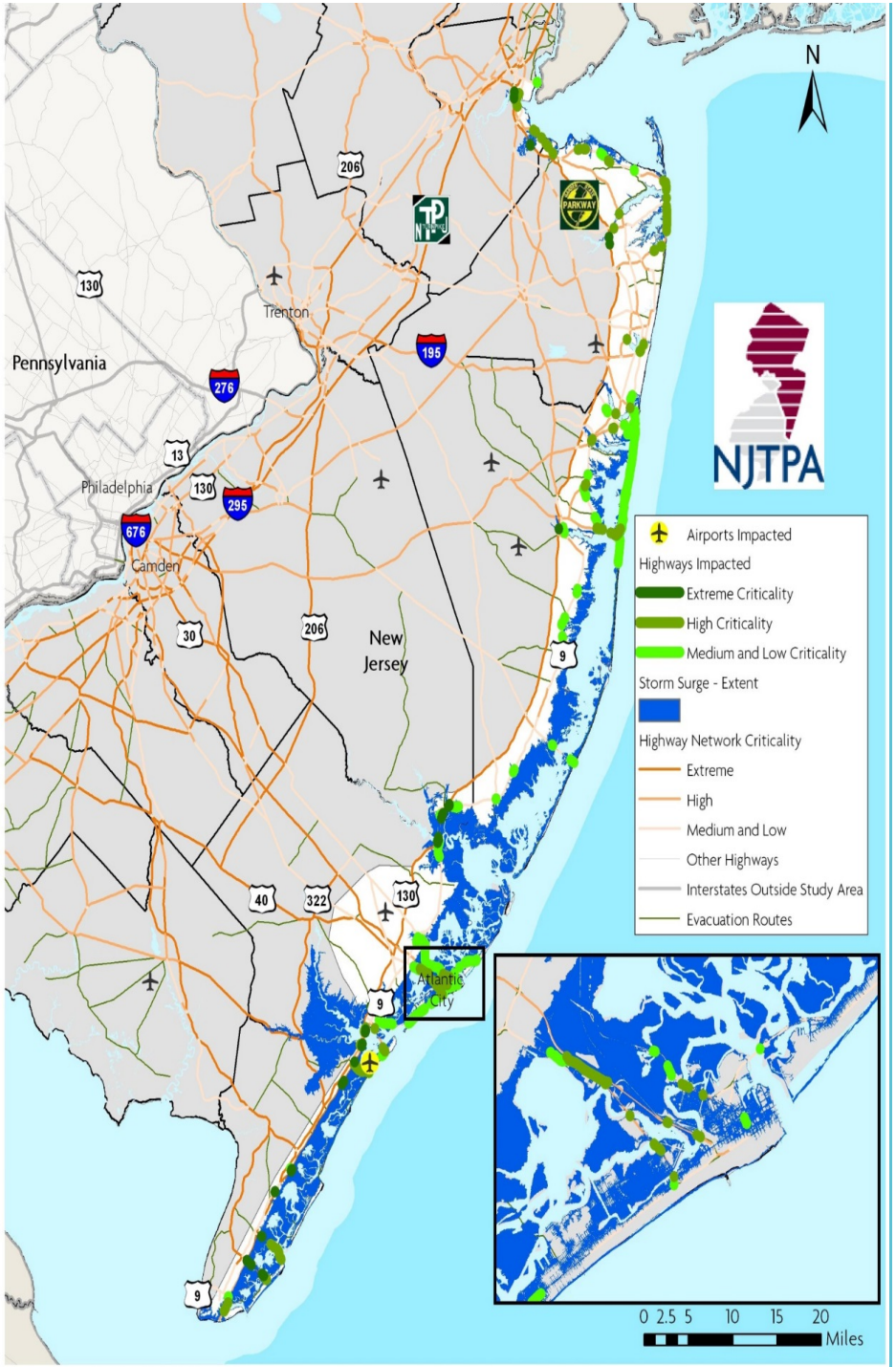
3. Overlay to assess potential future impacts.



Results:

Coastal Study Area

- Year 2100, Medium Scenario Results
- 1 Meter Sea Level Rise with Storm Surge
- 48.5 miles of roadway potentially impacted
- 2.9 miles of NJ Transit Lines impacted.
- 31 total rail miles impacted.



Results:

Central Study Area

- Year 2100, Medium Scenario
- 81 miles of roadway potentially impacted
- Major Routes Impacted: I-295, I-676 and US 130
- 138 rail miles, 11.7 miles Amtrak.

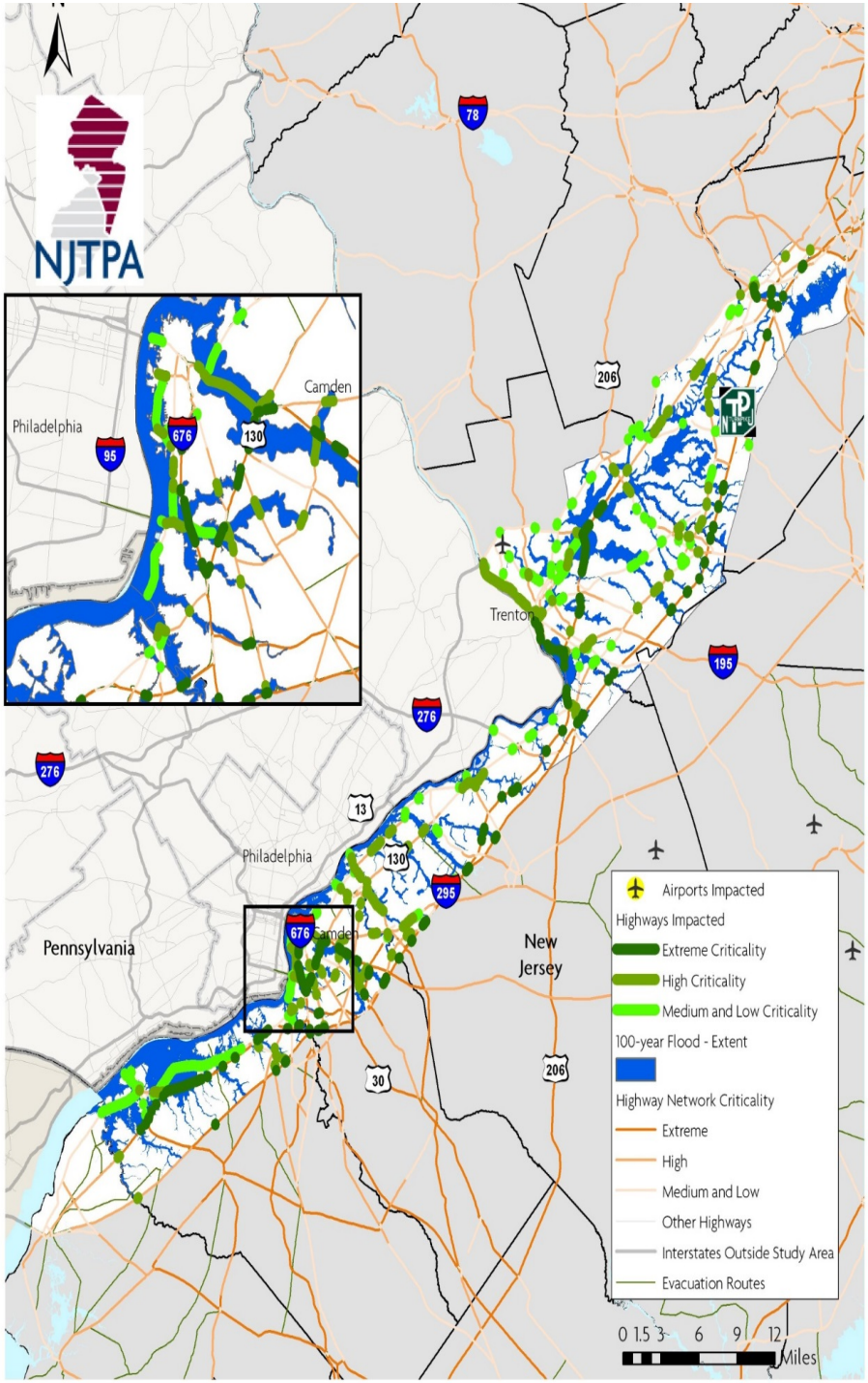


Table 27. Adaptation Strategy Matrix (Roadways, Bridge Approaches, and Tunnels)

IMPACT	STRATEGY			Frequency/ Severity of Future Incidence
	Planning	Design	Operations	
Climate Stressor: Sea Level Rise				
Flooding	• Site future infrastructure out of or above estimated flood impact zone • Identify or create redundant routes • Abandon/ relocate infrastructure (for chronically flooded segments) • Land use policies discouraging development in at-risk zones	• Enhance shoreline infrastructure (sea walls and shoreline armoring) • Elevate infrastructure • Enhance drainage to minimize road closure time and pavement deterioration (pumping infrastructure for tunnels)	• Road closures as necessary • Traveler notification of flooded roadways and alternative routes/modes (ITS)	
Erosion		• Create/ strengthen seawalls and barriers	• More frequent inspections and maintenance • Beach nourishment • Wetland maintenance	
Corrosion (from chronic sea water exposure)		• Design infrastructure to resist salt water corrosion	• More frequent inspections and maintenance	
Climate Stressor: Storm Surge (Hurricanes and Nor'easters)				
Flooding	• Establish and frequently update emergency detours and evacuation routes • Site future infrastructure out of or above estimated flood impact zone • Abandon/ relocate infrastructure (for chronically flooded segments) • Land use policies discouraging development in at-risk zones	• Enhance shoreline infrastructure (sea walls and shoreline armoring) • Elevate infrastructure • Enhance drainage to minimize road closure time and pavement deterioration (pumping infrastructure for tunnels)	• Emergency sandbagging • Road closures as necessary • Traveler notification of flooded roadways and alternative routes/modes (ITS)	
Erosion/ washouts		• Create/ strengthen seawalls and barriers • Harden/ stabilize slopes	• More frequent inspections and maintenance • Beach nourishment • Wetland maintenance	

Recommendations

FHWA Model:

- Acceptance/comfort/validity of predictions. What are agencies/ public willing to buy in to? Development of public policies that provide political cover for planning/engineering decisions based on accepted risk tolerance.

- Adaptation module could be developed.

New Jersey Specific:

- Data gaps were identified in terms of bridges, culverts, incidents.

- Recommend high level vulnerability assessment for the entire state.

Climate Change Vulnerability and Risk Assessment of New Jersey's Transportation Infrastructure

Medium Sea Level Rise Scenario

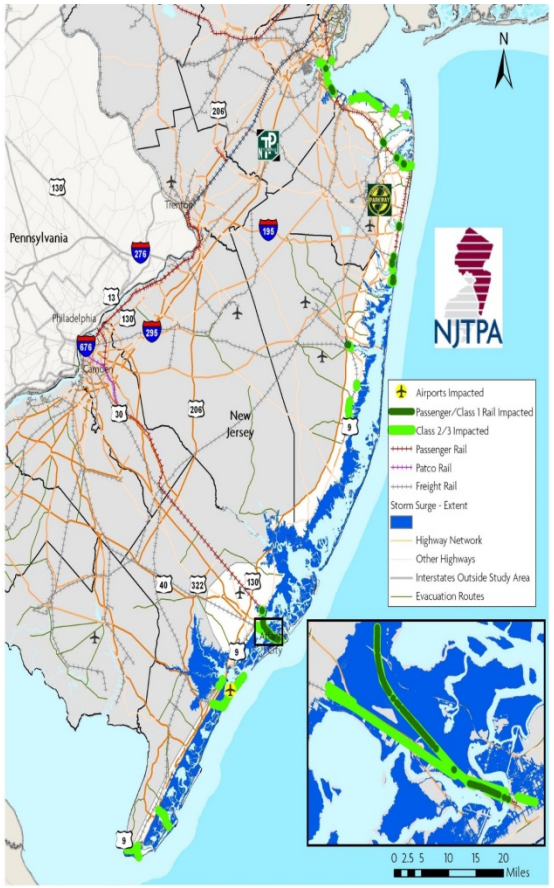
Coastal Study Area (Rail)

Year 2100

1 Meter Sea Level Rise with Storm Surge

21 miles of track potentially impacted

Lines Impacted: Atlantic City Line



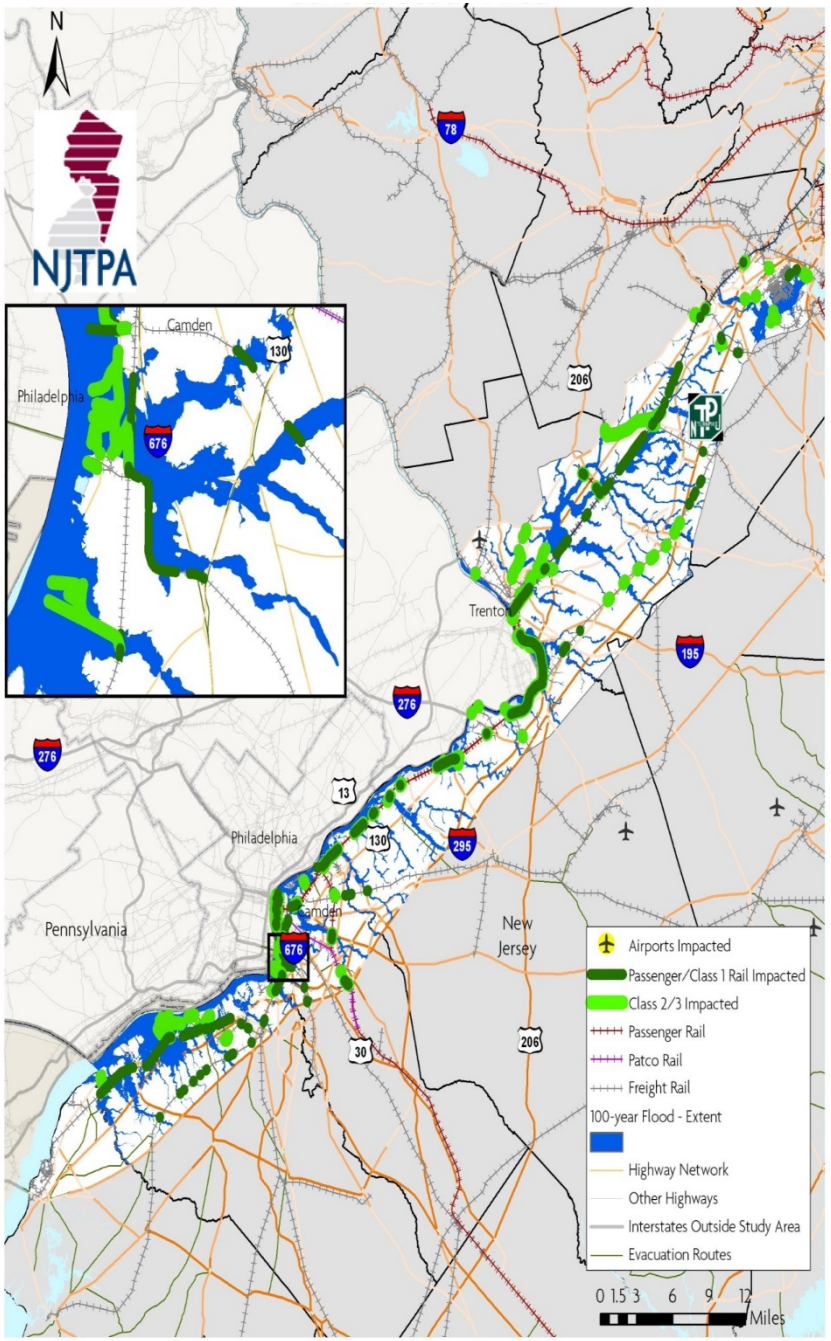
Climate Change Vulnerability and Risk Assessment of New Jersey's Transportation Infrastructure

Inland Flooding using A1B Emissions Scenario

Central Study Area (Rail)

Year 2100

138.5 miles of track potentially impacted including 26 miles of NJ Transit track and 21 miles of Class 1 freight track.



FHWA Hurricane Sandy Follow-Up Vulnerability Assessment and Adaptation Study for Tri-State Region

Hurricane Sandy, October 2012 (THOMAS A. MATHIS BRIDGE (EB NJ 37), Ocean County)

Purpose:

Examine impacts of Sandy and other recent storms and compare to predictive models.

Develop engineering adaptation assessment process.

Identify up to 10 assets for adaptation assessment.

Hurricane Sandy, October 2012 (THOMAS A. MATHIS BRIDGE (EB NJ 37), Ocean County)

Identify at-risk sub-regions and associated at-risk assets.

Engineering-Based Adaptation Assessment Process

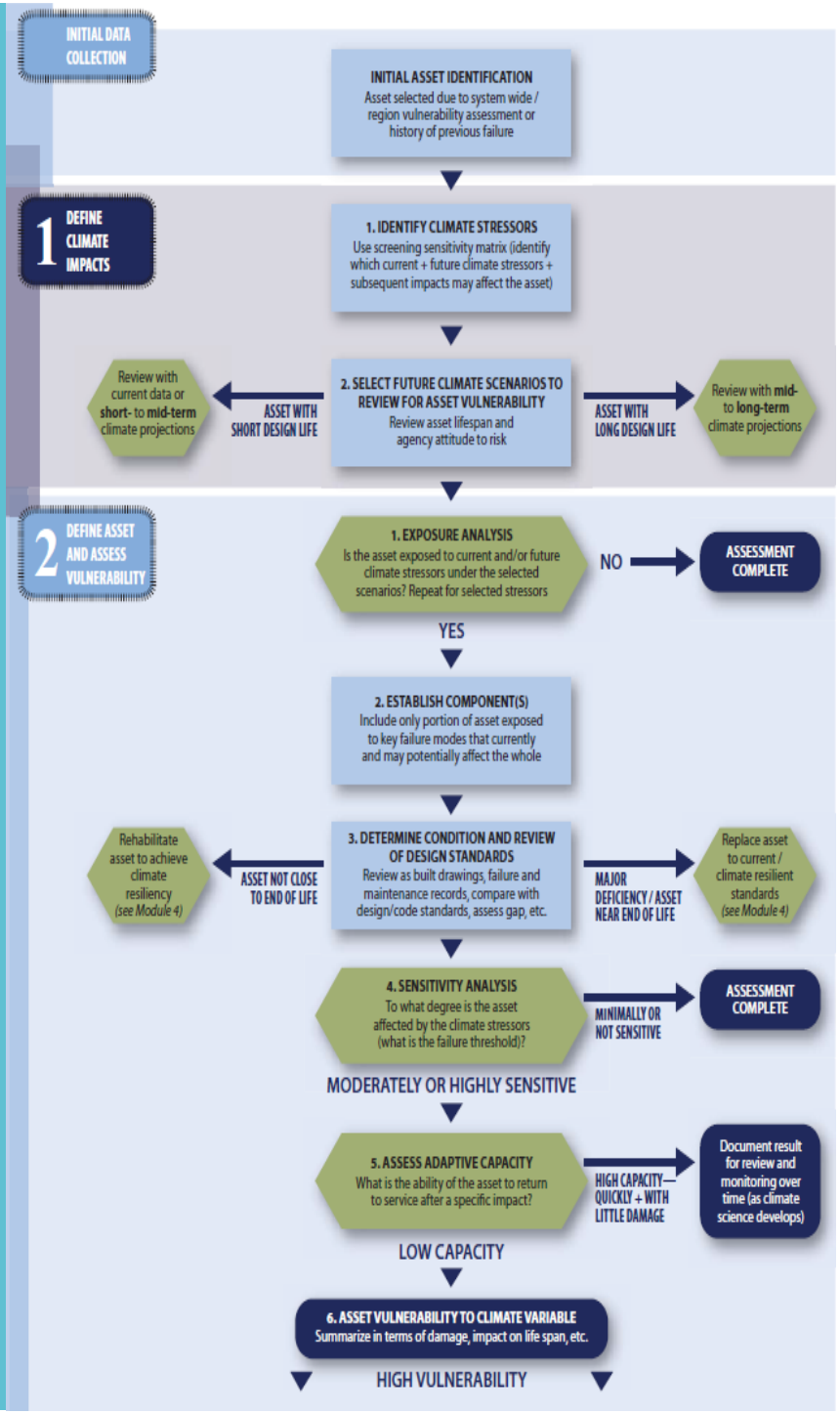
Pre-Assessment: Asset Data/ Description

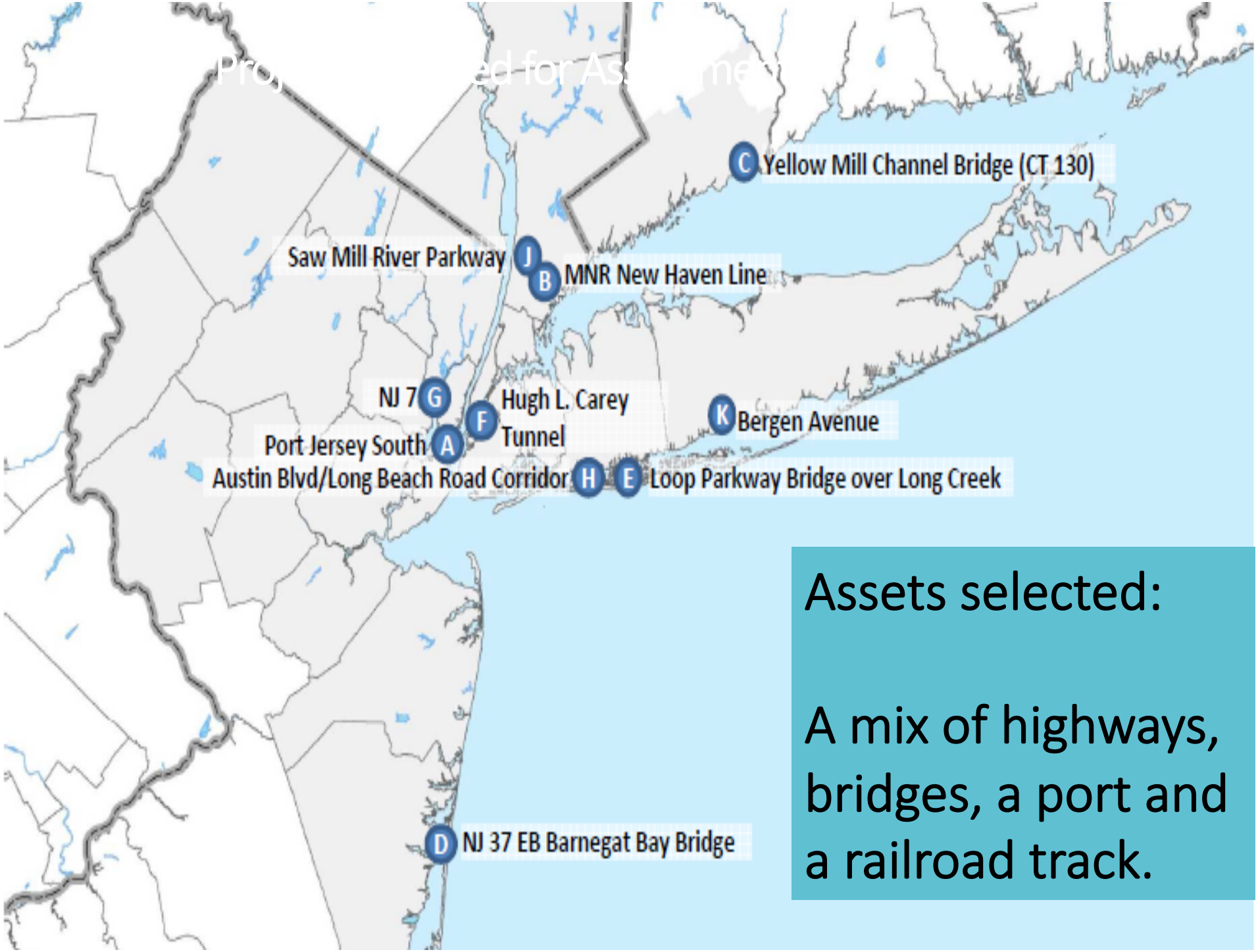
Module 1: Current and Future Climate Stressors

Module 2: Vulnerability Assessment

Module 3: Consequence Analysis

Module 4: Develop and Select Adaptation Strategies




C Yellow Mill Channel Bridge (CT 130)
Saw Mill River Parkway
J
B MNR New Haven Line
NJ 7 G
F Hugh L. Carey Tunnel
K Bergen Avenue
Port Jersey South A
Austin Blvd/Long Beach Road Corridor H
E Loop Parkway Bridge over Long Creek
D NJ 37 EB Barnegat Bay Bridge
Assets selected:
A mix of highways, bridges, a port and a railroad track.

Progress

- Data from actual storms compiled.
- Engineering adaptation process developed.
- 9 of 10 engineering assessments will be completed by the end of August 2015.
- System-wide vulnerability assessment/analysis is underway.
- Final report expected Spring 2016.