

## GENESEE TRANSPORTATION COUNCIL

### RESOLUTION

**Resolution 16-44    Accepting the *Genesee-Finger Lakes Regional Critical Transportation Infrastructure Vulnerability Assessment* as evidence of completion of UPWP Task 5750**

#### WHEREAS,

1. The *FY 2015-2016 Unified Planning Work Program* includes Task 5750, Genesee-Finger Lakes Regional Critical Transportation Infrastructure Vulnerability Assessment, for the purpose of determining the vulnerability of the region's surface transportation infrastructure assets to natural and human-caused hazards and identifying actions for preventing and/or mitigating the impacts of hazard events on those assets;
2. Said Task included an inventory of critical surface transportation infrastructure assets including roads, bridges, railroads, highway garages, operations centers, and intermodal transfer facilities; an analysis of anticipated natural and human-caused hazard extents and impacts; an assessment of the vulnerability of critical transportation assets to anticipated hazards; and the identification of implementation strategies for preventing and/or mitigating the impacts of hazard events on those assets;
3. Said Task has been completed and has resulted in the *Genesee-Finger Lakes Regional Critical Transportation Infrastructure Vulnerability Assessment*, which identifies specific actions to prevent and/or mitigate the impacts of hazard events on those assets; and
4. Said Study has been reviewed by GTC staff and member agencies through the GTC committee process and has been found to be consistent with the goals, objectives, and recommendations of the Long Range Transportation Plan.

#### NOW, THEREFORE, BE IT RESOLVED

1. That the Genesee Transportation Council hereby accepts the *Genesee-Finger Lakes Regional Critical Transportation Infrastructure Vulnerability Assessment* as evidence of completion of UPWP Task 5750; and
2. That this resolution takes effect immediately.

#### CERTIFICATION

The undersigned duly qualified Secretary of the Genesee Transportation Council certifies that the foregoing is a true and correct copy of a resolution adopted at a legally convened meeting of the Genesee Transportation Council held on June 9, 2016.

Date \_\_\_\_\_

\_\_\_\_\_  
KEVIN C. BUSH, Secretary  
Genesee Transportation Council

## EXECUTIVE SUMMARY

The crippling impact of recent major storms on our country's critical infrastructure has necessitated a change in the way we plan, design, construct, operate, and maintain our critical infrastructure elements in order to make our communities more resilient and sustainable. A series of severe weather events, including Hurricane Irene in August 2011, Tropical Storm Lee in September 2011, and Superstorm Sandy in October 2012, revealed vulnerabilities in New York State's transportation system that are currently being addressed through several state-wide planning initiatives and have further heightened the need to assess vulnerabilities of our transportation assets. Several Federal and state agencies have already begun assessing the vulnerability of their critical infrastructure in the face of climate change and have been strategizing decision-making processes to prevent or mitigate the impacts of natural and manmade hazards on our critical infrastructure.

Within the nine-county Genesee-Finger Lakes Region, county emergency management agencies have developed county-wide all-hazard mitigation plans, flooding mitigation plans, emergency management plans for specific events such as hazardous materials spills, and identified and publicized evacuation routes for the R. E. Ginna Nuclear Power Plant. However, while elements of the transportation system have been factored into all these plans, there has not been a systematic region-wide attempt to assess the vulnerability and resiliency of critical elements of the transportation network.

*The policy basis for this project at the regional level is the Long Range Transportation Plan (LRTP) 2035, which identifies planning for the impacts of climate change as one of six emerging opportunities and issues that the Genesee-Finger Lakes Region will face over the next 25 years and beyond.*

The *Genesee-Finger Lakes Regional Critical Transportation Infrastructure Vulnerability Assessment* offers a regional look at critical transportation assets across the Genesee-Finger Lakes Region, profiles the natural and human-caused hazards that have the potential to impact critical transportation assets, and identify the vulnerability of these critical transportation assets in the face of such hazards. The study further goes into presenting strategies for preventing and/or mitigating the impacts of hazard events on those critical transportation assets.

Given the limited availability of funds for transportation infrastructure projects, transportation planning and management agencies are concerned with maximizing their investments. Information on hazard vulnerabilities and asset criticality provided by this study can be used by member agencies to help prioritize transportation infrastructure projects that address a broad range of issues. This means that

projects can be developed to address multiple agency objectives, including mitigating hazard impacts on the movements of people and goods and safeguarding public investments against threats. These most vulnerable critical assets and issues related to critical assets will be considered holistically during annual reviews and prioritization of potential projects by transportation agencies.

This project is the first time a systematic assessment of the region's transportation system vulnerabilities has been undertaken. The process used to conduct this assessment is modeled on the Federal Highway Administration's (FHWA) *Climate Change and Extreme Weather Vulnerability Assessment Framework*<sup>1</sup>, which provides a guide and resources for transportation agencies seeking to understand their vulnerability to the anticipated impacts of climate change and extreme weather events. The *Framework*, in turn, is built on five pilot projects funded by the Federal Highway Administration in California, New Jersey, Virginia, Washington State, and Hawaii, as well as on the U.S. Department of Transportation *Gulf Coast Study*. These projects assessed transportation infrastructure vulnerabilities and identified strategies for strengthening infrastructure resiliency in their respective study areas. Where applicable, the experiences and lessons of these initiatives have been integrated into this project.



## Critical Transportation Assets

The Federal Highway Administration (FHWA) has classified critical transportation assets into four categories:

- Infrastructure: Roads, bridges, ramps, overpasses, tunnels, etc.

---

<sup>1</sup> *Federal Highway Administration's Climate Change & Extreme Weather Vulnerability Assessment Framework*, U.S. Department of Transportation FHWA, December 2012, [http://www.fhwa.dot.gov/environment/climate\\_change/adaptation/publications/vulnerability\\_assessment\\_framework/fhwahep13005.pdf](http://www.fhwa.dot.gov/environment/climate_change/adaptation/publications/vulnerability_assessment_framework/fhwahep13005.pdf).

- Facilities: Operations centers, headquarters buildings, district/ regional complexes, maintenance garages/ yards, fuel depots, salt storage, rest areas, weigh stations, vehicle inspection stations, toll plazas, etc.
- Equipment: Vehicles, traffic signals, Intelligent Transportation Systems field instrumentation (communications elements, traffic cameras, dynamic message signs, system sensors), etc.
- Personnel: Employees, vendors, contractors, etc.

*The focus of this study is on the resiliency and vulnerability of the first two asset categories, Infrastructure and Facilities.*

Since this is a regional study, the way in which it was determined whether transportation assets were critical was to focus on those that are critical to the function and operation of the *regional* transportation system. That said, critical transportation assets that were considered as part of this study include:

- Roadways consisting of a functional classification of “Minor Collector” or greater (includes Expressways, Principal Arterials, Minor Arterials, Major Collector, and Minor Collector);
- Bridges along the regional roadway network, with a callout for those that are weight and/or height restricted;
- Facilities essential to emergency response (Police, Fire, Hospitals, etc.);
- Highway garages, fueling depots, staging areas, etc.;
- Traffic and Transit Operations Centers; and,
- Emergency Operations Facilities.

Where appropriate, local roads were included as a component of the regional critical transportation infrastructure if they were deemed to provide access to a facility critical to transportation or emergency response, provide an essential regional mobility or connectivity link, provide access to an important economic center, or are part of an evacuation or detour route.

All state, county, and municipal police, fire, and highway garages/



facilities, hospitals, the regional traffic operations center in Rochester, RGRTA transit operations centers, county emergency operations facilities, and DOT communications towers were identified as being critical transportation assets, and were portrayed on the maps throughout this document.

## Natural and Human-Caused Hazards

In order to understand the types and geographic extent of natural and human-caused hazards throughout the Genesee-Finger Lakes Region and to the extent to which they have the potential to impact critical transportation assets, hazard profiles were developed. Hazard profiles include a textual description explaining each hazard along with a geographical representation that identifies where the hazard is known to occur or has the potential to occur.



Further analysis described the relationship between hazard extents and critical transportation assets. Table ES-1 outlines the natural and human-caused hazards that were profiled as part of this study.

Table ES-1: Natural and Human-Caused Hazards Profiled

Natural Hazards	Human Caused Hazards
Flooding (including fluvial, lacustrine, and urban flash flooding)	Hazardous Materials Spills and Fires/ Explosions Resulting from such
Severe Storms (snow, ice, rain, etc.)	Terrorist Attacks
High Winds (straight line, downbursts, tornado)	Sabotage
Extreme Temperatures and Frequent Freeze/ Thaw Cycles	Structural Collapse
Landslides	Highway Crashes/ Incidents
Land Subsidence/ Sinkholes	Derailments
Earthquakes	

Various GIS data was obtained from New York State Thruway Authority (NYSTA), New York State Department of Transportation (NYSDOT), New York State Department of Environment and Conservation (NYSDEC), New York State Office of Emergency Management (NYSOEM), Genesee-Finger Lakes Regional Planning Council, Genesee Transportation Council, and other agencies. Information and maps were also taken from the New York State Hazard Mitigation Plan and All-County Hazard Mitigation Plans developed by each county. A more thorough analysis of GIS data combined with input from stakeholders went into identifying more specific locations or “hot spots” in each county that are known to experience hazard events and specifically addresses how hazards have been known or can be expected to impact critical transportation assets.

## Critical Transportation Infrastructure Vulnerability

In order to identify the vulnerability of critical transportation assets throughout the Genesee-Finger Lakes Region, each asset was numerically scored using a database developed using Microsoft Excel and then graphically portrayed by joining the Microsoft Excel database with the GIS data.

Each critical transportation asset was scored for its vulnerability based upon the regional criticality of the asset and its exposure and sensitivity to a variety of natural and human-caused hazards. For the purposes of scoring like assets, critical transportation assets were placed into one of three categories- Roadway Segments, Bridges, or Facilities. There are four vulnerability components, as follows:

- *Criticality* – The asset is scored based on how critical it is to the regional transportation network.
- *Sensitivity* – The asset is scored based on how sensitive it is to existing or future hazards. Sensitivity is defined as the severity of the impact that a hazard event has on an asset. For instance, an asset may be exposed to a hazard only once in a while, but the impacts from that hazard event on the asset are severe.
- *Exposure* – The asset is scored based on its exposure to existing or future hazards. Exposure is defined as how often the asset is or potentially will be exposed to hazard events. Exposure variables were scored based on the following:
  - Exposure to flooding was based on identification by local officials of the areas prone to flooding.
  - Exposure to snow storms was based on annual snowfall and areas prone to Lake Effect storms.
  - Exposure to high winds was based on identification by local officials of the areas prone to high winds as well as high profile and elevated roadways or bridges.
  - Exposure to sink holes was based on USGS Evaporite and Karst Topography maps.
  - Exposure to terrorist attacks/ sabotage was based on identification by local officials of likely targets.
- *Local Input* – The asset is scored based on its local importance and as identified in a local plan or by local stakeholders as being vulnerable to hazards.

*The Excel databases are set up to allow users to conduct a query to identify assets by county or by jurisdiction, allowing the databases to become working documents that agencies can use to update or customize the database or conduct more localized vulnerability assessments.*



Each asset was scored according to the established scoring categories that are given to each variable (see Chapter 4). Some scores are quantitative in that they provide a score to an asset because it falls within a certain category; some scores are qualitative in that they provide a score to an asset based on input received from stakeholders or a local plan.



Each variable is then given a weight that places greater emphasis on those variables that play a larger role in making an asset critical, sensitive, exposed, or of local importance. Once an asset is scored for a variable, the variable weight is applied to give a total variable score for that asset.

Once all the scores for a vulnerability component are tallied, a factor is applied to the vulnerability component

based on a percentage of 100% and customized to the importance of each in determining the overall vulnerability of an asset. The Exposure component receives a percentage factor of 25%, the Criticality component receives a percentage factor of 20%, the Sensitivity component receives a percentage factor of 45%, and the Local Input component receives a percentage factor of 10%, for a total of 100%.

Once all of the assets were scored, the assets were then placed into a category, based on their score, to identify their level of vulnerability. Assets for roadways, facilities, and bridges were placed into vulnerability categories as follows:

#### *Transportation Asset Vulnerability Categories*

- High Vulnerability (score of 225 or greater)
- Moderately High Vulnerability (score of 200-224)
- Moderate Vulnerability (score of 175-199)
- Moderately Low Vulnerability (score of 150-174)
- Low Vulnerability (score of under 150)

## Critical Transportation Infrastructure Vulnerability Results

For the purposes of this study, focus is placed on those critical transportation assets that were identified as having a “high” or “moderately high” vulnerability as a result of the scoring exercise. In total, there were 84 roadway segments that scored as high or moderately high vulnerably (18 scored as high and 66 scored as moderately high), 20 bridges that scored as high or moderately high vulnerability (12 scored as

high and 8 scored as moderately high), and 18 facilities that score as high or moderately high vulnerability (3 scored as high and 15 scored as moderately high).

#### *Roadway Segments*

Map ES-1 portrays the vulnerability scoring of roadway segments throughout the Genesee-Finger Lakes Region. The following summarizes those roadway segments that were scored as high vulnerability.

- New York State Thruway (various segments throughout the entire study area)
- NY State Route 31 in Wayne County (between Vienna Street and Leach Road)
- I-390 (portions in Monroe and Livingston County)
- NY State Route 104 (portions in Monroe County)
- I-490 (portions in Monroe County)
- I-590 (portions in Monroe County)
- NY State Route 390 in Monroe County (between Exit 21 and Exit 22)

#### *Bridges*

Map ES-2 portrays the vulnerability scoring of bridges throughout the Genesee-Finger Lakes Region. The following summarizes those bridges that were scored as high vulnerability.

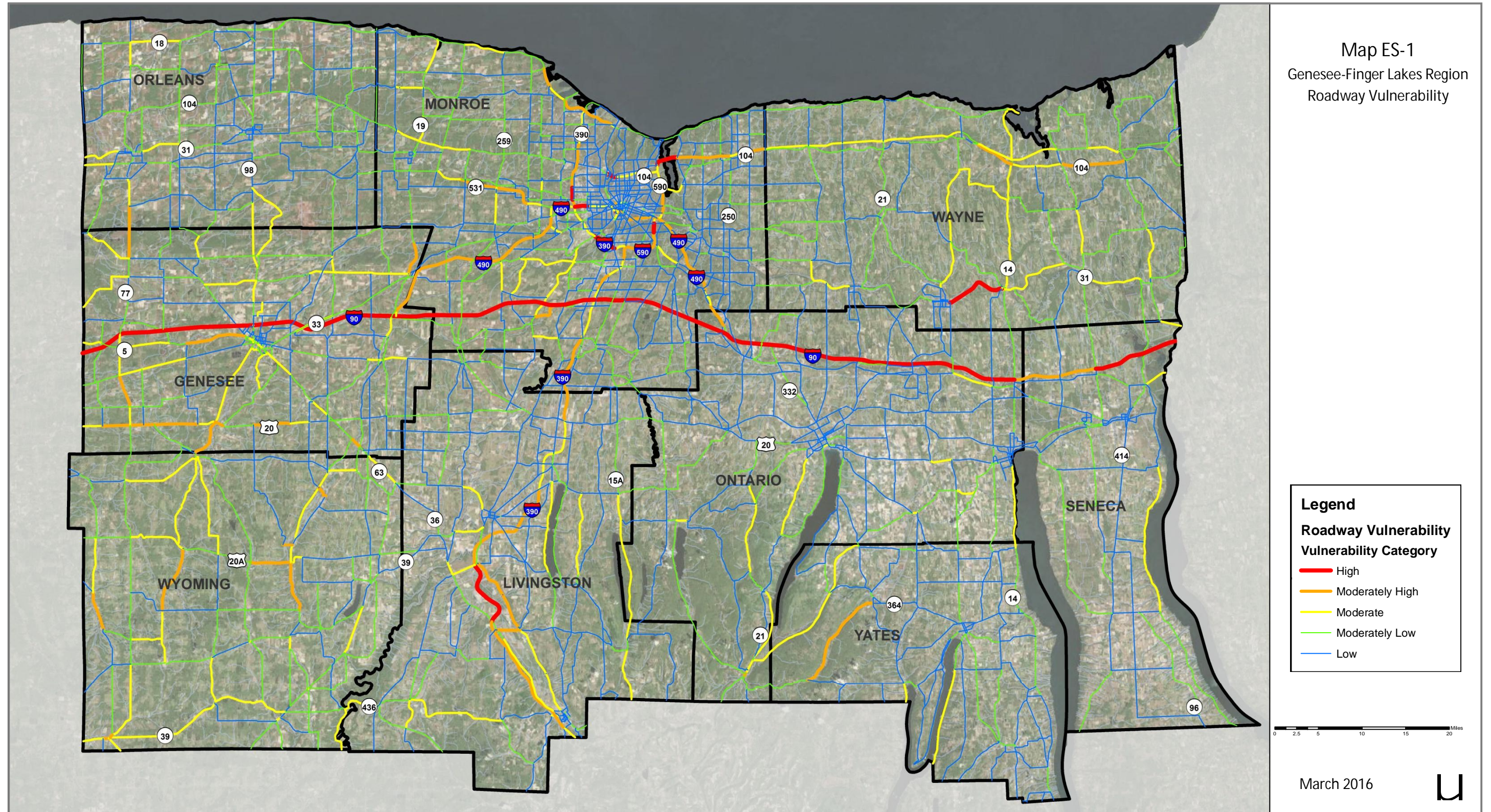
- I-390 over Genesee River in Monroe County
- NY State Route 104 over Genesee River in Monroe County (Veteran's Memorial Bridge)
- I-490 over Genesee River in Monroe County (Frederick Douglass-Susan B. Anthony Memorial Bridge)
- US 20 over NY State Route 98 in Genesee County
- I-390 over railroad in Monroe County
- NY State Route 63 in Orleans and Genesee Counties (several bridges through Oak Orchard Swamp)
- NY State Route 104 over Irondequoit Bay in Monroe County (Irondequoit Bay Bridge)

#### *Facilities*

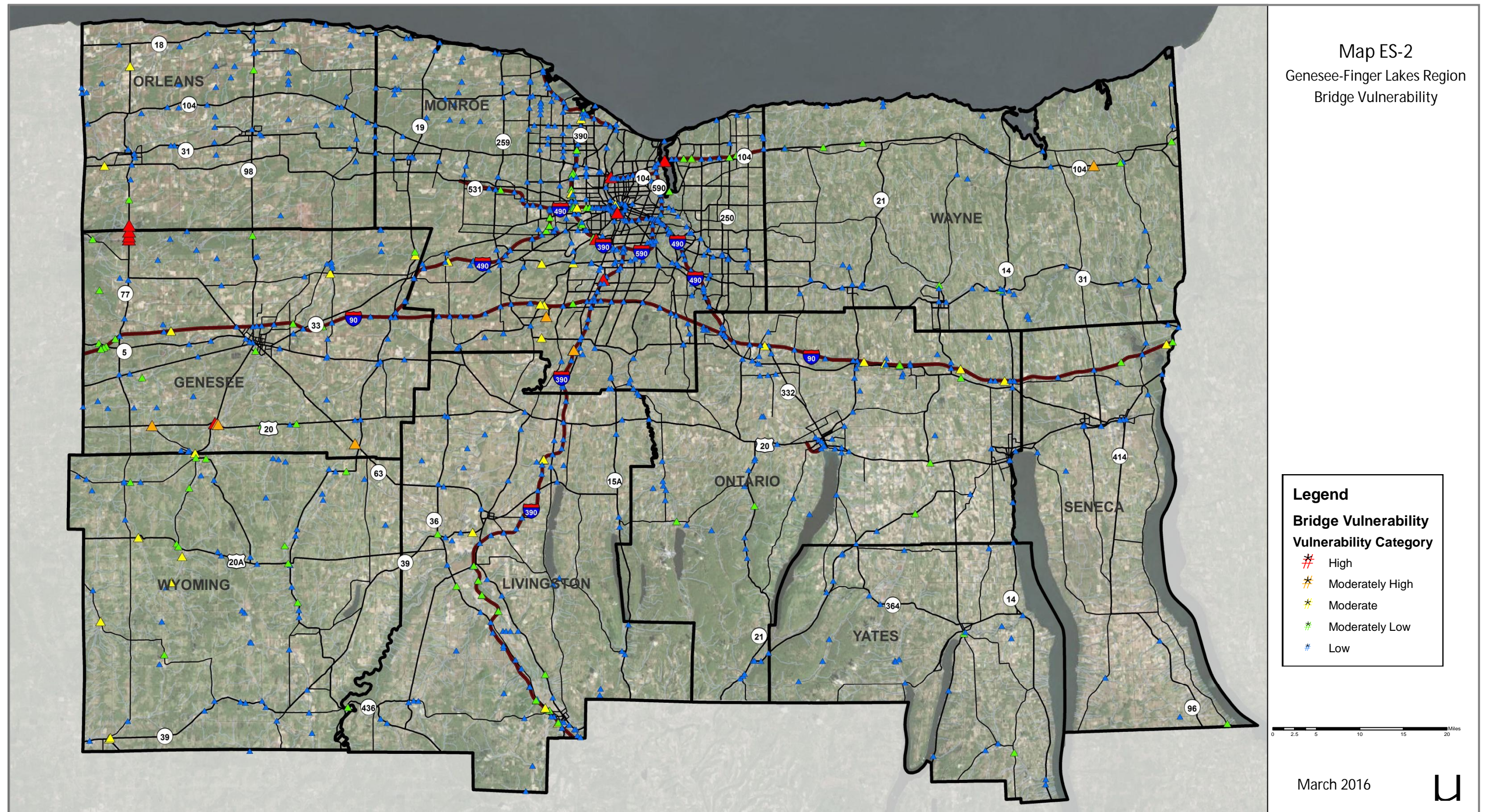
Map ES-3 portrays the vulnerability scoring of bridges throughout the Genesee-Finger Lakes Region. The following summarizes those bridges that were scored as high vulnerability.

- NYSDOT Region 4 Office in Monroe County
- Town of Alexander Highway Garage in Wyoming County
- Regional Traffic Operations Center in Monroe County

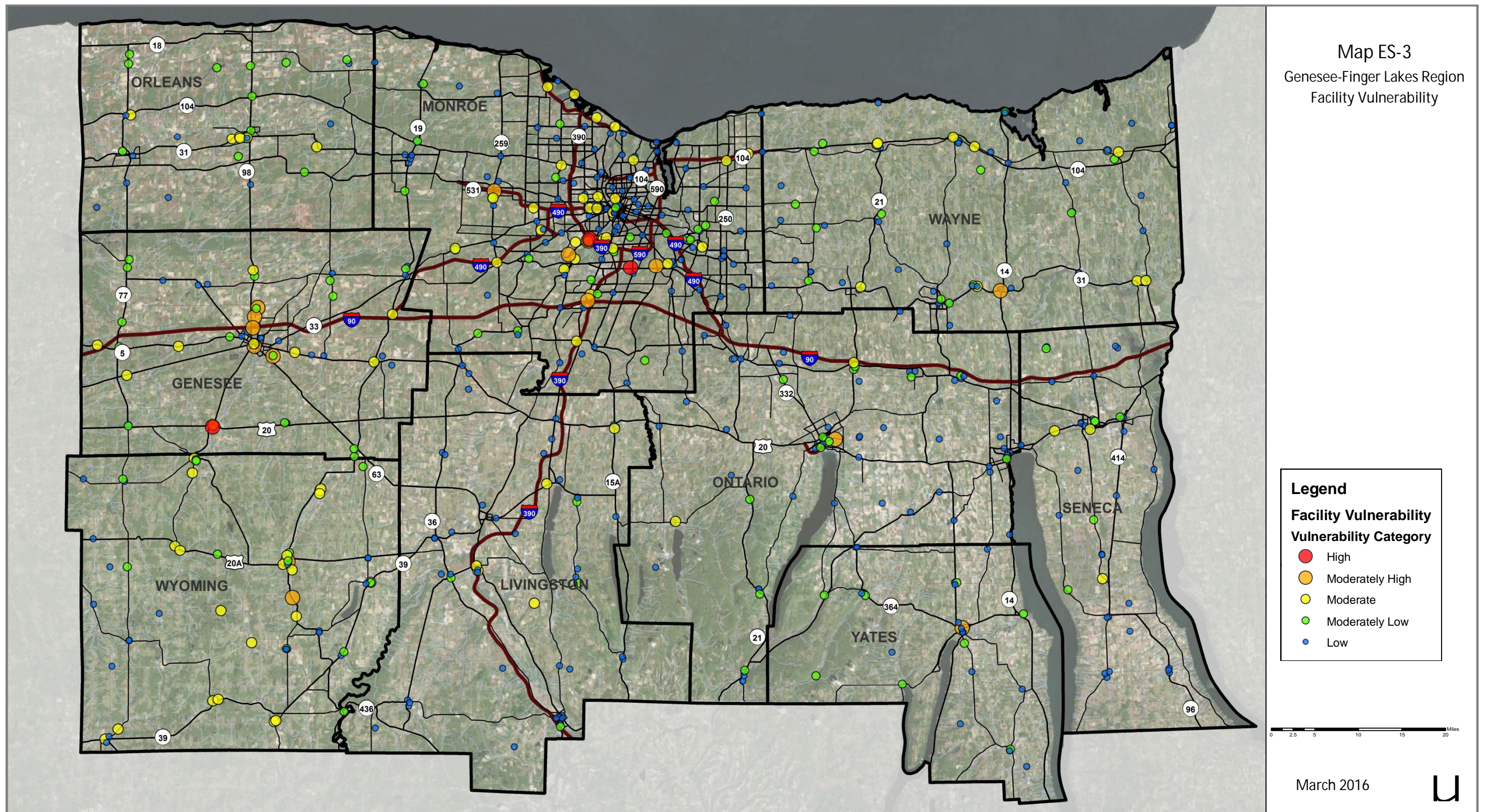














## Hazard Mitigation Strategies

In its Multi-Hazard Mitigation Planning Guidance, the Federal Emergency Management Agency (FEMA) defines hazard mitigation as “any sustained action taken to reduce or eliminate long-term risk to people and property from natural and human-caused hazards and their effects<sup>2</sup>.” Mitigation strategies aim to reduce or minimize potential impacts from hazard events and differ from actions taken to prepare for or respond to hazard events. The objective is that mitigation strategies minimize or potentially eliminate the need for preparedness or response actions in the future. Mitigation is different from preparedness, which is action taken to improve emergency response or operational preparedness.

As part of this study, a hazard mitigation strategy toolbox was developed to provide the Genesee Transportation Council and member agencies and municipalities with a toolbox for minimizing or eliminating the potential impacts of natural or human-caused hazard events on critical transportation assets that were identified in this study as being the most vulnerable. The toolbox identifies a broad range of options that can be employed to prevent or minimize the impacts of natural and human-caused hazards on transportation assets. Agencies should use the toolbox to identify the strategies that can be applied to their situation and develop a more customized mitigation strategy to implement.

Hazard mitigation strategies are placed into the following categories:

- *Planning and Policy* – Involves development of plans and planning processes, zoning and land use regulations, and compliance and enforcement programs.
- *Communication, Education, and Awareness* – Involves Federal, State, and local agencies getting information out to the public, media, and stakeholders about the potential for hazard events to occur as well as strategies that can aid in preventing or minimizing the impacts of hazards.
- *Infrastructure and Construction* – Are physical and/or structural improvements made to increase the resiliency of critical transportation assets in the face of natural and human-caused hazards.
- *Natural and Land Resource Protection* – Involves improvements made to natural or agricultural lands, rather than to actual transportation infrastructure, that aid in making nearby critical transportation infrastructure more resilient to the potential impacts of natural hazards.
- *Operations and Maintenance* – Involve the routine operations and maintenance activities that can be undertaken by State and local agencies to prevent or minimize the impact hazard events have on the critical transportation system.

---

<sup>2</sup>*Multi-Hazard Mitigation Planning Guidance Under the Disaster Mitigation Act of 2000, FEMA, January 2008 (Revised).*

## Potential Funding Sources

The following table identifies some of the more popular funding sources and opportunities that can be used for creating a more resilient critical transportation system. The list is derived from those sources identified in the 2014 New York State Hazard Mitigation Plan as well as other known sources.

Table ES-2: Potential Funding Sources

Program	Agency	Description
Aquatic Ecosystem Restoration	Environmental Protection Agency (EPA)	Support for carrying out aquatic ecosystem restoration projects that will improve quality of the environment.
National Flood Insurance Program	FEMA	Formula grants to assist FEMA communities to comply with NFIP floodplain management requirements.
National Dam Safety Program	FEMA	Technical assistance, training, and grants to help improve State dam safety programs.
Hazard Mitigation Assistance (HMA) Program	FEMA	Grants to provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages.
Flood Mitigation Assistance (FMA) Program	FEMA	Grants to communities for pre-disaster mitigation planning and projects to help reduce or eliminate the long-term risk of flood damage to structures insurable under the NFIP.
Hazard Mitigation Grant Program (HMGP)	FEMA	Grants to communities for planning and projects proving long-term hazard mitigation measures following a major disaster declaration.
Pre-Disaster Mitigation (PDM) Competitive Grant Program	FEMA	Grants to communities for planning and projects that provide long-term hazard pre-disaster mitigation measures.
Partners for Fish and Wildlife	U.S. Fish and Wildlife Service	Financial and technical assistance to landowners interested in pursuing restoration projects affecting wetlands and riparian habitats.
FHWA Emergency Relief Program	U.S. DOT	Funding for the repair or reconstruction of Federal-aid highways that have suffered serious damage as a result of natural disasters or catastrophic failures.
National Institute of Food and Agriculture's Disaster Resilience for Rural Communities Grant Program	U.S. Dept. of Agriculture	Advance basic research in engineering and in the social, behavioral, and economic sciences to enhance disaster resilience in rural communities.
Emergency Watershed Protection (EWP) Program	Natural Resources	Provides assistance to relieve imminent hazards to life and property caused by natural disasters.



Program	Agency	Description
	Conservation Service (NRCS)	
Homeland Security Grant Program (HSGP)	Department of Homeland Security (DHS)	Financial assistance to communities to prevent, protect against, mitigate, respond to, and recover from acts of terrorism and other threats.
Emergency Management Performance Grants (EMPG)	DHS	Assist local and State governments in enhancing and sustaining all hazards emergency management capabilities.
New York State Emergency Services Revolving Loan	NYS Division of Homeland Security and Emergency Services (DHSES)	Assistance for repair of firefighting apparatus, ambulances, or rescue vehicles; Renovation, rehabilitation, or repair of facilities that house firefighting equipment, ambulances, rescue vehicles, and related equipment.

In addition to the above funding sources, Governor Andrew Cuomo is proposing the following transportation and infrastructure funding in his proposed 2016 State Budget:

- Launch the \$1 Billion New BRIDGE NY Program to Fix Bridges – Statewide, there are approximately 8,600 bridges, 34% of which are in poor condition. To upgrade bridges, the Governor is proposing BRIDGE NY, a new \$1 billion initiative that will provide \$500 million to help municipal governments replace, rehabilitate, and maintain vital local bridges and invest \$500 million in state-owned bridges.
- Launch a New \$500 Million Infrastructure Hardening Program – The Governor is proposing a \$500 million Extreme Weather Hardening Program to make safety and resiliency enhancements to roadways across the state that have proven to be susceptible to flooding and other extreme weather events.
- Protect Critical Infrastructure through Targeted Security Assessments – The Governor is proposing to invest \$1.3 million to fund annual security assessments of critical infrastructure and strategies to reduce the State’s vulnerability to terrorism by strengthening readiness and response.