Genesee-Finger Lakes Regional Local Bridge Vulnerability Assessment

GENESEE TRANSPORTATION COUNCIL

Final Report

June 2019

Genesee-Finger Lakes Regional
Local Bridge Vulnerability Assessment

Prepared For:

Genesee Transportation Council

50 West Main Street, Suite 8112

Rochester, New York 14614

Prepared By:

WSP USA Inc.

50 Lakefront Blvd., Suite 111

Buffalo, New York 14202

Financial assistance for the preparation of this report was provided by the Federal Highway Administration and Federal Transit Administration through the Genesee Transportation Council. The project sponsor is solely responsible for its content and the views and opinions expressed herein do not necessarily reflect the official views or policy of the U.S. Department of Transportation.

GTC's Commitment to the Public

The Genesee Transportation Council assures that no person shall, on the grounds of race, color, national origin, disability, age, gender, or income status, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity. GTC further assures every effort will be made to ensure nondiscrimination in all of its programs and activities, whether those programs and activities are federally funded or not.

En Español

El Consejo Genesee del Transporte asegura completa implementación del Título VI de la Ley de Derechos Civiles de 1964, que prohibe la discriminación por motivo de raza, color de piel, origen nacional edad, género, discapacidad, o estado de ingresos, en la provisión de beneficios y servicios que sean resultado de programas y actividades que reciban asistencia financiera federal.

Table of Contents

EXECUTIVE SUMMARY

The purpose of the *Genesee-Finger Lakes Regional Local Bridge Vulnerability Assessment* is to assess the vulnerability of local bridges located along non-federal aid roadways in the Genesee-Finger Lakes Region to natural and human-caused hazards and propose strategies for preventing and/or mitigating the impacts of hazard events on those bridges. Further, this assessment provides an on-site assessment of nineteen local bridges, selected by county highway superintendents.

In 2016, Genesee Transportation Council (GTC) completed the *Genesee-Finger Lakes Regional Critical Transportation Infrastructure Vulnerability Assessment*, which assessed the vulnerability of federal-aid eligible roads and the bridges on those roads, as well as regionally significant transportation facilities and assets, to natural and human-caused hazards. That project focused on bridges located along roads eligible for federal-aid funds; whereas this study focuses on those bridges located along non-federal aid local roads (i.e. "local bridges"). This study uses the same methodology and format as the Regional Critical Transportation Infrastructure Assessment.

The Regional Local Bridge Vulnerability Assessment focuses on those bridges located along non-federal aid local roads (i.e. "local bridges") using the same methodology and format as the Regional Critical Transportation Infrastructure Assessment.

This Local Bridge Vulnerability Assessment acts as a supplement to the Regional Critical Transportation Infrastructure Vulnerability Assessment and using the same methodology, data, and assumptions as the regional study, thus for purposes of avoiding duplication, much of the explanation surrounding the purpose of conducting vulnerability assessments and the discussion and extent of hazard profiles outlined in the Regional Critical Transportation Infrastructure Vulnerability Assessment is incorporated into this study by reference.

The participants of this study include planning officials and highway superintendents and their staff from Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne, Wyoming, and Yates counties along with GTC staff.

GIS data was used to identify local bridges, querying BINs that begin with the number "2" or "3" to develop a list of local bridges. Then, based upon information collected from existing plans and studies, data from the Regional Critical Transportation Infrastructure Vulnerability Assessment, and input received from county highway superintendents and officials, an inventory of existing local bridges was confirmed. Following discussions with Monroe County officials, it was determined that several bridges in

Monroe County that had BINs that began with the number “1” were actually local bridges and should be included in this study. This resulted in the identification of 712 local bridges in the region.

All 712 local bridges were numerically scored using a database developed using Microsoft Excel and then graphically portrayed by joining the Microsoft Excel database with the GIS data using the same methodology that was used in the Regional Critical Transportation Infrastructure Vulnerability Assessment. Each local bridge was scored for its vulnerability based upon the criticality of the bridge and its exposure and sensitivity to a variety of natural and human-caused hazards. There are four vulnerability components: Criticality (how critical the bridge is to the transportation network), Sensitivity (the severity of the impact that a hazard event has on a bridge), Exposure (how often the bridge is or potentially will be exposed to hazard events), and Local Input (local importance and as identified in a local plan or by local stakeholders).

Once all of the local bridges were scored, the bridges were then placed into a category, based on their score, to identify their level of vulnerability, as follows:

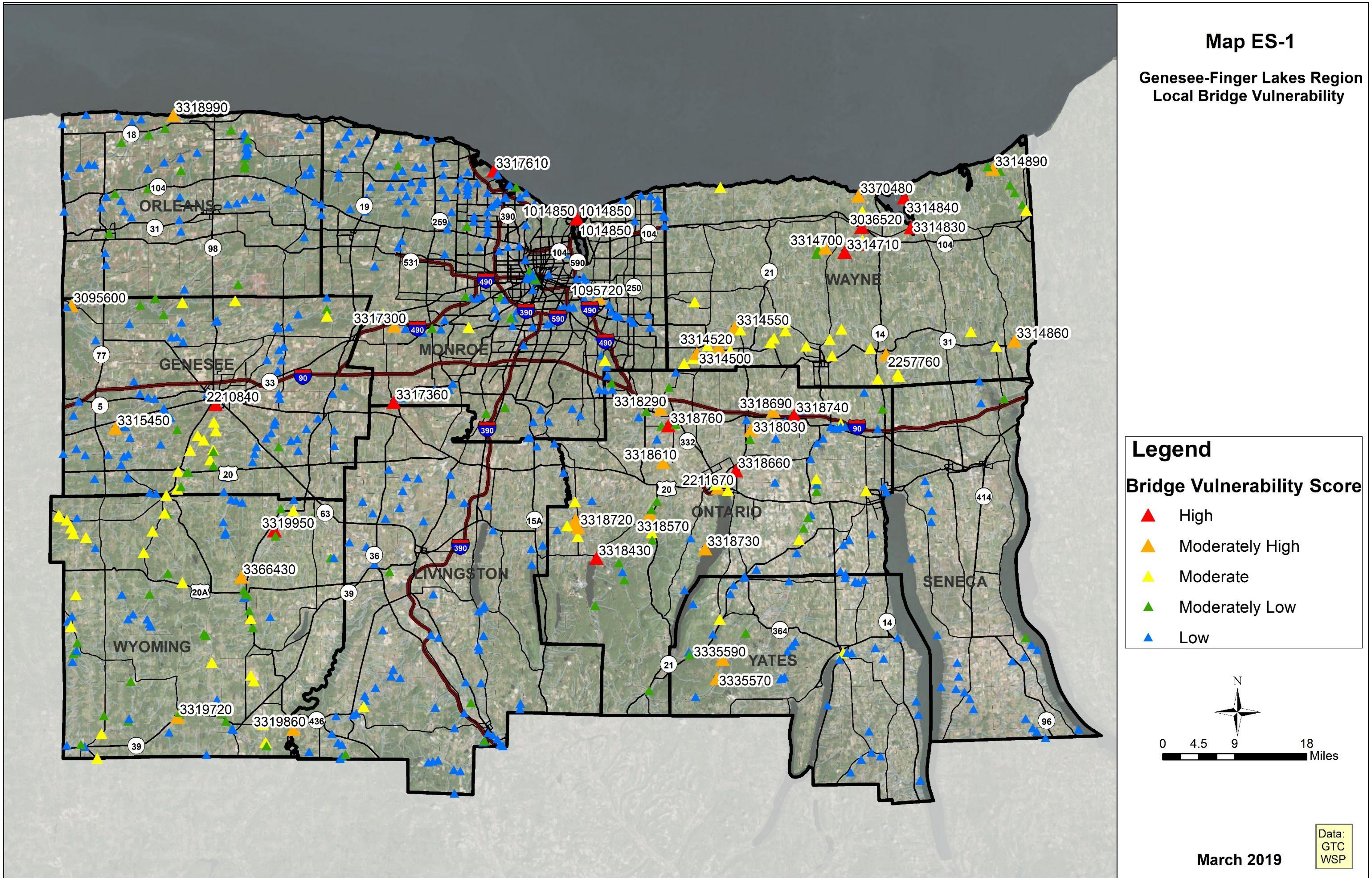
Local Bridge Vulnerability Categories

- High Vulnerability (score of 200 or greater)
- Moderately High Vulnerability (score of 175-199)
- Moderate Vulnerability (score of 150-174)
- Moderately Low Vulnerability (score of 125-149)
- Low Vulnerability (score of under 125)

For the purposes of this study, focus is placed on those local bridges that were identified as having a “high” or “moderately high” vulnerability. Across the region, there were 14 local bridges identified as being highly vulnerable and 29 local bridges identified as being moderately highly vulnerable. These are explained further in Chapter 4; the map on the following page portrays the results of the vulnerability scoring of all local bridges throughout the region.

As part of this Local Bridge Vulnerability Assessment, certified engineers from WSP conducted site visits on nineteen bridges across the region that county highway superintendents identified as bridges that they’d like to have further assessment undertaken on. These assessments are discussed in Chapter 5.

Finally, this report offers strategies that can be applied to local bridges that were identified as being most vulnerable in order to prevent or mitigate impacts from potential natural and human-caused hazards.


Map ES-1
Genesee-Finger Lakes Region
Local Bridge Vulnerability
Legend
Bridge Vulnerability Score
High
Moderately High
Moderate
Moderately Low
Low
0 4.5 9 18 Miles
March 2019
Data: GTC WSP
ORLEANS
GENESEE
MONROE
WAYNE
ONTARIO
SENECA
YATES
LIVINGSTON
WYOMING

CHAPTER 1: INTRODUCTION

Study Purpose

The purpose of the *Genesee-Finger Lakes Regional Local Bridge Vulnerability Assessment* is to assess the vulnerability of local bridges located along non-federal aid roadways in the Genesee-Finger Lakes Region to natural and human-caused hazards and propose strategies for preventing and/or mitigating the impacts of hazard events on those bridges. Further, this assessment provides an on-site assessment of nineteen local bridges, selected by county highway superintendents. Ultimately, this study will enhance the sustainability of local bridges by providing member agencies with information that will be used to strengthen the resiliency of their critical transportation assets.

Study Background

In 2016, Genesee Transportation Council (GTC) completed the *Genesee-Finger Lakes Regional Critical Transportation Infrastructure Vulnerability Assessment*, which assessed the vulnerability of federal-aid eligible roads and the bridges on those roads, as well as regionally significant transportation facilities and assets, to natural and human-caused hazards. That project focused on bridges located along roads eligible for federal-aid funds; whereas this study focuses on those bridges located along non-federal aid local roads (i.e. “local bridges”). This study uses the same methodology and format as the Regional Critical Transportation Infrastructure Assessment.

Given the limited availability of funds for transportation infrastructure projects, transportation planning and management agencies are focused on maximizing their investments. Information on hazard vulnerabilities and bridge criticality provided by this study can be used by member agencies to help prioritize transportation infrastructure projects. This means that projects can be developed to address multiple agency objectives, including mitigating hazard impacts on the movement of people and goods and safeguarding public investments against threats.

Study Methodology

This Local Bridge Vulnerability Assessment acts as a supplement to the Regional Critical Transportation Infrastructure Vulnerability Assessment, using the same methodology, data, and assumptions as the regional study. For purposes of avoiding duplication, much of the explanation surrounding the purpose of conducting vulnerability assessments and the discussion and extent of hazard profiles outlined in the Regional Critical Transportation Infrastructure Vulnerability Assessment is incorporated into this study by reference.

Study Area

The study area consists of the nine-county Genesee-Finger Lakes Region, including Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne, Wyoming, and Yates Counties, shown on Map 1. The 4,700 square mile study area consists of 712 local bridges, as of November 2018.


Map 1
Genesee-Finger Lakes Region
Study Area
ORLEANS
MONROE
WAYNE
GENESEE
ONTARIO
SENECA
LIVINGSTON
WYOMING
YATES
0 2.5 5 10 15 20 Miles
March 2019

Study Participants

The participants of this study include planning officials and highway superintendents and their staff from Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne, Wyoming, and Yates counties along with GTC staff.

GTC staff and the consulting team met individually with each of the county highway superintendents, their staff, and other county officials to review the methodology for assessing the vulnerability of local bridges, discuss critical local bridge assets and local bridges that are subject to natural and/or human-caused hazards, and identify bridges that will be subject of on-site assessments.

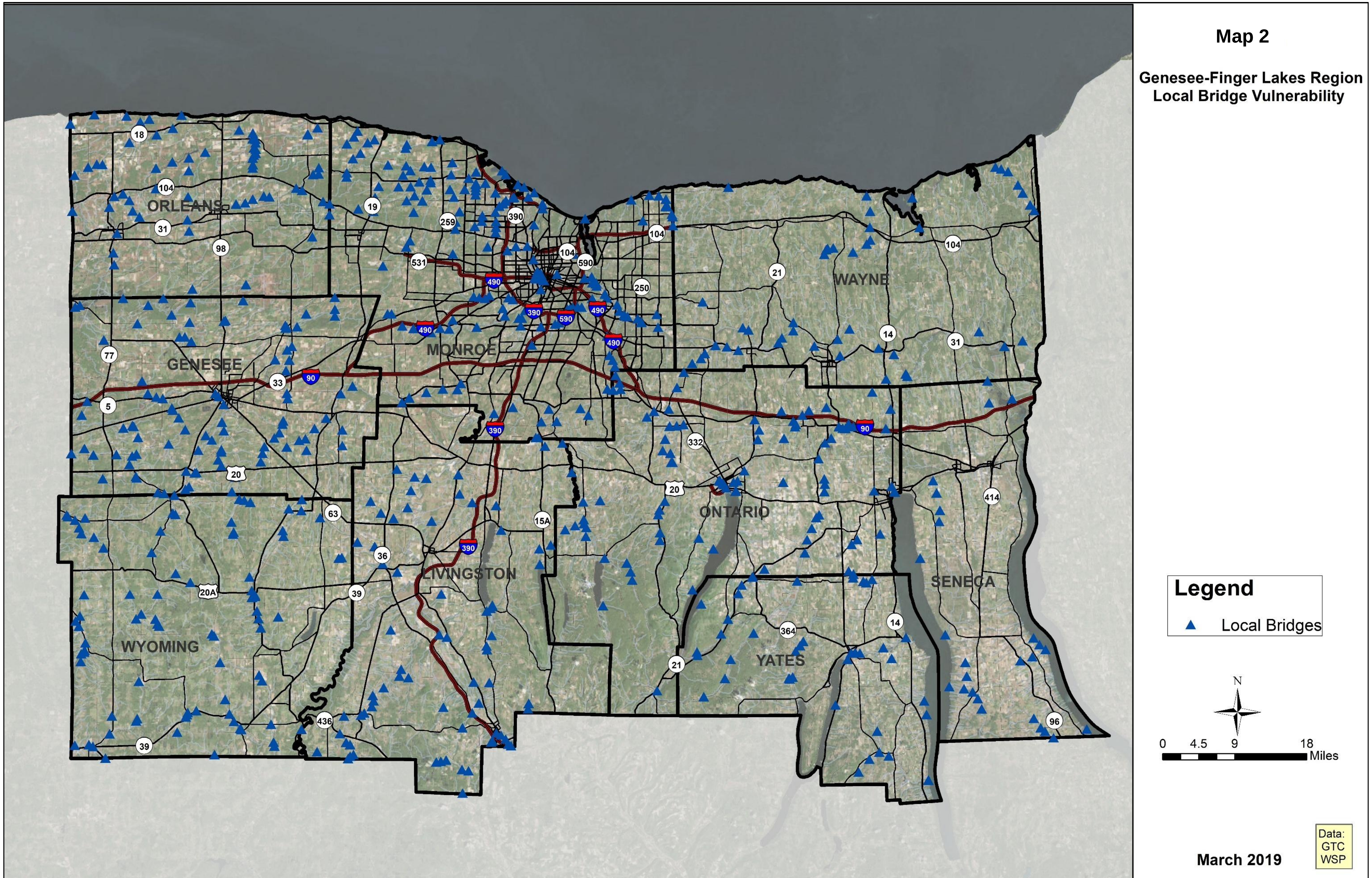
Photo: Lakeside Road over Johnson Creek, WSP

CHAPTER 2: INVENTORY OF LOCAL BRIDGES

GIS data was used to identify local bridges, querying BINs that begin with the number “2” or “3” to develop a list of local bridges. Then, based upon information collected from existing plans and studies, data from the Regional Critical Transportation Infrastructure Vulnerability Assessment, and input received from county highway superintendents and officials, an inventory of existing local bridges was confirmed. Following discussions with Monroe County officials, it was determined that several bridges in Monroe County that had BINs that began with the number “1” were actually local bridges and should be included in this study. This resulted in the identification of 712 local bridges, broken down as follows:

- 94 Genesee County Local Bridges
- 74 Livingston County Local Bridges
- 186 Monroe County Local Bridges
- 95 Ontario County Local Bridges
- 63 Orleans County Local Bridges
- 26 Seneca County Local Bridges
- 47 Wayne County Local Bridges
- 87 Wyoming County Local Bridges
- 40 Yates County Local Bridges

Map 2 portrays all of the local bridges included as part of this study across the Genesee-Finger Lakes region. The full list of local bridges assessed as part of this study, along with their corresponding vulnerability scores calculated as part of this study are included in Appendix A.


Map 2
Genesee-Finger Lakes Region
Local Bridge Vulnerability
ORLEANS
MONROE
WAYNE
GENESEE
ONTARIO
SENECA
WYOMING
LIVINGSTON
YATES
Legend
Local Bridges
N
0 4.5 9 18
Miles
March 2019
Data:
GTC
WSP

CHAPTER 3: HAZARD PROFILES

This chapter profiles the natural and human-caused hazards throughout the nine-county Genesee-Finger Lakes Region that can potentially impact local bridges that were identified in Chapter 2. A full hazard profile assessment was applied across the region as part of the Regional Critical Transportation Infrastructure Assessment (Chapter 3 of that report) that included a textual description explaining each hazard along with a discussion and geographical representation that identifies where the hazard is known to occur or has the potential to occur. These same hazard profiles were used to assess the relationship between hazard extents and local bridges. Since hazard profiles have not changed since that regional study, for the purposes of avoiding duplication, hazard profiles are briefly summarized in this Chapter, and the full hazard profiles are included by reference.

Regional Profile of Hazards

Table 1 outlines the natural and human-caused hazards that have the potential to affect local bridges throughout the Genesee-Finger Lakes Region, which are the same as were assessed as part of the Regional Critical Transportation Asset Vulnerability Assessment.

Table 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. 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.

CHAPTER 4: LOCAL BRIDGE VULNERABILITY

This chapter explains the methodology that was used to assess local bridge vulnerability (which follows that used for the Regional Critical Transportation Infrastructure Vulnerability Assessment) and identifies and profiles the most vulnerable local bridges throughout the Genesee-Finger Lakes Region. These most vulnerable local bridges and issues related to local bridges should be considered holistically during annual reviews and prioritization of potential projects.

Local Bridge Vulnerability Scoring Methodology

All 712 local bridges identified as part of this study were numerically scored using a database developed using Microsoft Excel and then graphically portrayed by joining the Microsoft Excel database with the GIS data. The following outlines the methodology that was applied to determine the most vulnerable local bridges throughout the Genesee-Finger Lakes Region.

Assets to be Scored

- *Local Bridges*
  - Local Bridges owned and maintained by county and local municipalities (BINs that have numbers beginning with 2 or 3, or where county highway superintendents identified other bridge BINs that are the responsibility of county or local municipalities).

Scoring Methodology

Each local bridge was scored for its vulnerability based upon the criticality of the bridge and its exposure and sensitivity to a variety of natural and human-caused hazards. There are four vulnerability components, as follows:

- *Criticality* – The bridge is scored based on how critical it is to the transportation network. Typically, since these bridges are located on non federal-aid highways and are not regionally significant, a local bridge is critical if it provides access to a locally significant resource or location.
- *Sensitivity* – The bridge 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 a bridge. For instance, a bridge may be exposed to a hazard only once in a while, but the impacts from that hazard event on the bridge are severe.
- *Exposure* – The bridge is scored based on its exposure to existing or future hazards. Exposure is defined as how often the bridge is or potentially will be exposed to hazard events. Exposure variables were scored based on the following:
  - Exposure to flooding was based on input from local officials of areas prone to flooding.

- o Exposure to snow storms was based on annual snowfall and Lake Effect snow areas.
- o 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.
- o Exposure to sink holes was based on USGS Evaporite and Karst Topography maps.
- o Exposure to terrorist attacks/ sabotage was based on input from local officials on likely targets.

- *Local Input* – The bridge is scored based on its local importance and as identified in a local plan or by local stakeholders as being vulnerable to hazards.

Local Bridge Scoring

The scoring of local bridges was done using Microsoft Excel. The Excel database is set up to allow users to conduct a query to identify local bridge by county or by BIN, allowing the databases to become working documents that agencies can use to update or customize the database.

Each local bridge was scored according to the established scoring categories that are given to each variable (see Figure 1). Some scores are quantitative in that they provide a score to a local bridge because it falls within a certain category; some scores are qualitative in that they provide a score to a bridge based on input received from stakeholders or a local plan. The maximum score set up for any variable is 5, with the minimum score being 0. To keep scoring consistent across all variables, all scores are portrayed in whole numbers.

Scoring criteria differs per variable depending on the nature of the bridge in its category. For instance, one of the variables in the Sensitivity vulnerability component is "Bridge is listed as being weight and/or height restricted or is a critical bridge". The scoring categories for this variable are:

- Bridge is weight and height restricted and is critical = 5
- Bridge is weight or height restricted and is critical = 4
- Bridge is critical = 3
- Bridge is weight and height restricted (but not critical) = 2
- Bridge is weight or height restricted (but is not critical) = 1

A score is given to the bridge based on where it falls in the above categories. As an example, if the local bridge is determined to be weight restricted and is a critical bridge, the bridge is given a score of 4 for this variable.

Each variable is then given a weight that places greater emphasis on those variables that play a larger role in making a bridge critical, sensitive, exposed, or of local importance. Once a bridge is scored for a variable, the variable weight is applied to give a total variable score for that bridge. For each one of the vulnerability components, the total weighted score must equal 100. For instance, in the example of scoring the bridge above, the "bridge is listed as being weight and/or height restricted or is a critical bridge" variable carries a weight of 25; thus, a score of 4 weighed by 25, provides a weighted score of 100 for this variable.

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 a bridge. The Exposure component receives a percentage factor of 45%, the Criticality component receives a percentage factor of 25%, the Sensitivity component receives a percentage factor of 20%, and the Local Input component receives a percentage factor of 10%, for a total of 100%. In the same example above, if at the end of scoring all the variables in the Sensitivity vulnerability component yields a weighted score of 100, the percentage factor is then applied (20%). The final calculated Sensitivity score for this bridge would be 20. This scoring is done for all four vulnerability components and then a final Vulnerability score is tallied for that bridge.

Ranking Vulnerability of Local Bridges

Once all of the local bridges were scored, the bridges were then placed into a category, based on their score, to identify their level of vulnerability, as follows:

Local Bridge Vulnerability Categories

- High Vulnerability (score of 200 or greater)
- Moderately High Vulnerability (score of 175-199)
- Moderate Vulnerability (score of 150-174)
- Moderately Low Vulnerability (score of 125-149)
- Low Vulnerability (score of under 125)

Figure 1: Local Bridge Vulnerability Assessment Scoring Methodology

Vulnerability Component	GIS Code	Variable (by segment)	Scoring Categories (1-5)						Asset Scoring				
			5	4	3	2	1	0	Max Score	Asset Score	Variable Weight Total = 100	Max weighted score	Weighted Asset Score
Criticality	C1	Necessary to provide access to a locally significant resource (number of locations)	5+	4	3	2	1	None	5		100	500	
	C2	*Sum of Criticality Scores*							5	0	100	500	0
	C3	*Vulnerability Component Percentage of Total Score*										20%	25%
	C4	***Final Criticality Score***										**100.00**	**0**
Sensitivity	S1	Identified as being impacted or having the potential to be impacted by hazards	Yes- Historical Event	Yes- High Potential Exists	Yes- Moderate Potential Exists			No	5		50	250	
	S2	Bridge is listed as being weight and/or height restricted or is a critical bridge	Weight and height restricted and critical	Weight or height restricted and critical	Is critical	Weight and height restricted	Weight or height restricted	No	5		25	125	
	S3	Detour Options (If Bridge is Closed)			Few	Moderate	Many		3		25	75	
	S4	*Sum of Sensitivity Scores*							13	0	100	450	0
	S5	*Vulnerability Component Percentage of Total Score*										20%	20%
	S6	***Final Sensitivity Score***										**90.00**	**0**
Exposure	E1	Located in a floodplain	Yes- Entirely	Yes- Mostly	Yes- Partially	Yes- Minimal	No- but Adjacent	No	5		10	50	
	E2	Downstream of a dam classified as being a High Hazard	Yes- within 1 mile	Yes- within 3 miles	Yes- within 5 miles	Yes- within 10 miles	Yes- 10 miles+	No	5		5	25	
	E3	Exposure to Flooding	Very High	High	Moderately High	Moderate	Moderately Low	Low	5		15	75	
	E4	Exposure to Snow Storms	Very High	High	Moderately High	Moderate	Moderately Low	Low	5		10	50	
	E5	Exposure to High Winds	Very High	High	Moderately High	Moderate	Moderately Low	Low	5		10	50	
	E6	Landslide Susceptability			Moderate	Moderately Low	Low	No	3		10	30	
	E7	Spectral Acceleration of Soils		24+%	20-24%	16-20%	12-16%	Less than 12%	4		10	40	
	E8	Exposure to Sink Hole (Karst Topography)				In an area of Evaporite and Karst topography	In an area of Evaporite or Karst topography	No	2		10	20	
	E9	Exposure to Hazmat Incidents	Very High	High	Moderately High	Moderate	Moderately Low	Low	5		10	50	
	E10	Exposure to Terrorist Attacks/ Sabotage (based on input of likely targets)	Very High	High	Moderately High	Moderate	Moderately Low	Low	5		10	50	
	E11	*Sum of Exposure Scores*							44	0	100	440	0
	E12	*Vulnerability Component Percentage of Total Score*										50%	45%
	E13	***Final Exposure Score***										**220.00**	**0**
Local Input	L1	Identified in a local plan/ or local expertise indicates that asset is vulnerable to existing or future hazards	Very High	High	Moderately High	Moderate	Moderately Low	Low	5		100	500	
	L2	*Sum of Local Input Scores*							5	0	100	500	0
	L3	*Vulnerability Component Percentage of Total Score*										10%	10%
	L4	***Final Local Input Score***										**50.00**	**0**
TOTAL		**TOTAL ASSET VULNERABILITY SCORE**							**67**	**0**		**460.00**	**0**

*scoring categories indicate how a bridge will be scored. Some scores are quantitative in that they are scored because they fall in a certain category; some scores are qualitative in that they are based upon input received from stakeholders.

** Exposure variables scored based on the following:

Exposure to flooding based on identification by local officals of the areas prone to flooding

Exposure to snow storms based on annual snowfall and areas prone to Lake Effect storms

Exposure to high winds based on identification by local officials of the areas prone to high winds

Exposure to sink holes based on USGS Evaporite and Karst Topography maps

Exposure to terrorist attacks/ sabotage based on identification by local officials of likely targets

***The "local input" variable component allows for a bridge to be scored based purely on input from local stakeholders.

Local Bridge Vulnerability Results

For the purposes of this study, focus is placed on those local bridges that were identified as having a "high" or "moderately high" vulnerability. Across the region, there were 14 local bridges identified as being highly vulnerable and 29 local bridges identified as being moderately highly vulnerable. Table 2 portrays the local bridges that were scored as having "high" vulnerability and Table 3 portrays the local bridges that were scored as having "moderately high" vulnerability as a result of the vulnerability scoring exercise. These tables identify the bridge BIN, the county, the roadway or waterway that the bridge carries, the total bridge vulnerability score, and for Table 2, the determining factors that brought about a high vulnerability ranking of bridges. The results of the scoring for all bridges are provided in the Excel tables that are provided to agencies in a digital format. The summary of the results of the vulnerability scoring of all local bridges is provided in Appendix A.

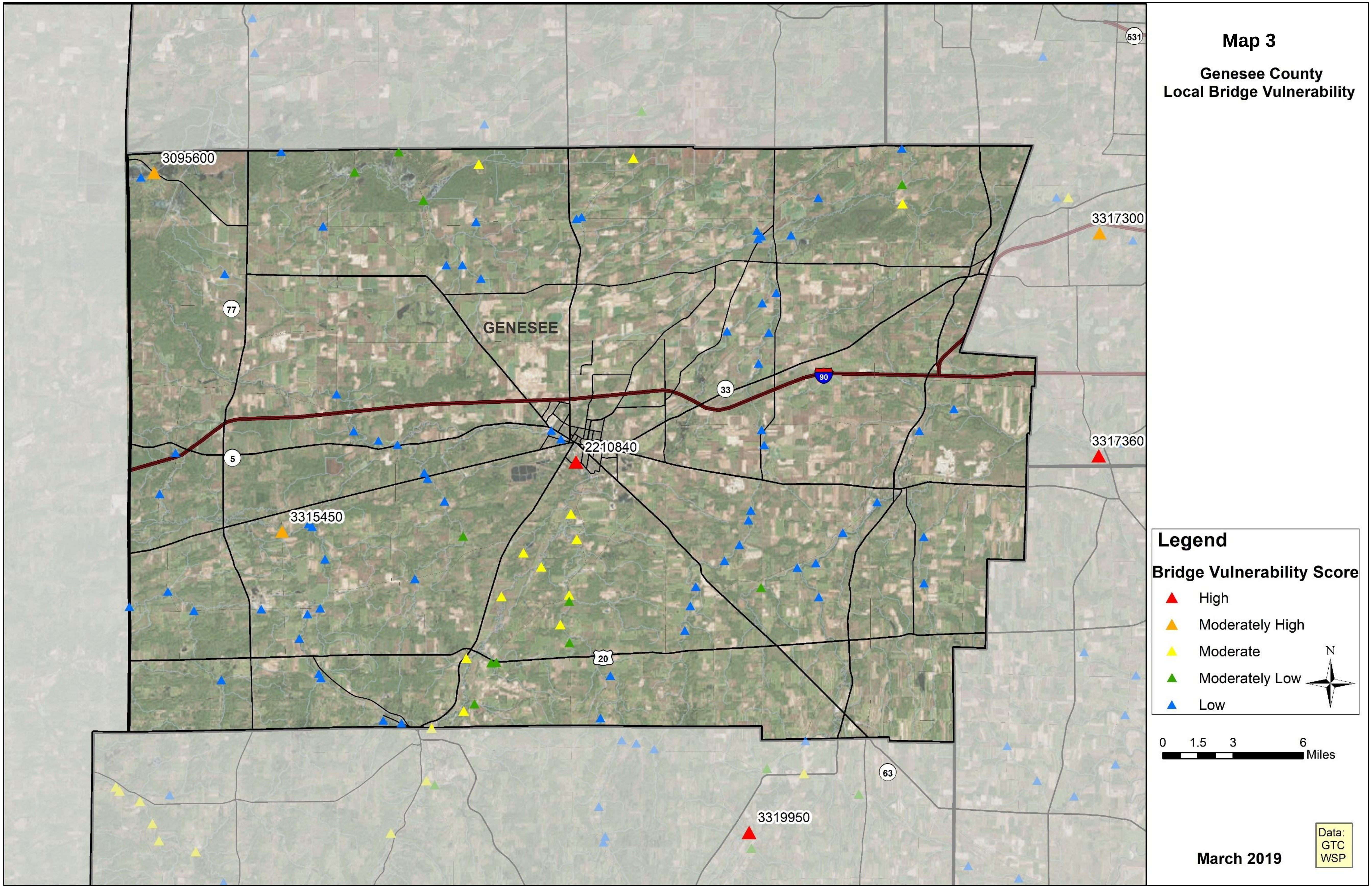
The maps on the following pages (Maps 3-11) portray the vulnerability of the local bridges considered as part of this study on a county-by-county basis, with those assets that were identified as having a "high" or "moderately high" vulnerability labeled with their BIN and identified to allow for reference between the tables (Tables 2 and 3) and maps.

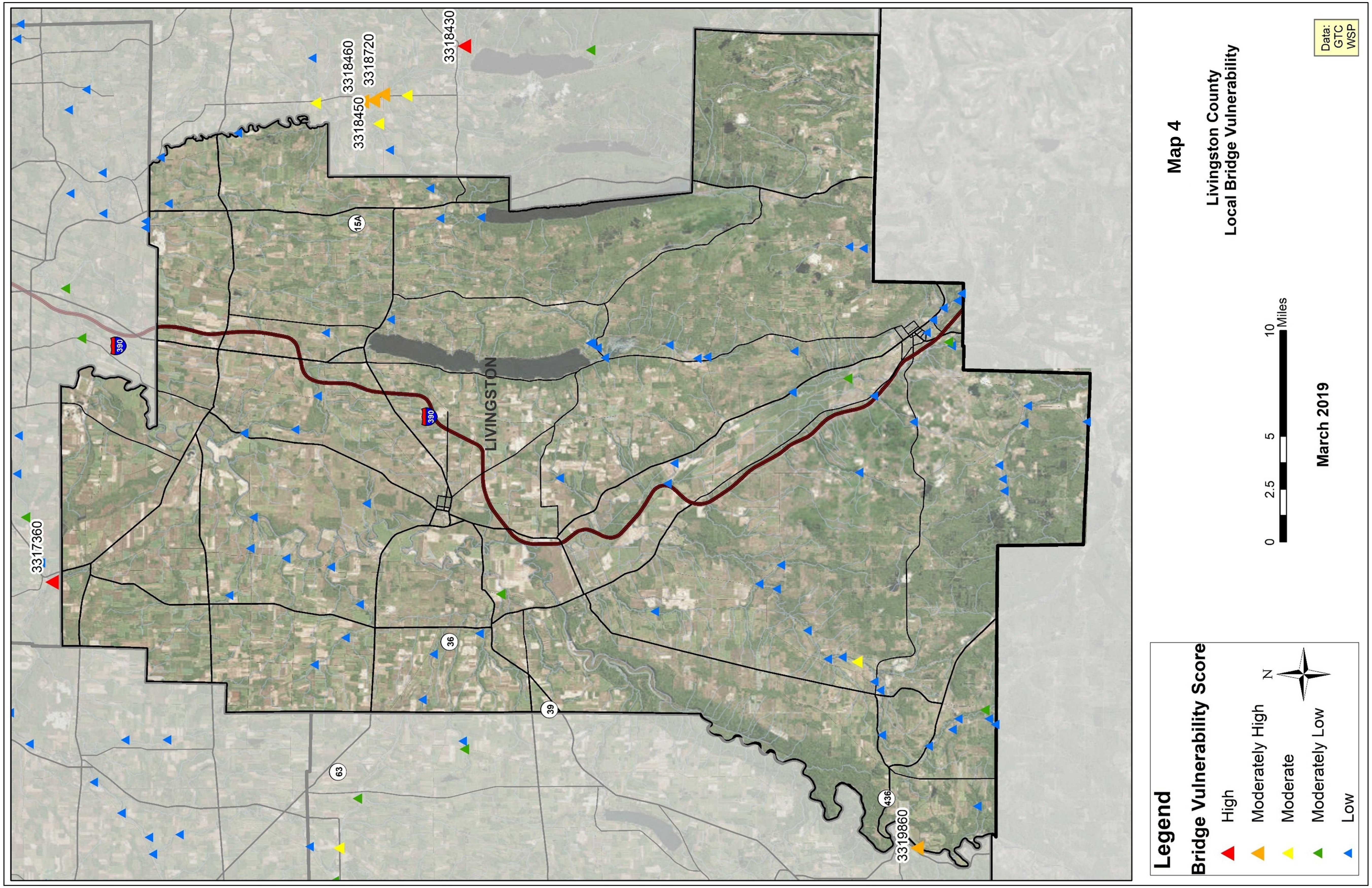
Table 2: Local Bridges Identified as Being Highly Vulnerable

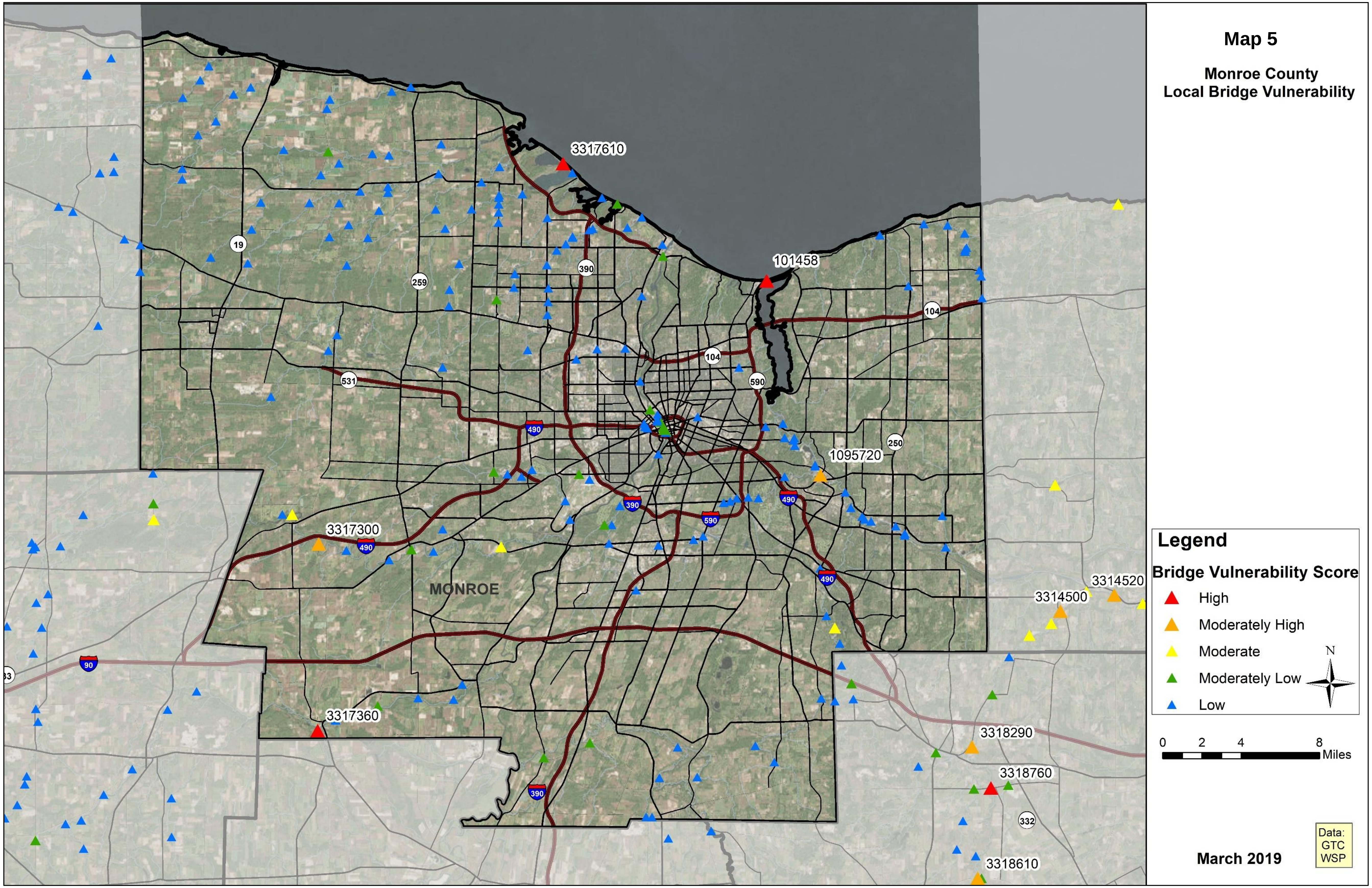
HIGH VULNERABILITY					
BIN	County	Carried	Crossed	Total Bridge Vulnerability Score	Determining Factors Resulting in High Vulnerability
3314710	Wayne	Arcadia Zuric Road	Salmon Creek	233	Previously exposed to flooding events and potential for continued flooding events, few detour options if impacted
2210840	Genesee	Law Street	Tonawanda Creek	228	Previously exposed to flooding events and potential for continued flooding events, few detour options if impacted
3314830	Wayne	Ridge Road	Sodus Bay	228	Previously exposed to flooding events and potential for continued flooding events
3036520	Wayne	Ridge Road	Salmon Creek	223	Previously exposed to flooding events and potential for continued flooding events
3314840	Wayne	Leroy Island Road	Sodus Bay	223	Previously exposed to flooding events and potential for continued flooding events
1014850	Monroe	IBOB	Irondequoit Bay Outlet	220	Critical bridge that provides access to local resources, exposure to multiple natural hazards, lack of detour options
3317360	Monroe	George Street	Spring Creek	218	Previously exposed to flooding events and potential for continued flooding events
3319950	Wyoming	County Road 7	Oatka Creek	218	Previously exposed to flooding events and potential for continued flooding events, few detour options if impacted
3317610	Monroe	Lowden Point Road	Cranberry Pond Outlet	213	Previously exposed to flooding events and potential for continued flooding events, few detour options if impacted
3318660	Ontario	County Road 4	Canandaigua Outlet	213	Previously exposed to flooding events and potential for continued flooding events
3318430	Ontario	East Lake Road	Mill Creek	210	Previously exposed to flooding events and potential for continued flooding events, few detour options if impacted
2210710	Wayne	School Street	Salmon Creek	208	Previously exposed to flooding events and potential for continued flooding events, few detour options if impacted, exposure to snow events
3318740	Ontario	Five Waters Clift	Canandaigua Outlet	203	Previously exposed to flooding events and potential for continued flooding events
3318760	Ontario	Boughton Hill Road	Mud Creek	203	Previously exposed to flooding events and potential for continued flooding events

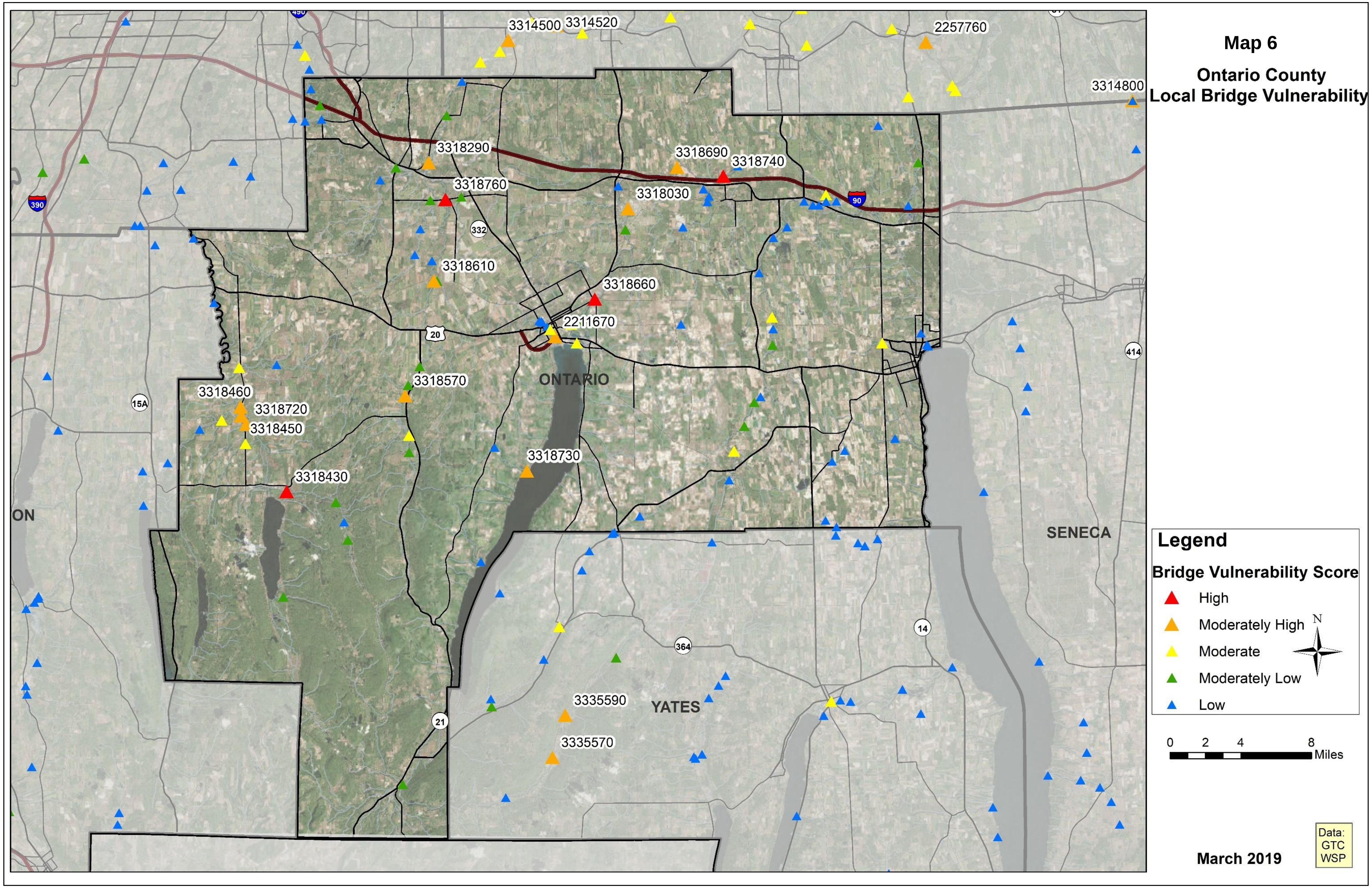
Table 3: Bridges Identified as Being Moderately Highly Vulnerable

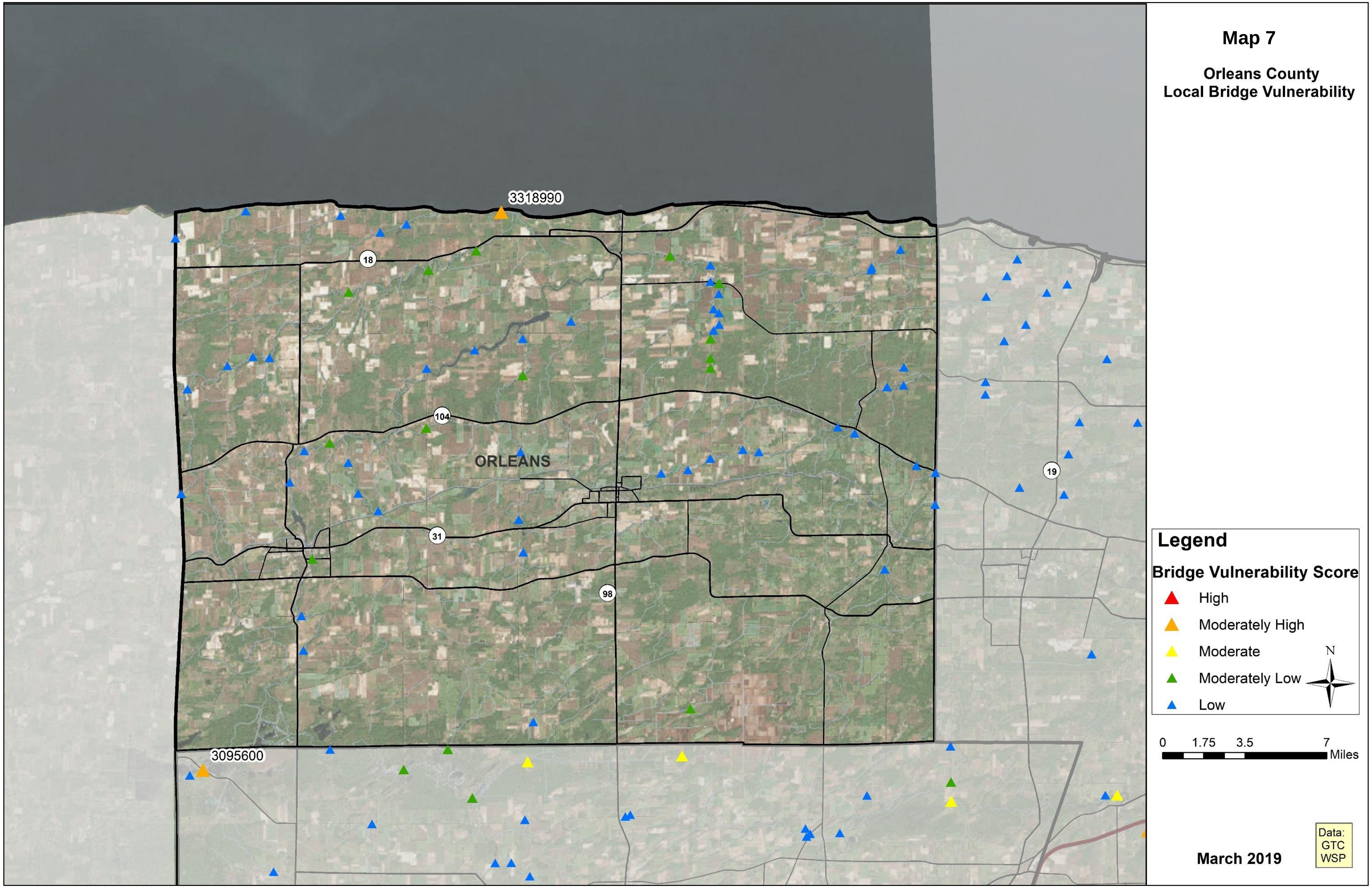
MODERATELY HIGH VULNERABILITY				
BIN	County	Carried	Crossed	Total Bridge Vulnerability Score
3318460	Ontario	County Road 37	Honeoye Creek	198
3366430	Wyoming	Buffalo Road	Oatka Creek	195
3319860	Livingston	Whiskey Bridge	Genesee River	193
3318610	Ontario	North Bloomfield Road	Mud Creek	193
3318720	Ontario	County Road 15	Honeoye Creek	193
2257760	Wayne	County Road 344	CSX Trans/ Amtrak	193
3314800	Wayne	County Road 105/ Armitage Road	Clyde River	193
3314890	Wayne	Broadway Road	Red Creek	193
3318990	Orleans	Lakeside Road	Johnson Creek	190
3095600	Genesee	Lewiston Road	Unnamed Stream	188
3317300	Monroe	Burnt Mill Road	Black Creek	188
3314700	Wayne	Joy Road	Salmon Creek	188
3318450	Ontario	County Road 37	Hemlock Outlet	185
3315450	Genesee	Colby Road	Murder Creek	183
1095720	Monroe	Panorama Trail	Irondequoit Creek	183
3318030	Ontario	Main Street	Canandaigua Outlet	183
3318290	Ontario	Plastermill Road	Ganargua Creek	183
3318690	Ontario	Port Gibson Road	Canandaigua Outlet	183
3335570	Yates	County Road 18	Flint Creek	183
3370480	Wayne	Lake Rd (CR 101)	Maxwell Creek	180
2211670	Ontario	Parrish Street	Sucker Brook	178
3318570	Ontario	Jenks Road	Mud Creek	178
3314500	Wayne	Canandaigua Road	Ganargua Creek	178
3314520	Wayne	Alderman Road	Ganargua Creek	178
3314550	Wayne	Macedon Center Road	Red Creek	178
3314860	Wayne	Savannah Spg Lake Rd	Crusoe Creek	178
3335590	Yates	Italy Valley Road	Flint Creek	178
3318730	Ontario	West Lake Road	Menteth Gully	175
3319720	Wyoming	Cooley Road	Wiscoy Creek	175

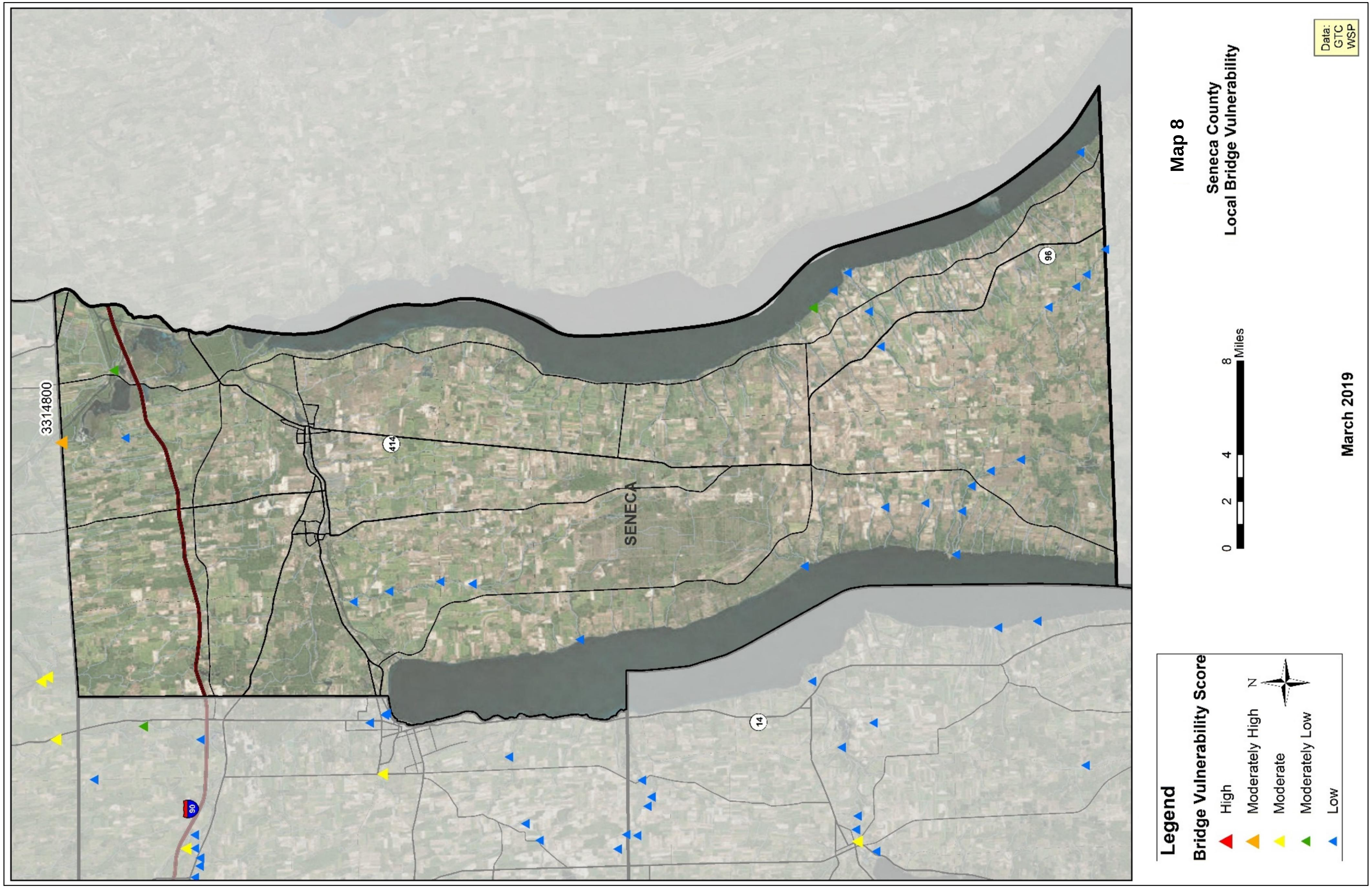

Map 3
Genesee County
Local Bridge Vulnerability
GENESEE
3095600
3317300
3317360
2210840
3315450
3319950
Legend
Bridge Vulnerability Score
High
Moderately High
Moderate
Moderately Low
Low
N
0 1.5 3 6 Miles
March 2019
Data: GTC WSP

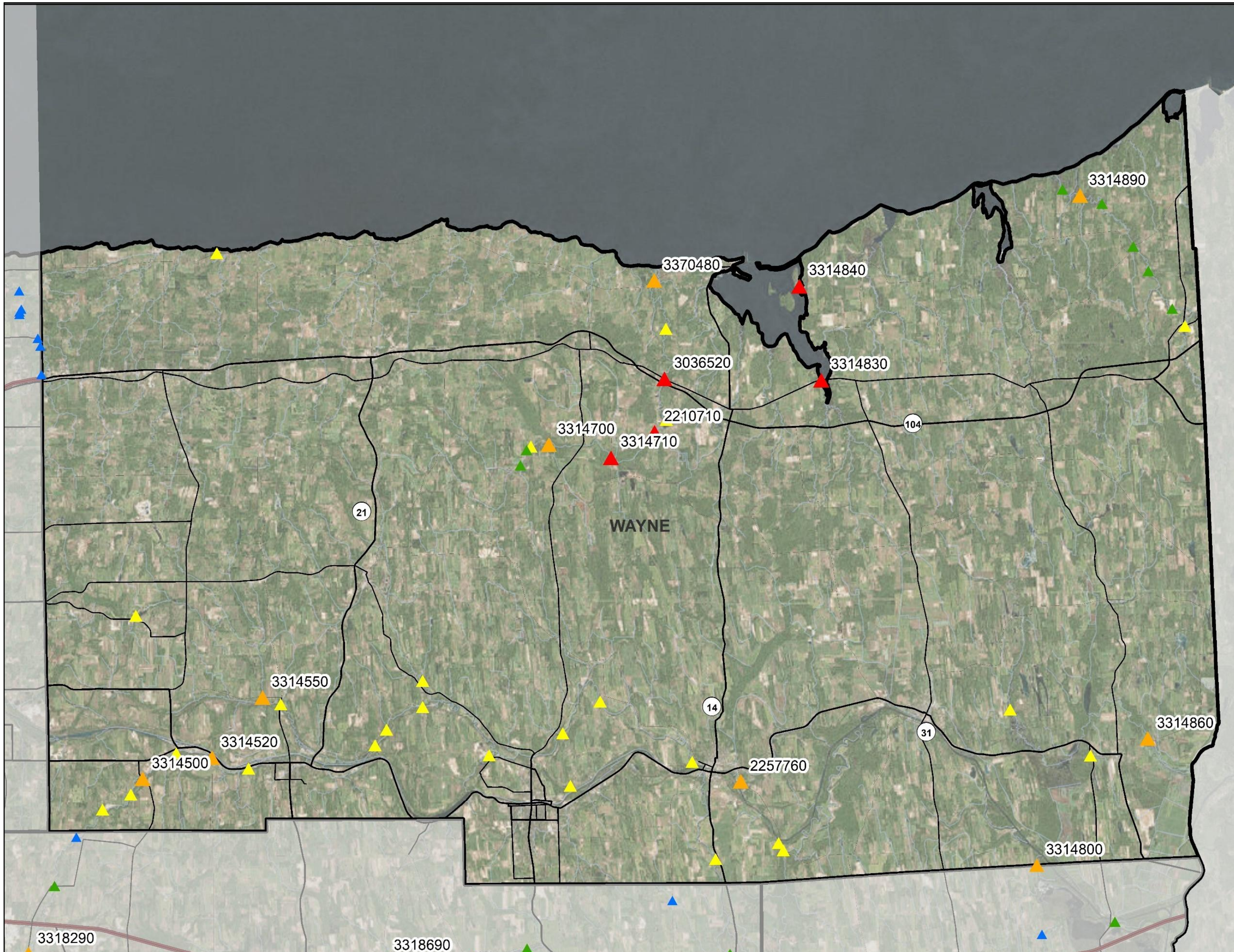

Map 4
Livingston County
Local Bridge Vulnerability
March 2019
Legend
Bridge Vulnerability Score
High
Moderately High
Moderate
Moderately Low
Low
N
0 2.5 5 10 Miles
Data: GTC WSP
LIVINGSTON
3318430
3318460
3318720
3318450
3317360
3319860
390
15A
36
39
63
436


Map 5
Monroe County
Local Bridge Vulnerability
Legend
Bridge Vulnerability Score
High
Moderately High
Moderate
Moderately Low
Low
N
0 2 4 8 Miles
March 2019
Data: GTC WSP
MONROE
3317610
101458
1095720
3317300
3317360
3314520
3314500
3318290
3318760
3318610


Map 6
Ontario County
Local Bridge Vulnerability
Legend
Bridge Vulnerability Score
High
Moderately High
Moderate
Moderately Low
Low
0 2 4 8
Miles
March 2019
Data: GTC WSP
ONTARIO
YATES
SENECA
ON
3314500
3314520
2257760
3314800
3318290
3318690
3318740
3318760
3318030
3318610
3318660
2211670
3318570
3318460
3318720
3318450
3318730
3318430
3335590
3335570


Map 7
Orleans County
Local Bridge Vulnerability
Legend
Bridge Vulnerability Score
High
Moderately High
Moderate
Moderately Low
Low
N
0 1.75 3.5 7
Miles
March 2019
Data:
GTC
WSP
3318990
3095600
ORLEANS
18
104
31
98
19


Map 8
Seneca County
Local Bridge Vulnerability
March 2019
Data: GTC WSP
0 2 4 8 Miles
Legend
Bridge Vulnerability Score
High
Moderately High
Moderate
Moderately Low
Low
N
SENECA
3314800
414
96
14
90



Map 9

Wayne County
Local Bridge Vulnerability

Legend

Bridge Vulnerability Score

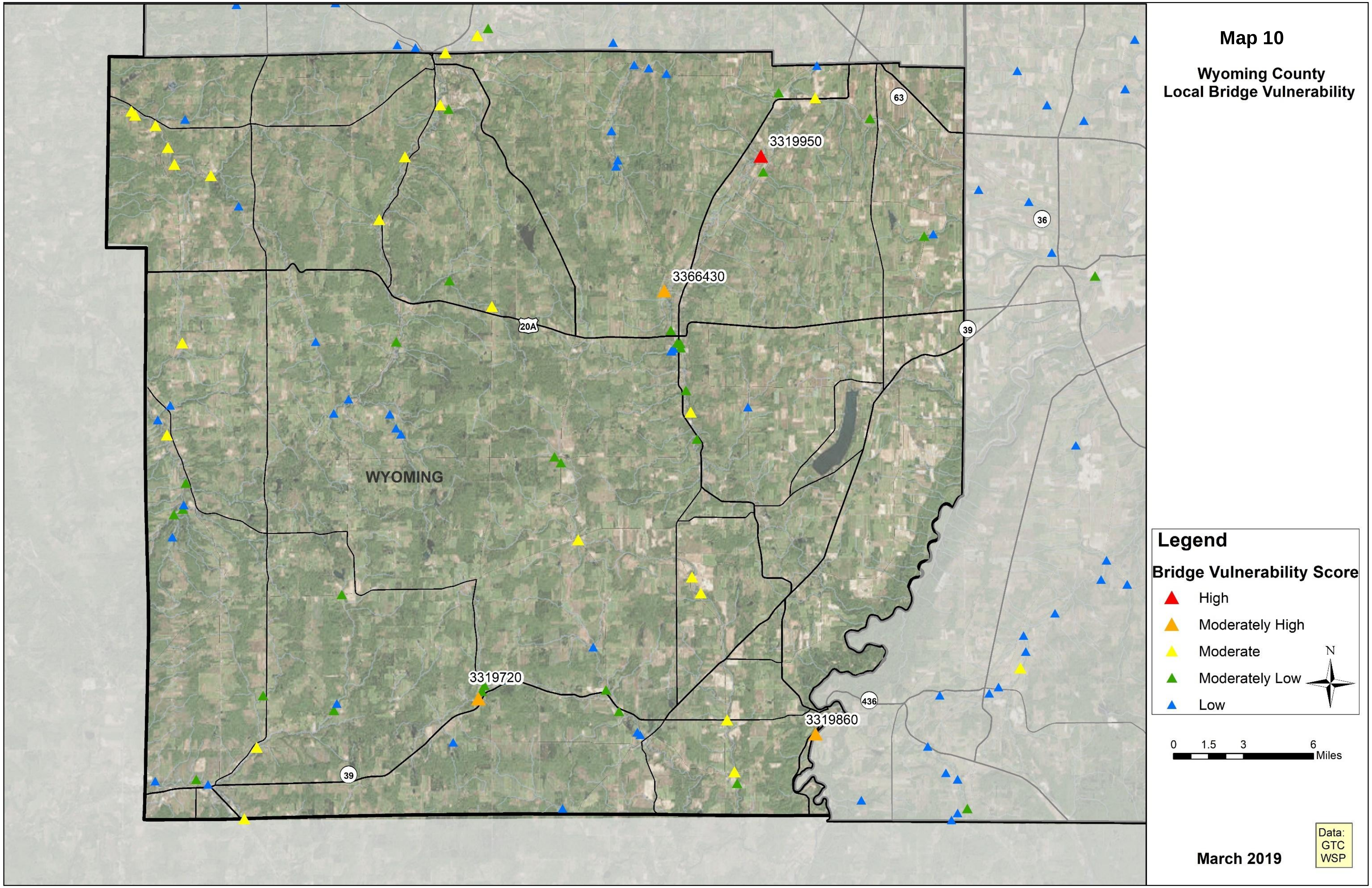
- High
- Moderately High
- Moderate
- Moderately Low
- Low

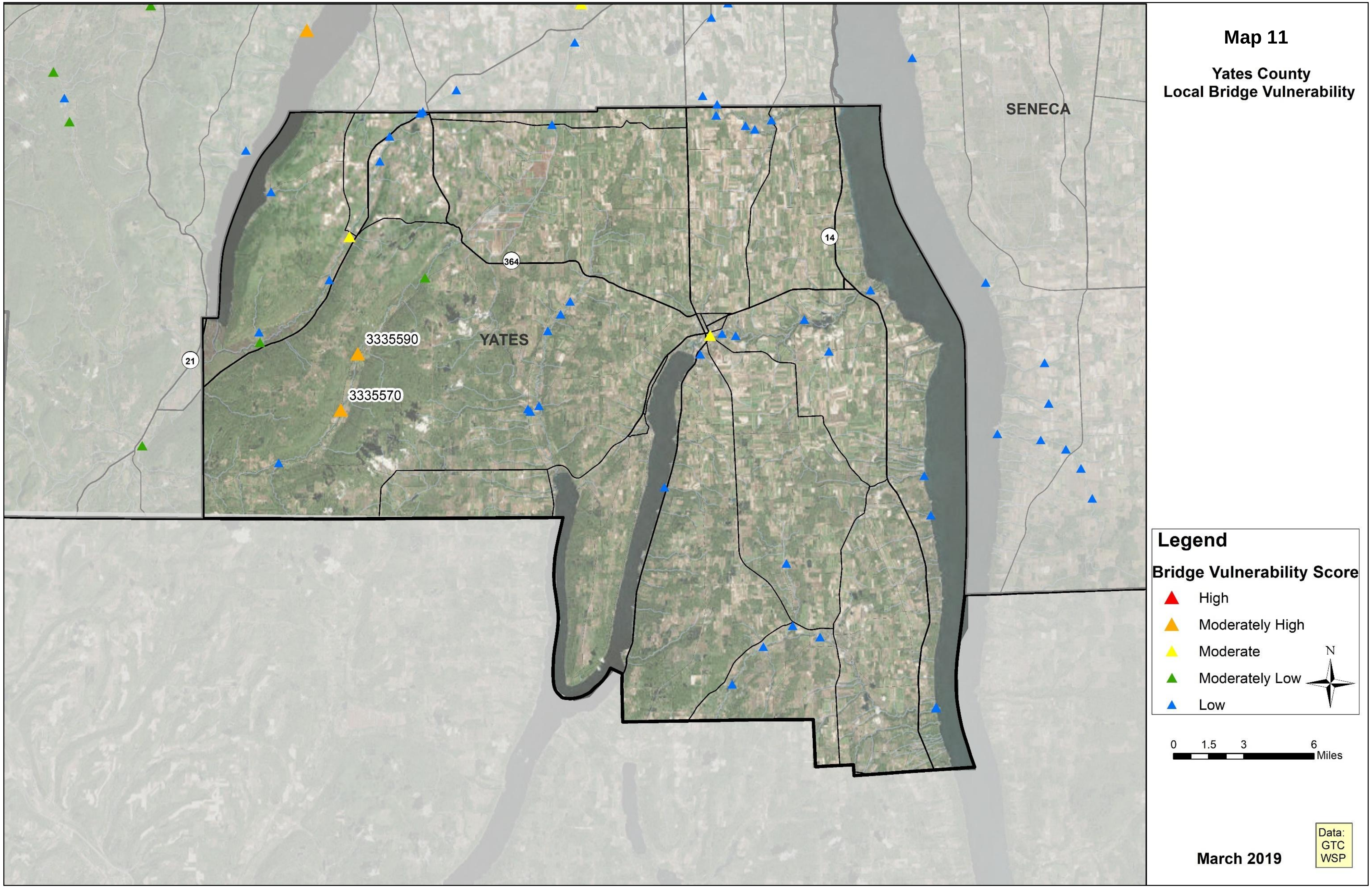
N

0 1.75 3.5 7 Miles

March 2019

Data:
GTC
WSP


Map 10
Wyoming County
Local Bridge Vulnerability
WYOMING
3319950
3366430
3319720
3319860
20A
63
36
39
436
39
Legend
Bridge Vulnerability Score
High
Moderately High
Moderate
Moderately Low
Low
N
0 1.5 3 6
Miles
March 2019
Data:
GTC
WSP


Map 11
Yates County
Local Bridge Vulnerability
SENECA
YATES
3335590
3335570
14
364
21
Legend
Bridge Vulnerability Score
High
Moderately High
Moderate
Moderately Low
Low
N
0 1.5 3 6
Miles
March 2019
Data:
GTC
WSP

CHAPTER 5: BRIDGE ASSESSMENTS

As part of this Local Bridge Vulnerability Assessment, certified engineers from WSP conducted site visits on nineteen bridges across the region that county highway superintendents identified as bridges that they'd like to have further assessment undertaken on. These bridges were identified by county highway superintendents as bridges that have or potentially have experienced some impact due to natural or human-caused events or are susceptible to various impacts. In a span of time between December 2018 and February 2019, WSP engineers conducted on-site bridge assessments for the following bridges:

- BIN 2210840 – Law Street over Tonawanda Creek, Genesee County (page 25)
- BIN 3315450 – Colby Road over Murder Creek, Genesee County (page 28)
- BIN 3319860 – Whiskey Bridge over Genesee River, Livingston County (page 31)
- BIN 3316240 – Fowlersville Road over Genesee River, Livingston County (page 34)
- BIN 3317290 – N. Main Street over Black Creek, Monroe County (page 37)
- BIN 3317640 – N. Hamlin Road over Sandy Creek, Monroe County (page 40)
- BIN 3318430 – East Lake Road over Mill Creek, Ontario County (page 43)
- BIN 3318660 – County Road 4 over Canandaigua Outlet, Ontario County (page 46)
- BIN 3319170 – Norway Road over Sandy Creek, Orleans County (page 49)
- BIN 3366340 – Norway Road over Sandy Creek Tributary, Orleans County (page 52)
- BIN 3318990 – Lakeside Road over Johnson Creek, Orleans County (page 55)
- BIN 3313960 – County Road 119 over Kendig Creek, Seneca County (page 57)
- BIN 3314800 – County Road 105/ Armitage Road over Clyde River, Wayne County (page 60)
- BIN 3314830 – Ridge Road over Sodus Day, Wayne County (page 63)
- BIN 3314840 – Leroy Island Road over Sodus Bay, Wayne County (page 66)
- BIN 3319950 – County Road 7 over Oatka Creek, Wyoming County (page 69)
- BIN 3366430 – Buffalo Road over Oatka Creek, Wyoming County (page 72)
- BIN 3335570 – Country Road 18 over Flint Creek, Yates County (page 75)
- BIN 3335590 – Italy Valley Road over Flint Creek, Yates County (page 77)

The following pages display each of the bridge assessments conducted by the engineering staff.

Law Street over Tonawanda Creek (Genesee County)

BIN 2210840

(looking west): BIN 2210840 – Monolithic concrete deck and sidewalk.

(looking north, upstream side): Two-span adjacent prestressed concrete box beams.

Site Visit Findings (December 26, 2018)

A site visit to the Law Street bridge over Tonawanda Creek, BIN 2210840 was completed by WSP on December 26, 2018 to gather specific site data about the general condition of the bridge and its location.

BIN 2210840 is a two-span adjacent concrete box beam bridge with monolithic deck, granite curbs, and a sidewalk on the north side of the roadway. The beams are supported by a solid wall concrete pier and concrete abutments. The bridge carries two lanes of traffic.

At the time of the visit, the integral wearing surface appeared to be in good condition with no evidence of concrete deterioration. The galvanized steel railing was also in good condition with no signs of damage or defects. The concrete deck fascia and underside of the overhangs appeared to be in good condition on both sides of the bridge. The adjacent prestressed concrete box beams were in good condition with no signs of hairline cracking, rust stains, or efflorescence. The bridge substructure was in fair to good condition and appeared to be stable. The concrete solid pier had evidence of previous spall repairs and a full length rehabilitated bridge seat. The concrete abutments and wingwalls exhibited minor deterioration with localized spalling. Evidence of a reconstructed bridge seat and spall repairs was also apparent at the abutments. Spalling can be remedied through localized patching techniques.

On the day of the visit, some ice was present along the shoreline and small pieces of ice flowed freely in the creek. Looking upstream, there were some large trees and large bushes along the shoreline that appeared to be at risk of falling into the creek. Some fallen debris was visible upstream but there did not appear to be any problems with debris piling-up at the bridge.

Tonawanda Creek flows south to north. At the location of the bridge, the flow of water is not constrained, so there is little risk of contraction scour. While an in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time around the pier. Contraction scour did not appear to be an issue. The foundations appeared to be stable, but there is some erosion occurring at the abutments due to runoff. Large stones were placed on the abutment slope to stabilize the soil, but erosion appeared to be continuing. The shoreline near the bridge is also eroding, which may be due to high water levels in the creek. Some damage to the shoreline and movement of the shoreline was evident at the bridge. The latest available inspection report (June 2015) in the National Bridge Inventory noted this erosion along the bank but reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1383841). The bridge's generous freeboard, even at high water allowed plenty of room for the passage of large debris. Finally, overtopping risk appeared to be very low at this bridge.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

- Have biennial inspection performed during times of low water.
- Place rip-rap at and around the abutments and/or install other slope anchoring measures.
- Place rip-rap at and around the abutments and/or install other slope anchoring measures.
- All eroded banks subject to hydraulic flows should be protected by stone fill (size depends on stream flow velocities) to an elevation 1 foot above design high water.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Colby Road over Murder Creek (Genesee County)

BIN 3315450

(looking north): BIN 3315450 – Open steel grid deck.

(looking east, downstream side): Single span steel multi-girder bridge.

Site Visit Findings (December 26, 2018)

A site visit to the Colby Road bridge over Murder Creek, BIN 3315450 was completed by WSP on December 26, 2018 to gather specific site data about the general condition of the bridge and its location.

BIN 3315450 is a single span steel multi-girder bridge with an open steel grid deck supported by concrete abutments. The bridge carries two lanes of traffic.

At the time of the visit, the open steel grating deck had minor wear to the serrations and was moderately rusted throughout, but without any appreciable section loss, and was in overall fair condition. The metal railing was in fair condition with isolated areas of coating failures and rusted thru holes in the lower rails. The steel girders exhibited widespread surface corrosion, particularly at the interior girders due to the open deck, but no section loss was evident and the overall condition was fair. The bridge substructure was in poor condition. The abutment stemwalls exhibited severe deterioration with spalling, efflorescence, and horizontal and vertical cracks, particularly at the north abutment. The backwalls in between the girders were covered with wooden forms, possibly to prevent the loss of fill material behind the abutments. There were areas of surface depressions in the approach pavement along the joint where the steel grid deck begins, further evidence that fill could be eroding behind the backwalls. Debris had accumulated on the bridge seats, surrounding the bearings and contributing to their deterioration. The backwalls that were beyond the girders and atop the wingwalls had severe spalling along the horizontal joint aligned with the bridge seat and appeared to be unstable.

On the day of the visit, some ice was present along the shoreline and small pieces of ice flowed freely in the creek. Looking upstream, there was no evidence of debris that appeared to be at risk of piling-up at the bridge.

Murder Creek flows east to west at the location of the bridge. The flow of water is not constrained at the bridge, so there is little risk of contraction scour. While an in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time along the abutments. Contraction scour did not appear to be an issue. Some damage to the shoreline and movement of the streambed was evident at the bridge. The latest available inspection report (May 2015) in the National Bridge Inventory noted this erosion along the bank but reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1388029). The bridge's freeboard appeared to allow sufficient room for the passage of large debris. Finally, overtopping risk appeared to be very low at this bridge.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

- Have biennial inspection performed during times of low water.
- Place rip-rap at and around the abutments and/or install other slope anchoring measures.
- Place rip-rap at and around the abutments and/or install other slope anchoring measures.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.
- Install flow control measures such as bendway weirs on the outside curve of the channel to stabilize the bank and help limit scour at abutment.
- Realign the channel with the bridge, and arrest bank erosion and stream meander.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Whiskey Bridge (Bailey Road) over Genesee River (Wyoming County)

BIN 3319860

(looking northwest): BIN 3319860 – asphalt wearing surface on stay-in-place formed concrete deck.

(looking northwest, downstream side): Four-span bridge with three armored, hammerhead concrete piers and concrete abutments. Debris in channel, erosion of banks.

(looking northwest): Steel stringers and girders. Slope stabilization.

Site Visit Findings (February 11, 2019)

A site visit to the Whiskey Bridge (Bailey Road) over the Genesee River, BIN 3319860 was completed by WSP on February 11, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3319860 is a four-span steel bridge with integral concrete wearing surface on concrete deck formed on stay-in-place steel forms, supported by steel beams, and carried by armored hammerhead concrete piers, and concrete abutments. The bridge carries two lanes of traffic.

At the time of the visit, the integral concrete wearing surface was in good condition. The galvanized bridge railing was in good condition. The bridge concrete deck appeared to be in good condition. The weathering steel superstructure appeared to be in good condition. The concrete bridge piers appeared to be in fair condition with map cracking, staining from the weathering steel, and evidence of previous spall repairs having already been completed. The concrete abutments appeared to be in fair condition with widespread failure of the coating-type sealer that had been applied to the surfaces. The abutments exhibited efflorescence and rust staining at cracks, evidence of corrosion of embedded rebar. There was evidence of isolated spall repairs, particularly at the bridge seats.

On the day of the visit, some large pieces of ice were present along the shoreline and flowing freely in the river. Looking upstream, there were some large trees and large bushes along the banks of the creek. Some were at risk of falling into the creek. There was evidence of ice jamming and erosion along the shoreline. Fallen debris was visible upstream, and there has been history of debris pile-up at the bridge, and log jams have had to be cleared from the piers and abutments. The abutments exhibited signs of erosion due to runoff from the roadway.

The Genesee River flows south to north, and empties into Lake Ontario. At the location of the bridge, the flow of water is not constrained, so there is little risk of contraction scour. While in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time around the piers. Contraction scour did not appear to be an issue. The foundations appeared to be stable, but there is some erosion occurring at the abutments due to runoff. Gabion baskets had been placed at the southeast abutment to protect the abutment from erosion. At the northwest abutment, rip-rap and diagonal timbers had been placed. It was unclear if these were placed significantly after construction of the bridge, or if they were placed more recently to arrest erosion, but erosion appeared to be continuing. The shoreline near the bridge is also eroding, which may be due to high water levels in the river. Some damage to the shoreline and migration of the shoreline was evident at the bridge. The latest available inspection report (May 2015) in the National Bridge Inventory noted the bank erosion and reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1388388). The bridge's generous freeboard, even at high water allowed plenty of room for the passage of large debris. Finally, overtopping risk appeared to be very low at this bridge.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

- Have biennial inspection performed during times of low water.
- Place rip-rap at and around the abutments and/or install other slope anchoring measures.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Fowlerville Rd. over Genesee River (Livingston County)

BIN 3316240

(looking west): BIN 3316240 – asphalt wearing surface on cast-in-place concrete deck.

(looking east, upstream side): Three-span bridge with two solid wall concrete piers and concrete abutments.

(looking east, upstream side): Steel stringers and girders.

Site Visit Findings (February 11, 2019)

A site visit to the Fowlerville Road bridge over the Genesee River, BIN 3316240 was completed by WSP on February 11, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3316240 is a three-span steel bridge with asphalt wearing surface, supported by cast in place concrete deck, steel stringers and steel girders, and carried by two solid wall concrete piers and concrete abutments. The bridge carries two lanes of traffic and two gas pipelines (RG&E).

At the time of the visit, the thin asphalt wearing surface was in poor to fair condition. The asphalt was so thin that it appeared that the original intent was for the concrete deck to be the surface. The coating system on the bridge steel railing was critical with total paint failure and widespread initiation of corrosion. The bridge concrete deck appeared to be in good condition based on what could be seen from underneath the bridge. The steel superstructure appeared to be in good condition with localized degradation of the components at faying surface and at scupper downspouts. The coating system on the bridge superstructure was in fair condition with widespread locations of minor paint failure. The concrete bridge piers appeared to be in good condition and stable. The concrete abutments appeared to be in fair condition with some efflorescence at isolated cracks. There was evidence of previous spall repairs, particularly at the bridge seats. The repairs appeared to be stable.

On the day of the visit, some ice was present along the shoreline and small pieces of ice flowed freely in the river. Looking upstream, there were some large trees and large bushes along the banks of the creek. Some were at risk of falling into the creek. The trunks of some trees were submerged indicating that the water level may have been at or near high water. Nevertheless, no fallen debris was visible upstream or downstream and there did not appear to be any problems with debris pile-up at the bridge.

The Genesee River flows south to north, and empties into Lake Ontario. At the location of the bridge, the flow of water is not constrained, so there is little risk of contraction scour. While in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time around the piers. Contraction scour did not appear to be an issue. The foundations appeared to be stable, but there is some erosion occurring at the abutments due to runoff. Large stones were placed on the abutment slope to stabilize the soil, but erosion appeared to be continuing. The shoreline near the bridge is also eroding, which may be due to high water levels in the river. Some damage to the shoreline and migration of the shoreline was evident at the bridge. The latest available inspection report (December 2016) in the National Bridge Inventory noted the bank erosion and reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1388090). The bridge's generous freeboard, even at high water allowed plenty of room for the passage of large debris. Finally, overtopping risk appeared to be very low at this bridge, as there were large fields adjacent to the bridge that were lower in elevation than the bridge superstructure.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

- Have biennial inspection performed during times of low water.
- Place rip-rap at and around the abutments.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

North Main St. over Black Creek (Monroe County)

BIN 3317290

(looking north): BIN 3317290– asphalt wearing surface on cast-in-place concrete deck.

(looking south, downstream side): Concrete superstructure, cantilevered sidewalk, and concrete substructure.

Site Visit Findings (February 11, 2019)

A site visit to the North Main Street bridge over Black Creek, BIN 3317290 was completed by WSP on February 11, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3317290 is a continuous three-span concrete arch bridge with asphalt wearing surface, supported by cast in place concrete deck, concrete stringers to concrete arch girders, and carried by two integral concrete piers and integral concrete abutments. The shoreline at the bridge was protected by stone riprap and some vegetation. The bridge carries two lanes of traffic and cantilevered pedestrian sidewalks.

At the time of the visit, the asphalt wearing surface was in good condition. The bridge concrete barrier wall separating the roadway from the pedestrian sidewalks was in poor to fair condition with widespread areas of surface spalling. The steel railing along the pedestrian sidewalks appeared to be in poor to fair condition, with widespread areas of coating failure and corrosion initiated in some members. The bridge concrete deck could not be assessed. The concrete superstructure appeared to be in fair condition with some staining and small surface spalls. There was widespread evidence of previous concrete spall repairs that appeared stable. The concrete bridge piers appeared to be in fair condition and stable. The concrete abutments appeared to be in fair condition with some efflorescence at isolated cracks.

On the day of the visit, the Black Creek was mostly covered in ice and some flow could be seen in the areas of open water. Looking upstream (to the west), there were few large trees and large bushes along the banks of the creek. No fallen debris was visible upstream or downstream and there did not appear to be any problems with debris pile-up at the bridge despite the low freeboard.

The Black Creek flows west to east. At the location of the bridge, the flow of water is not constrained. While in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time around the piers. The latest available inspection report (October 2015) in the National Bridge Inventory reported that the bridge is scour critical and that the bridge foundations were determined to be unstable (link: https://bridgereports.com/1388167). The bridge's low freeboard on the day of the visit did not appear to allow much room for the passage of large debris, but there appeared to be very little risk of overtopping, as there were large fields adjacent to the bridge that were lower in elevation than the bridge superstructure.

The latest available inspection report in the NBI noted that this bridge is scour critical with unstable foundations. Per Federal Highway Administration (FHWA) recommendations for scour critical bridges, this bridge should have a Plan of Action (POA) in place that details inspection and monitoring requirements specifically designed for the bridge, countermeasure designs and associated schedule for installation, closure/detour protocol and associated signing layouts, and monitoring after countermeasures are installed (refer also to FHWA Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23)).

This bridge was designated as scour critical and is a concrete arch bridge with low freeboard. As of the latest available inspection report, the substructure rated Satisfactory (6 out of 9), so it is not likely that any repairs are warranted right now. However, scour issues may necessitate costly and difficult repairs to the concrete structure in the future. In lieu of performing such repairs, replacement at the end of its life should be considered.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in HEC-23:

- Develop POA per FHWA recommendations.
- Have annual inspection performed during times of low water.
- Install scour and water level monitoring equipment.
- Install additional riprap along the abutments.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should continue to be monitored closely.

North Hamlin Rd. over Sandy Creek (Monroe County)

BIN 3317640

(looking east): BIN 3317640– asphalt wearing surface on cast-in-place concrete deck.

(looking west, upstream side): Steel superstructure carried by concrete pier and abutments.

(looking north, downstream side): Evidence of ice jamming downstream (north east) of bridge.

Site Visit Findings (February 12, 2019)

A site visit to the North Hamlin Road bridge over Sandy Creek, BIN 3317640 was completed by WSP on February 12, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3317640 is a two-span steel bridge with asphalt wearing surface, supported by cast in place concrete deck over steel beams carried by a solid wall concrete pier and concrete abutments with concrete wingwalls. The bridge carries two lanes of traffic and has a USGS stream gaging station at the southeast corner of the bridge.

At the time of the visit, the asphalt wearing surface appeared to be in good condition. The steel railing appeared to be in poor to fair condition, with widespread areas of coating failure and corrosion initiated in some members. The bridge concrete deck could not be assessed. The steel superstructure appeared to be in fair condition with some local areas of coating failure and corrosion. The concrete pier appeared to be in poor condition with spalls and staining at the location of the fascia beam bearing. The concrete abutments appeared to be in fair condition with some efflorescence at isolated cracks.

On the day of the visit, Sandy Creek was mostly covered in ice and ice flow could be seen in the areas of open water. Looking upstream (south west) there were large trees and large bushes along the banks of the creek. Debris was visible upstream, at the bridge, and downstream. Large pieces of ice were piled high up on the shoreline, presumably the result of downstream ice jamming.

Sandy Creek flows southwest to northeast and ultimately empties into Lake Ontario. At the location of the bridge, the flow of water is restricted by debris and shallows. While in-depth investigation of scour issues is out of the scope of this assessment, local and contraction scour appeared to be a significant risk around the piers and at the abutments. The foundations did not appear to be failing at the time of the visit, but the condition of channel bottom at the foundations could not be assessed. The latest available inspection report (November 2016) in the National Bridge Inventory revealed that the bank and embankment protection is *severely* undermined. Furthermore, the bridge is scour critical and the bridge foundations were determined to be unstable (link: https://bridgereports.com/1388199). While the current condition should be monitored as it relates to the integrity of the foundations, there appeared to be little risk of overtopping. There were large fields adjacent to the bridge that were lower in elevation than the bridge superstructure.

The latest available inspection report in the NBI noted that this bridge is scour critical with unstable foundations. Per Federal Highway Administration (FHWA) recommendations for scour critical bridges, this bridge should have a Plan of Action (POA) in place that details inspection and monitoring requirements specifically designed for the bridge, countermeasure designs and associated schedule for installation, closure/detour protocol and associated signing layouts, and monitoring after countermeasures are installed (refer also to FHWA Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23)).

Some or all of the following countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in HEC-23:

- Develop POA per FHWA recommendations.
- Have annual inspection performed during times of low water.
- Install additional scour and water level monitoring equipment.
- Install micropiles to stabilize foundations that are unstable.
- Pressure grout voids in foundations, if any.
- Install partially grouted riprap or geotextile sand containers in scour holes, if any.
- All eroded banks subject to hydraulic flows should be protected by stone fill (size depends on stream flow velocities) to an elevation 1 foot above design high water.
- Install geotextile and/or native vegetation buffer strips along banks.
- Install flow control measures such as bendway weirs on the outside curve of the channel to stabilize the banks and help limit local scour at abutment.
- Install guide banks (spur dikes) to confine the flow and move it away from abutments (to limit local scour at abutments.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should continue to be monitored closely.

East Lake Road over Mill Creek (Ontario County)

BIN 3318430

(looking north): BIN 3318430 – Asphalt wearing surface on adjacent box beams.

(looking east, downstream side): Single span adjacent prestressed concrete box beams.

Site Visit Findings (January 16, 2019)

A site visit to the East Lake Road bridge over Mill Creek, BIN 3318430 was completed by WSP on January 16, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3318430 is a single span adjacent concrete box beam bridge with an asphalt wearing surface supported by concrete abutments. The bridge carries two lanes of traffic.

At the time of the visit, the asphalt wearing surface was in good condition. The galvanized steel railing was also in good condition with no signs of damage or defects. The adjacent prestressed concrete box beams appeared to be in good condition with no signs of hairline cracking, rust stains, or efflorescence, except for the west fascia beam. The bridge supports a gas pipe on the west side. The west concrete beam exhibited surface spalls on its west face where it mated surfaces with the steel utility overhang brackets supporting the gas pipe. The concrete spalls on the fascia beam appear to have little effect on its strength or serviceability, but should be monitored during subsequent bridge inspections. The bridge substructure was in fair condition and appeared to be stable. The abutment stemwalls exhibited moderate deterioration with efflorescence at isolated cracks. There was evidence of reconstructed bridge seats to the abutments during the last major bridge rehabilitation. The concrete was spalling along the construction joints of the reconstructed bridge seats, but appeared to be stable. The wingwalls exhibited moderate deterioration with widespread surface edge spalling, diagonal cracks and efflorescence.

On the day of the visit, some ice was present along the shoreline and small pieces of ice flowed freely in the creek. Looking upstream, there were some large trees and large bushes along the shoreline that appeared to be at risk of falling into the creek. Some fallen debris was visible upstream but there did not appear to be any problems with debris piling-up at the bridge.

Mill Creek flows east to west at the location of the bridge. The flow of water is not constrained at the bridge, so there is little risk of contraction scour. While an in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time along the abutments. Contraction scour did not appear to be an issue. Some damage to the shoreline and movement of the streambed was evident at the bridge. The latest available inspection report (April 2015) in the National Bridge Inventory noted this erosion along the bank but reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1388265). The bridge's generous freeboard, even at high water allowed plenty of room for the passage of large debris. Finally, overtopping risk appeared to be very low at this bridge.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

- Have biennial inspection performed during times of low water.

- Place rip-rap at and around the abutments and/or install other slope anchoring measures.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

CR4 over Canandaigua Outlet (Ontario County)

BIN 3318660

(looking east): BIN 3318660 – Asphalt wearing surface on adjacent box beams.

(looking north, upstream side): Single span adjacent prestressed concrete box beams.

Site Visit Findings (January 16, 2019)

A site visit to the County Road 4 bridge over Canandaigua Outlet, BIN 3318660 was completed by WSP on January 16, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3318660 is a single span adjacent concrete box beam bridge with an asphalt wearing surface supported by concrete abutments. The bridge carries two lanes of traffic.

At the time of the visit, the asphalt wearing surface was in fair condition with large transverse cracks that appeared to be aligned over the ends of the structural beams and one isolated surface depression on the north shoulder line near the east end of the bridge. The metal railing was in good condition with no signs of damage or defects. The adjacent prestressed concrete box beams appeared to be in good condition with no signs of hairline cracking, rust stains, or efflorescence. The overhang fascia of monolithic deck exhibited isolated longitudinal cracks with minor rust stains indicating rebar corrosion, but serviceability does not appear to be affected. The bridge substructure was in good condition. The concrete of the abutments and wingwalls exhibited no signs of significant cracking or spalling.

On the day of the visit, some ice was present along the shoreline and small pieces of ice flowed freely in the channel. Looking upstream, there were some large trees and large bushes along the shoreline that appeared to be at risk of falling into the water. Some fallen debris was visible upstream but there did not appear to be any problems with debris piling-up at the bridge.

Canandaigua Outlet flows south to north at the location of the bridge. The flow of water is not constrained at the bridge, so there is little risk of contraction scour. While an in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time along the abutments. Contraction scour did not appear to be an issue. Some damage to the shoreline and movement of the streambed was evident at the bridge. The latest available inspection report (August 2016) in the National Bridge Inventory noted this erosion along the bank but reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1388286). The bridge appeared to have inadequate freeboard to allow the passage of large debris. Finally, overtopping did not appear to be a risk at this bridge.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

- Have biennial inspection performed during times of low water.
- All eroded banks subject to hydraulic flows should be protected by stone fill (size depends on stream flow velocities) to an elevation 1 foot above design high water.

- Place rip-rap at and around the abutments to confine the flow and move it away from abutments.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.
- Install guide banks (spur dikes) to confine the flow and move it away from abutments (to limit local scour at abutments).

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Norway Road over Sandy Creek (Orleans County)

BIN 3319170

(looking north): BIN 3319170 – asphalt wearing surface on concrete deck (note the sub-standard guide rail protection).

(looking south, upstream side): concrete abutments and wingwalls, constriction of flow.

(looking west, upstream side): bank erosion, debris in channel, and evidence of ice jamming.

Site Visit Findings (February 12, 2019)

A site visit to the Norway Road bridge over Sandy Creek, BIN 3319170 was completed by WSP on February 12, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3319170 is a single span concrete bridge with asphalt wearing surface, supported by concrete abutments, concrete wingwalls on the upstream side, and partial stone wingwalls on the downstream side. The bridge carries two lanes of traffic.

At the time of the visit, the asphalt wearing surface appeared to be in fair condition. The concrete superstructure appeared to be in fair condition. The concrete abutments and wingwalls appeared to be in fair condition with some cracks, and isolated spalls at cracks.

On the day of the visit, Sandy Creek was partially covered in ice and ice flow could be seen in the areas of open water. Looking upstream (south west) there were large trees and large bushes along the banks of the creek. Debris was visible upstream and downstream. Erosion of the banks was evident. Large pieces of ice were piled up on the shoreline, presumably the result of ice jamming.

Sandy Creek flows southwest to northeast, and ultimately empties into Lake Ontario. At the location of the bridge, the flow of water is partly restricted by debris, and constrained by narrowing of the creek. Some loss of material behind the wingwalls due to roadway runoff was evident. While in-depth investigation of scour issues is out of the scope of this assessment, local and contraction scour could occur over time at the abutments. The foundations did not appear to be failing in any way at the time of the visit, but the condition of channel bottom at the foundations could not be assessed. The latest available inspection report (August 2016) in the National Bridge Inventory noted erosion of the banks, and debris in the channel, but reported that the bridge foundations were determined to be stable (link: https://bridgereports.com/1388333). There is a second bridge of similar character about 100 feet south of the BIN 3319170 that would provide hydraulic relief from forces acting at the bridge if overtopping of the banks occurred, as a diversion spillway. Due to this buffer, the risk for overtopping the bridge is reduced. Overtopping of the bridge appeared to be a low risk.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

- Have biennial inspection performed during times of low water.
- Place rip-rap at and around the abutments.
- All eroded banks subject to hydraulic flows should be protected by stone fill (size depends on stream flow velocities) to an elevation 1 foot above design high water.

- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Norway Rd. over Sandy Creek Trib. (Orleans County)

BIN 3366340

(looking north): BIN 3366340 – asphalt wearing surface on concrete deck (note the lack of guide rails).

(looking west, downstream side): concrete pipe outlet.

(looking east, upstream side): bank erosion, debris in channel, and evidence of ice jamming.

Site Visit Findings (February 12, 2019)

A site visit to the Norway Rd. bridge over Sandy Creek Tributary, BIN 3366340 was completed by WSP on February 12, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3366340 is a single span concrete deck bridge with asphalt wearing surface. It was noted that the bridge does not have any protection, such as guardrails. The National Bridge Inventory (NBI) reports that it is a 21-foot concrete deck span, but in the field, it was noted that the bridge span appeared to be small enough to be called a culvert, at only approximately five feet. On the upstream side (west), the inlet appeared to be formed by two concrete abutments with a wooden fascia beam. The downstream side (east) appeared to be formed by a section of concrete pipe. The bridge carries two lanes of traffic.

On the day of the visit, the road, ditches, and Sandy Creek Tributary were covered with ice and snow. The condition of the bridge was difficult to ascertain. WSP was not able to verify the characteristics of the bridge deck/superstructure due to the high water and ice, and the small inlet and outlet. However, at the time of the visit, the asphalt wearing surface appeared to be in fair condition. The concrete abutments at the inlet as well as the concrete pipe outlet appeared to be in fair condition with some minor cracks and isolated spalls.

At the time of the visit, Sandy Creek Tributary was partially covered in ice and water flow could be seen in the areas of open water at the inlet and outlet. Looking upstream (west) there were trees and bushes along and in the banks of the creek. Debris was visible upstream. Some erosion of the banks was evident. It was also noted that the channel bottom was shallow and clearly visible at the inlet and outlets. Long green grass blanketed the bottom of the Sandy Creek Tributary in the vicinity of the bridge.

Sandy Creek Tributary flows from west to east, and empties into Sandy Creek. At the location of the bridge, the flow of water is partly restricted by debris, and constrained by narrowing of the creek. Some loss of material at both the inlet and the outlet was evident. While in-depth investigation of scour issues is out of the scope of this assessment, local and contraction scour could occur over time at the abutments. The foundations did not appear to be failing at the time of the visit. The latest available inspection report (August 2016) in the National Bridge Inventory noted erosion of the banks, and debris in the channel, but reported that the bridge foundations were determined to be stable (link: https://bridgereports.com/1391871). The long grass in the channel bottom indicates that the stream dries up periodically, probably during the summer and fall months. This vegetation holds material and reduces the volume of water that can travel underneath the bridge. Sedimentation and maintenance of flow is a larger problem than scour at this bridge. Overtopping of the bridge appeared to be a low risk due to the low-lying adjacent fields, but with the approaches and the bridge at roughly the same elevation, there is some risk.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of

this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

- Have biennial inspection performed during times of low water.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.
- Install concrete headwalls on both sides.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Lakeside Road over Johnson Creek (Orleans County)

BIN 3318990

(looking north): BIN 3318990 – Galvanized steel thru-truss (Bailey bridge).

(looking east, downstream side): Steel superstructure carried by concrete abutments.

Site Visit Findings (February 12, 2019)

A site visit to the Lakeside Rd. bridge over Johnson Creek, BIN 3318990 was completed by WSP on February 12, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3318990 is a single span steel thru- truss bridge (Bailey bridge) with steel diamond plate deck, supported by concrete abutments with concrete wingwalls. The bridge carries one lane of traffic. At the time of the visit, the steel diamond plate wearing surface appeared to be in fair condition. The galvanized steel superstructure appeared to be in fair to good condition with some isolated areas of minor coating failure and initiation of corrosion. The concrete abutments appeared to be in fair condition with some efflorescence at isolated cracks, and isolated spalls. The abutments and wingwalls are partially protected by vegetation along the shore.

On the day of the visit, Johnson Creek was covered in ice and water flow could not be seen. Looking upstream (east) there were large trees and large bushes along the banks of the creek. Debris was not visible, but some trees appeared to be at risk of falling into the creek. The water level appeared to be high,

Johnson Creek flows generally south to north and empties into Lake Ontario very near the bridge. Due to its proximity to Lake Ontario, this bridge is prone to lake effect snow storms, high water events, and high wind events. At the location of the bridge, the flow of water is not constrained, but some erosion of the banks and loss of material behind the wingwalls was evident. While in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time at the abutments. The latest available inspection report (November 2016) in the National Bridge Inventory noted some damage to and drift of the banks/channel, but reported that the bridge foundations were determined to be stable (link: https://bridgereports.com/1388317). The bridge is very near the Lake Ontario shore, so high water events in the lake could push water into the Creek, thereby quickly raising (and lowering) the water levels. The risk of this action causing erosion of the banks and around the foundations would be particularly threatening in the spring, when lake levels are at their highest. There appeared to be very little risk of overtopping, as the lake level was well below the elevation of the bridge superstructure.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

- Have biennial inspection performed during times of low water.
- Place rip-rap at the toe of and around the abutments.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

CR119 over Kendig Creek (Seneca County)

BIN 3313960

(looking east): BIN 3313960.

(looking east, downstream side): Some wingwall stones have fallen into the creek.

(looking west, downstream side): Some wingwall stones have fallen into the creek.

Site Visit Findings (February 13, 2019)

A site visit to the County Road 119 bridge over Kendig Creek, BIN 3313960 was completed by WSP on February 13, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3313960 is a single span steel bridge with asphalt wearing surface on concrete deck formed on stay-in-place steel forms, supported by steel beams, and carried by concrete abutments with concrete wingwalls on the upstream side of the bridge and stacked stone wingwalls on the downstream side of the bridge. The bridge carries two lanes of traffic.

On the day of the site visit, the asphalt overlay appeared to be in good condition. The condition of the concrete deck was not able to be determined. From underneath the bridge, it appeared that the bridge steel structure was in fair to good condition, exhibiting incidental section loss to primary and secondary members with some degradation of the stay-in-place steel forms. The coating system was found to be in good condition, apart from local paint failures where the steel forms were deteriorated.

The concrete abutments and backwalls appeared to be in good condition and stable. Wingwalls on the upstream side of the bridge are concrete and appeared to be in good condition and stable. However, the stone wingwalls on the downstream side of the bridge were found to be in fair to poor condition with evidence of previous attempts to stabilize the stone walls using shotcrete. Rainwater runoff from the road, and degradation of the stone joints over time appear to have contributed to the loss of material behind the stone walls, and further de-stabilization of the stone wingwalls. Some of the stones had fallen into the creek.

On the day of the visit, the creek it spans over was completely blanketed in snow covered ice, so characteristics of the flow and the bottom of the channel could not be assessed, but it appeared to be shallow at the location of the bridge; rocks in the channel protruded through the ice. The bridge had a generous freeboard for the passage of debris in the creek beneath, but debris could be seen upstream. Looking upstream, there were some medium sized trees and large bushes along the banks of the creek. Some trees appeared to be at risk of falling into the creek and causing a pile-up of debris at the bridge or impeding flow.

Kendig Creek flows generally south to north, but the areas immediately upstream and downstream of the bridge are on curves in the creek and the width of the channel appeared to be slightly narrower at the bridge. Because the bridge is located on a slight bend in the creek, the thalweg of the creek may have moved over time. While an on-site assessment of scour is outside of the scope of this assessment erosion of the banks appears to have occurred, and local scour is a possibility. Also, due to the slight restriction of flow at the bridge, there is a risk of contraction scour at the bridge. The latest available inspection report (October 2015) in the National Bridge Inventory reported that the bridge is scour critical; and that the bridge foundations were determined to be unstable (link: https://bridgereports.com/1387925). Finally, overtopping did not appear to be a risk at this bridge.

The latest available inspection report in the NBI noted that this bridge is scour critical with unstable foundations. Per Federal Highway Administration (FHWA) recommendations for scour critical bridges, this bridge should have a Plan of Action (POA) in place that details inspection and monitoring requirements specifically designed for the bridge, countermeasure designs and associated schedule for installation, closure/detour protocol and associated signing layouts, and monitoring after countermeasures are installed (refer also to FHWA Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23)).

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in HEC-23:

- Develop POA per FHWA recommendations.
- Have annual inspection performed during times of low water.
- Install riprap on the banks upstream and downstream to confine the flow and move it away from abutments (to limit local scour at abutments).
- Install geotextile and/or native vegetation buffer strips along banks.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.
- Remove existing stone wingwalls and install concrete flared wingwalls.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should continue to be monitored closely.

CR105/Armitage Rd. over Clyde River (Wayne County)

BIN 3314800

(looking east): BIN 3314800.

(looking south, downstream side): Wooden timber multi-span bridge on wooden pile bents.

Site Visit Findings (February 13, 2019)

A site visit to the County Road 105/Armitage Rd. bridge over Clyde River, BIN 3314800 was completed by WSP on February 13, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3314800 is a multi-span wooden timber bridge with asphalt overlay on rubber sheet membrane, supported by wooden deck and wooden stringers, and carried by timber pile bents and stone abutments. The bridge carries two lanes of traffic.

On the day of the visit, the asphalt overlay appeared to be in fair condition, but exhibited orthogonal cracks in the asphalt and areas of ponding water. The bridge wooden superstructure appeared to be in fair condition with little degradation of the wooden components. However, severe degradation of the steel components/brackets in contact with the wood framing at the fascia beams was evident.
The bridge substructure was in poor to fair condition. The timber pile bents exhibited various degrees of degradation with evidence of repairs/fortification in differing states. Some of the timber bracing members that tie the piles together had failed. The abutments and backwalls were a mix of stone and formed concrete, likely the result of efforts to stabilize the abutment. The abutment appeared to be in fair condition. The wingwalls were also a mix of stone and formed concrete, and they appeared to be in poor to fair condition with evidence of previous attempts to stabilize the stone using shotcrete. Rainwater runoff from the road, and degradation of the stone joints over time appear to have contributed to the loss of material behind the stone walls, and further de-stabilization of some of the stones in the wingwalls.

At the time of the site visit, the river was covered with ice and no flow could be directly observed. However, while no significant damage was observed, evidence of ice flow impact was observed at the timber piles. Looking upstream, there were some large trees and large bushes along the banks of the creek. Some appeared to be at risk of falling into the creek. Indeed, there were large trees that had already fallen into the river upstream, and their branches could be seen poking up through the ice. At the time of the visit, there did not appear to be any problems with debris pile-up at the bridge.

Clyde River flows generally south to north and at the location of the bridge, the Clyde River is an offshoot of the Erie Canal; the Clyde River diverges from the Erie Canal upstream, passes under the bridge, and then rejoins the Erie Canal downstream of the bridge. The areas immediately upstream and downstream of the bridge do not curve significantly. Also, the width of the channel appeared to be consistent upstream and downstream, with no constriction of flow at the bridge. While on-site investigation of scour issues is out of the scope of this assessment, local scour could occur over time around the piles and at the abutments. There appeared to be little risk of contraction scour at this location. However, erosion of the banks appeared to be occurring upstream and downstream of the bridge, as trees were about to or had already fallen into the river. The latest available inspection report (August 2016) in the National Bridge Inventory noted the bank erosion and that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1387988). Overtopping did not appear to be a risk at this bridge, as there were adjacent fields that were lower in elevation than the bridge superstructure. In fact, most of the surrounding area including the banks of the river appeared to be lower than the bridge superstructure.

In the National Bridge Inventory (NBI), this bridge is in listed as Structurally Deficient and in Poor condition, with deck geometry described as, 'Basically intolerable requiring high priority of replacement.' As such, replacement of this bridge should be considered. However, if the Owner determines that it is worth preserving the bridge, the following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23):

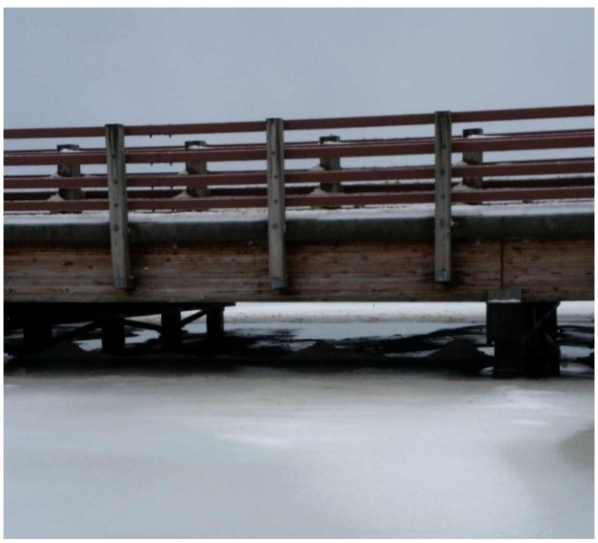
- Have biennial inspection performed during times of low water.
- Place steel angles up to 3 ft above high water on the upstream face of timber piers to improve hydraulics and break up ice.
- Place rip-rap at and around the abutments.
- Install geotextile and/or native vegetation buffer strips along banks.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Ridge Road over Sodus Bay (Wayne County)

BIN 3314830

(looking west): BIN 3314830.



Wood/timber multi-span bridge deck supported on steel H-pile bents.

(looking east, upstream side): Utilities (Cable TV, Electric – RG&E) carried by bridge.

Site Visit Findings (February 13, 2019)

A site visit to the Ridge Rd. bridge over Sodus Bay, BIN 3314830 was completed by WSP on February 13, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3314830 is a multi-span wooden timber bridge with asphalt wearing surface, supported by wooden deck and wooden stringers, and carried by galvanized steel H-pile bents and timber abutments. A combination of stone rip-rap and vegetation protected the banks and the abutments. The bridge carries two lanes of traffic, a pedestrian sidewalk, and cable TV and electric (RG&E) lines across Sodus Bay.

On the day of the visit, the asphalt wearing surface appeared to be in fair condition, but exhibited some degradation of longitudinal asphalt joints and transverse asphalt joints at each pile bent, and some spalls in the asphalt. The bridge wooden superstructure appeared to be in good condition with little degradation of the wooden components.

The bridge substructure appeared to be in good condition and stable. The only visible portion of the abutments were the timber abutment seats which extended past the bridge structure to create wingwalls and retain soil. The abutments appeared to be in good condition with minor loss of material behind the wingwalls due to runoff.

At the time of the site visit, the bay was covered with ice and no flow could be directly observed. However, while no significant damage was observed, evidence of ice flow impact was observed at the steel pile bents. Looking upstream, there were some large trees and large bushes along the banks of the creek, but they were very far away, and most of the shoreline of the bay was protected by vegetation such as cattails. At the time of the visit, there did not appear to be any problems with debris pile-up at the bridge.

Sodus Bay flows south to north, and empties into Lake Ontario. Due to its proximity to Lake Ontario, this bridge is prone to lake effect snow storms, high water events, and high wind events. At the location of the bridge, the flow of water in the bay is constrained and forced to flow through an area that is narrower than the upstream width. While in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time around the piles and at the abutments. Further, the constriction of flow at the bridge could cause contraction scour and erosion issues at the bridge over time. However, the risk appeared to be small due to the shoreline vegetation, and the foundations appeared to be stable. The latest available inspection (August 2015) in the National Bridge Inventory reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1387990). Also, ice jamming did not appear to be a problem at the bridge. Finally, overtopping did not appear to be a risk at this bridge, as there were large fields adjacent to the bridge that appeared to be lower in elevation than the bridge superstructure.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of

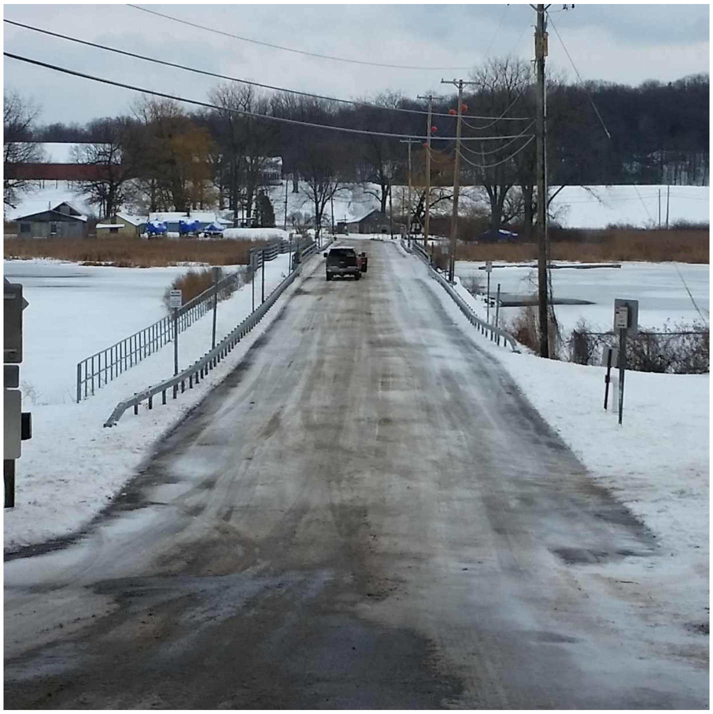
this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23

- Have biennial inspection performed during times of low water.
- Install water level monitoring equipment.
- Lower the approach profiles to allow overtopping of the approaches before the superstructure is submerged (to limit risk of contraction scour).
- Raise the elevation of the bridge superstructure to allow for the passage of more debris (to limit risk of contraction scour).

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Leroy Island Road over Sodus Bay (Wayne County)

BIN 3314840



(looking east): BIN 3314840.

(looking east, downstream side): Sidewalk at the abutment.

(looking east, upstream side): Wood/timber multi-span deck supported on steel H-pile bents.

Site Visit Findings (February 13, 2019)

A site visit to the Ridge Road bridge over Sodus Bay, BIN 3314840 was completed by WSP on February 13, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3314840 is a multi-span wooden timber bridge with asphalt wearing surface, supported by wooden deck and wooden stringers, and carried by galvanized steel H-pile bents and timber abutments. The end spans of the bridge timber deck rested on continuous timber abutment seats on top of steel sheet pile wall with steel cap. A combination of stone rip-rap, vegetation and the sheet pile wall protected the banks and the abutments. The bridge carries two lanes of traffic and a pedestrian sidewalk. It should be noted that the bridge is the only vehicular access to Leroy Island's residents and landowners.

On the day of the visit, the condition of the asphalt wearing surface could not be assessed, as the bridge was covered in snow and ice. The bridge wooden superstructure appeared to be in good condition with little degradation of the wood and galvanized steel components. The bridge substructure also appeared to be in good condition and stable. The abutments appeared to be in good condition with some minor impact and corrosion degradation of the sheet pile walls.

At the time of the visit, most of the bay it spans over was blanketed in snow covered ice, but some open water was visible at the bridge. The flow of water under the bridge was barely visible. While no significant damage was observed at the time of the visit, there was evidence of minor ice flow impact at the steel pile bents. Looking upstream, there were some large trees and large bushes along the banks of the creek, but they were very far away, and most of the shoreline of the bay was well protected by vegetation such as cattails. There did not appear to be any problems with debris pile-up at the bridge.

Sodus Bay flows south to north, and empties into Lake Ontario. Due to its proximity to Lake Ontario, this bridge is prone to lake effect snow storms, high water events, and high wind events. Because the island and the bridge are at the eastern edge of the bay at its widest point, most water flow out of the bay occurs away from the bridge. That is, water flow under the bridge is incidental to the success of the bay transporting water. At the location of the bridge, the flow of water in that section of the bay is constrained and forced to flow through an area that is narrower than the upstream width. While in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time around the piles. Further, the constriction of flow at the bridge could cause contraction scour and erosion issues at the bridge over time. However, the risk appeared to be small due to the shoreline vegetation, and the foundations appeared to be stable. The latest available inspection (March 2015) in the National Bridge Inventory reported that the bridge foundations were determined to be stable for scour (link: http://bridgereports.com/1387991). Also, ice jamming did not appear to be a problem at the bridge. Finally, overtopping did not appear to be a risk at this bridge, as there were large fields adjacent to the bridge that appeared to be lower in elevation than the bridge superstructure.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of

this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23).

- Have biennial inspection performed during times of low water.
- Install water level monitoring equipment.
- Lower the approach profiles to allow overtopping of the approaches before the superstructure is submerged (to limit risk of contraction scour).
- Raise the elevation of the bridge superstructure to allow for the passage of more debris (to limit risk of contraction scour).

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

CR7 over Oatka Creek (Wyoming County)

BIN 3319950

(looking south): BIN 3319950 – Monolithic Concrete deck on adjacent box beams.

(looking east, upstream side): Single span adjacent prestressed concrete box beams.

Site Visit Findings (December 26, 2018)

A site visit to the County Road 7 bridge over Oatka Creek, BIN 3319950 was completed by WSP on December 26, 2018 to gather specific site data about the general condition of the bridge and its location.

BIN 3319950 is a single span adjacent concrete box beam bridge with a curbless monolithic deck supported by concrete abutments. The bridge carries two lanes of traffic.

At the time of the visit, the integral wearing surface appeared to be in good condition with no evidence of concrete deterioration. The galvanized steel railing was also in good condition with no signs of damage or defects. The concrete deck fascia and underside of the overhangs appeared to be in good condition on both sides of the bridge. The adjacent prestressed concrete box beams were in good condition with no signs of hairline cracking, rust stains, or efflorescence. The bridge substructure was in good condition. The concrete of the abutments and wingwalls exhibited no signs of significant cracking or spalling.

On the day of the visit, some ice was present along the shoreline and small pieces of ice flowed freely in the creek. Looking upstream, there were some large trees and large bushes along the shoreline that could fall into the water. Some fallen branches were visible upstream that appeared to be at risk of pile-up at the bridge and impede the flow.

Oatka Creek flows west to east at the location of the bridge. The flow of water is not constrained at the bridge, so there is little risk of contraction scour. While an in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time along the abutments. Contraction scour did not appear to be an issue. Some damage to the shoreline and movement of the streambed was evident at the bridge. The latest available inspection report (July 2015) in the National Bridge Inventory noted this erosion along the bank but reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1388395). The bridge appeared to have inadequate freeboard to allow the passage of large debris. Finally, overtopping did not appear to be a risk at this bridge.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23).

- Have biennial inspection performed during times of low water.
- Install scour and water level monitoring equipment.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.

- Install rip-rap to confine the flow and move it away from abutments (to limit local scour at abutments).
- All eroded banks subject to hydraulic flows should be protected by stone fill (size depends on stream flow velocities) to an elevation 1 foot above design high water.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Buffalo Road over Oatka Creek (Wyoming County)

BIN 3366430

(looking west): BIN 3366430 – Monolithic Concrete deck on adjacent box beams.

(looking north, upstream side): Single span adjacent prestressed concrete box beams.

Site Visit Findings (December 26, 2018)

A site visit to the Buffalo Road bridge over Oatka Creek, BIN 3366430 was completed by WSP on December 26, 2018 to gather specific site data about the general condition of the bridge and its location.

BIN 3366430 is a single span adjacent concrete box beam bridge with a curbless monolithic deck supported by concrete abutments. The bridge carries two lanes of traffic.

At the time of the visit, the integral wearing surface appeared to be in good condition with no evidence of concrete deterioration. The galvanized steel railing was also in good condition with no signs of damage or defects. The concrete deck fascia and underside of the overhangs appeared to be in good condition on both sides of the bridge. The adjacent prestressed concrete box beams were in good condition with no signs of hairline cracking, rust stains, or efflorescence. The bridge substructure was in good condition. The concrete of the abutments and wingwalls exhibited no signs of significant cracking or spalling.

On the day of the visit, some ice was present along the shoreline and small pieces of ice flowed freely in the creek. Looking upstream, there were no signs of large trees or bushes along the shoreline that posed the threat of falling into the water and obstruct creek flow at the bridge. During the bridge assessment, a large tree branch was seen caught at the upstream side that is restricting the channel.

Oatka Creek flows south to north at the location of the bridge. The flow of water is not constrained at the bridge, so there is little risk of contraction scour. While an in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time along the abutments. Contraction scour did not appear to be an issue. Major damage to the shoreline and embankment washout was evident at the bridge. The latest available inspection report (October 2015) in the National Bridge Inventory noted this erosion along the bank but reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1391877). The bridge appeared to have inadequate freeboard to allow the passage of large debris. Finally, overtopping did not appear to be a risk at this bridge.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23).

- Have biennial inspection performed during times of low water.
- Place rip-rap at and around the abutments to confine the flow and move it away from abutments.
- All eroded banks subject to hydraulic flows should be protected by stone fill (size depends on stream flow velocities) to an elevation 1 foot above design high water.

- If degradation of the ditches is verified to be a concern, install check dams and/or other means of restoring the approach banks.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

CR18 over Flint Creek (Yates County)

BIN 3335570

(looking south): BIN 3335570 – Asphalt wearing surface over concrete culvert.

(looking northeasterly, upstream side): Double box CIP concrete culvert bridge.

Site Visit Findings (January 16, 2019)

A site visit to the County Road 18 bridge over Flint Creek, BIN 3335570 was completed by WSP on January 16, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3335570 is a double box cast-in-place concrete culvert bridge with an asphalt wearing surface. The bridge carries two lanes of traffic.

At the time of the visit, the asphalt wearing surface appeared to be in fair condition with minor fatigue cracks forming intermittently throughout. The metal railing was in good condition with no signs of damage or defects. The culvert concrete was in good condition with light scaling and no significant signs of cracking or spalling.

On the day of the visit, some ice was present along the shoreline and small pieces of ice flowed freely in the channel. Looking upstream, there were some large trees and large bushes along the shoreline that appeared to be at risk of falling into the water. Some fallen debris was visible upstream but there did not appear to be any problems with debris piling-up at the bridge.

Flint Creek flows south to north at the location of the bridge. The flow of water is not constrained at the bridge, so there is little risk of contraction scour. While an in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time along the curtain walls. Contraction scour did not appear to be an issue. Minor damage to the shoreline and movement of the streambed was evident at the bridge. The latest available inspection report (May 2016) in the National Bridge Inventory noted this erosion along the bank but reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1389680). The bridge appeared to have adequate freeboard to allow for the passage of large debris. Finally, overtopping did not appear to be a risk at this bridge.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23).

- Have biennial inspection performed during times of low water.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.
- All eroded banks subject to hydraulic flows should be protected by stone fill (size depends on stream flow velocities) to an elevation 1 foot above design high water.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

Italy Valley Road over Flint Creek (Yates County)

BIN 3335590

(looking west): BIN 3335590 – Asphalt wearing surface on adjacent box beams.

(looking south, downstream side): Single span adjacent prestressed concrete box beams.

Site Visit Findings (January 16, 2019)

A site visit to the Italy Valley Road bridge over Flint Creek, BIN 3335590 was completed by WSP on January 16, 2019 to gather specific site data about the general condition of the bridge and its location.

BIN 3335590 is a single span adjacent concrete box beam bridge with an asphalt wearing surface supported by concrete bridge seats that are presumably on deep foundations. Steel sheet pile embedded walls are used to retain the embankment in front of the abutments and at the wingwalls. The bridge carries two lanes of traffic.

At the time of the visit, the asphalt wearing surface appeared to be in good condition. The metal railing was also in good condition with no signs of damage or defects. The adjacent prestressed concrete box beams were in good condition with minor isolated hairline cracking and efflorescence noted along the bottom edges of the fascia beams. The bridge substructure was in satisfactory condition. The concrete bridge seats had evidence of previous spall repairs and the steel sheet piling exhibited evidence of atmospheric corrosion, the degree of which can still be considered as negligible.

On the day of the visit, some ice was present along the shoreline and small pieces of ice flowed freely in the channel. Looking upstream, there were some large trees and large bushes along the shoreline that appeared to be at risk of falling into the water. Some fallen debris was visible upstream but there did not appear to be any problems with debris piling-up at the bridge.

Flint Creek flows south to north at the location of the bridge. The flow of water is not constrained at the bridge, so there is little risk of contraction scour. While an in-depth investigation of scour issues is out of the scope of this assessment, local scour could occur over time along the abutments. Contraction scour did not appear to be an issue. Minor damage to the shoreline and movement of the streambed was evident at the bridge. The latest available inspection report (August 2015) in the National Bridge Inventory noted this erosion along the bank but reported that the bridge foundations were determined to be stable for scour (link: https://bridgereports.com/1389682). The bridge appeared to have adequate freeboard to allow for the passage of large debris. Finally, overtopping did not appear to be a risk at this bridge.

The following preliminary recommendations for countermeasures may be considered to make the bridge less vulnerable to hazard events based on the limited information available, the cursory nature of this Assessment, and FHWA recommendations outlined in Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23).

- Have biennial inspection performed during times of low water.
- Perform periodic cleaning of aggrading stream beds and remove debris upstream that may impede flow.
- Place rip-rap at around the abutments to confine flow and move it away from abutments.

- All eroded banks subject to hydraulic flows should be protected by stone fill (size depends on stream flow velocities) to an elevation 1 foot above design high water.
- If degradation of the roadway ditches leading up to the bridge is verified to be a concer, install check dams or other means to help retain material.

After installation of countermeasures and repairs of deficiencies, the behavior of the channel may be changed. Scour conditions should be monitored.

CHAPTER 6: HAZARD MITIGATION STRATEGIES

This chapter outlines strategies that can be applied to local bridges that were identified in Chapter 4 as being most vulnerable in order to prevent or mitigate impacts from potential natural and human-caused hazards.

New York State bridges are required to be inspected per the New York State Uniform Code of Bridge Inspection (UCBI) biennially with dive inspections every 5 years for bridges over water that meet certain criteria (depends on depth of channel at high water level), at a minimum. During those inspections, the condition of the bridge components, including its foundations are inspected and rated in the Bridge Inspection Report. If the inspector has cause for concern, the inspector may call for special inspections and/or the deficiencies may be flagged, which may lead to repairs or closures. Each of the bridges assessed in this report will be maintained and repaired as needed per applicable laws, the Owner's requirements, and based on the Inspection Reports. Municipalities may decide to perform preventative maintenance and/or corrective repairs or they may not. Instead they might allow the bridge to remain in service until the end of its useful life. Obviously, bridges that are not maintained reach the end of their useful lives earlier.

Some of the bridges assessed were noted as being scour critical in the latest available inspection reports in the National Bridge Inventory. This designation is based on hydraulic vulnerability assessment calculations and does not necessarily mean that there is damage to the foundations. Indeed, most of the scour critical bridges assessed had foundations that were rated Satisfactory (6 out of 9) or better. Because scour critical bridges are at a higher risk of damage due to flooding, they pose a risk to public safety and should be monitored and inspected more closely than other bridges, especially after flood events. For all scour critical bridges over water, the Federal Highway Administration (FHWA) recommends annual inspections and that a Plan of Action (POA) be developed detailing inspection and monitoring requirements specifically designed for the bridge, countermeasure designs and associated schedule for installation, closure/detour protocol and associated signing layouts, monitoring after countermeasures are installed, etc. For bridges that are scour critical and not founded on deep foundations, replacement should be considered if feasible. If replacement is not feasible, countermeasures and monitoring are recommended. Regardless of foundation type, any scour critical bridge should have a POA in place.

Bridge Vulnerability Score as it is calculated in this Assessment is determined from many factors, and countermeasures should be considered to prevent and/or mitigate the impacts of hazard events on these assets. While selection and design of countermeasures is out of the scope of this Assessment, and should be based on risk, feasibility, cost and more thorough investigations (Federal Highway Administration Hydraulic Engineering Circular No. 23, *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance* (HEC-23) should be referred to when selecting and designing countermeasures), preliminary countermeasure recommendations for each bridge are offered for consideration based on the limited information available and the nature of this Assessment.

The Regional Critical Transportation Asset Vulnerability Study provided the Genesee Transportation Council and member agencies and municipalities with a toolbox for minimizing or eliminating the potential impacts of hazard events to critical transportation assets. To supplement that toolbox, the below strategies are geared towards mitigation strategies for local bridges, and since the major cause of local bridges being scored as highly or moderately highly vulnerable is due to flooding or hazards that result from flooding, the below are heavily geared towards strategies agencies can employ to minimize, avoid, or mitigate the impacts of flooding on local bridges. Flooding damage to bridges is typically caused by water overtopping decks, erosion under piers and abutment footings, erosion of embankments, and impacts to accumulating floating debris on the desks, piers, and abutments.

STRATEGIES FOR MITIGATING HAZARD IMPACTS TO LOCAL BRIDGES

Hazmat and Oversize Truck Routes *Load Restrictions*	• Ensure drivers of hazmat materials and/or oversize trucks can easily obtain information on hazmat and truck routing as well as any travel restrictions of local bridges due to severe weather or other hazard events or because they are load rated. *Responsible Agencies: County and local jurisdictions*
Implement Low Impact and Green Infrastructure Best Practices to Minimize Flooding *Flooding ● Landslide/ Erosion*	The use of low impact and green infrastructure best practices can minimize the impact of flooding in flood prone areas. • Implement green infrastructure to reduce peak stormwater runoff, especially in flood prone areas (permeable pavement, rain gardens, bio-swales). • Use of porous/ permeable pavement and surfaces to reduce runoff. *Responsible Agencies: NYSDEC, County and local jurisdictions*

Slope Stabilization *Flooding ● Landslide/ Erosion*	• Prevent erosion with proper bank stabilization, sloping or grading techniques, planting vegetation on slopes, terracing hillsides, or installing riprap boulders or geotextile fabric. • Use a hybrid of hard/soft engineering techniques (i.e., combine low-profile rock, riprap, or wood structures with vegetative planting or other soft stabilization techniques). *Responsible Agencies: County and local highway departments*
Construct Bridge Wingwalls *Flooding ● Erosion*	• Install bridge entrance and outlet wingwalls to redirect flow of water into the bridge opening and eliminate erosion under bridge piers, abutments, and embankments. *Responsible Agencies: County and local highway departments*
Install Additional Bridge Openings or Spans *Flooding*	• Install additional bridge openings or bridge spans located at historical and/or potential stream alignments at a crossing to mitigate for the impacts of a braiding or widening riverbed. *Responsible Agencies: County and local highway departments*
Elevate the Bridge Deck *Flooding*	• Elevate the bridge deck and associated superstructure to a level sufficient to allow anticipated flood flows to pass beneath. *Responsible Agencies: County and local highway departments*

Install scour and water level monitoring equipment *Flooding ● Erosion*	• Install scour and water level monitoring equipment to monitor high water conditions or conditions where scour is occurring. *Responsible Agencies: County and local highway departments*
Place Riprap at piers and areas of local scour *Flooding ● Erosion*	• Place large stones, known as riprap, around the base of a pier to prevent scour. *Responsible Agencies: County and local highway departments*
Place Riprap at and around abutments *Flooding ● Erosion*	• Place large stones, known as riprap, at and around abutments to anchor slopes from erosion. *Responsible Agencies: County and local highway departments*
Install geotextile and/or native vegetation buffer strips along banks *Flooding ● Erosion*	• Geotextile and/or native vegetation can protect stream banks from erosion. *Responsible Agencies: County and local highway departments*
Perform periodic cleaning of aggrading stream beds and remove debris upstream *Flooding*	• Periodic cleaning of aggrading stream beds and removing upstream debris will help prevent build-up of debris at bridges and help to reduce flooding potential. *Responsible Agencies: County and local highway departments*

Replace Multi-Span Bridges with a Single Span Bridge *Flooding*	• Replace multi-span bridges with a single clear-span to eliminate the need for piers. This will help increase water flow through the bridge opening and reduce potential for debris collection, which will help upstream flooding conditions. *Responsible Agencies: County and local highway departments*
Install Flow Deflectors or Batters *Flooding ● Severe Storms*	• Install "V" shaped or semicircular flow deflectors, steel plate batters, or spur dikes on or immediately upstream from piers and abutments to reduce flow velocities and protect footings from scouring and floating debris. *Responsible Agencies: County and local highway departments*
Construct Debris Catchments *Flooding ● Severe Storms*	• Debris catchment structures, such as debris barriers (trash racks) or low height dams, may be constructed on small tributary streams upstream from a bridge to trap debris. *Responsible Agencies: County and local highway departments*
Create and Preserve Floodplain, Open Space, Wetland, or Spill Areas *Flooding*	Identify and preserve lands that lie within floodplain areas so that they are able to function as flood relief and mitigation. • Partner with local governments and other pertinent agencies to develop a land banking program for the preservation of the natural and beneficial functions of flood hazard areas.

	•Purchasing land or permanent easements to expand floodplain areas (create spill areas) in areas of little to no development to act as flood water retention to lessen the impact of flooding downstream in more developed areas. •Create additional wetlands or expand wetland areas in flood prone areas to act as designated spill fields for flooding, thereby reducing the impact of downstream flooding. *Responsible Agencies: NYSDEC, County and local jurisdictions*
Debris Maintenance *Flooding ● Severe Storms*	Debris clogging waterways is a major cause of flooding. Debris control can help prevent or mitigation flooding impacts. •Routine removal of dead trees, tree branches, and other dead vegetation. •Perform vegetation management, including pruning and thinning of trees, to minimize the damage that can be caused by downed tree limbs. •Conduct routine maintenance and cleaning of riverbeds and drainage ways to minimize amount of debris that can clog waterways. *Responsible Agencies: County and local highway departments*

APPENDIX A: RESULTS OF VULNERABILITY SCORING OF LOCAL BRIDGES IN THE GENESEE-FINGER LAKES REGION

Local Bridge Vulnerability Scoring

The following tables portray the results of the vulnerability scoring of local bridges in the Genesee-Finger Lakes Region assessed as part of this study.

Legend of Transportation Asset Vulnerability Scores

- High Vulnerability (score of 200 or greater) = [red]
- Moderately High Vulnerability (score of 175-199) = [orange]
- Moderate Vulnerability (score of 150-174) = [yellow]
- Moderately Low Vulnerability (score of 125-149) = [green]
- Low Vulnerability (score of under 125) = [blue]

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3314710	Wayne	ARCADIA ZURIC RD	SALMON CREEK	233
2210840	Genesee	LAW STREET	TONAWANDA CREEK	228
3314830	Wayne	RIDGE ROAD	SODUS BAY	228
3036520	Wayne	RIDGE ROAD	SALMON CREEK	223
3314840	Wayne	LEROY ISLAND ROAD	SODUS BAY	223
1014850	Monroe	IBOB	Irondequoit Bay Outlet	220
3317360	Monroe	George Street	Spring Creek	218
3319950	Wyoming	COUNTY ROAD 7	OATKA CREEK	218
3317610	Monroe	LOWDEN POINT ROAD	CRANBERRY PD OTLT	213
3318660	Ontario	COUNTY ROAD 4	CANANDAIGUA OUTLE	213
3318430	Ontario	EAST LAKE ROAD	MILL CREEK	210
2210710	Wayne	SCHOOL STREET	SALMON CREEK	208
3318740	Ontario	FIVE WATERS CLIFT	CANANDAIGUA OUTLT	203
3318760	Ontario	BOUGHTON HILL RD	MUD CREEK	203
3318460	Ontario	COUNTY ROAD 37	HONEOYE CREEK	198
3366430	Wyoming	BUFFALO ROAD	OATKA CREEK	195
3319860	Livingston	WHISKEY BRIDGE	GENESEE RIVER	193
3318610	Ontario	NO BLOOMFIELD RD	MUD CREEK	193
3318720	Ontario	COUNTY ROAD 15	HONEOYE CREEK	193
2257760	Wayne	COUNTY ROAD 344	CSX TRANS/AMTRAK	193
3314800	Wayne	CR105 ARMITAGE RD	CLYDE RIVER	193
3314890	Wayne	BROADWAY RD	RED CREEK	193
3318990	Orleans	LAKESIDE ROAD	JOHNSON CREEK	190
3095600	Genesee	LEWISTON ROAD	UNKNOWN STREAM	188

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3317300	Monroe	BURNT MILL ROAD	BLACK CREEK	188
3314700	Wayne	JOY ROAD	SALMON CREEK	188
3318450	Ontario	COUNTY ROAD 37	HEMLOCK OUTLET	185
3315450	Genesee	COLBY ROAD	MURDER CREEK	183
1095720	Monroe	Panorama Trail	Irondequoit Creek	183
3318030	Ontario	MAIN STREET	CANANDAIGUA OUTLT	183
3318290	Ontario	PLASTERMILL ROAD	GANARGUA CREEK	183
3318690	Ontario	PORT GIBSON RD	CANANDAIGUA OUTLT	183
3335570	Yates	COUNTY ROAD 18	FLINT CREEK	183
3370480	Wayne	Lake Rd (CR 101)	Maxwell Creek	180
2211670	Ontario	PARRISH STREET	SUCKER BROOK	178
3318570	Ontario	JENKS ROAD	MUD CREEK	178
3314500	Wayne	CANANDAIGUA ROAD	GANARGUA CREEK	178
3314520	Wayne	ALDERMAN ROAD	GANARGUA CREEK	178
3314550	Wayne	MACEDON CENTER RD	RED CREEK	178
3314860	Wayne	SAVANNAH SPR LK R	CRUSOE CREEK	178
3335590	Yates	ITALY VALLEY ROAD	FLINT CREEK	178
3318730	Ontario	WEST LAKE ROAD	MENTETH GULLY	175
3319720	Wyoming	COOLEY ROAD	WISCOY CREEK	175
3318670	Ontario	COUNTY ROAD 4	FLINT CREEK	173
3318710	Ontario	COUNTY ROAD 15	HEMLOCK OUTLET	173
3210790	Wayne	SOUTH STREET	RED CREEK	173
3314560	Wayne	COUNTY ROAD 101	BEAR CREEK	173
3314570	Wayne	CR210 MAPLE AVE	RED CREEK	173
3314680	Wayne	ARCAD-ZURIC ROAD	GANARGUA CREEK	173
3314790	Wayne	LYONS MARENGO RD	POND BROOK	173
3370770	Wayne	Lyons-Marengo Road	Clyde River	173
2268270	Ontario	LAKESHORE DRIVE	CANANDAIGUA OUTLE	170
3318500	Ontario	COUNTY ROAD 37	BEBEE CREEK	170
3319550	Wyoming	COTTON HILL ROAD	TONAWANDA CREEK	170
3315090	Genesee	FISHER ROAD	OAK ORCHARD CREEK	168
3315150	Genesee	HUNDREDMARK ROAD	DRAINAGE DITCH	168
3317290	Monroe	North Main Street	BLACK CREEK	168
3318560	Ontario	MAIN STREET	IRONDEQUOIT CREEK	168
3314480	Wayne	VICTOR ROAD	GANARGUA CREEK	168
3314720	Wayne	COUNTY ROAD 241	SALMON CREEK	168
2257840	Ontario	SALTONSTALL STREE	FEEDER CANAL	165
3318680	Ontario	PREMPTION ROAD	CASTLE CREEK	165
3315700	Genesee	COOKSON ROAD	DRAINAGE DITCH	163
3315720	Genesee	DORMAN ROAD	TONAWANDA CREEK	163

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3315730	Genesee	OLD CREEK ROAD	LIT TONAWANDA CRK	163
3315740	Genesee	OLD CREEK ROAD	TRB TONAWANDA CRK	163
3315770	Genesee	PEAVINER ROAD	TONAWANDA CREEK	163
3317440	Monroe	252 X	BLACK CREEK	163
3318180	Ontario	MARBLETOWN ROAD	CANANDAIGUA OUTLT	163
3314510	Wayne	COUNTY ROAD 310	GANARGUA CREEK	163
3314530	Wayne	YELLOW MILLS ROAD	GANARGUA CREEK	163
3314610	Wayne	COUNTY ROAD 224	GANARGUA CREEK	163
3314810	Wayne	NOBLE ROAD	BLACK CREEK	163
3370760	Wayne	Canandaigua Rd	Black Creek	163
3319570	Wyoming	ECK ROAD	TONAWANDA CREEK	163
3319700	Wyoming	WYOMING ROAD	PEARL CREEK	163
3319610	Wyoming	SCHOELLKOPF ROAD	CAYUGA CREEK	160
2219350	Yates	MAIN STREET	KEUKA LAKE OUTLET	160
3315340	Genesee	WEST SWEDEN ROAD	BLACK CREEK	158
3315810	Genesee	CREEK ROAD	LIT TONAWANDA CRK	158
3315820	Genesee	COUNTY ROAD 1	TONAWANDA CREEK	158
3317860	Monroe	Park Road	IRONDEQUOIT CREEK	158
2267180	Ontario	BRISTOL STREET	SUCKER BROOK	158
2207670	Wayne	WATER STREET	GANARGUA CREEK	158
2256260	Wayne	VAN BUREN STREET	CSX TRANS/AMTRAK	158
3314580	Wayne	COUNTY ROAD 222	RED CREEK	158
3314640	Wayne	COUNTY ROAD 225	STEBBINS CREEK	158
3314660	Wayne	MUD MILLS ROAD	GANARGUA CREEK	158
3314770	Wayne	ALLOWAY ROAD	CANANDAIGUA OUTLT	158
3319470	Wyoming	GENESEE ROAD	CATTARAUGUS CREEK	158
3319540	Wyoming	DUNBAR ROAD	TONAWANDA CREEK	158
3319600	Wyoming	BURROUGH ROAD	CAYUGA CREEK	158
3319800	Wyoming	COUNTY ROAD 40	EAST KOY CREEK	158
3319810	Wyoming	JORDAN RD	EAST KOY CREEK	158
3319860	Wyoming	WHISKEY BRIDGE	GENESEE RIVER	158
3320260	Wyoming	MUNGERS MILL ROAD	OATKA CREEK	158
3321620	Wyoming	BRAY ROAD	CLEAR CREEK	158
3318550	Ontario	LEE ROAD	MUD CREEK	155
3320090	Wyoming	EAST KOY ROAD	EAST KOY CREEK	155
3320360	Wyoming	HARDYS ROAD	EAST KOY CREEK	155
3219300	Yates	WILLIAM STREET	WEST RIVER	155
3315780	Genesee	TELEPHONE ROAD	TONAWANDA CREEK	153
3315840	Genesee	GILHOOLY ROAD	LIT TONAWANDA CRK	153
3316650	Livingston	BAILEY ROAD	KESHEQUA CREEK	153

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3318470	Ontario	CANADICE HILL RD	WHETSTONE CREEK	153
3318330	Ontario	LAKE TO LAKE ROAD	FLINT CREEK	153
2257750	Wayne	HOGBACK ROAD	CSX TRANS/AMTRAK	153
3314490	Wayne	FARMINGTON ROAD	GANARGUA CREEK	153
3314620	Wayne	SOUTH CREEK ROAD	GANARGUA CREEK	153
3314630	Wayne	HOGBACK ROAD	GANARGUA CREEK	153
2210720	Wayne	STEELE ROAD	SALMON CREEK	153
3314750	Wayne	CHRISTIAN HLLER R	SALMON CREEK	153
3319560	Wyoming	PROSPECT STREET	TONAWANDA CREEK	153
3319620	Wyoming	FOLSOMDALE ROAD	CAYUGA CREEK	153
3319650	Wyoming	COUNTY ROAD 26	CAYUGA CREEK	153
3320010	Wyoming	EXCHANGE ST CR31	STONY BROOK	153
3320120	Wyoming	GRIFFITH ROAD	EAST KOY CREEK	153
3319630	Wyoming	REILEIN ROAD	CAYUGA CREEK	150
3319640	Wyoming	URF ROAD	CAYUGA CREEK	150
3320160	Wyoming	CENTERLINE ROAD	SHELDON CREEK	150
3320190	Wyoming	SANDERS ROAD	BUFFALO CREEK	150
3315490	Genesee	PIKE ROAD	BOWEN CREEK	148
3316940	Livingston	POAGS HOLE ROAD	CANASERAGA CREEK	148
3318770	Ontario	COUNTY ROAD 46	CANANDAIGUA OUTLT	148
3318240	Ontario	MARKS CIRCLE	NAPLES CREEK	148
3318320	Ontario	TILEYARD ROAD	FLINT CREEK	148
3318780	Ontario	COUNTY ROAD 32	MUD CREEK	148
3314740	Wayne	SO CENTENARY ROAD	SALMON CREEK	148
3319530	Wyoming	EXCHANGE STREET	CROW CREEK	148
3319870	Wyoming	CHAFFEE ROAD	CATTARAUGUS CREEK	148
3320140	Wyoming	HARDYS ROAD	TROUT BROOK	148
3320380	Wyoming	HERMITAGE ROAD	TRIB EAST COY CRK	148
3369130	Wyoming	WETHERSFIELD ROAD	TRIB EAST KOY CRK	148
3318520	Ontario	COUNTY ROAD 33	MILL CREEK	145
3314880	Wayne	CHAPMANS CRNRS RD	RED CREEK	145
3319750	Wyoming	MAIN STREET	N BR WISCOY CREEK	145
3319850	Wyoming	DUTTON ROAD	OATKA CREEK	145
3320100	Wyoming	OVERHOLT ROAD	EAST KOY CREEK	145
3315790	Genesee	TELEPHONE ROAD	TRB TONAWANDA CRK	143
3315850	Genesee	WEST BETHANY ROAD	LIT TONAWANDA CRK	143
3366370	Genesee	COUNTY ROAD 1	TRIB TONAWANDA CK	143
3043630	Monroe	260 X	WEST CREEK	143
3368180	Monroe	AIRPORT ACCESS RD	204 X	143
3318070	Ontario	BROWNSVILLE ROAD	GANARGUA CREEK	143

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3318420	Ontario	FISHER ROAD	IRONDEQUOIT CREEK	143
3318800	Orleans	YATES CARLTON TLR	JOHNSON CREEK	143
3319110	Orleans	KENT ROAD	MARSH CREEK	143
2210730	Wayne	MAIN STREET	SALMON CREEK	143
2210780	Wayne	YOUNGLOVE ROAD	RED CREEK	143
2211250	Monroe	COURT STREET	GENESEE RIVER	140
3318060	Ontario	EAST LAKE ROAD	BRIGGS GULLY	140
3318110	Ontario	STRYKER ROAD	CANANDAIGUA OUTLT	140
3315070	Genesee	ALBION ROAD	OAK ORCHARD CREEK	138
3315330	Genesee	WEST SWEDEN ROAD	TRIB BLACK CREEK	138
3315800	Genesee	TELEPHONE ROAD	TRB TONAWANDA CRK	138
3315860	Genesee	WEST BETHANY ROAD	LIT TONAWANDA CRK	138
1043310	Monroe	Coldwater Road	Little Black Creek	138
3318340	Ontario	MAPLE AVENUE	GREAT BROOK	138
3318750	Ontario	BOUGHTON HILL RD	FISH CREEK	138
3318040	Ontario	COUNTY ROAD 19	CANANDAIGUA OUTLT	138
3318590	Ontario	NO BLOOMFIELD RD	SHAFFER CREEK	138
2211770	Ontario	LOWER EGYPT ROAD	MILL CREEK	138
3318220	Ontario	GIFFORD ROAD	CANANDAIGUA OUTLT	138
3318930	Orleans	BATES ROAD	OAK ORCHARD CREEK	138
3319380	Orleans	KENT RD.CR 11	MARSH CREEK	138
3319390	Orleans	COUNTY ROAD 11	MARSH CREEK	138
3314900	Wayne	LARKIN ROAD	RED CREEK	138
3319520	Wyoming	DUNN ROAD	TRIB MONKEY RUN	138
3319560	Wyoming	PROSPECT STREET	TONAWANDA CREEK	138
3319900	Wyoming	SHEEHE RD	BUFFALO CREEK	138
3319910	Wyoming	MICHIGAN ROAD	PLATO CREEK	138
3319930	Wyoming	HOLLAND ROAD	BUFFALO CREEK	138
3320000	Wyoming	CENTERLINE ROAD	TONAWANDA CREEK	138
3320020	Wyoming	SNYDER ROAD	STONY BROOK	138
3320280	Wyoming	WEST COURT STREET	OATKA CREEK	138
3320290	Wyoming	WASHINGTON ST.	OATKA CREEK	138
3320300	Wyoming	ALLEN ST	OATKA CREEK	138
3320340	Wyoming	BROOKLYN ST	STONY CREEK	138
2211270	Monroe	MAIN STREET	GENESEE RIVER	135
221125A	Monroe	LIBRARY LOAD DOCK	OLD RACE	135
3318980	Orleans	HARRIS RD	JOHNSON CREEK	135
3319670	Wyoming	OLD STATE ROAD	PEARL CREEK	135
3316330	Livingston	RIVER ROAD	BEARDS CREEK	133
3317310	Monroe	RUSH WEST RUSH RD	TRIB HONOYE CREE	133

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3317890	Monroe	EAST RIVER ROAD	HONEOYE CREEK	133
3317120	Monroe	PATTONWOOD DRIVE	CSX TRANSPRTATION	133
3368080	Monroe	N. GREECE ROAD	LARKIN CREEK	133
3370220	Ontario	CR41	Beaver Creek	133
3318410	Ontario	WHEELER ROAD	MUD CREEK	133
3319020	Orleans	SAWYER RD	MARSH CREEK	133
3319270	Orleans	OAK ORCHARD ROAD	MANNING MUKLND CK	133
3361980	Orleans	EAST KENT ROAD	MARSH CREEK	133
2209630	Seneca	WYERS POINT ROAD	GROVES CREEK	133
3361550	Seneca	MAYS POINT RD	CLYDE RIVER	133
2210750	Wayne	EADES ROAD	RED CREEK	133
2210800	Wayne	HAWLEY ROAD	RED CREEK	133
3319440	Wyoming	WEST STREET	CATTARAUGUS CREEK	133
3319480	Wyoming	EAST ARCADE ROAD	CATTARAUGUS CREEK	133
3319710	Wyoming	EXCHANGE ST	WISCOY CREEK	133
3320130	Wyoming	ALBRO ROAD	WISCOY CREEK	133
3320270	Wyoming	KEENEY ROAD	OATKA CREEK	133
3315050	Genesee	KNOWLESVILLE ROAD	OAK ORCHARD CREEK	130
3315060	Genesee	EAST SHELBY ROAD	OAK ORCHARD CREEK	130
3316700	Livingston	OLD STATE ROAD	KESHEQUA CREEK	130
2211280	Monroe	ANDREWS STREET	GENESEE RIVER	130
2256078	Monroe	31 X	GENESEE RIVER	130
2256080	Monroe	31 X	SUBWAY TUNNEL	130
221125B	Monroe	PLAZA FOR LIBRARY	ABANDONED SUBWAY	130
3318260	Ontario	FACTORY HOLLOW RD	HONEOYE CREEK	130
3318820	Orleans	BLOOD ROAD	JOHNSON CREEK	130
3318940	Orleans	KNOWLESVILLE RD	TRIB OAK ORCHARD	130
3369830	Wyoming	SALTVALE ROAD	HANDYSIDE GULF	130
3320060	Wyoming	SIMMONS ROAD	LITTLE BEARDS CRK	130
3366410	Wyoming	COUNTY ROAD 53	KELLY BROOK	130
3219250	Yates	SUNNYSIDE ROAD	WEST RIVER	130
3219380	Yates	PHELPS ROAD	FLINT CREEK	130
3316010	Genesee	TRANSIT ROAD	WHITE CREEK	128
3316770	Livingston	WHITE BRIDGE ROAD	CANASERAGA CREEK	128
2211300	Monroe	SMITH STREET	GENESEE RIVER	128
3211130	Monroe	EDGEMERE DRIVE	ROUND POND OUTLET	128
3317430	Monroe	UNION STREET	BLACK CREEK	128
3317920	Monroe	Wheatland Center Road	OATKA CREEK	128
3361580	Monroe	CRITTENDEN ROAD	W BR RED CREEK	128
3316210	Ontario	MARTIN ROAD	HONEOYE CREEK	128

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3318210	Ontario	CHARLTON ROAD	FLINT CREEK	128
3318270	Ontario	VOGT ROAD	FLINT CREEK	128
3318650	Ontario	BAPTIST HILL ROAD	MUD CREEK	128
3319320	Orleans	E OAK ORCHARD ST	OAK ORCHARD CREEK	128
3319400	Orleans	EGL HBR-WATERPORT	OTTER CREEK	128
3318260	Livingston	FACTORY HOLLOW RD	HONEOYE CREEK	125
3319680	Wyoming	CROSSMAN RD	OATKA CREEK	125
3320310	Wyoming	OATKA STREET	STONY CREEK	125
3370600	Wyoming	County Fair Access	Wiscoy Creek	125
3315520	Genesee	SUMNER ROAD	MURDER CREEK	123
1043510	Livingston	PRESBYTERIAN ROAD	KESHEQUA CREEK	123
3316470	Livingston	PIONEER ROAD	BRADNER CREEK	123
3316760	Livingston	APPLINVILLE ROAD	CANASERAGA CREEK	123
2211310	Monroe	DRIVING PARK AVE	ROCH.G&E.SERV. RD	123
3043640	Monroe	260 X	BRUSH CREEK	123
3316970	Monroe	BRGHTN-HENRTTA TL	RED CREEK	123
3317030	Monroe	LAWTON ROAD	MOORMAN CREEK	123
3317040	Monroe	PIXLEY ROAD	LITTLE BLACK CR.	123
3317050	Monroe	NORTH GREECE ROAD	NORTHRUP CREEK	123
3317080	Monroe	ISLAND COTTAGE RD	ROUND POND CREEK	123
3317240	Monroe	OLD PENFIELD ROAD	IRONDEQUOIT CREEK	123
3317420	Monroe	CRITTENDEN ROAD	RED CREEK	123
3317490	Monroe	TRABOLD ROAD	LITT BLACK CREEK	123
3317530	Monroe	NORTH GREECE ROAD	NORTHRUP CREEK	123
3317560	Monroe	EDGEMERE DRIVE	LONG POND OUTLET	123
3317570	Monroe	EDGEMERE DRIVE	BUCK POND OUTLET	123
3317580	Monroe	LONG POND ROAD	LARKIN CREEK	123
3317880	Monroe	Attridge Rd	Black Creek	123
3317910	Monroe	UNION STREET	OATKA CREEK	123
3318300	Ontario	MAIN ST FISHERS	IRONDEQUOIT CREEK	123
3318190	Ontario	MILL STREET	FLINT CREEK	123
3319220	Orleans	HULBERTON ROAD	W BRN SANDY CREEK	123
2209610	Seneca	POTTER ROAD	SHELDRAKE CREEK	123
3219280	Yates	LOOMIS ROAD	WEST RIVER	123
3316240	Livingston	FOWLERVILLE ROAD	GENESEE RIVER	120
3043620	Monroe	260 X	MOORMAN CREEK	120
3319060	Orleans	KNOWLESVILLE ROAD	OAK ORCHARD CREEK	120
3319300	Orleans	HARRISON ROAD	OAK ORCHARD CREEK	120
3319430	Wyoming	CHURCH STREET	CATTARAUGUS CREEK	120
3319450	Wyoming	HURDVILLE ROAD	CATTARAUGUS CREEK	120

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3319510	Wyoming	JAVA LAKE RD	CATTARAUGUS CREEK	120
3319980	Wyoming	THOMSON ROAD	LIT TONAWANDA CRK	120
3319990	Wyoming	PFLAUM RD	LIT TONAWANDA CRK	120
3320070	Wyoming	ALVERSON RD	LITTLE BEARDS CRK	120
3320150	Wyoming	EAST HILLSIDE RD	TROUT BROOK	120
3370780	Wyoming	C. Fairgnd North Access	Wiscoy Creek	120
3219310	Yates	CAWARD CROSS RD	WEST RIVER	120
3335640	Yates	COUNTY ROAD 9	KEUKA LAKE OUTLET	120
2210810	Genesee	RIVER STREET	TONAWANDA CREEK	118
2210820	Genesee	SOUTH LYON STREET	TONAWANDA CREEK	118
3316210	Livingston	MARTIN ROAD	HONEOYE CREEK	118
3316480	Livingston	PIONEER ROAD	CANASERAGA CREEK	118
3316640	Livingston	DE GROFF ROAD	KESHEQUA CREEK	118
3316660	Livingston	WALNUT STREET	KESHEQUA CREEK	118
3316680	Livingston	CHURCH STREET	KESHEQUA CREEK	118
3316860	Livingston	LINZY ROAD	SUGAR CREEK	118
1043430	Monroe	Paul Road	Little Black Creek	118
1046600	Monroe	Church Road	Sandy Creek	118
2257850	Monroe	HARPINGTON DRIVE	LITTLE BLACK CRK	118
3317020	Monroe	IRELAND ROAD	SALMON CREEK	118
3317500	Monroe	NORTH GREECE RO	NORTHRUP CREEK	118
3317590	Monroe	COUNTY ROAD 142	NORTHRUP CREEK	118
3317650	Monroe	REDMAN ROAD	SANDY CREEK	118
3317800	Monroe	OGDEN PARMA TL RD	SALMON CREEK	118
3317810	Monroe	WILDER ROAD	SALMON CREEK	118
3361660	Monroe	BRK SCHOOL HSE RD	SANDY CREEK	118
3318700	Ontario	COUNTY ROAD 13	SPRING BROOK	118
3318090	Ontario	DRYER ROAD	GREAT BROOK	118
3318440	Ontario	LOWER EGYPT ROAD	MILL CREEK	118
2209640	Seneca	HALL ROAD	SHELDRAKE CREEK	118
3335580	Yates	COUNTY ROAD 4	POTTER SWAMP CRK	118
3359540	Yates	COUNTY ROAD 18	SEGAR GULLY	118
3314990	Genesee	MEADVILLE ROAD	CANAL FEEDER	115
3315140	Genesee	OAK ORCHARD ROAD	OAK ORCHARD CREEK	115
3316500	Livingston	SLIKER HILL ROAD	CONESUS INLET	115
1095700	Monroe	Lake Road	Mill Creek	115
2266710	Monroe	WEST BEACH DRIVE	EAST CREEK	115
2211610	Ontario	NORTH PEARL ST	SUCKER BROOK	115
3318890	Orleans	SLADE ROAD	OAK ORCHARD CREEK	115
3319130	Orleans	FORD STREET	MARSH CREEK	115

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3319280	Orleans	GILLETTE ROAD	UNNAMED CREEK	115
3358760	Orleans	237 237 45021155	BALD EAGLE CREEK	115
3361960	Orleans	EAST KENT ROAD	MARSH CREEK	115
3361970	Orleans	EAST KENT ROAD	MARSH CREEK	115
3362000	Orleans	LAKE SHORE ROAD	UNNAMED CREEK	115
3315610	Genesee	TOWN LINE ROAD	TUNNERY CREEK	113
2210990	Livingston	WOODSVILLE ROAD	BRADNER CREEK	113
2256330	Livingston	GIBSON STREET	MILL CREEK	113
3316880	Livingston	BLANK HILL ROAD	SUGAR CREEK	113
1043470	Monroe	Linden Avenue	Irondequoit Creek	113
2211090	Monroe	MAIDEN LANE	ROUND POND CREEK	113
2257870	Monroe	POLICE ACCESS RD	ROUND POND CREEK	113
3317370	Monroe	Twin Bridge Road	Oatka Creek Tributary	113
3317470	Monroe	STOTTLE ROAD	BLACK CREEK	113
3317700	Monroe	CALKINS ROAD	RED CREEK	113
3370060	Monroe	Mill Road	LARKIN CREEK	113
3318230	Ontario	ALLEN PADGHAM RD	GANARGUA CREEK	113
3318380	Ontario	NEWARK STREET	FLINT CREEK	113
2211750	Ontario	KASHONG ROAD	KASHONG CREEK	113
3318200	Ontario	EAGLE STREET	FLINT CREEK	113
3318390	Ontario	WHEAT ROAD	FLINT CREEK	113
3318790	Ontario	COUNTY ROAD 23	FLINT CREEK	113
3318830	Orleans	ANGLING ROAD	JOHNSON CREEK	113
3318840	Orleans	MARSHALL ROAD	JOHNSON CREEK	113
3318950	Orleans	KENYONVILLE ROAD	OAK ORCHARD RIVER	113
3313890	Seneca	DAWSON CORNERS RD	BOARDMAN CREEK	113
3319590	Wyoming	TOOLEY ROAD	CAYUGA CREEK	113
3319920	Wyoming	MICHIGAN ROAD	UNNAMED STREAM	113
3320320	Wyoming	JEFFERSON STREET	STONY CREEK	113
3320330	Wyoming	LIBERTY STREET	STONY CREEK	113
3366440	Wyoming	CENTERLINE ROAD	CAYUGA CREEK	113
3335620	Yates	COUNTY ROAD 24	SUGAR CREEK	113
3314930	Genesee	LEWISTON ROAD	BRINNINGSTOOL CRK	110
3315600	Genesee	ATTICA ROAD	TUNNERY CREEK	110
3315990	Genesee	MC LERNON ROAD	BLACK CREEK	110
3316740	Livingston	KYSORVILLE-BYERSVILLE RD	BUTTERNUT CREEK	110
3316400	Livingston	ADAMS ROAD	KINNEY CREEK	110
3316410	Livingston	RIX HILL ROAD	HEMLOCK OUTLET	110
3316890	Livingston	CANASERAGA ROAD	SUGAR CREEK	110
3316900	Livingston	FAULKNER ROAD	CANASERAGA CREEK	110

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
2211120	Monroe	STRAUB ROAD	ROUND POND CREEK	110
2266640	Orleans	EAST KENT ROAD	MARSH CREEK	110
3318880	Orleans	HORAN ROAD	OAK ORCHARD CREEK	110
3319040	Orleans	KENT RD	MARSH CREEK TRIB.	110
3319050	Orleans	KENT RD	MARSH CREEK	110
3319080	Orleans	LAKE SHORE ROAD	MARSH CREEK	110
3319120	Orleans	BAKER ROAD	MARSH CREEK	110
3319180	Orleans	CARTON RD	SANDY CREEK	110
3367060	Orleans	MORRISON ROAD	MARSH CREEK	110
3371460	Wayne	TRAVELL KNAPPS CORNERS ROAD	BLACK BROOK	110
3319970	Wyoming	W MIDDLEBURY ROAD	LIT TONAWANDA CRK	110
3320170	Wyoming	DUTCH HOLLOW ROAD	GLADE CREEK	110
3361950	Wyoming	W MIDDLEBURY ROAD	MIDDLEBURY BROOK	110
3366420	Wyoming	COUNTY ROAD 1	KENNEDY GULF	110
3369140	Wyoming	W MIDDLEBURY ROAD	MIDDLEBURY BROOK	110
3315360	Genesee	LAKE ROAD	MURDER CREEK	108
3315390	Genesee	NORTH PEMBROKE RD	TONAWANDA CREEK	108
3359080	Livingston	Red Jacket St	MILL CREEK	108
2211150	Monroe	COLLAMER ROAD	WEST CREEK	108
3317060	Monroe	NORTH GREECE ROAD	BUTTONWOOD CREEK	108
3317380	Monroe	Twin Bridge Road	OATKA CREEK	108
3317900	Monroe	SALT ROAD	FOURMILE CREEK	108
3361620	Monroe	Lake Road	FOUR MILE CREEK	108
3368040	Monroe	BRIGHTON HENRIETT	ALLEN CREEK	108
3368050	Monroe	SOUTH WINTON ROAD	ALLENS CREEK	108
3370050	Monroe	English Rd	Larkin Creek	108
3318020	Ontario	PREEMPTION RD CR6	CANANDAIGUA OUTLT	108
2211760	Ontario	LAKE TO LAKE ROAD	BURRELL CREEK	108
2211780	Ontario	MIDDLE STREET	MARSH CREEK	108
3318120	Ontario	MCBURNEY ROAD	CANANDAIGUA OUTLT	108
3318150	Ontario	BRACE ROAD	MUD CREEK	108
3318250	Ontario	CLIFTON STREET	CANANDAIGUA OUTLT	108
3318370	Ontario	GRIFFITH ROAD	FLINT CREEK	108
3318400	Ontario	FISHER ROAD	CANANDAIGUA OUTLE	108
3318540	Ontario	NORTH WAYNE ST	CANANDAIGUA OUTLT	108
3315190	Genesee	COLE ROAD	BLACK CREEK	105
3315980	Genesee	PAUL ROAD	BLACK CREEK	105
3316060	Genesee	CIRCULAR HILL RD	OATKA CREEK	105
3316130	Genesee	COLE ROAD	OATKA CREEK	105

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
2258030	Livingston	CASEY ROAD	FOWLER CREEK	105
3316230	Livingston	SIMPSON ROAD	UNNAMED CREEK	105
3316280	Livingston	RETSOF ROAD	BIDWELLS CREEK	105
3316390	Livingston	BIG TREE ROAD	HEMLOCK OUTLET	105
3316430	Livingston	SCIPIO ROAD	KESHEQUA CREEK	105
3316450	Livingston	DUDLEY ROAD	KESHEQUA CREEK	105
3316530	Livingston	PARKER ROAD	KESHEQUA CREEK	105
3316630	Livingston	COOPERSVILLE ROAD	KESHEQUA CREEK	105
3316870	Livingston	LINZY ROAD	SUGAR CREEK	105
3361680	Livingston	STARR ROAD	TAUNTON GULLY	105
3317070	Monroe	FRISBEE HILL ROAD	BUTTONWOOD CREEK	105
3369710	Monroe	LONG POND ROAD	ROUND POND CREEK	105
3318480	Ontario	REED ROAD	HEMLOCK OUTLET	105
3319090	Orleans	LAKESHORE RD	UNNAMED CREEK	105
3319170	Orleans	NORWAY RD	SANDY CREEK	105
3319210	Orleans	GROTH RD	E BRA SANDY CREEK	105
3319330	Orleans	EAGLE HBR-W BARRE	OTTER CREEK	105
3366350	Orleans	W.COUNTY HOUSE RD	OTTER CREEK	105
3367960	Orleans	NIAG-ORL CO LN RD	UNKNOWN CREEK	105
2209620	Seneca	WYERS POINT ROAD	NIVEK CREEK	105
3319660	Wyoming	SCHAD ROAD	RED BROOK	105
3315500	Genesee	SUMNER ROAD	ELEVENMILE CREEK	103
3315510	Genesee	SUMNER ROAD	ELLICOTT CREEK	103
3316080	Genesee	NORTH STREET ROAD	OATKA CREEK	103
3316460	Livingston	MILL GULLY ROAD	MILL GULLY	103
3316950	Livingston	STONE FALLS ROAD	LITTLE MILL CREEK	103
2211070	Monroe	FRENCH ROAD	ALLEN CREEK	103
2211110	Monroe	LING ROAD	SLATER CREEK	103
2211290	Monroe	PLATT ST. (CLOSED	GENESEE RIVER	103
2211320	Monroe	EAST RIVER ROAD	RED CREEK	103
2257860	Monroe	WYE BRIDGE ROAD	ROUND POND CREEK	103
2268240	Monroe	WILLOWOOD DRIVE	ROUND POND CREEK	103
3317000	Monroe	LAWRENCE ROAD	BROCKPORT CREEK	103
3317010	Monroe	LAWRENCE ROAD	OTIS CREEK	103
3317220	Monroe	PECK ROAD	NORTHUP CREEK	103
3317270	Monroe	ALLENS CREEK ROAD	ALLEN CREEK	103
3317540	Monroe	KIRK ROAD CR 262	ROUND POND CREEK	103
3317550	Monroe	COUNTY ROAD 262	ROUND POND CRK TR	103
3317780	Monroe	CLARKSON PARMA TL	OTIS CREEK	103
3317820	Monroe	PECK ROAD	SALMON CREEK	103

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3317950	Monroe	BEECHWOOD DRIVE	BLACK CREEK TRIB	103
3359090	Monroe	BOWERMAN ROAD	OATKA CREEK	103
3367000	Monroe	VINTAGE LANE	ROUND POND CREEK	103
3368450	Monroe	DEPARTURE VIADUCT	ARRIVAL ROADWAY	103
2211700	Ontario	BLODGETT ROAD	WEST RIVER	103
3318310	Ontario	TAFT ROAD	BEBEE CREEK	103
3313980	Seneca	YELLOW TAVERN RD	KENDIG CREEK	103
3335550	Yates	PREEMPTION ROAD	KASHONG CREEK	103
3315000	Genesee	SOUR SPRINGS ROAD	BR OAK ORCHARD CK	100
3315420	Genesee	COUNTY ROAD 32	TONAWANDA CREEK	100
3315440	Genesee	COUNTY LINE ROAD	ELLICOTT CREEK	100
3315470	Genesee	ELLINWOOD ROAD	MURDER CREEK	100
3315880	Genesee	SILVER ROAD	LIT TONAWANDA CRK	100
3315960	Genesee	TORREY ROAD	BLACK CREEK	100
3315970	Genesee	LITTLE CANADA RD	BLACK CREEK	100
3316000	Genesee	JERICO ROAD	BLACK CREEK	100
3316030	Genesee	COVELL ROAD	OATKA CREEK	100
3316040	Genesee	JUNCTION ROAD	OATKA CREEK	100
3366390	Genesee	NORTH BYRON ROAD	TB OAK ORCHARD CK	100
2258050	Livingston	PENNIMITE ROAD	WILKINS CREEK	100
3317340	Monroe	MON-WYN CO LNE RD	FOUR MILE CREEK	100
3317350	Monroe	SCHLEGEL ROAD	FOUR MILE CREEK	100
3317400	Monroe	EDGEWOOD AVENUE	ALLEN CREEK	100
3361650	Monroe	BEACH AVENUE	SLATER CREEK	100
3318870	Orleans	COUNTY LINE ROAD	JEDDO CREEK	100
3320030	Wyoming	HOLLOW RD	E.FK.TONAWANDA CR	100
3320180	Wyoming	FACTORY RD	BUFFALO CREEK	100
3320200	Wyoming	ALMETER ROAD	E FK TONAWANDA CK	100
3320210	Wyoming	ALMETER RD	TONAWANDA CREEK	100
3320220	Wyoming	ROYCE RD	E FK TONAWANDA CK	100
3369540	Wyoming	MAXON ROAD	TONAWANDA CREEK	100
3315370	Genesee	COUNTY ROAD 4	ELLICOTT CREEK	98
2211060	Monroe	EVANS LANE	ALLEN CREEK	98
2211160	Monroe	HILL ROAD	SALMON CREEK	98
2211170	Monroe	HILL ROAD	BROCKPORT CREEK	98
2268810	Monroe	SILENT MEADOWS RD	NORTHRUP CREEK	98
3316980	Monroe	STUART ROAD	BLACK CREEK	98
3317190	Monroe	HMLIN-PRMA T.L.RD	BRUSH CREEK	98
3317230	Monroe	BENNETT ROAD	WEST CREEK	98
3317250	Monroe	LYNDON ROAD	THOMAS CREEK	98

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3317330	Monroe	BASKET ROAD	FOUR MILE CREEK	98
3317630	Monroe	LAKE ROAD W FORK	SANDY CREEK	98
3317640	Monroe	NORTH HAMLIN ROAD	SANDY CREEK	98
3317660	Monroe	WALKER ROAD	MOORMAN CREEK	98
3317770	Monroe	CLARKSON PARMA TL	SALMON CREEK	98
3317790	Monroe	PARMA HAM T L RD	WEST CREEK	98
3367800	Monroe	DEAN ROAD	NORTHRUP CREEK	98
2211640	Ontario	CHAPIN STREET	SUCKER BROOK	98
2211790	Ontario	GULVIN PARK FOOT	MARSH CREEK	98
2257950	Ontario	DRIVE FROM SCHOOL	SUCKER BROOK	98
2258020	Ontario	BRACE ROAD	FISH CREEK	98
2267850	Ontario	W. GIBSON STREET	SUCKER BROOK	98
3318080	Ontario	DEUEL ROAD	DEUEL GULLY	98
3318100	Ontario	REDMAN ROAD	BURRELL CREEK	98
3318140	Ontario	FERGUSON ROAD	FLINT CREEK	98
3318160	Ontario	OLD MILL ROAD	FLINT CREEK	98
3318350	Ontario	EAST SWAMP ROAD	FLINT CREEK	98
3318510	Ontario	PROBST ROAD	IRONDEQUOIT CREEK	98
2209490	Seneca	FRONTENAC ROAD	TRUMANSBURG CREEK	98
2219180	Yates	HALEY RD	BIG STREAM	98
2219210	Yates	MOON HILL ROAD	TRIB BIG STREAM	98
3219420	Yates	GLENORA ROAD	BIG STREAM	98
3219430	Yates	SOUTH GLENORA RD	BIG STREAM	98
3335600	Yates	COUNTY ROAD 29	BIG GULLY	98
3335610	Yates	CO.RD 24	BIG GULLY	98
3315290	Genesee	COCKRAM ROAD	BLACK CREEK	95
3315460	Genesee	ELLINWOOD ROAD	MURDER CREEK	95
3315480	Genesee	RICHLEY ROAD	MURDER CREEK	95
3315560	Genesee	HARPER ROAD	MURDER CREEK	95
3315570	Genesee	SHARRICK ROAD	MURDER CREEK	95
3315580	Genesee	GRISWOLD ROAD	MURDER CREEK	95
3315590	Genesee	GRISWOLD ROAD	MURDER CREEK	95
3315900	Genesee	CLIPNOCK ROAD	BLACK CREEK	95
3315910	Genesee	GRISWOLD ROAD	BLACK CREEK	95
3315940	Genesee	E MORGANVILLE RD	BLACK CREEK	95
3315950	Genesee	SWEETLAND ROAD	BLACK CREEK	95
3316110	Genesee	MUNSON ROAD	OATKA CREEK	95
3368170	Genesee	SLUSSER ROAD	TONAWANDA CREEK	95
2210970	Livingston	EAST SWAMP ROAD	CONESUS INLET	95
2211570	Monroe	FORD STREET	BIKE PATH OLD RR	95

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3317200	Monroe	PARMA CENTER ROAD	SALMON CREEK	95
3317510	Monroe	NORTH GREECE ROAD	NORTHRUP CREEK	95
3317520	Monroe	N.GREECE ROAD	NORTHRUP CREEK	95
3368060	Monroe	LONG POND ROAD	TRIB RND POND CRK	95
3319150	Orleans	WOODCHUCK ALLEY	BALD EAGLE CREEK	95
3319160	Orleans	LAKESHORE RD CR75	BALD EAGLE CREEK	95
3319420	Orleans	MON-ORL CO LNE RD	E BR SANDY CREEK	95
3313910	Seneca	COUNTY ROAD 153	SHELDRAKE CREEK	95
3319730	Wyoming	HILLSIDE ROAD	WISCOY CREEK	95
3319760	Wyoming	POCHUCK RD	COLD CREEK	95
3319780	Wyoming	TELEGRAPH RD	TRIB WISCOY CREEK	95
3319890	Wyoming	MICHIGAN ROAD	UNNAMED BROOK	95
3320250	Wyoming	SILVER SPRINGS RD	WARNER CREEK	95
3316510	Livingston	GUILTNER ROAD	CONESUS INLET	93
3316850	Livingston	LINZY ROAD	SUGAR CREEK	93
2211360	Monroe	LAKE AVENUE	CSX TRANSPRTATION	93
1029000	Monroe	Clover Street	Allen Creek	93
1048530	Monroe	Penfield Road	Irondequoit Creek	93
2211080	Monroe	DRAKE ROAD	MOORMAN CREEK	93
2211220	Monroe	WOODARD ROAD	FOUR MILE CREEK	93
2211330	Monroe	COMMERCIAL STREET	BROWNS RACEWAY	93
2256060	Monroe	31 X	SUBWAY- ABANDONED	93
2257890	Monroe	RG&E STEAM LINE	MILL STREET	93
2257920	Monroe	ONTARIO STREET	IRONDEQUOIT CREEK	93
2257970	Monroe	WILER ROAD	WEST CREEK	93
3316990	Monroe	LAWRENCE ROAD	MOORMAN CREEK	93
3317450	Monroe	BEAHAN ROAD	LITTLE BLK CREEK	93
3317480	Monroe	GILMORE ROAD	BROCKPORT CREEK	93
3317730	Monroe	PLAINS ROAD	HONEOYE CREEK	93
3359980	Monroe	CHESTNUT RIDGE RD	CSX TRANS/W SHORE	93
3369440	Monroe	BASKET ROAD	FOUR MILE CREEK	93
3369450	Monroe	BASKET ROAD	FOUR MILE CREEK	93
221133A	Monroe	BROWNS RACE ST	BROWNS RACEWAY	93
2211680	Ontario	PEDESTRIAN	CANANDAIGUA OUTLT	93
2211740	Ontario	FLAT STREET	KASHONG CREEK	93
3318050	Ontario	SENECA POINT ROAD	SENECA POINT GLLY	93
3318600	Ontario	RAILROAD AVENUE	WEST RIVER	93
3318630	Ontario	WILLIAMS STREET	FLINT CREEK	93
2219330	Yates	PLUM POINT ROAD	PLUM POINT CREEK	93
2219410	Yates	CASTLE POINT ROAD	TRIB SENECA LAKE	93

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3219190	Yates	RAY CROSBY ROAD	BIG STREAM	93
3219320	Yates	OLD EAST LAKE RD.	TRIB KEUKA LAKE	93
3314940	Genesee	LOCKPORT ROAD	OAK ORCHARD CREEK	90
3314960	Genesee	JUDGE ROAD	WHITNEY CREEK	90
3315280	Genesee	CASWELL ROAD	BIGELOW CREEK	90
3315430	Genesee	COHOCTON ROAD	MURDER CREEK	90
3315550	Genesee	HERKIMER ROAD	ELEVENMILE CREEK	90
3315620	Genesee	POWERS ROAD	TONAWANDA CREEK	90
3315640	Genesee	UPTON ROAD	BOWEN CREEK	90
3316020	Genesee	ROANOKE ROAD	WHITE CREEK	90
3316120	Genesee	HARRIS ROAD	MUD CREEK	90
3316140	Genesee	BLACK STREET ROAD	MUD CREEK	90
2211020	Livingston	RIVER ROAD	BROWNS CREEK	90
3316180	Livingston	POLEBRIDGE RD	CONESUS OUTLET	90
3316250	Livingston	RIVER ROAD	SALT CREEK	90
3316260	Livingston	FEDERAL ROAD	BIDWELLS CREEK	90
3316490	Livingston	EAST LAKE ROAD	NORTH MCMILLAN CK	90
3369940	Livingston	MAIN ST	KESHEQUA CREEK	90
3317260	Monroe	TURK HILL ROAD	THOMAS CREEK TRIBUTARY	90
3317410	Monroe	WESTFALL ROAD	ALLEN CREEK	90
3317760	Monroe	HONEOYE FALLS RD	SPRING BROOK	90
3319410	Monroe	ORL MNROE C LN RD	SANDY CREEK	90
3319420	Monroe	MON-ORL CO LNE RD	E BR SANDY CREEK	90
3368070	Monroe	COUNTY ROAD 5	TRB MILL CREEK	90
3368100	Monroe	MONROE-WNE C.L.RD	FOUR MILE CREEK	90
3318970	Orleans	EGL HBR-WATPRT RD	OTTER CREEK	90
3319100	Orleans	WATERPORT CARLTON	BEARDSLEY CREEK	90
3319290	Orleans	SANDERSON ROAD	OAK ORCHARD CREEK	90
3319370	Orleans	EGL HBR WATERPORT	OTTER CREEK	90
3319410	Orleans	ORL MNROE C LN RD	SANDY CREEK	90
3366340	Orleans	NORWAY RD	TRIB. SANDY CREEK	90
3315530	Genesee	DODGESON ROAD	BOWEN CREEK	88
3316930	Livingston	POAGS HOLE ROAD	CANASERAGA CREEK	88
1041320	Monroe	Redman Road	Yante Creek	88
2063840	Monroe	STEAMLINE	940K 940K43011032	88
2211050	Monroe	CORWIN RD	IRONDEQUOIT CK TR	88
2211180	Monroe	BUTCHER ROAD	BLACK CREEK	88
2211200	Monroe	OLD BROWNCROFT	IRONDEQUOIT CREEK	88
2211340	Monroe	DEWEY AVENUE	EASTMAN KODAK	88
2257910	Monroe	SCOTT CRESENT	OLD MILL RACE	88

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3095730	Monroe	260 X	COWSUCKER CREEK	88
3211140	Monroe	RIDGEWAY AVENUE	EASTMAN KODAK RR	88
3317110	Monroe	MOSCOW ROAD	YANTY CREEK	88
3317140	Monroe	CHEESE FACTORY RD	BIG BEND CREEK	88
3317150	Monroe	Canal Road	Spring Creek	88
3317160	Monroe	BURRITT ROAD	SALMON CREEK	88
3317170	Monroe	BURRITT ROAD	BUTTONWOOD CREEK	88
3317180	Monroe	BURRITT ROAD	BLACK CREEK	88
3317320	Monroe	SWAMP ROAD	SALMON CREEK	88
3317670	Monroe	JACOBS ROAD	YANTY CREEK	88
3317720	Monroe	TAYLOR ROAD	IRONDEQUOIT CREEK	88
3317750	Monroe	SIBLEY ROAD	HONEOYE CREEK	88
3317930	Monroe	NORTH LODGE DRIVE	IRONDEQUOIT CREEK	88
3361600	Monroe	GILLETT ROAD	EX-NY CENTRAL RR	88
3361630	Monroe	FOREMAN CENTER DR	THOMAS CREEK	88
3369600	Monroe	CHEESE FACTORY RD	TR IRONDEQUOIT CK	88
3370790	Monroe	Honeoye Falls Rd	Honeoye	88
2211690	Ontario	SLATE ROCK ROAD	WILSON CREEK	88
2258040	Ontario	RICE ROAD	FISH CREEK	88
3318530	Ontario	TOWN LINE ROAD	SPRING BROOK	88
3318850	Orleans	MURDOCK ROAD	JOHNSON CREEK	88
2209480	Seneca	ARDEN RD	BOARDMAN CREEK	88
3209500	Seneca	MARSHALL RD	KENDIG CREEK	88
3210250	Seneca	SENECA ROAD	BOARDMAN CREEK	88
3313900	Seneca	INTERLAKEN ROAD	BOARDMAN CREEK	88
2219450	Yates	BRIDGE STREET	BIG STREAM	88
2219460	Yates	SOUTH AVENUE	KIMBLES BROOK	88
2219470	Yates	CHERRY STREET	KEUKA LAKE OUTLET	88
2254590	Yates	GIBSON ROAD	TRIB BIG STREAM	88
2255980	Yates	WEST AVENUE	TRIB WEST RIVER	88
3219220	Yates	COLEMAN ROAD	KASHONG CREEK	88
3219240	Yates	THISTLE STREET	KASHONG CREEK	88
3219290	Yates	VALLEY VIEW ROAD	WEST RIVER	88
3219340	Yates	FOX MILL ROAD	KEUKA LAKE OUTLET	88
3335560	Yates	VINE VALLEY ROAD	VINEVALLEY CREEK	88
3335660	Yates	EAST SHERMAN HOLL	SUGAR CREEK	88
3315180	Genesee	TOWER HILL ROAD	SPRING CREEK	85
3315210	Genesee	WARBOYS ROAD	TRIB BLACK CREEK	85
3315650	Genesee	ROSE ROAD	BOWEN CREEK	85
3315930	Genesee	PRENTICE ROAD	BLACK CREEK	85

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3366970	Genesee	COUNTY PARK ROAD	BLACK CREEK	85
2210950	Livingston	PENNYCOOK ROAD	UNNAMED CREEK	85
3316190	Livingston	TRIPHAMMER ROAD	CONESUS OUTLET	85
3316270	Livingston	DOW ROAD	BIDWELLS CREEK	85
3316810	Livingston	CARNEY HOLLOW RD	CARNEY HOLLOW CRK	85
3316820	Livingston	POKAMOONSHINE RD	CARNEY HOLLOW CRK	85
3317130	Monroe	MILE SQUARE RD	IRONDEQUOIT CREEK	85
3317840	Monroe	BAIRD ROAD	THOMAS CREEK	85
3318900	Orleans	CULVERT ROAD	FISH CREEK	85
3318910	Orleans	PORTAGE ROAD	FISH CREEK	85
3318920	Orleans	EAST SCOTT ROAD	FISH CREEK	85
3319230	Orleans	HINDSBURG RD	W BRA SANDY CREEK	85
3319240	Orleans	TRANSIT ROAD	W BR SANDY CREEK	85
3319350	Orleans	DENSMORE ROAD	W BR SANDY CREEK	85
3319360	Orleans	KEITEL ROAD	W BR SANDY CREEK	85
3361890	Orleans	BUTTS ROAD	W.BRA.SANDY CREEK	85
3316150	Livingston	LITTLEVILLE ROAD	CONESUS OUTLET	83
3371420	Livingston	SLIKER HILL ROAD	SOUTH MCMILLAN CREEK	83
3371430	Livingston	EAST LAKE ROAD	SOUTH MCMILLAN CREEK	83
2211460	Monroe	BROWN STREET	OLD SUBWAY BED	83
2211480	Monroe	ALLEN STREET	SUBWAY TUNNEL	83
2257930	Monroe	WATER STREET	THOMAS CREEK	83
2257960	Monroe	GLEN ROAD	ALLEN CREEK	83
3317830	Monroe	O'CONNOR ROAD	THOMAS CREEK	83
3361570	Monroe	ELLISON PARK ROAD	IRONDEQUOIT CREEK	83
3368090	Monroe	REDMAN ROAD	TRIB SANDY CREEK	83
2211720	Ontario	BOOTH ROAD	SPRING BROOK	83
3318860	Orleans	MILL ROAD	JEDDO CREEK	83
2209520	Seneca	ALLEN ROAD	KENOIG CREEK	83
2209540	Seneca	DEAN ROAD	MILL CREEK	83
2209560	Seneca	LOWER LAKE RD	MILL CREEK	83
3313930	Seneca	EAST LAKE ROAD	INDIAN CREEK	83
3313950	Seneca	COUNTY ROAD 125	REEDER CREEK	83
3314800	Seneca	CR105 ARMITAGE RD	CLYDE RIVER	83
2219440	Yates	MILO STREET	KEUKA LAKE OUTLET	83
2219480	Yates	WATER STREET	WEST RIVER	83
3219230	Yates	ALEXANDER RD	KASHONG CREEK	83
3219400	Yates	OLD COUNTY ROAD	SUGAR CREEK	83
3335630	Yates	CR26 CITY HILL RD	HIMROD CREEK	83
3315100	Genesee	MALTBY ROAD	OAK ORCHARD CREEK	80

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3315110	Genesee	MALTBY ROAD	OAK ORCHARD CREEK	80
3315200	Genesee	COUNTY ROAD 19A	SPRING CREEK	80
3315230	Genesee	SEARLES ROAD	SPRING CREEK	80
3315240	Genesee	WALKERS CORNRS RD	BIGELOW CREEK	80
3315320	Genesee	WEST SWEDEN ROAD	TRIB BLACK CREEK	80
3315630	Genesee	HOPKINS ROAD	BOWEN CREEK	80
3361840	Genesee	FISHER ROAD	OAK ORCHARD CREEK	80
2210920	Livingston	WILCOX ROAD	BRADNER CREEK	80
3316160	Livingston	PAPERMILL ROAD	CONESUS OUTLET	80
3316290	Livingston	COVINGTON ROAD	TAUNTON CREEK	80
3316350	Livingston	NATIONS ROAD	JAYCOX CREEK	80
3316420	Livingston	SWANSON ROAD	BUCK RUN CREEK	80
3316440	Livingston	WILDCAT ROAD	WILDCAT GULLY	80
3316570	Livingston	HUNTS HOLLOW ROAD	NORFOLK SOUTHERN	80
3316580	Livingston	CHEESE FACTORY RD	KESHEQUA CREEK	80
3316590	Livingston	DOAN ROAD	KESHEQUA CREEK	80
3316600	Livingston	BAKER ROAD	KESHEQUA CREEK	80
3368160	Livingston	STONE ROAD	MILL CREEK	80
3317280	Monroe	THORNELL RD.	IRONDEQUOIT CREEK	80
3366910	Monroe	31F 31F43011049	CSX TRANS/AMTRAK	80
3370360	Monroe	Whitney Rd	Thomas Creek	80
3319200	Orleans	HURD RD CR 42	E BRA SANDY CREEK	80
3319260	Orleans	SOUTH HOLLEY ROAD	E BR SANDY CREEK	80
2211350	Monroe	EAST MAIN STREET	CSX TRANS/AMTRAK	78
2211370	Monroe	LAKE AVENUE	CSX TRANSPRTATION	78
2268620	Monroe	PARK ROAD	IRONDEQUOIT CREEK	78
2270060	Monroe	Clay Road	CSX Railroad	78
3317850	Monroe	WOOLSTON ROAD	IRONDEQUOIT CREEK	78
3317870	Monroe	MARSH ROAD/ CR 38	CULLEN'S RUN CRK.	78
3369080	Monroe	ELLISON PARK ROAD	IRONDEQUOIT CREEK	78
2257880	Ontario	WALKWAY BLDG-BLDG	GATES AVENUE	78
3318130	Ontario	STEVENS STREET	ROCKY RUN	78
3318640	Ontario	KING ROAD	ROCKY RUN	78
3313960	Seneca	COUNTY ROAD 119	KENDIG CREEK	78
3313990	Seneca	CR 101	BLACK BROOK	78
3219390	Yates	YATESVILLE ROAD	SUGAR CREEK	78
3315250	Genesee	WALKERS CORNER RD	BLACK CREEK	75
3316200	Livingston	CORBY ROAD	SPRING BROOK	75
3316310	Livingston	COVINGTON ROAD	GENESEE & WYOMING	75
3316800	Livingston	ROSS ROAD	PATTERSON GULLY	75

BIN	COUNTY	CARRIED	CROSSED	Total Local Bridge Vulnerability Score
3316960	Livingston	STONE FALLS ROAD	MILL CREEK	75
3317710	Monroe	NORTON STREET	DENSMORE CREEK	73
2209550	Seneca	UPPER LAKE ROAD	MILL CREEK	73
3313920	Seneca	CR137 LODI CTR RD	MILL CREEK	73
3313940	Seneca	UPPER LAKE ROAD	SIXTEEN FALLS C	73
3314030	Seneca	GILBERT ROAD	TOMMY CREEK	73
3365780	Seneca	COUNTY ROAD 136A	MILL CREEK	73
3371410	Livingston	SPRINGWATER RD	CONESUS INLET	65
3318560	Monroe	MAIN STREET	IRONDEQUOIT CREEK	65