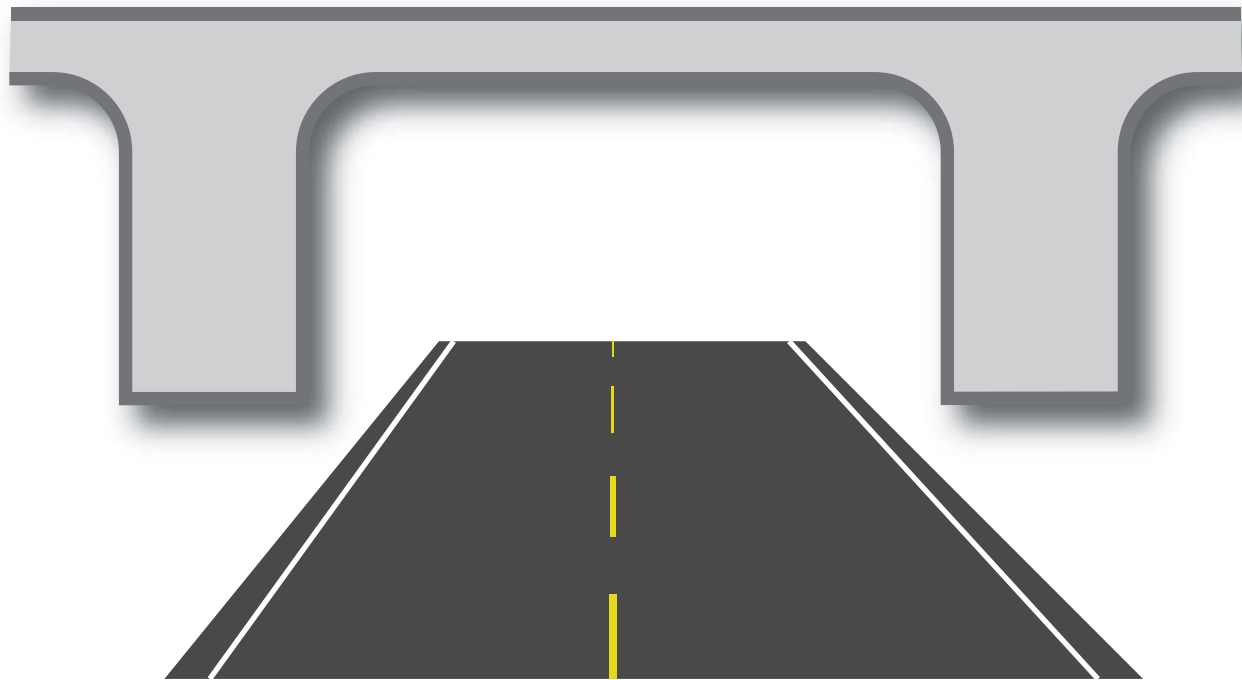


Bridge and Pavement Condition Management System (BPCMS)



2016-2017 UPWP
report prepared by:



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Bridge and Pavement Condition Management System (BPCMS)

March 2017



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I | Introduction

This project was completed by the Syracuse Metropolitan Transportation Council (SMTC) as part of the 2016-2017 Unified Planning Work Program (UPWP). The goal of the project is to report, map, and analyze bridge and pavement conditions in our Metropolitan Planning Area (MPA), which includes all of Onondaga County and parts of Oswego and Madison County. For the bridge section, the report focuses on highway bridges (bridges that carry vehicular traffic), of which there are 555 in the MPA. The New York State Department of Transportation (NYSDOT) defines a bridge as “a structure (including supports), erected over a depression, or an obstruction (such as water, etc.), having track or passageway for carrying public traffic, and, measured along the centerline of the roadway, has an opening between supports of 20’ or more (may include multiple culvert pipes).” Beginning in last year’s report, pavement condition data will only include information about roads that are Federal Aid-Eligible (FAE), which total approximately 976 centerline miles of roadway.

All maps included in this document were compiled using digital Geographic Information System (GIS) files, which are the basis of the calculations in this document. Through the process of entering bridge and pavement condition ratings data into GIS, a database has been built that is available to all SMTC member agencies with bridge and pavement data from the past several years.

The NYSDOT Pavement Condition Rating Chart

The New York State Department of Transportation uses a 1-10 scale to rate the surface condition of pavement. All roads included in this document have been rated on the NYSDOT system.

Table 1: Pavement Condition Rating Chart

Rating		Condition Description
U	Under Construction/No Data	Not rated due to on-going work or no data was available.
1-5	Poor	Distress is frequent and may be severe.
6	Fair	Distress is clearly visible.
7-8	Good	Distress symptoms are beginning to show.
9-10	Excellent	No pavement distress.

All roads included in this document have been rated according to the NYSDOT rating system. The overall surface ratings are categorized according to Table 1.

Bridges are rated in several ways. The NYSDOT rates bridges on a scale of 1.0 to 7.0., as shown in Table 2. According to NYSDOT, each element of every bridge span in the state is inspected at least biennially and rated on a scale of 1.0 to 7.0; a bridge's overall condition rating is the weighted average of the scores given to its components during inspection. Bridges with a condition rating less than 5.0 are categorized by the NYSDOT as being in a deficient state. In addition to NYSDOT condition ratings, this report considers several other measures, which are explained further in the Bridge section of the report.

Table 2: NYSDOT Bridge Condition Ratings

Rating	Category	Condition Description
< 5.0	Deficient	Bridge is a candidate for rehabilitation, replacement or perhaps closure.
5.0 - 7.0	Non-Deficient	No bridge distress identified.



Spencer St. over I-81

A note on measurements

The pavement condition rating data reported on throughout this document is based on linear centerline miles of roads, not lane miles of roads. A linear centerline mile of road is a continuous line of pavement along the center of the length of pavement. A lane mile is the length of each lane in a given section of pavement. For example, one mile of interstate road with two lanes in each direction would have four lane miles. For the purposes of this report, the number of miles based on the number of lanes for each approach was not calculated. Instead, the road centerline length, disregarding the number of lanes and direction, is calculated. This calculation is a linear centerline mile of pavement.

The NYSDOT calculates pavement ratings based on linear lane miles. Therefore, the NYSDOT may have different calculations than the results in this report (for example, total miles by owner, percentages of poor or excellent pavement, etc.). For the NYSDOT official linear lane mile totals, please refer to the NYSDOT Highway Mileage Chart for Onondaga County.

2 | Bridges

There are 555 roadway bridges in the MPA, which are the types of bridges considered for this report (railroad, pedestrian, and other bridges are not included). NYSDOT rates each bridge at least once every two years and provides SMTC with this data yearly. Data is then converted to a shapefile for mapping purposes (maps begin with Exhibit 8). Beginning last year, this report considered National Bridge Inventory (NBI) classifications as well as NYSDOT condition ratings; these include Not Deficient, Functionally Obsolete, and Structurally Deficient. In addition to NBI classifications and NYSDOT condition ratings, the report also provides sufficiency ratings, a federal measure which has been included in previous reports. New guidance from the Federal Highway Administration (FHWA) is shifting how we analyze bridge conditions away from sufficiency ratings, however, and instead recommends using NBI classifications as well as considering the percentage deck area classified as in good, fair, or poor condition. However, since sufficiency ratings (and NYSDOT condition ratings) have been included in previous reports, SMTC has decided to keep them for comparison purposes.

Exhibit 1 shows bridges by owner in the MPA; and Exhibits 2, 3, and 3a show summary data for all roadway bridges in the MPA as a whole, and by owner, respectively. This data is based on bridge inspections that occurred during the 2014-2015 rating cycle.

Exhibit 1: Bridges by Owner in the MPA

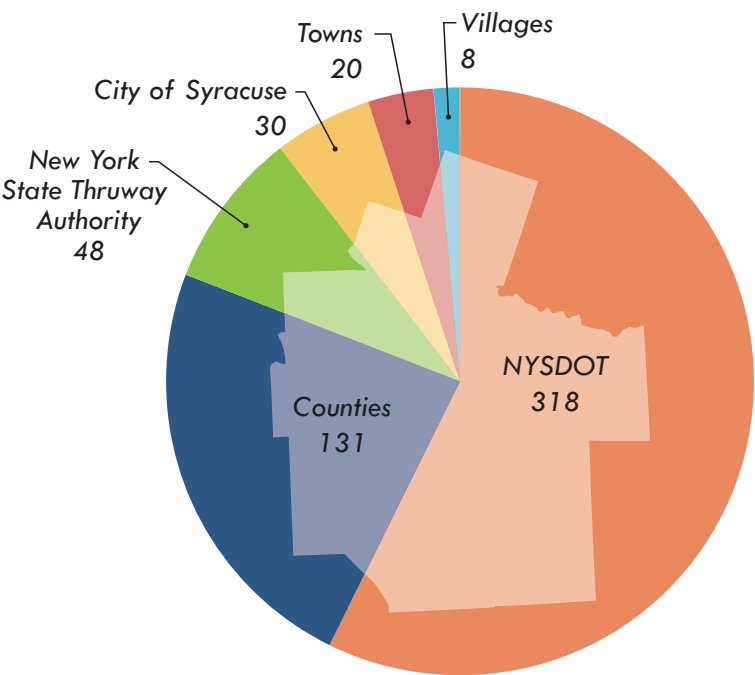


Exhibit 2: Summary Data for Bridges in the MPA

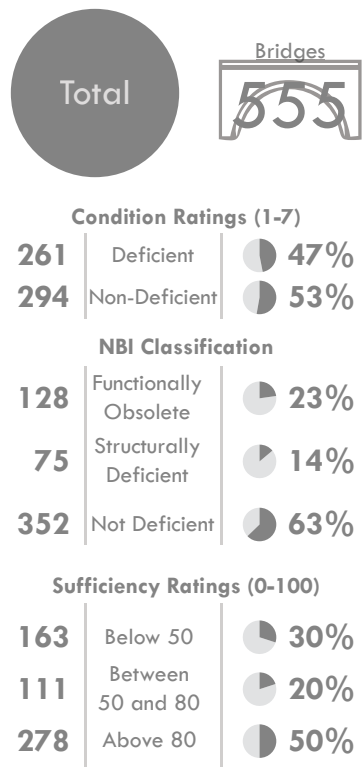
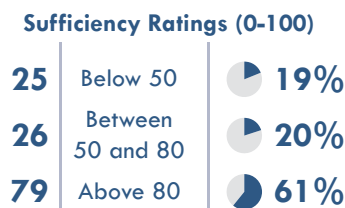
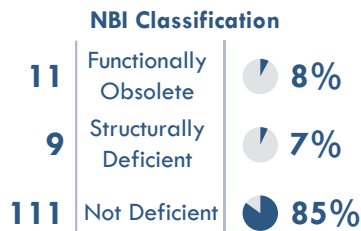
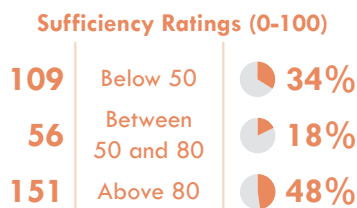
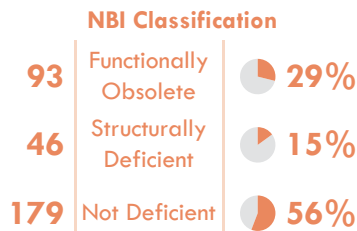
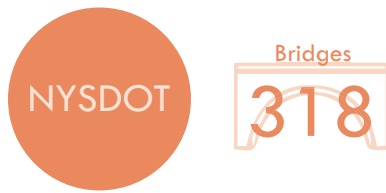


Exhibit 3: Summary Data for Bridges in the MPA, by Owner



Note: This includes Onondaga, Oswego, and Madison Counties. See Exhibit 3a on the next page for information on each individual county.

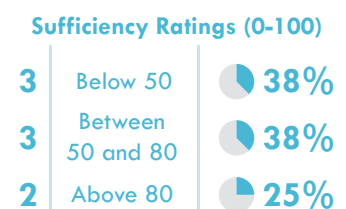
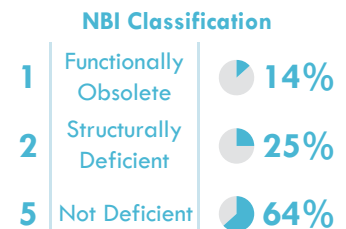
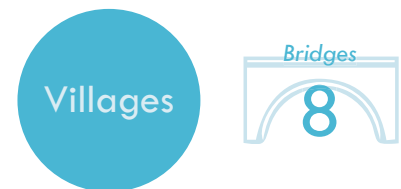
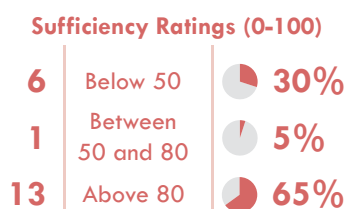
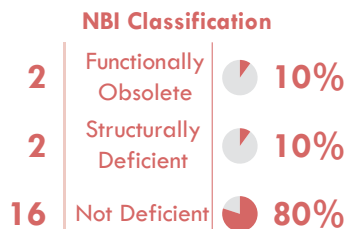
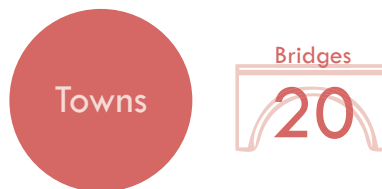
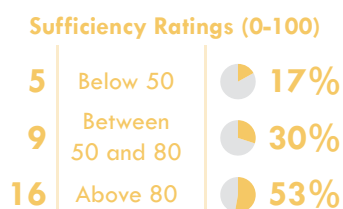
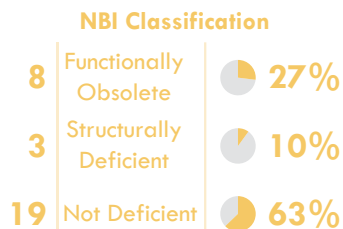
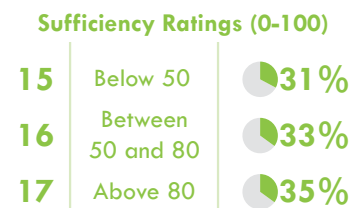


Exhibit 3a: Summary Data for Bridges in the MPA, by County Owner

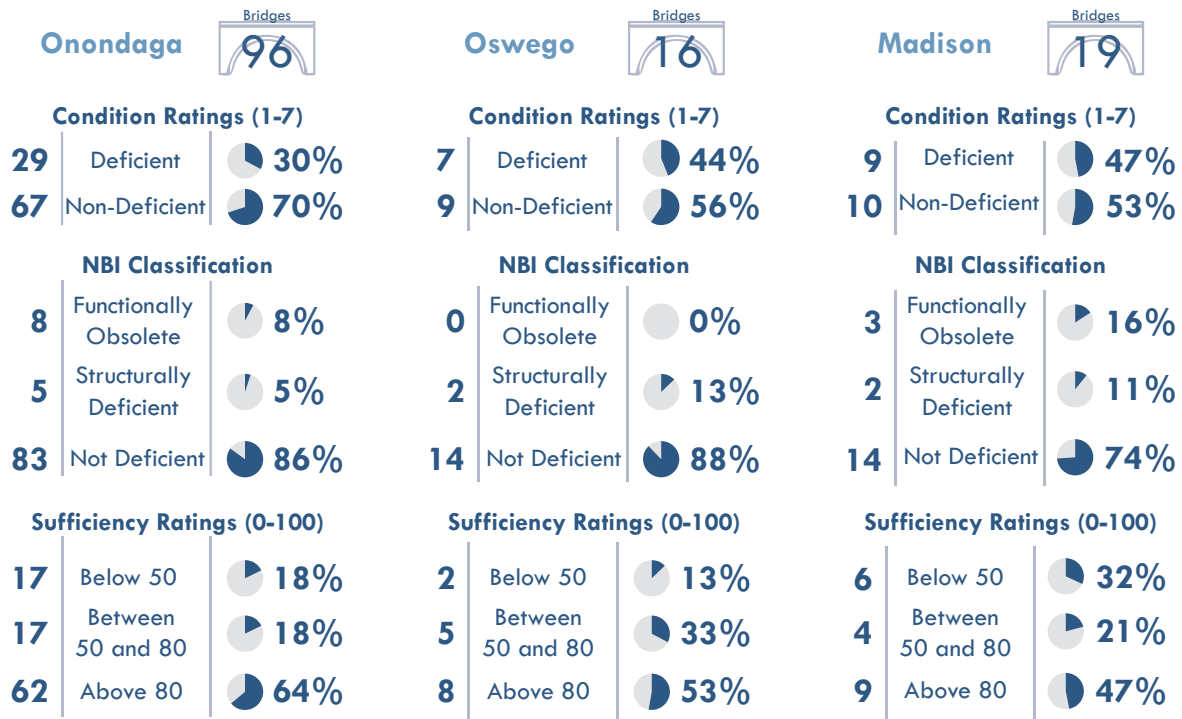
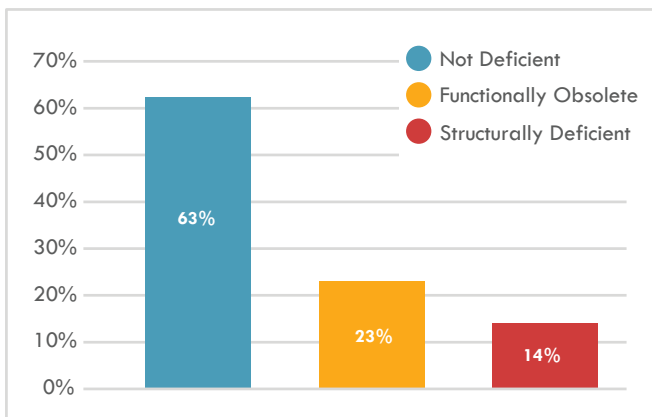


Exhibit 1 shows that NYSDOT owns a majority of the MPA's bridges (318, or 57%). Towns and villages have the smallest share of bridges, at 1% and 4%, respectively. Exhibits 2 and 3 show summary data for NYSDOT condition ratings, NBI Classifications, and Sufficiency Ratings. Across the MPA, 47% of all roadway bridges are deficient, which is 1% higher compared to last year. The type of owner with the highest percentage of deficient bridges is Villages, with 75% of their eight bridges classified as deficient. Next are NYSTA (63% deficient) and NYSDOT (51%).

Exhibit 4 shows NBI classifications of bridges. Structurally Deficient bridges refer to those bridges that need significant maintenance, rehabilitation, or replacement, while Functionally Obsolete refers to bridges that no longer meet current design criteria, either because traffic volumes exceed what was anticipated or design standards have changed. A bridge that is not deficient is neither Structurally Deficient or Functionally Obsolete; this type of bridge makes up 63% of all bridges in the MPA.

Exhibit 4: NBI Classifications for Bridges in the MPA



37%
of bridges in the MPA
are classified as
Structurally
Deficient or
Functionally
Obsolete.

Bridge Decks

There has been a recent emphasis on including bridge deck area in the quantification of bridge conditions. By considering the condition of a bridge as well as its deck area, it is possible to weight condition ratings by the magnitude of the overall bridge deck area, and rank these by either individual bridges or groups of bridges. Table 3 shows NYSDOT condition ratings weighted by deck area, by owner. Bridges owned by NYSDOT constitute 81% of bridge deck area in the MPA, compared to owning 57% of bridges. Bridges owned by NYSDOT have the lowest condition ratings weighted by deck area, at 4.8; bridges owned by Towns have the highest rating at 5.96.

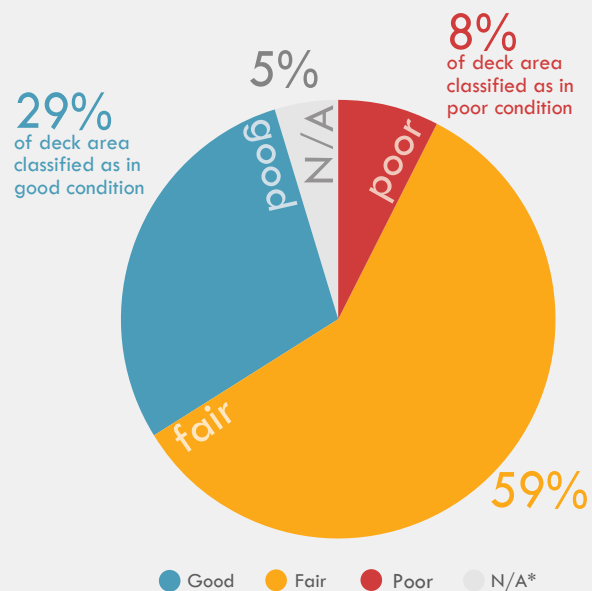
Table 3: Condition Ratings Weighted by Deck Area

Owner	% Deck Area	Rating
NYSDOT	81.1%	4.79
NYSTA	8.2%	4.91
County	7.2%	5.30
City	2.6%	5.19
Town	0.5%	5.96
Village	0.4%	5.04

The average bridge condition rating weighted by deck area in the MPA is **4.85**, compared to **5.3** for New York State's roadway bridges overall.

Exhibit 5 : Bridge Deck NBI Classifications

Exhibit 5, at right, shows NBI classifications of bridge decks. In our region, 8% of deck area is classified as being in poor condition. FHWA recommends that this number not exceed 10%. Most of the bridge decks in the MPA (59%) are in fair condition.



* Bridges classified as N/A refer to bridges, such as arches and frames, that technically do not have a deck, and thus do not have an NBI Bridge Deck classification.

Environmental Justice Areas

SMTC completed an Environmental Justice (EJ) report in 2012 and designated certain areas of the MPA as Environmental Justice Areas based on three criteria, including Minority, Limited English Proficiency and Senior Citizens. For this report, the Senior Citizen variable was replaced with Low-Income and data was updated to 2011-2015 5-year American Community Survey (ACS) data to portray EJ areas. Exhibit 6 shows EJ areas in the MPA and bridge condition percentages within and outside those areas, and Exhibit 7 shows NBI deck conditions in EJ and non-EJ areas.

Exhibit 6: Environmental Justice Target Areas and Bridge Statistics

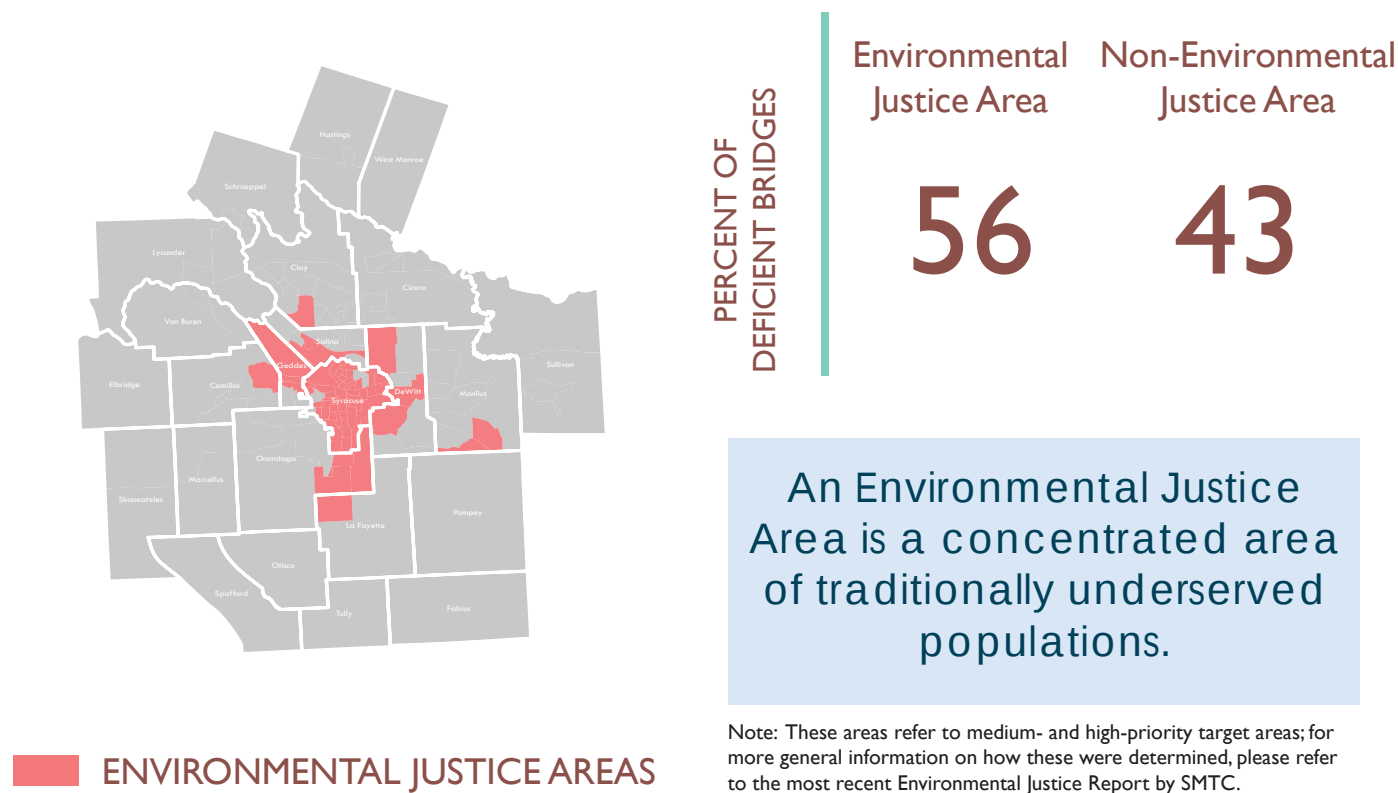
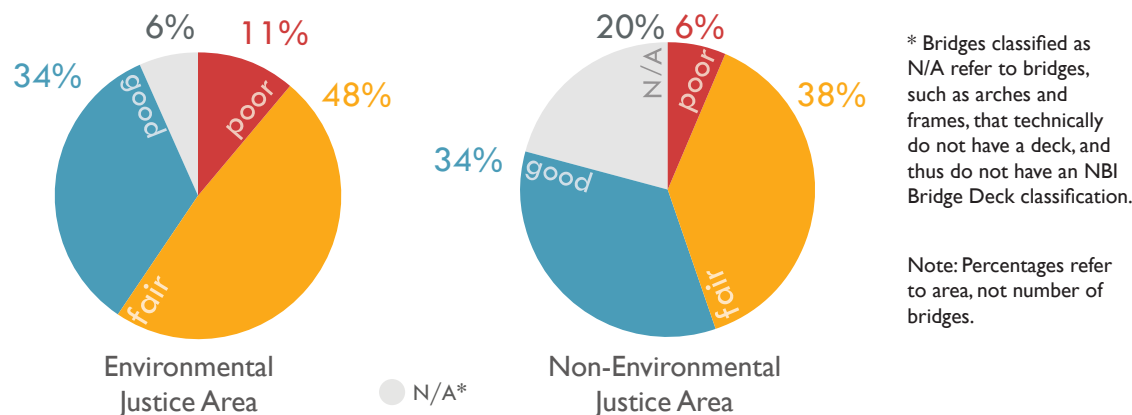


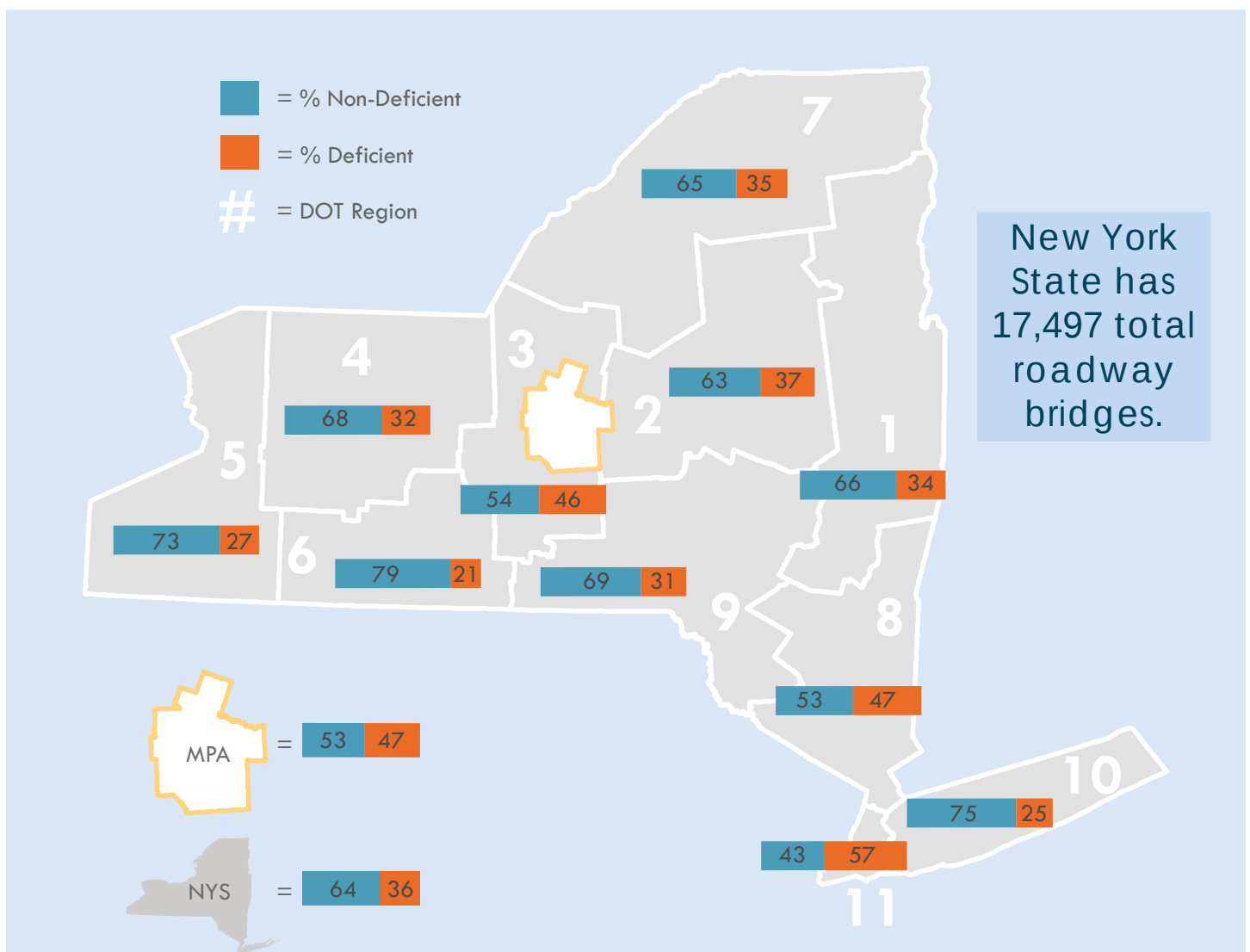
Exhibit 7: Environmental Justice Areas and NBI Deck Condition



Our Area Compared to the State

The SMTC MPA has 58% deficient roadway bridges compared to 36% across all of New York State. Exhibit 8 shows all of the eleven NYSDOT regions and their respective percentages of deficient bridges. Our MPA, which is mostly in Region 3, has the highest percentage of deficient bridges, at 58%, than any other DOT region with Region 11 (the New York City region), in second which has 57% deficient bridges.

Exhibit 8: Comparison of Bridge Ratings of SMTC and New York State DOT Regions



National Transportation Performance Measures

A Note on Bridge Performance Measures

SMTC’s most recent Long Range Transportation Plan (LRTP) has information on the goals, objectives, and performance measures that tie into the MAP-21 and FAST Act federal transportation legislation. For bridges, the objective is to “Preserve and maintain bridges,” and the performance measure associated with that objective is the percent of National Highway System (NHS) Bridges and Non-NHS bridges in “good” and “poor” condition. See Table 4 for 201 Conditions.

Table 4: 2015 Bridge Performance Measure Conditions

	NHS	Non-NHS
Non-Deficient	43%	38%
Deficient	57%	63%

Bridge Section Summary

Of the 555 roadway bridges in the MPA, 47% are Deficient, and 53% are Non-Deficient. NYSDOT owns a majority of the MPA’s bridges (318, or 57%), of which 51% are Deficient. National Bridge Inventory (NBI) ratings across all bridges in the MPA show that 23% of bridges are Functionally Obsolete, and 14% are Structurally Deficient (see p. 6 for definitions of these terms). NYSTA’s 48 bridges have the highest percentage of bridges that are Structurally Deficient, at 27%. As mentioned on p. 4, FHWA has shifted away from emphasis on Sufficiency Ratings, but these are included in Exhibit 3 for comparison purposes to previous years’ reports. Across the MPA, 30% of all bridges have a Sufficiency Rating below 50, compared to Village-owned bridges, at 38%;Town-owned bridges, at 30%; and NYSTA bridges, at 31%. For complete information on all bridges and owners, please see Exhibit 3.

Additionally, information on bridge statistics inside and outside of Environmental Justice (EJ) Areas shows that 56% of bridges are deficient within EJ areas, and 43% are deficient outside of these areas.

Finally, as mentioned in our Long Range Transportation Plan (LRTP), the performance measure associated with the objective of preserving and maintaining bridges is the percentage of National Highway System (NHS) bridges and non-NHS bridges in good and poor condition. Table 4, above, shows that NHS roads have 57% Deficient bridges, compared to Non-NHS roads, which have 43%.

The following several pages contain maps that display the geographic locations of the data presented in this section.

Exhibit 9: Bridges by Owner in the MPA

Maps

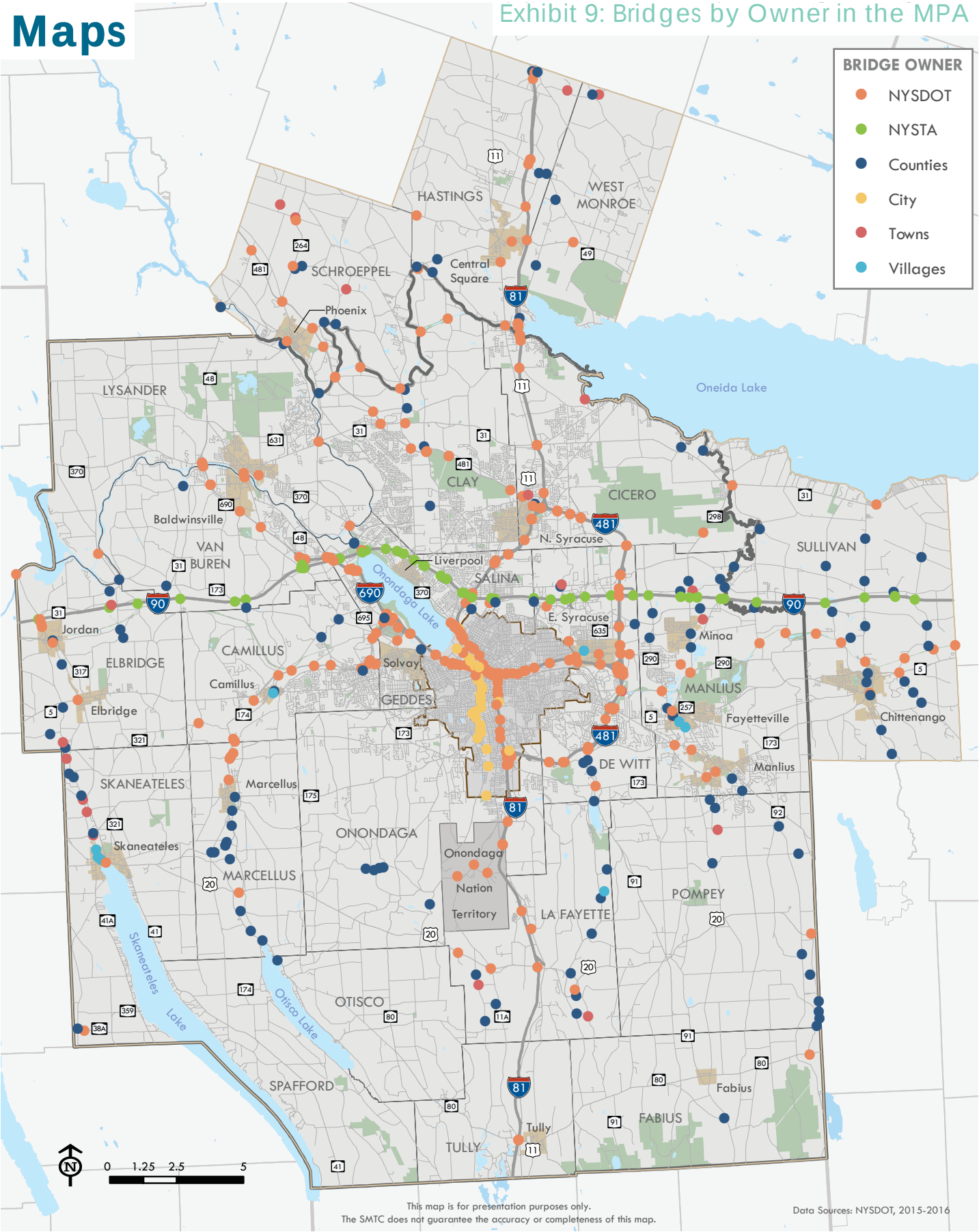
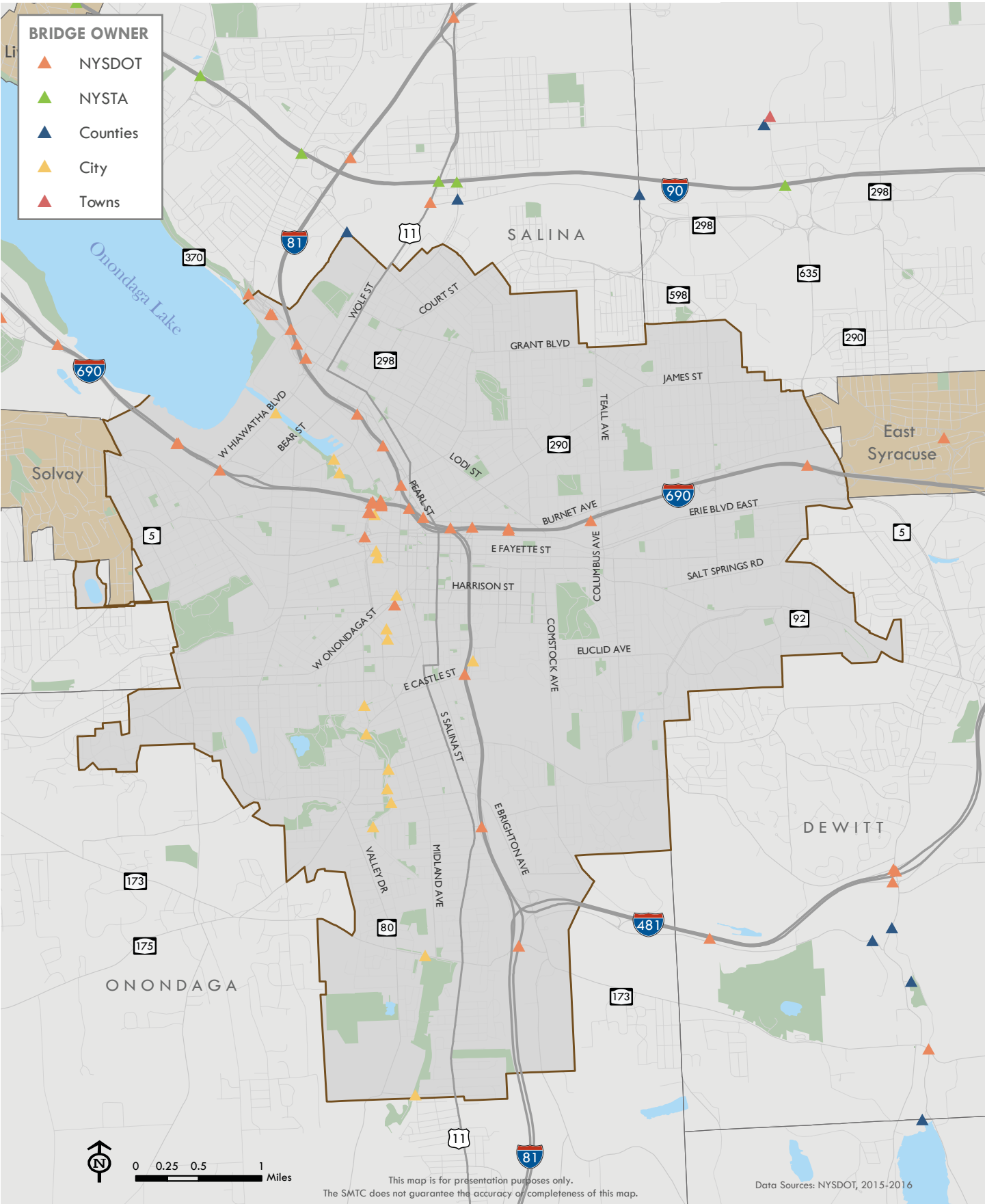
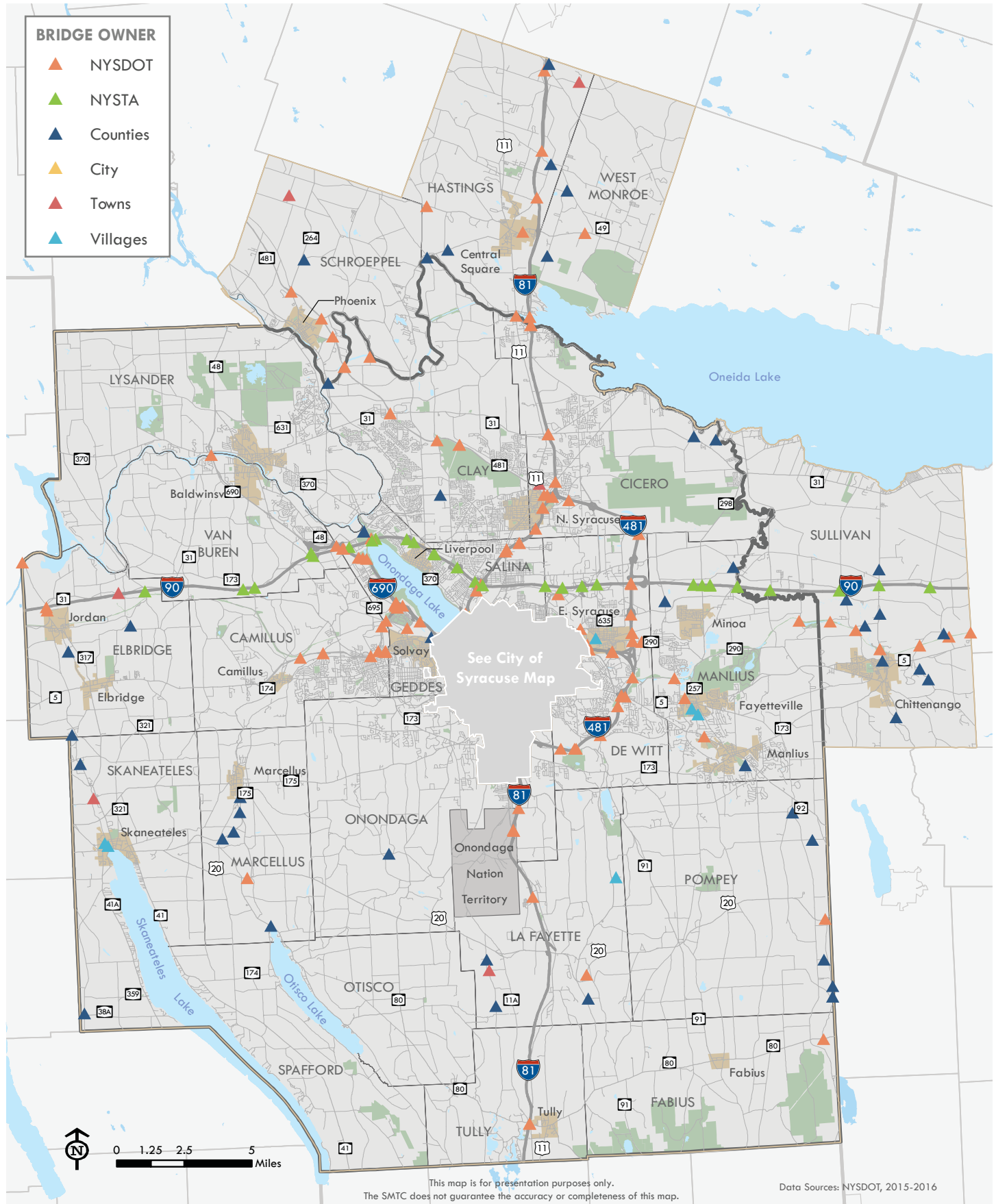


Exhibit 11: Non-Deficient Bridges in the City of Syracuse



Bridge and Pavement Condition Management System

Exhibit 12: Deficient Bridges in the MPA



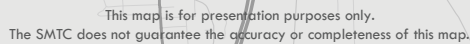


Exhibit 14: Sufficiency Ratings in the MPA

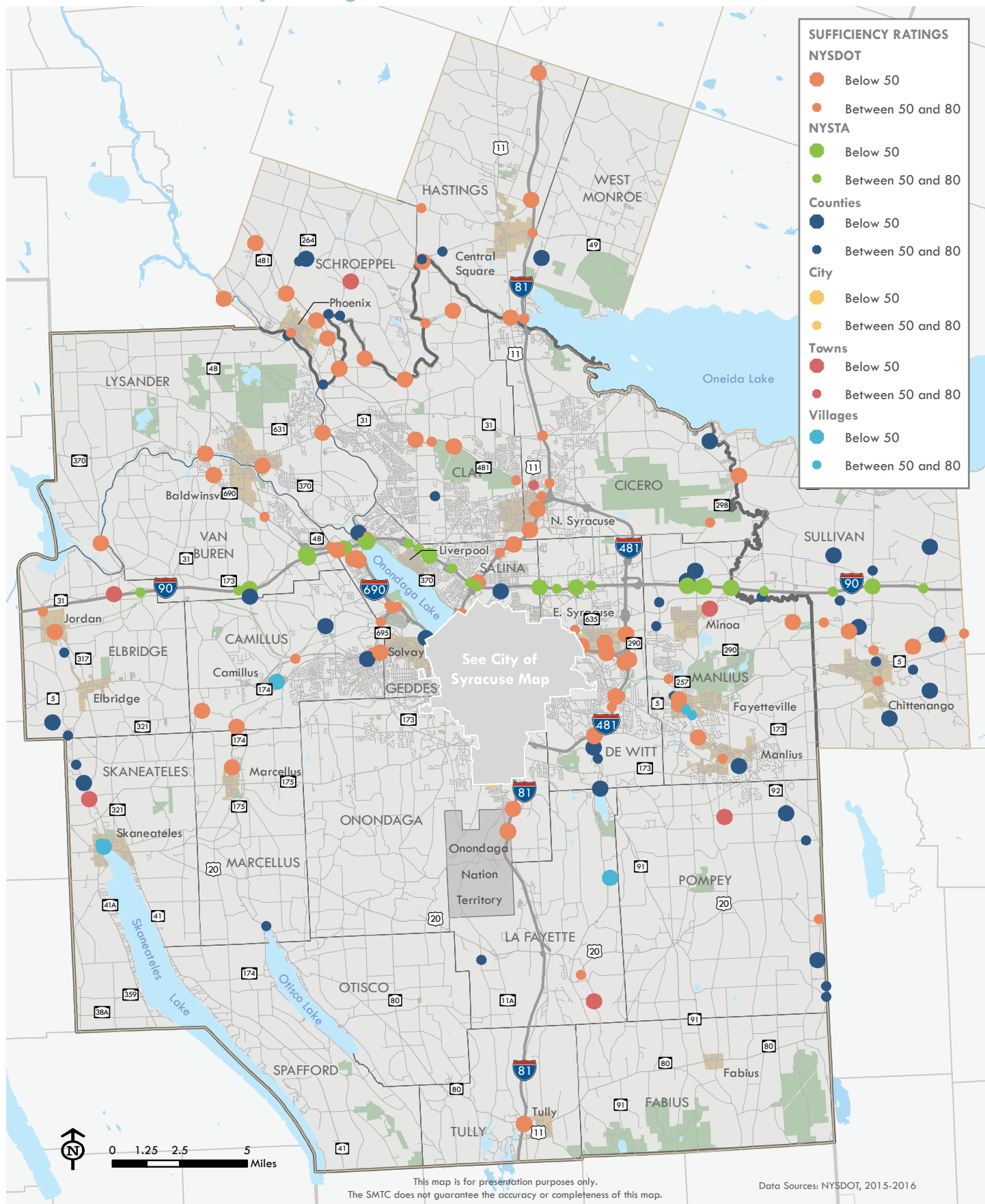


Exhibit 15: Sufficiency Ratings in the City of Syracuse

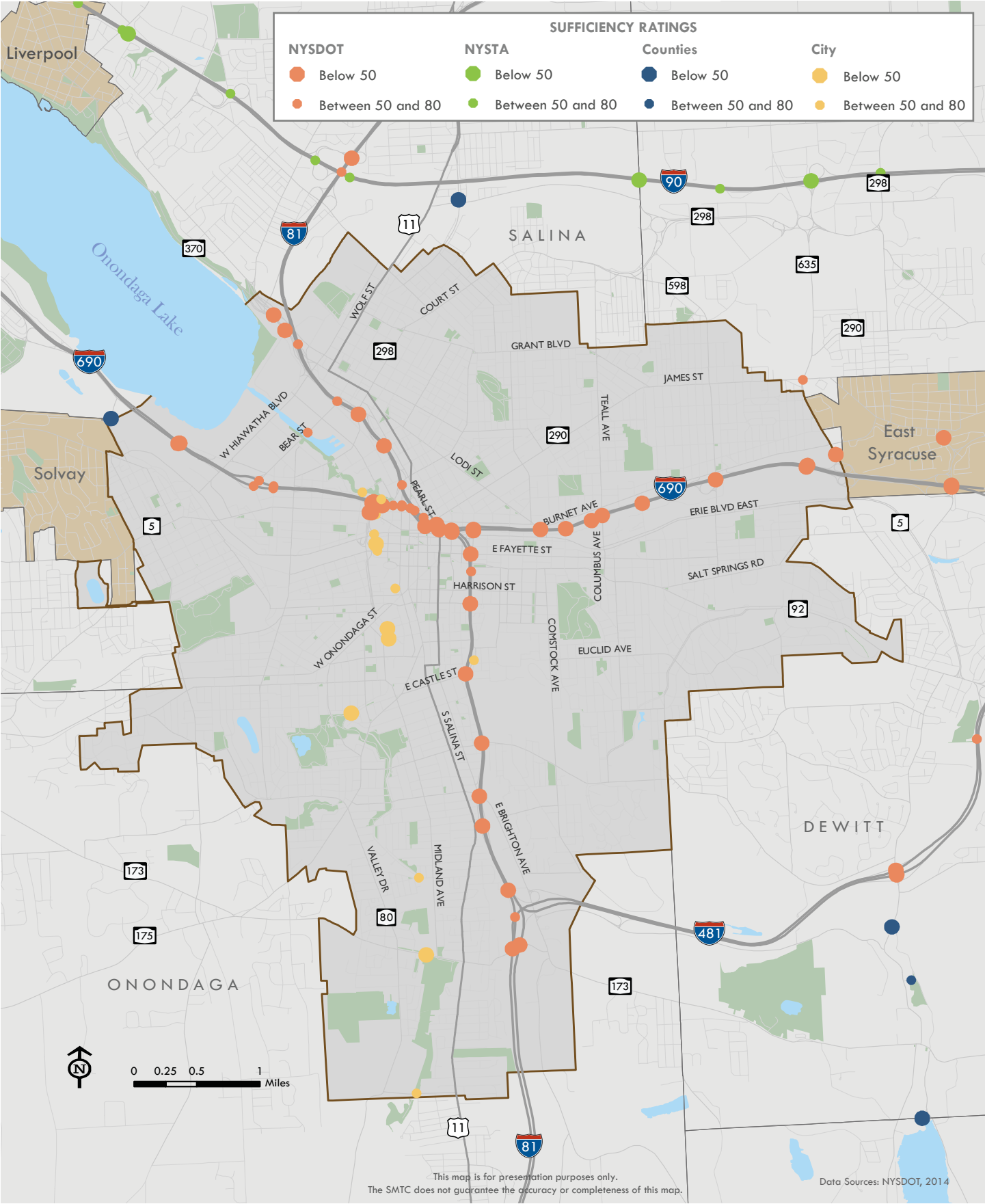


Exhibit 16: National Bridge Inventory (NBI) Ratings in the MPA

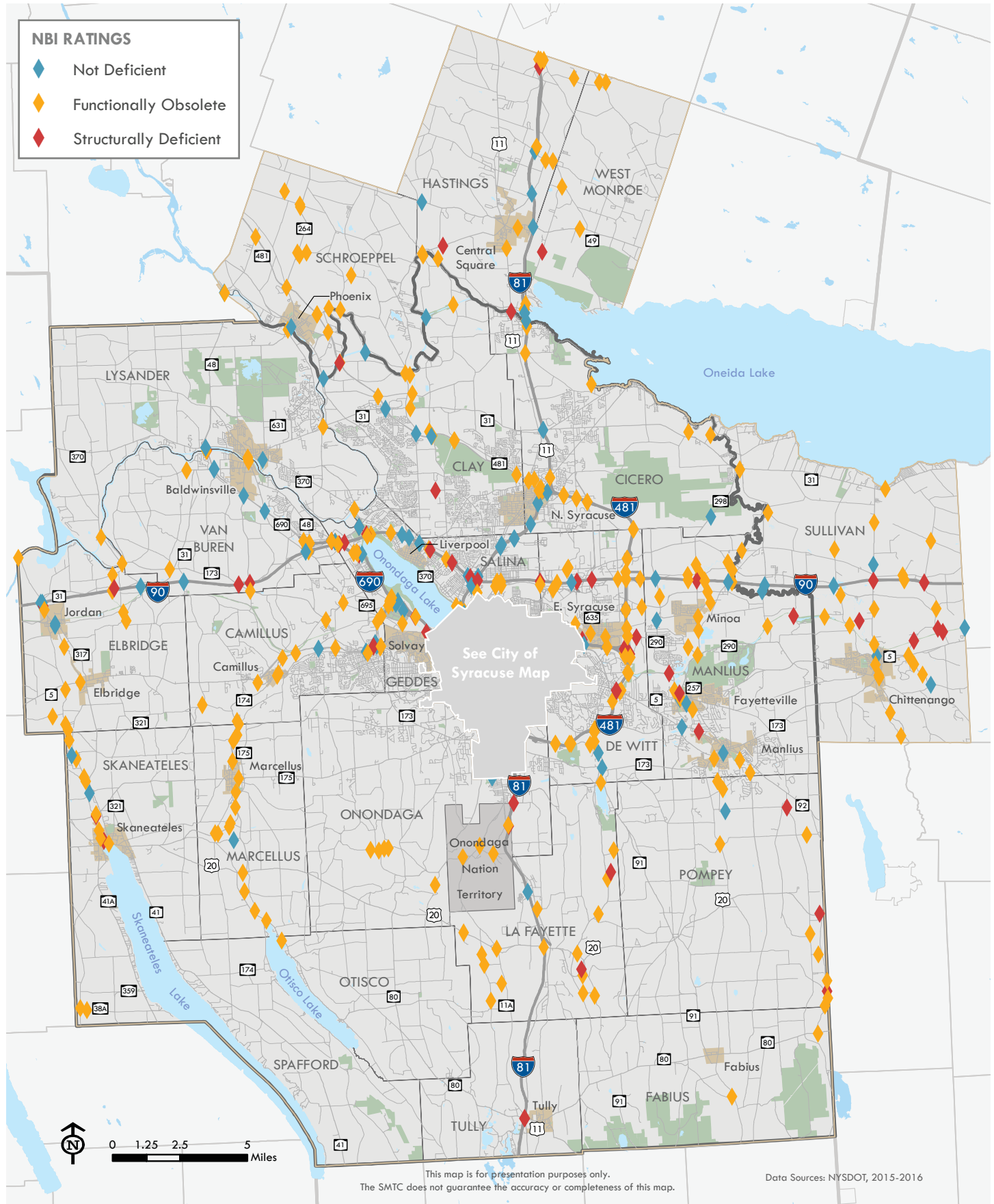
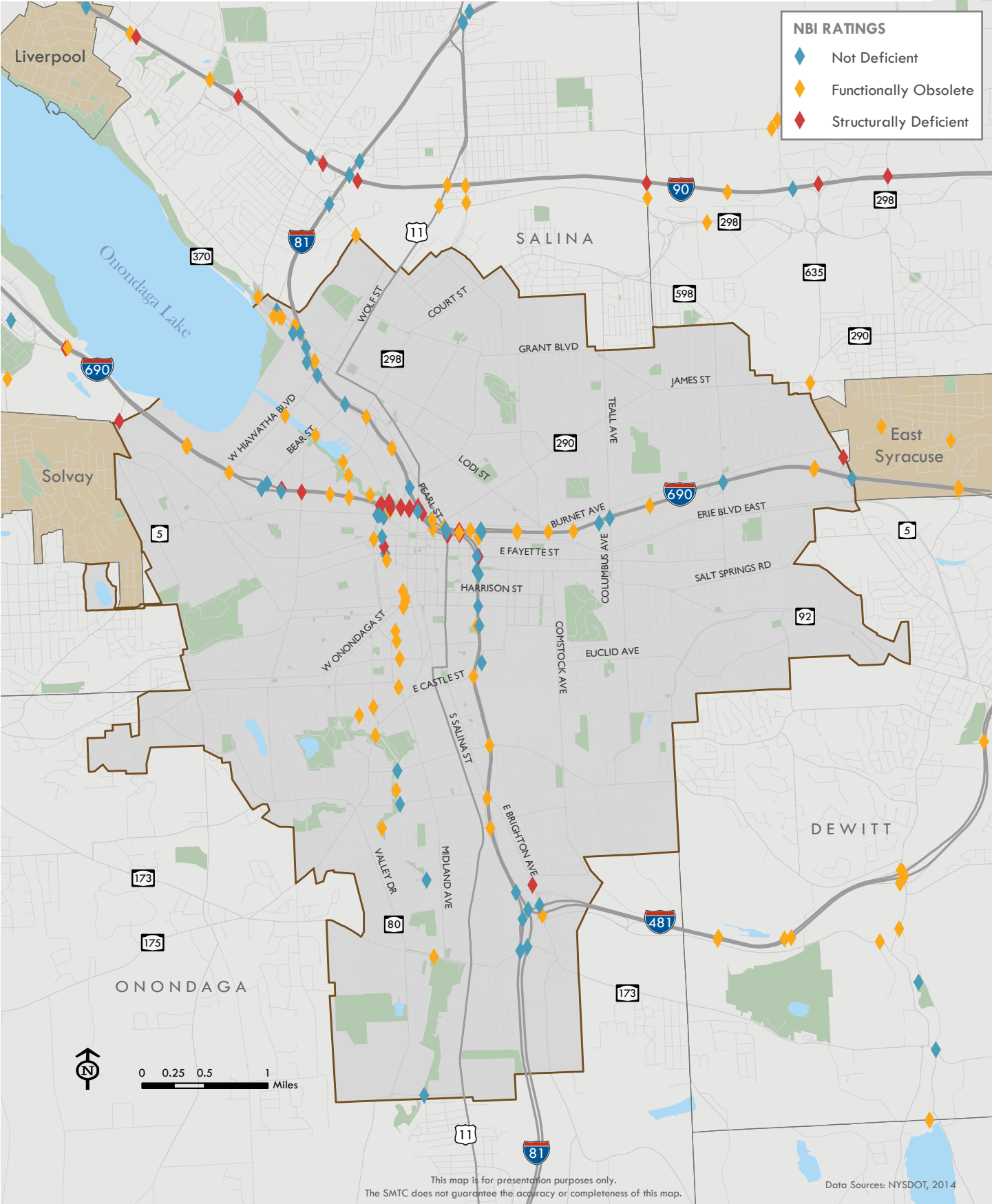


Exhibit 17: National Bridge Inventory (NBI) Ratings in the City of Syracuse



3 | Pavement

As mentioned in the Introduction, this report will reference Federal Aid-Eligible (FAE) roads only. In addition to a more standardized dataset, data collected for this report represents a comparatively more current dataset: all data was collected in the summer of 2016 with the exception of NYSDOT ratings, which were completed in 2015. Please refer to p.2 for a detailed table of the NYSDOT scoring system used for the pavement ratings presented in this section. Also, please note that the following charts and maps refer to centerline miles of road, not lane miles.

Exhibit 18 is a stacked bar chart that shows pavement ratings by owner, rating category (excellent, good, etc.), and mileage for all FAE roads in the MPA. Exhibit 19 is a summary of this information, as well as the overall MPA ratings. Across the MPA, the average pavement score is 6.8, or a rating of Fair. The MPA has 16% poor roads overall, compared to the City of Syracuse’s 34% poor roads, and NYSDOT’s 25% poor roads. Note that in this report, “Local” refers to roads that are owned by towns or villages; Local FAE roads total approximately 53 miles, 58% of which are good.

Exhibit 18: Pavement Ratings for Federal Aid-Eligible Roads by Owner, Rating Category, and Mileage

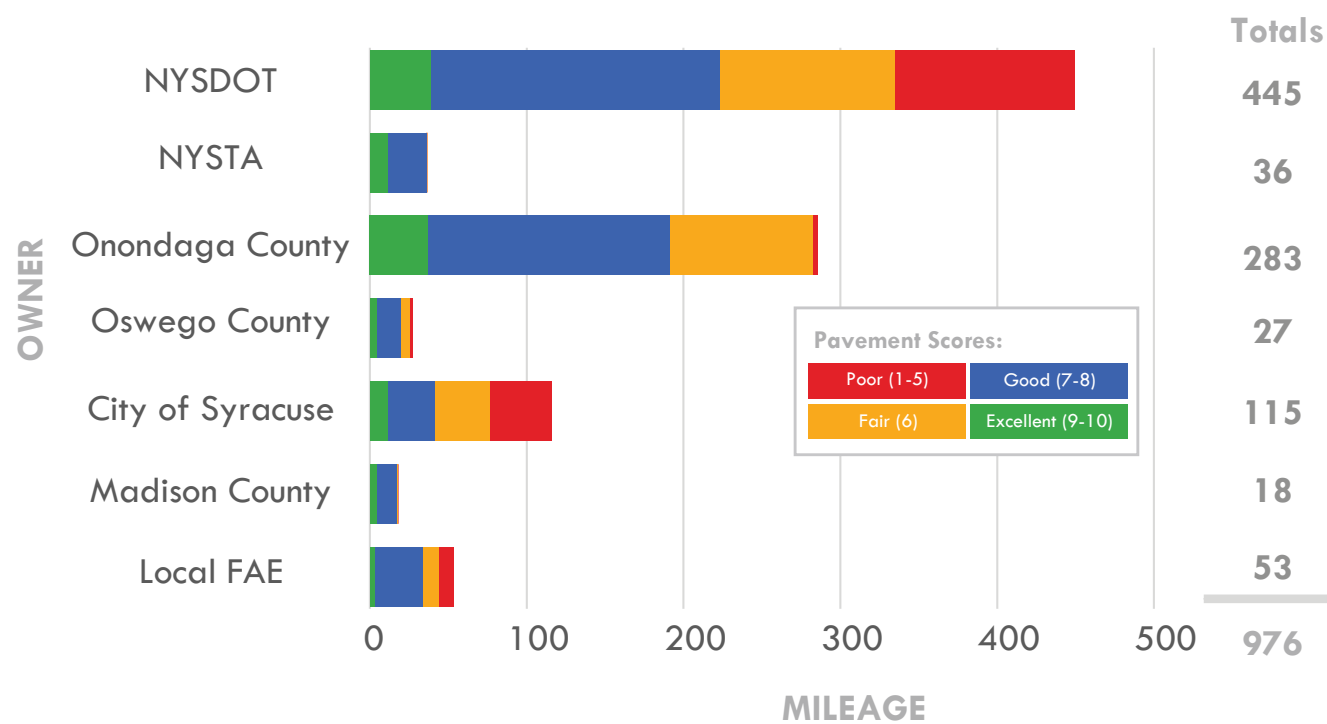


Exhibit 19: Pavement Ratings for Federal Aid-Eligible Roads

 NYSDOT	Miles	Percent	Average Rating 6.5	 NYSTA	Miles	Percent	Average Rating 8.2
	Excellent	38.3 8.6%			Excellent	11.0 30.5%	
	Good	182.6 41.1%			Good	25.0 69.5%	
	Fair	110.1 24.7%			Fair	0 0%	
	Poor	114.0 25.6%			Poor	0 0%	
Total	444.9	99.9%		Total	36.0	100%	
 Onondaga County	Excellent	36.6 12.9%	7.1	 Oswego County	Excellent	4.2 15.6%	7.3
	Good	152.4 53.9%			Good	15.5 57.4%	
	Fair	90.8 32.2%			Fair	5.6 20.7%	
	Poor	3 1%			Poor	1.7 6.3%	
	Total	282.8 100%			Total	27.0 100%	
 City of Syracuse	Excellent	11.2 9.8%	6.3	 Madison County	Excellent	4.2 23.6%	7.9
	Good	29.8 26%			Good	13.2 74.2%	
	Fair	34.6 30.2%			Fair	.4 2.2%	
	Poor	39.1 34%			Poor	0 0%	
	Total	114.7 100%			Total	17.8 100%	
 Local FAE	Excellent	2.8 5.3%	6.7	 All FAE Roads	Excellent	108.3 11%	7.1
	Good	30.9 58.6%			Good	449.4 43%	
	Fair	9.9 18.8%			Fair	251.4 29%	
	Poor	9.1 17.3%			Poor	166.9 16%	
	Total	52.7 100%			Total	976 100%	

Functional Class

There are ten functional classification codes in the SMTC study area used to describe the road network. Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide.ⁱ

Table 5: Functional Classification of Roadways

Urban Classifications	Rural Classifications
Urban Principal Arterial (interstates, other expressways and other principal arterials)	Rural Principal Arterial (interstates, other expressways and other principal arterials)
Urban Minor Arterial	Rural Minor Arterial
Urban Major Collector Urban Minor Collector	Rural Major Collector Rural Minor Collector ●
Urban Local ●	Rural Local ●

● Not Federal Aid-Eligible (FAE) (these roads are excluded from the report).

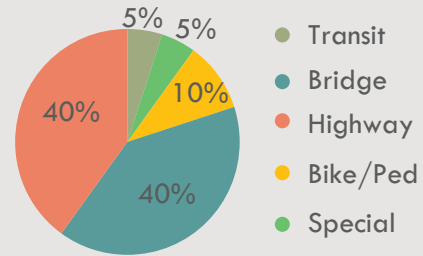
Arterials generally have higher design standards than other roads, often with multiple lanes and some degree of access control. Collectors provide a lower degree of mobility than arterials. They are designed for travel at lower speeds and for shorter distances. Collectors are typically two-lane roads that collect and distribute traffic from the arterial system.ⁱⁱ The rural functional classification codes apply to those road segments that are outside the SMTC urban area boundary. Two of these rural functional classification codes, rural minor collector and rural local, along with the urban local functional classification are not categorized within the federal aid-eligible (FAE) network and are therefore not eligible for traditional federal surface transportation program funds; these non-FAE roads are not referenced in the report. Table 5 contains a summary of functional classifications.

Regarding the most recent Transportation Improvement Program (TIP), total funding equates to approximately \$293,197,271. The TIP identifies the timing and funding of all transportation projects scheduled for implementation in the MPA over a multi-year period using federal transportation funds (federal highway and federal transit). See Chart I on the opposite page for a breakdown of TIP program funds.

ⁱ Federal Highway Administration. Highway Functional Classification Concepts, Criteria and Procedures. Revised March 1989. Section II-I.

ⁱⁱ Definitions taken from the Federal Highway Administration’s Conditions and Performance Report, Chapter 2.

Chart 1:
Breakdown of TIP Funds



Adams St - Principal Arterial



Exhibits 20, 21, and 22 show a breakdown of mileage, rating category, and owners for the three major functional class categories represented in this report: Principal Arterials, Minor Arterials, and Collectors, respectively. Owners who do not own roads in a given category are omitted (e.g. there are no principal arterials owned by Oswego County in our MPA, so that owner is not shown in Exhibit 20). Collectors make up nearly half (42%) of the FAE roads in our MPA, with Principal Arterials next at 28%.

Exhibit 20: Pavement Ratings for Principal Arterials,
by Mileage, Rating Category, and Owner

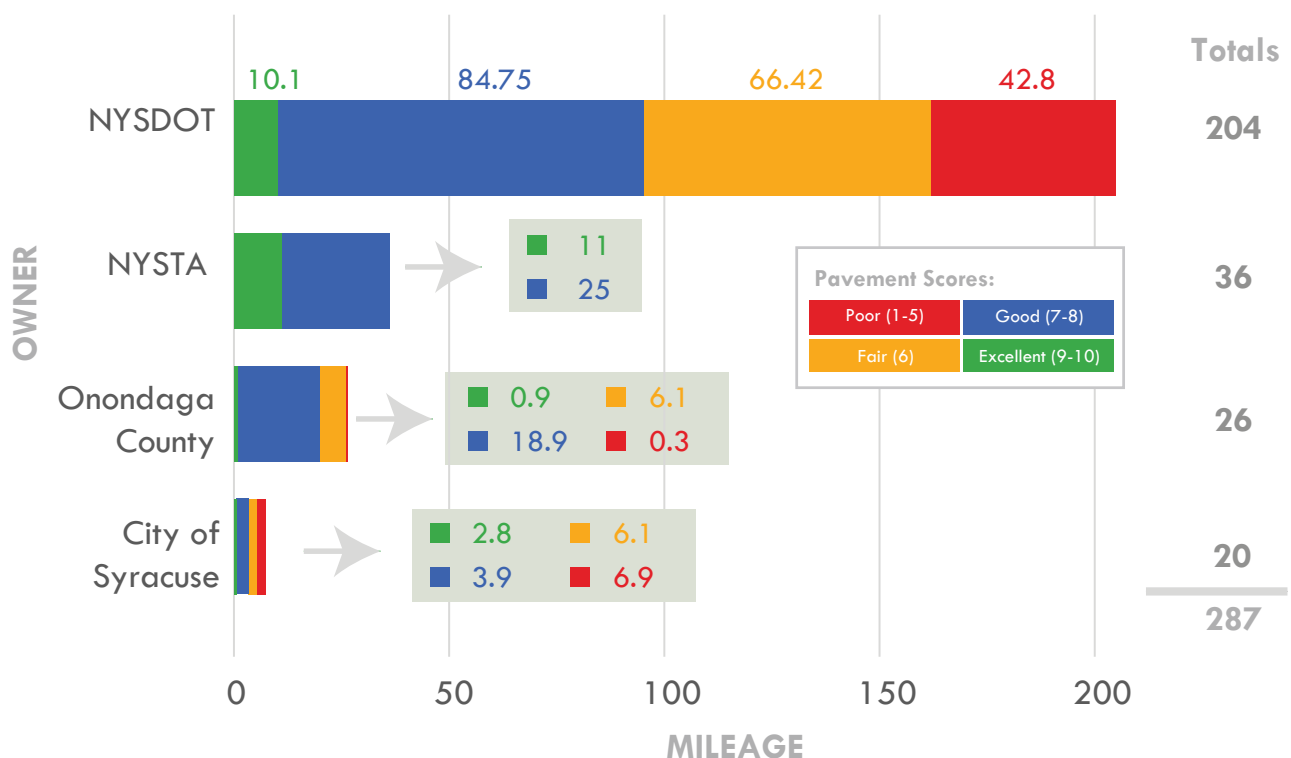
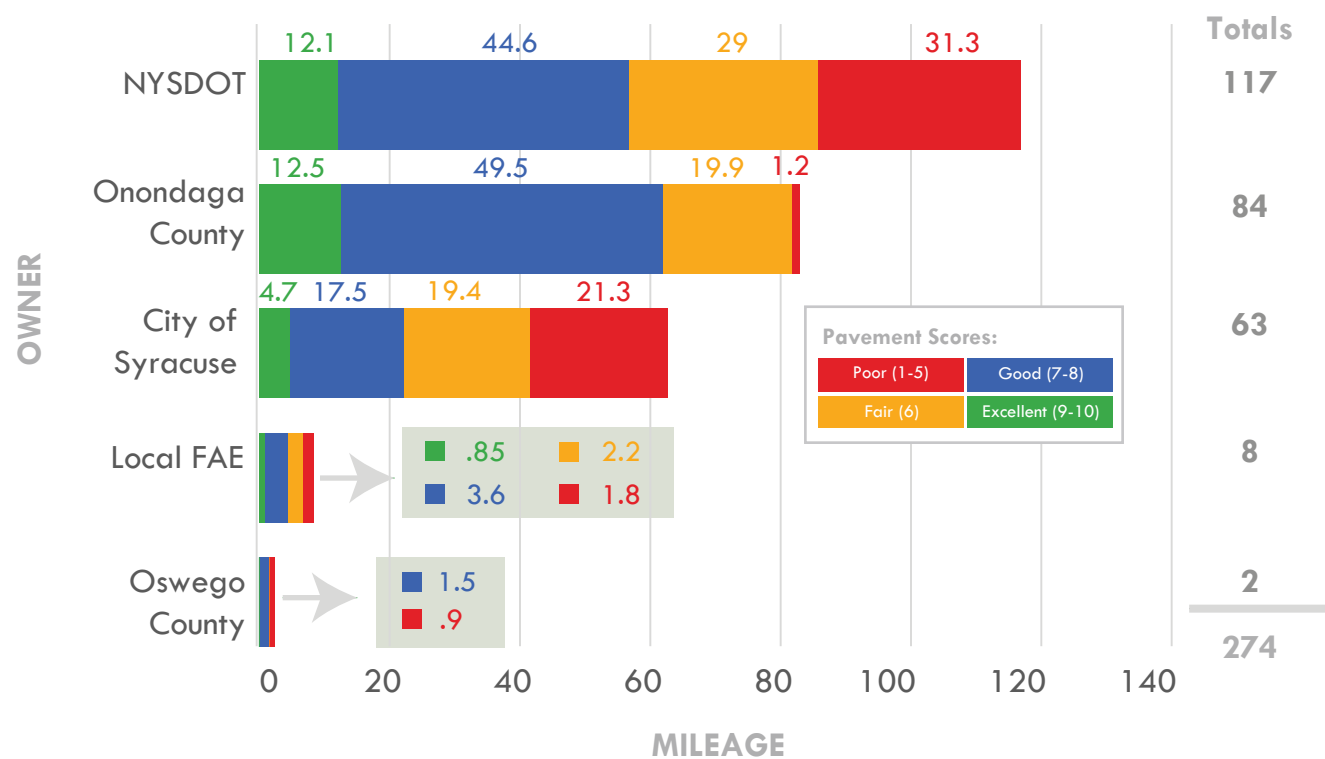
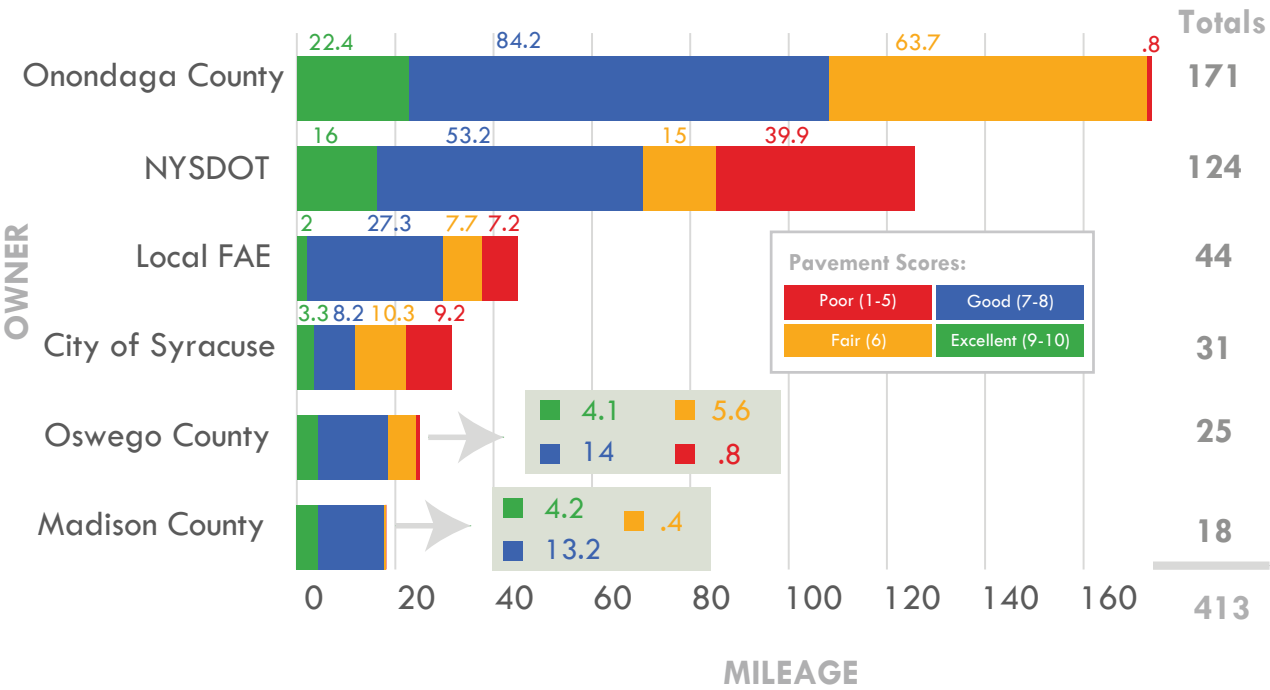


Exhibit 21: Pavement Ratings for Minor Arterials, by Mileage, Rating Category, and Owner



Onondaga Blvd. - Minor Arterial

Exhibit 22: Pavement Ratings for Collectors, by Mileage, Rating Category, and Owner



Montgomery St. - Collector

Environmental Justice Areas

Exhibit 23: Environmental Justice Areas and Pavement Condition Ratings

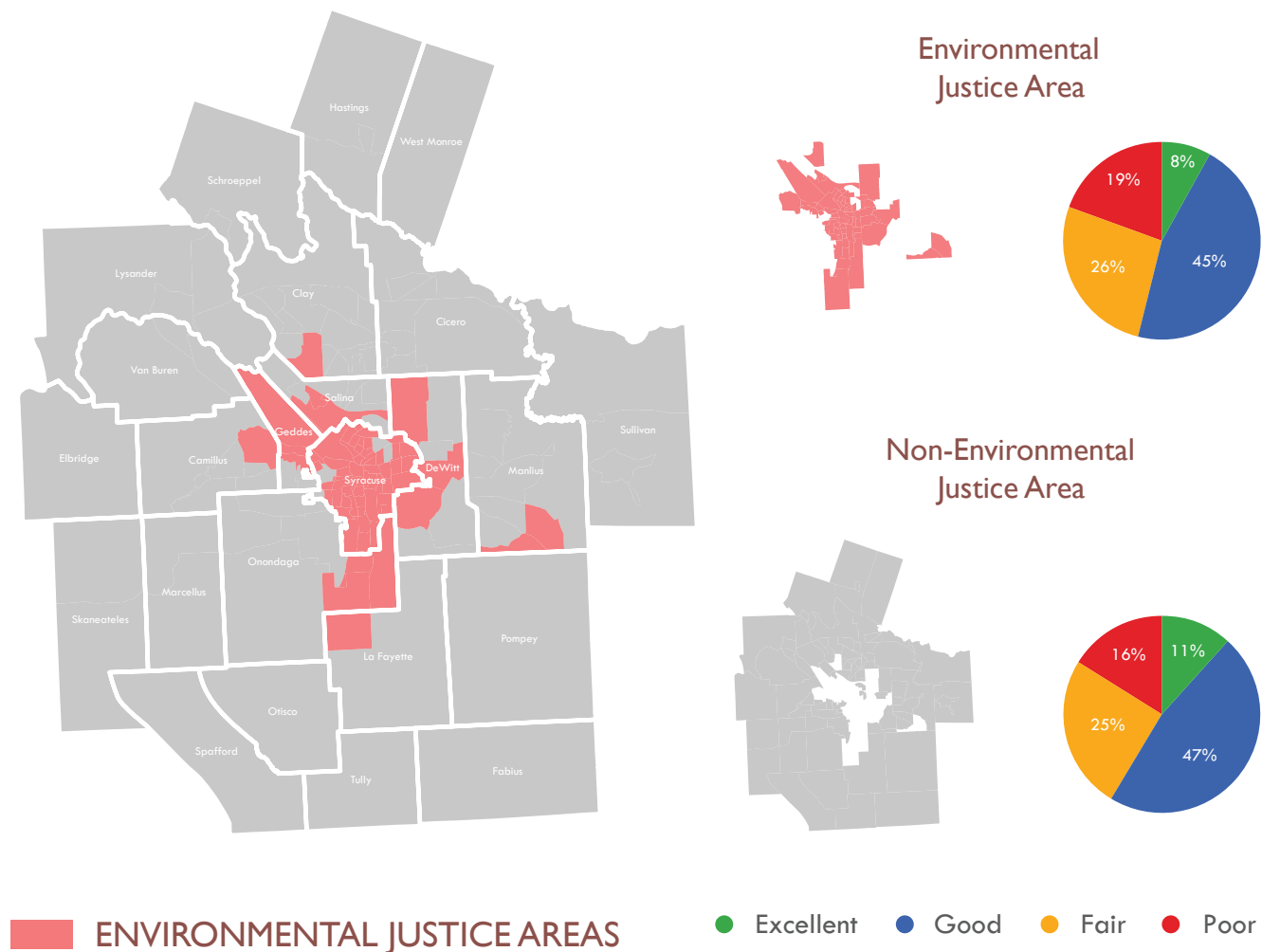


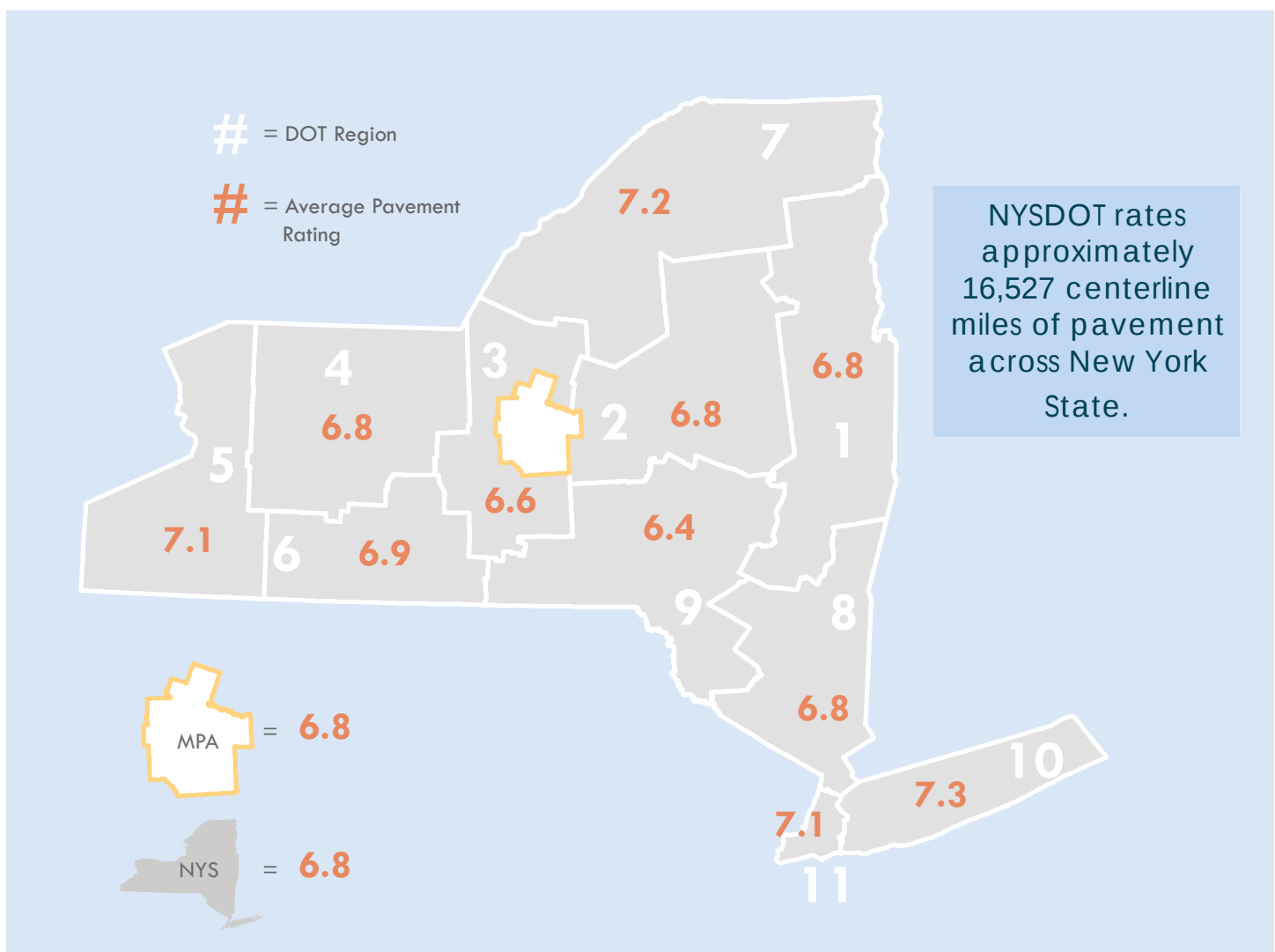
Exhibit 23 shows rating category of FAE roads inside and outside of Environmental Justice (EJ) Areas (please see p. 8 for more information on what EJ Areas include). The above graphic shows that pavement conditions by rating category are generally similar inside and outside of EJ areas, with the exception of a higher percentage of poor roads in EJ areas compared to outside (19% vs. 16%), and a lower percentage of good roads in EJ areas compared to outside (46% vs. 45%).

25%
of FAE centerline
mileage is within
Environmental Justice
Areas, and 75% is
outside of EJ areas.

Our Area Compared to the State

Exhibit 24, below, shows average pavement ratings of each DOT region in New York State. The numbers reflect 2014 ratings. Region 3, which contains the majority of our MPA, is second for the lowest average score across the state at 6.6, ahead of Region 9 with a score of 6.4. (Our MPA's average pavement rating is 6.8) Region 10, which is Downstate, has the highest average rating, at 7.3. Overall, New York State's average pavement rating is 6.8

Exhibit 24: Comparison of Pavement Ratings of
SMTC and New York State DOT Regions



National Transportation Performance Measures

A Note on Pavement Performance Measures

As mentioned on p. 10, SMTC’s most recent Long Range Transportation Plan (LRTP) has information on the goals, objectives, and performance measures that tie into the MAP-21 and FAST Act federal transportation legislation. For pavement, the objective is to “Preserve and maintain pavement,” and the performance measure associated with that objective is the percent of Interstate, non-Interstate National Highway System (NHS), and Other (non-NHS) system mileage with pavement in “good” and “poor” condition. The three road categories are presented below with the four NYSDOT rating categories used throughout this report.

Table 6: 2015 Pavement Performance Measure Conditions

Road Type	Excellent	Good	Fair	Poor	
NHS - Interstate	18.4	59.6	30.7	0	109
NHS - Non-Interstate	6	73.8	49.4	50.2	179
Other*	82.8	318	170.5	116.5	688
					976

*Other (non-NHS) system mileage is not a federal performance measure.

Pavement Section Summary

As shown in Exhibit 19, the average pavement score is 6.8 for all Federal Aid Eligible (FAE) roads, which were the only types of roads rated for this report; approximately 1,007 centerline miles of roads were rated. The owner with the lowest average rating is the City of Syracuse, at 6.1, which has a total of 86 miles; the City also has the highest percentage of Poor roads, at 36%, compared to the MPA’s 17% Poor roads overall.

Exhibit 23 shows pavement rating categories inside and outside Environmental Justice (Ej) areas. Inside of Ej areas, 23% of roads are poor; outside of Ej areas, poor roads make up 15%. Exhibit 24 shows average pavement ratings of NYSDOT roads in our region compared to other DOT regions; overall, State-owned roads in the MPA have an average rating of 6.6 compared to 7.0 in the state overall. Finally, as mentioned in our Long Range Transportation Plan (LRTP), the performance measure associated with the objective of “preserving and maintaining pavement” is the percent of Interstate, non-Interstate NHS, and Other system mileage with pavement in good and poor condition; see Table 6 above for results.

The following pages contain maps that display the geographic locations of the data presented in this section.

Maps

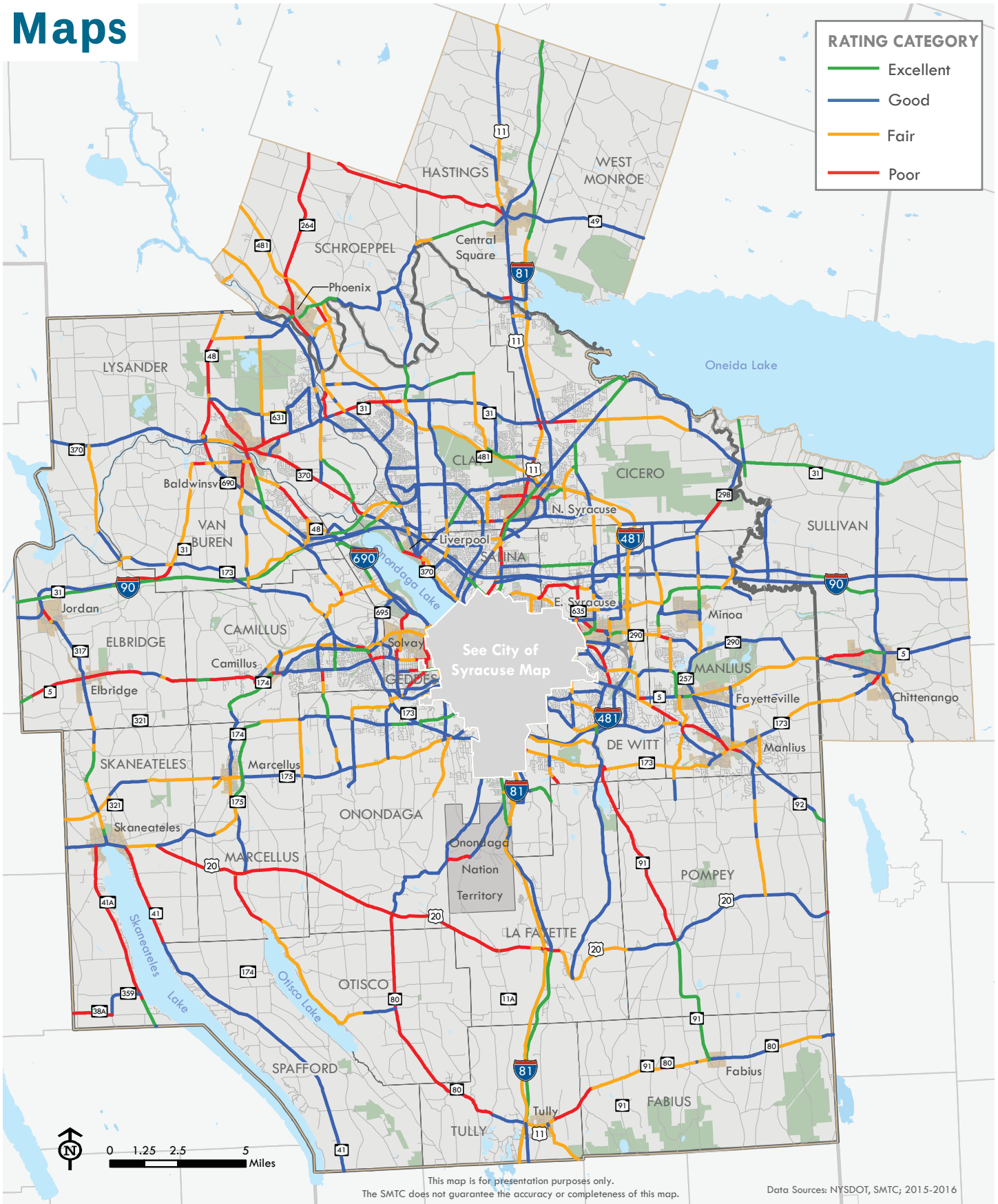


Exhibit 26: Pavement Ratings in the City of Syracuse

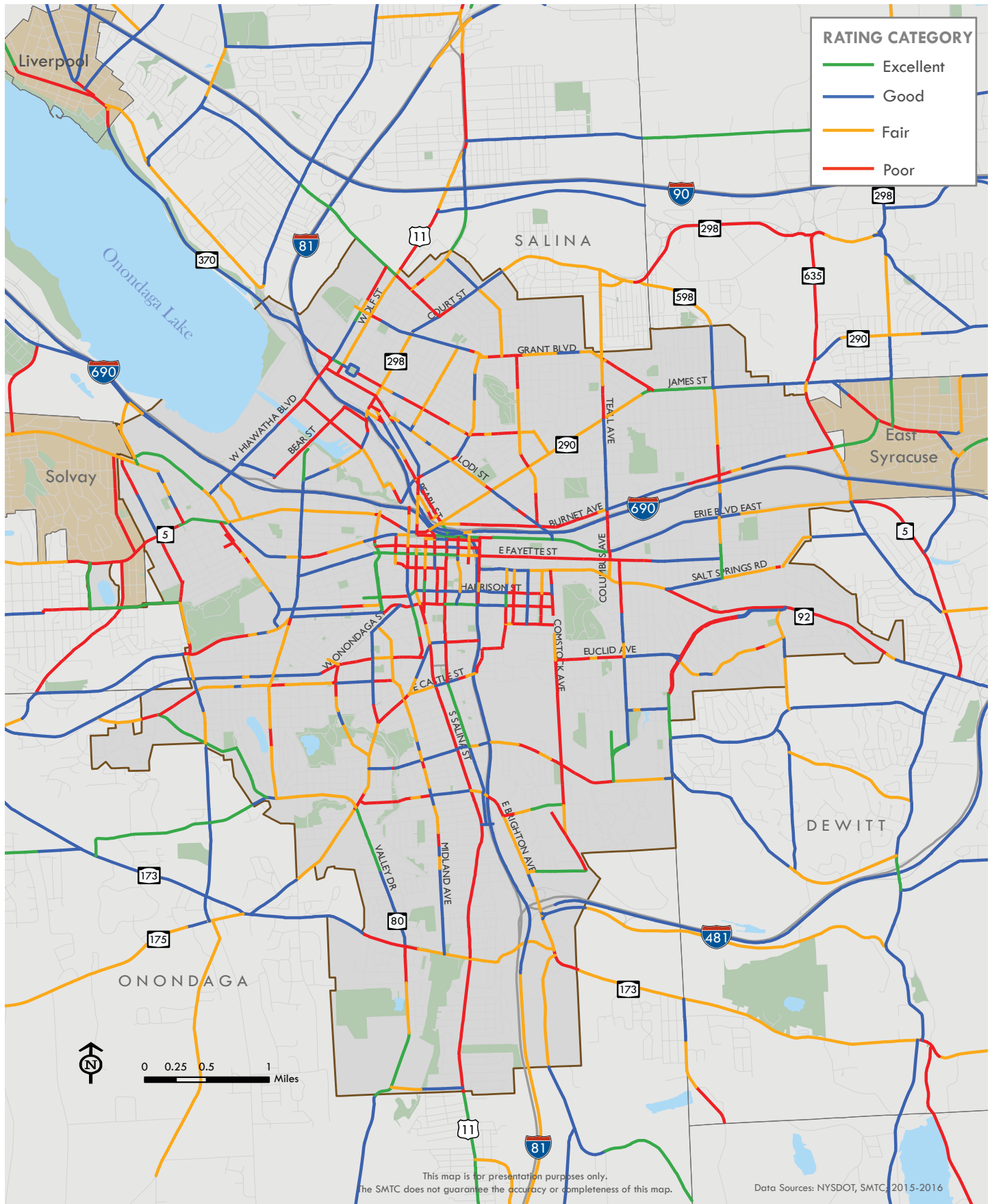
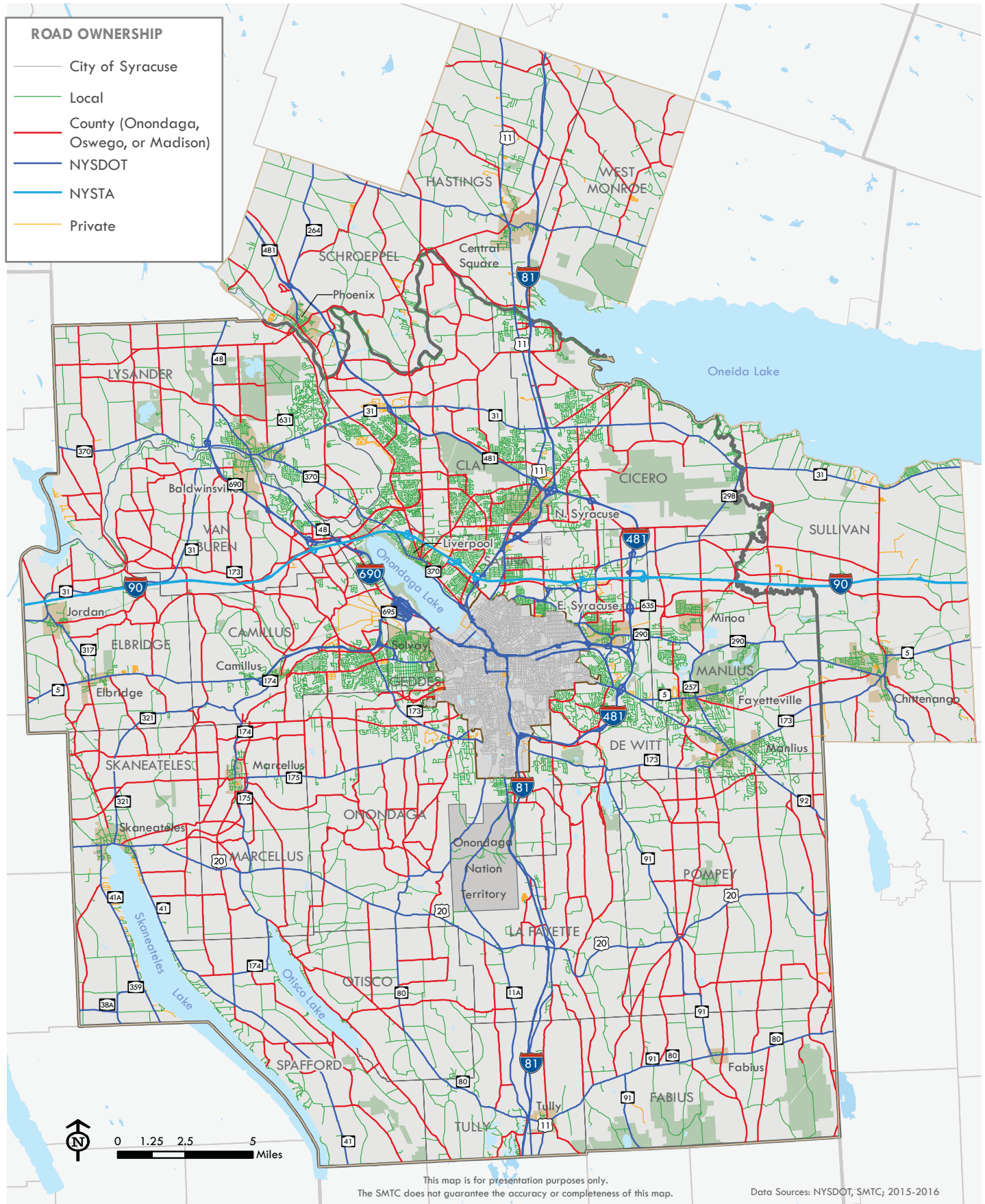


Exhibit 27: Road Ownership



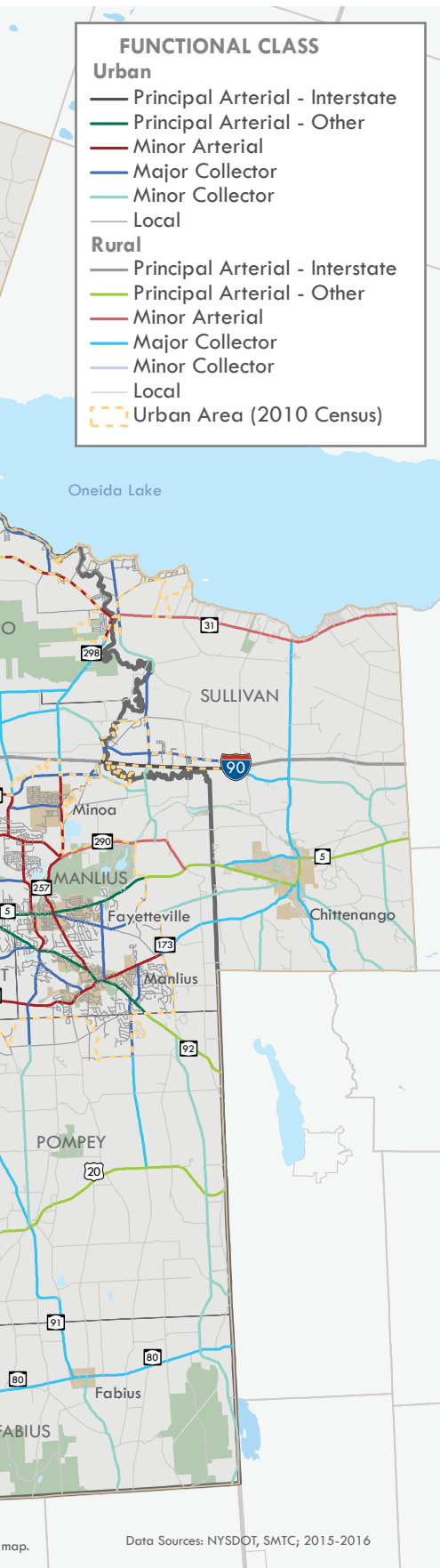


Exhibit 29: National Highway System (NHS)



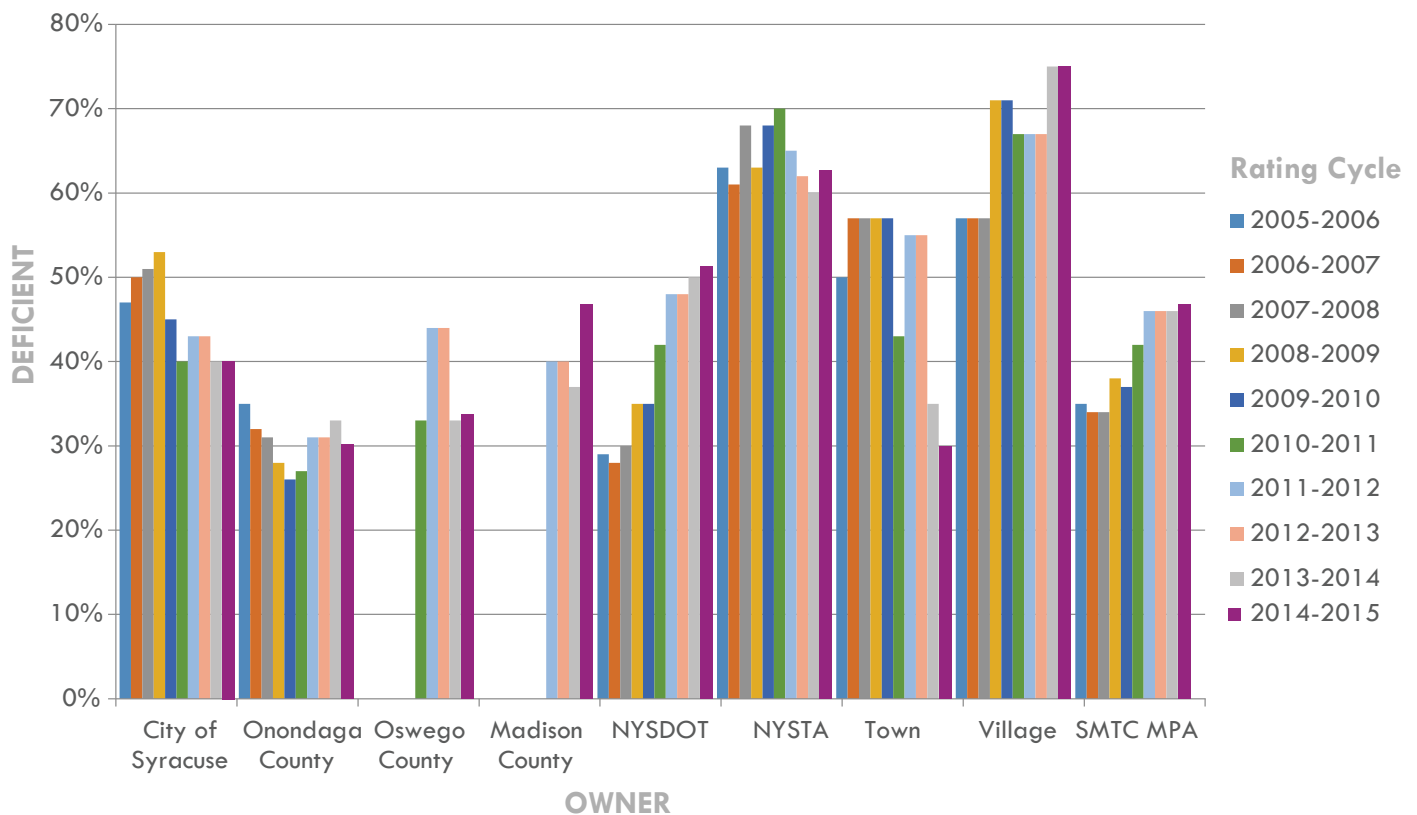
4 | Trends

Using data from previous Bridge and Pavement reports, it is possible to examine trends in bridge and pavement condition by owner. Overall, bridge ratings in the MPA, as measured by the percentage of deficient bridges, went up from 46% deficient to 47% deficient. Pavement scores of FAE roads improved to 7.1 from last year's average score of 6.8.

Please see Exhibits 29 and 30 for complete information about average conditions by owners for bridges and pavement.

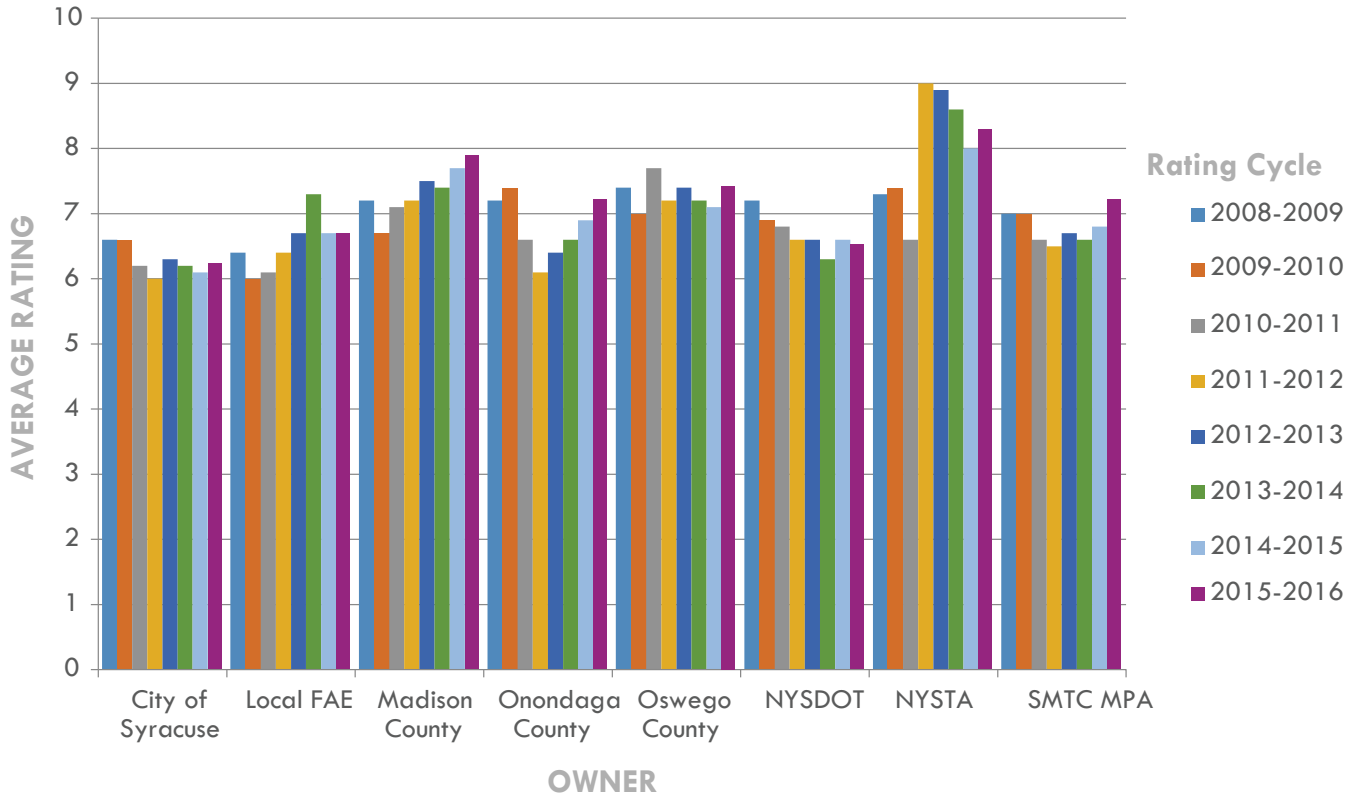
Bridge Trends

Exhibit 30: Trends of Percentage of Deficient Bridges in the MPA, by Owner



Pavement Trends

Exhibit 31: Trends of Average FAE Ratings in the MPA, by Owner



Costello Parkway over CSX Railroad

Closing

This report serves as a document that documents, analyzes, and presents various measures of bridge and pavement conditions in our planning area every year. This report includes a number of elements that document various elements of our infrastructure, such as Environmental Justice area statistics; National Bridge Inventory criteria; and robust and timely data collection of pavement conditions that results in a uniform dataset and that is useful to our member agencies. It is the SMTC's goal to continue to collect pavement condition ratings for all Onondaga County-owned and City of Syracuse-owned FAE roads for the foreseeable future in order to expand upon this dataset.

Overall, the average pavement score for all roads rated in this report - that is, FAE roads - is 7.1 which went up from 6.8 last year. The percentage of deficient bridges in the MPA is 47%, which went up 1% from last year. An examination of the Trends sections suggests that after some decline in bridge and pavement ratings, the ratings have leveled off. However, as Exhibit 8 shows, our region still lags behind the state, particularly in bridge conditions but also in pavement scores of state roads.

By tracking bridge and pavement conditions, the SMTC hopes to underscore the need for ongoing support of maintenance efforts. As this report has demonstrated over the years, deterioration of bridges and pavement is constant, demanding an ongoing program of monitoring and maintenance to keep the region's transportation infrastructure in good repair. As Chart 1 shows, 75% of the TIP is dedicated to federal aid-eligible highways and to bridge projects. Bridge and pavement maintenance continues to be a priority as funding available for capital improvements has remained relatively flat.



Bear St. over Inner Harbor

