2017 PAVEMENT CONDITION ANNUAL REPORT

DEPARTMENT OF TRANSPORTATION

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Office of Materials and Road Research

Pavement Management Unit

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INTRODUCTION

This report is prepared annually by the Minnesota Department of Transportation (MnDOT) Pavement Management Unit to provide information concerning trunk highway pavement performance. It discusses statewide performance trends compared with established targets and compares performance between the eight Area Transportation Partnerships (ATP).

BACKGROUND

MnDOT's trunk highway system consists of approximately 12,000 centerline miles of pavement. This system consists of bituminous, concrete, and composite pavement with a wide range of conditions, ages, and performance. Each year, the Pavement Management Unit collects pavement roughness and digital image data on the entire trunk highway system, in both directions, and calculates several different metrics related to pavement performance. Condition data has been collected on the trunk highway network since the late 1960s.

DATA COLLECTION

The pavement roughness and surface distress data are collected using a sophisticated digital inspection vehicle (shown below). The van is driven over every mile of trunk highway annually, in both directions. This van is equipped with two cameras to collect images for the Video Log. For pavement distress and rutting measurements, a scanning laser, and a 3D laser/camera system are used to produce images of the pavement surface, from which the type, severity, and amount of cracking can be determined. The van is also equipped with laser height sensors that measure the longitudinal pavement profile, from which pavement roughness is calculated.

Pavement condition data is used to monitor the performance of the system, to aid in project selection, and to identify future pavement maintenance or rehabilitation needs.

INDICES AND MEASURES

MnDOT's pavement condition data is reduced to several indices for reporting the statewide pavement performance measures in MnDOT's 20-year Transportation Plan: Ride Quality Index (RQI), Surface Rating (SR), Pavement Quality Index (PQI), and Remaining Service Life (RSL). Each index captures a different aspect of the pavement's health and can be used to rank pavement sections and predict the need for future maintenance and rehabilitation. They are each briefly described below.

RQI: Ride Quality Index

The RQI is MnDOT's ride, or smoothness, index. It uses a zero to five rating scale, rounded to the nearest tenth. The higher the RQI, the smoother the road is. The RQI is intended to represent the rating that a typical road user would give to the pavement's smoothness as felt while driving his/her vehicle. Most new construction projects have an initial RQI above 4.0. Pavements are normally designed for a terminal RQI value of 2.5. When a road has reached its terminal RQI value it does not mean the road cannot be driven on, but rather that it has deteriorated to the point where most people feel it is uncomfortable and a major rehabilitation is likely needed.

The RQI is calculated from the pavement's longitudinal profile, measured by the front mounted lasers on the digital inspection vehicle. A mathematical simulation, called the International Roughness Index (IRI), is then run to estimate the amount of vertical movement a standard vehicle would experience if driven down the road. The IRI is the roughness index used by every state DOT in the U.S. as well as most countries in the world. In the past, MnDOT has taken a rating panel of 30 to 40 people into the field and driven them over hundreds of test sections to get their perception of the smoothness of various pavement sections. Following right behind them was the digital inspection vehicle. This provides us with a direct correlation between the IRI, as measured by the van, and the perceived roughness, as felt by the rating panel.

SR: Surface Rating

Pavement distresses are those defects visible on the pavement surface. They are symptoms, indicating some problem or phenomenon of pavement deterioration such as cracks, patches, and ruts. The type and severity of distress a pavement has can provide great insight into what the future maintenance and/or rehabilitation needs will be.

MnDOT uses the SR to quantify pavement distress. The distress identification procedure used to determine the SR is done using computer workstations in the Pavement Management Unit of the Office of Materials and Road Research, located in Maplewood, MN. Specialized software is used to examine and analyze the digital images of the pavement captured by the van. The van captures several images simultaneously; front, side, and down.

All condition surveys in 2017 were done using the AutoCrack system. The AutoCrack software looks at digital images of the pavement surface and determines if any cracks or other distresses exist. If so, it then determines their location within the lane and also classifies them by type and severity, and calculates their length and width. A second system, called AutoClass, is then used to convert the AutoCrack distress types and severities into MnDOT distress types and severities. Because the system is automated, MnDOT is now able to conduct continuous distress surveys covering 100% of the length of each section that is rated. Previous surveys were done using a semi-automated method, where a technician would look at the digital images of the pavement and classify the type, severity, and amount of distress. This was a very labor intensive process and as a result only the first 500 feet of each mile could be rated. A 100% survey will better represent the actual condition of the roadway. On undivided roadways, only the outside lane in the increasing direction (north or east) is rated when the SR is measured. On divided routes, the outside lane in both directions is rated.

The percentage of each distress in the section is determined and multiplied by a weighting factor to get a weighted distress value. The weighting factors are greater for higher severity levels of the same distress and greater for distress types that indicate more serious problems exist in the roadway such as alligator cracking or broken panels. The weighted distresses are then combined to determine the SR. The SR ranges from 0.0 to 4.0, and is reported to the nearest tenth. A

higher SR means better condition. A road with no defects is rated at 4.0. A road in need of major rehabilitation or reconstruction will generally have an SR near or below 2.5.

Because the distress rating system changed from a using a 10% sample, semi-automated, human interpretation to the 100%, fully-automated AutoCrack system, there are some differences in the SR when comparing 2017 and 2016 distress data. Most sections have a 2017 SR that is 0.3–0.4 higher than 2016. This is likely due to one or more of the following reasons:

- AutoCrack has difficulty seeing the longitudinal joint along the edges of the lanes.
- Rating 100% of the section length rather than just the first 500 feet.
- Concrete joints are more accurately located with AutoCrack and as a result faulting is much more accurate

PQI: Pavement Quality Index

The PQI is a composite index, equal to the square root of the product of RQI and SR. As such, it gives an overall indication of the condition of the pavement, taking into account both the pavement smoothness and cracking. The PQI is the index used to determine if the state highway system is meeting performance thresholds established for the Government Accounting Standards Board, Standard 34 (GASB 34).

RSL: Remaining Service Life

The RSL is an estimate, in years, until the RQI will reach a value of 2.5, which is generally considered the end of a pavement's design life. Most pavements will need some type of major rehabilitation when the RQI has reached this value. The RSL is determined from pavement deterioration curves. A regression curve is fit through the historical RQI data for each pavement section and the year the RQI will reach 2.5 is estimated. If there is insufficient historical data to make this calculation, default models, based on statewide pavement performance, are used. Rehabilitation activities with long service lives will add a considerable number of years to the RSL of a pavement. Short-term fixes, such as patching, may increase the pavement smoothness for a short time, but do not result in many additional years of RSL.

Each year, the RSL is calculated for all highway segments. From these values, a length-weighted Average Remaining Service Life (ARSL) is calculated for the entire trunk highway system as well as for each ATP. Service life is added when some type of maintenance or rehabilitation is done on a pavement section. Service life is lost when the condition of a pavement section deteriorates due to aging. The ARSL of the highway system increases if the projects being done add more life to the system than the sum of the deterioration of all the other sections.

PERFORMANCE CATEGORIES

MnDOT currently categorizes pavement condition, as measured by the RQI, into five equal categories as shown in Table 1. When reporting performance measures, the top two and bottom two categories are combined and referred to as "Good" and "Poor," respectively. These terms will be used for the remainder of this report.

Table 1. Ride Quality Index (RQI) Performance Categories

Descriptive Category	RQI Range	Performance Measure Category
Very Good	5.0 – 4.1	Good
Good	4.0 – 3.1	
Fair	3.0 – 2.1	
Poor	2.0 – 1.1	Poor
Very Poor	1.0 – 0.0	

PERFORMANCE TARGETS

For reporting statewide pavement conditions, MnDOT breaks the trunk highway system down into three systems: Interstate, Other-NHS, and Non-NHS. Each has its own set of targets.

In 2017, Minnesota's trunk highway system mileage was comprised of 12.7 percent Interstate, 40.9 percent Other-NHS, and 46.4 percent Non-NHS. ATP-2 and ATP-8 do not have any roads on the Interstate system.

MnDOT's targets for the Interstate system are 70 percent, or more, in "Good" condition and 2 percent, or less, in "Poor" condition. The targets for the Other-NHS system are 65 percent, or more, in "Good" condition and 4 percent, or less, in "Poor" condition. The targets for the Non-NHS system: 60 percent or more Good and 10 percent or less Poor. These are shown in Table 2.

The Federal Highway Administration (FHWA) definition of "Good", "Fair", and "Poor" are different than what is described above. Since this document is not intended to be the official document regarding MnDOT's pavement system with regard to the federal definitions and targets, the FHWA measures and targets will not be discussed in this report. That information can be obtained from MnDOT's annual Highway Performance Monitoring System (HPMS) submittal.

RQI targets are based on the percent of miles in the "Good" and "Poor" categories as shown in Table 2. These are statewide targets. It is recognized that some ATPs' pavements will be better than the targets and some will be worse. However, it is desirable to have the ATPs' pavements in somewhat similar conditions so that the public will not encounter drastic differences as they drive throughout the state.

Table 2. Ride Quality Index (RQI) Targets by System

System	Ride Quality Index (RQI)	
	"Good" RQI Target	"Poor" RQI Target
Interstate	70 percent or more	2 percent or less
Other-NHS	65 percent or more	4 percent or less
Non-NHS	60 percent or more	10 percent or less

STATEWIDE HISTORICAL RQI TRENDS

In 2017, the smoothness of the state highway system as a whole improved with 115 more miles in the "Good" category and 92 fewer miles in the "Poor" category, compared to 2016. All three systems improved and had both an increase in the amount of "Good" roads and a decrease in the amount of "Poor" roads. The Non-NHS system improved the most and accounted for 69 of the 92 mile reduction in "Poor" roads.

2008-2017 "Good" RQI Trend (Figure 2)

From 2016 to 2017, the percent of statewide miles in "Good" condition increased on all three systems. The Interstate system increased from 81.0 percent to 82.5 percent, the Other-NHS system increased from 71.5 percent to 72.4 percent and the Non-NHS system increased from 65.8 percent to 66.3 percent. In 2017 there were 10,135 roadway miles in Good condition, roughly 115 more miles than there were in 2016.

Based on the pavement projects listed in the 2018-2021 State Transportation Improvement Program (STIP), the percent of miles in "Good" condition on all three systems is expected to decrease slightly over the next four years. The Interstate system is expected to decrease from its current value of 82.5 percent to 80.1 percent by 2021. The percent of miles in "Good" condition is also expected to decrease on the Other-NHS system, from its current value of 72.4 percent to 68.3 percent. The Non-NHS system is expected to decrease from 66.3 percent to 65.4 percent. This results in an expected decrease of 343 miles of "Good" road over the next four years.

2008-2017 "Poor" RQI Trend (Figure 3)

As was the case with the amount of "Good" roads, all three systems improved in 2017 with a decrease in the amount of "Poor" roads. The Interstate system had a decrease in the percent of miles in "Poor" condition from 1.5 to 1.1 percent. The Other-NHS also improved from 2.0 to 1.7 percent. The Non-NHS system had the biggest improvement with a decrease in "Poor" from 5.5 to 4.4 percent. In 2017 there were 414 roadway miles in Poor condition, roughly 92 fewer miles than there were in 2016.

Based on the pavement projects listed in the 2018-2021 STIP, all three systems are expected to decline and have an increase in the percent of miles in "Poor" condition over the next four years. The Interstate system is expected to increase from 1.1 percent "Poor" to 2.3 percent. The Other-NHS system is expected increase from 1.7 percent "Poor" to 3.6 percent. The Non-NHS system is expected to increase from 4.4 percent to 6.7 percent. This results in an expected increase of 286 miles of "Poor" road over the next four years.

Once a pavement falls into the "Poor" category it normally will require major rehabilitation or reconstruction to restore any meaningful amount of service life. These types of repairs are expensive, thus making it much harder with a limited budget to recover once the amount of miles in this condition becomes very high.

RQI COMPARISON BY ATP

"Good" RQI Comparison (Figures 4, 6, 7 and 8)

On the Interstate system, three of the six ATPs with Interstate pavement had an increase in the number of miles in "Good" condition in 2016 while three had a decrease. All of the changes, however, were very small. ATP-7 had the largest increase (18 miles) followed by Metro (10 miles). This is shown in Figure 4 and Figure 6.

When compared to 2016, the same basic pattern occurred in 2017 on the Other-NHS system, with half the ATP's having an increase in the number of miles in "Good" condition and half a decrease. ATP-4 had the largest increase (42 miles) followed closely by ATP-1 (40 miles). ATP-3 had the largest decrease with a reduction of 25 miles in "Good" condition. This is shown in Figure 4 and Figure 7.

The Non-NHS system also had half the ATP's with a slight increase and half a small decrease in the number of miles in the "Good" category. ATP-8 had the largest increase (33 miles) followed by ATP-1 (16 miles). Metro had the largest decrease with a loss of 24 miles in the "Good" category compared to 2016. This is shown in Figure 4 and Figure 8.

"Poor" RQI Comparison (Figures 5, 9, 10, and 11)

There was very little change in the amount of "Poor" roads on the Interstate system in any of the ATPs. Only ATP-3 had more "Poor" roads in 2017 than they did in 2016 (5 miles). ATP-1, 4 and

6 had no change while ATP-7 and Metro had small reductions (5 and 7 miles, respectively). This is shown in Figure 5 and Figure 9.

There was also very little change in the number of miles in "Poor" condition on the Other-NHS system. Seven of the eight ATP's had changes of 5 miles of less. ATP-1 improved the most with a reduction of 16 miles in "Poor" condition. This is shown in Figure 5 and Figure 10.

The Non-NHS system changed the most from 2016 to 2017, mostly due to ATP-1's 60 mile reduction in miles in "Poor" condition. The other seven ATP's changed by 4 miles or less. This is shown in Figure 5 and Figure 11.

AVERAGE REMAINING SERVICE LIFE (ARSL)

The Average Remaining Service Life (ARSL) is defined as the number of years until the RQI reaches a value of 2.5 or less. This is the point where most people begin to complain that a road's roughness is objectionable and some type of major rehabilitation is likely needed.

2008-2017 ARSL Trend (Figure 12)

The 2017 ARSL was 13.5 years on the Interstate system, 10.4 years on the Other-NHS system, and 8.4 years on the Non-NHS. The ARSL of the Interstate system increased slightly in 2017, from 13.2 to 13.5 years, its highest level since 2000. The ARSL of the Other-NHS system also had a slight increase from 10.3 years in 2016 to 10.4 years in 2017. The ARSL on Non-NHS system remained unchanged at 8.4 years. This is shown in Figure 12.

ARSL Comparison (Figure 13)

By ATP, the ARSL of the Interstate system ranges from 9.6 years (ATP-7) to 16.6 years (ATP-6). The ARSL of the Other-NHS system ranges from 8.8 years (ATP-1 and 7) to 11.8 years (ATP-4). The ARSL of the Non-NHS system ranges from 5.5 (ATP-7) to 10.1 (ATP-2 and 6).

ATP-6 has the highest Interstate ARSL (16.6 years), ATP-4 has the highest Other-NHS ARSL (11.8 years), and ATP-2 and 6 have the highest ARSL on the Non-NHS (10.1 years).

For the third year in a row, ATP-7 has the lowest ARSL on all three systems. However, the ARSL of ATP-7's Interstate and Other-NHS systems did improve in 2017. This is shown in Figure 13.

PREDICTED PAVEMENT CONDITIONS AND ACCURACY

Future year's pavement conditions are predicted using the pavement management system. These predictions are used to provide managers with insight into the impact different funding scenarios will have on pavement conditions. The accuracy of these predictions is reviewed yearly to reassure management that the pavement management system is operating correctly, therefore making it a reliable tool for predicting future needs.

The prediction of future pavement conditions relies on regression curves built into the pavement management system. The curves are either based on section specific historical data or statewide data. If there is adequate historical data since the last rehabilitation on a section, a regression curve is fit through the data and used to predict the RQI. If there is inadequate historical data for the section, or if the regression through the historical data results in an unrealistic curve, then a default curve is used to predict the future RQI. Default curves were developed for all pavement fixes in the pavement management system in the mid-1980s and subsequently updated in 1992 and 2008. The default curves are based on historical statewide performance. For pavement

sections scheduled for work during the STIP, default regression curves are used to predict future conditions.

In 2017, the districts were driven in the following order: D-6, Metro, D-7, D-2, D-1, D-3, D-4 and D-8. Districts 6, Metro and D-7 were driven in the early part of the construction season before few, if any, projects were completed. Districts 2, 1, and 3 were driven in mid-summer when about half of their pavement projects were completed. Districts 4 and 8 were driven in late summer early fall when most of their pavement projects were complete.

Table 3 compares the predicted 2017 pavement conditions, using last year's data, with the actual 2017 measured conditions.

Table 3. Comparison of Predicted 2017 and Actual 2017 RQI by System (percent of miles)

Interstate System RQI Category	**Actual 2016 Data**	**Predicted 2017 Data ***	**Actual 2017 Data**	**Difference Predicted vs Actual**
Good RQI (RQI > 3.0)	81.0	81.5	82.5	+1.0
Poor RQI (RQI ≤ 2.0)	1.5	1.2	1.1	-0.1
Other-NHS System RQI Category	**Actual 2016 Data**	**Predicted 2017 Data ***	**Actual 2017 Data**	**Difference Predicted vs Actual**
Good RQI (RQI > 3.0)	71.5	71.8	72.4	+0.6
Poor RQI (RQI ≤ 2.0)	2.0	2.0	1.7	-0.3
Non-NHS System RQI Category	**Actual 2016 Data**	**Predicted 2017 Data ***	**Actual 2017 Data**	**Difference Predicted vs Actual**
Good RQI (RQI > 3.0)	65.8	67.3	66.3	-1.0
Poor RQI (RQI ≤ 2.0)	5.5	5.7	4.4	-1.3

***Predictions based on the 2017-2020 STIP by 2016 M-Records

The actual 2017 conditions are very close to what they were predicted to be last year, especially on the Interstate and Other NHS systems. On a statewide level there are 13 fewer miles in "Good" condition and 106 fewer miles in "Poor" condition than expected. The difference between the predicted and the actual conditions can be attributed to the following.

1. Construction projects being advanced, reducing "Poor" and increasing "Good"
2. Construction projects not completed, keeping "Poor" from becoming "Good"
3. Changes in the STIP, either advances, delays, or additions.
4. Maintenance work, keeping roads from falling into "Poor" or out of "Good"
5. A change in a road's rate of deterioration (either faster or slower)
6. Unforeseen funding or projects, such as the IDIQ program, improving the road

GOVERNMENT ACCOUNTING STANDARDS BOARD, STATEMENT 34 (GASB 34)

The Government Accounting Standards Board (GASB), a private, nonprofit organization, was established in 1984 by the Financial Accounting Foundation. The Foundation oversees GASB, provides funding, and appoints the members of GASB's board. The Foundation has a similar relationship with GASB's sister organization, the private-sector, standard-setting Financial Accounting Standards Board. GASB's span of influence covers over 84,000 state, county, and other local governmental units. Also impacted by GASB's financial reporting standards are organizations such as public utilities, municipal hospitals, and state universities. GASB, which does not impact the federal government, establishes concepts and standards that guide the preparation of external financial reports. GASB establishes generally accepted accounting

principles that are utilized by auditors charged with evaluating state and local government financial statements.

In June 1999, GASB established a new financial reporting standard that fundamentally changed the way state and local governments report their financial results. Among other provisions, GASB Statement 34 (GASB 34), "Basic Financial Statements—and Management's Discussion and Analysis—for State and Local Governments," requires that major infrastructure assets acquired or having major additions or improvements in fiscal years beginning after June 15, 1980, be capitalized in financial statements. In addition, the cost of using the assets must be reflected. Source: U.S. Department of Transportation, Federal Highway Administration, Office of Asset Management, Primer: GASB 34 (November 2002).

One of the primary purposes of GASB 34 is to demonstrate to the public, and others, that the agency is maintaining its infrastructure in an acceptable condition and does not have any undisclosed liabilities looming in the future.

In terms of determining the cost of using the assets, GASB 34 allows governments to report either a depreciation expense or to apply an alternative modified/preservation approach. Governments may use the modified approach in lieu of depreciating their assets if they have a systematic approach to managing their assets that, at a minimum, meets the following four requirements:

- Having a current inventory of eligible assets
- Documenting the condition of those assets via a reproducible assessment procedure
- Demonstrating that assets are being preserved at a level predetermined by the government
- Estimating the actual cost to maintain and preserve the assets.

MnDOT has chosen to use the modified/preservation approach since it can meet all the requirements listed above. For the purposes of GASB 34, MnDOT established that the state highway system will be maintained, at a minimum, at the following levels.

- Principal Arterial System: Average PQI of 3.0 or higher
- Non-Principal Arterial System: Average PQI of 2.8 or higher

Figure 14 shows how actual and predicted pavement conditions, based on the 2018-2021 STIP, compare with the established GASB 34 levels. Although MAP-21 requires states to report the condition of the Interstate routes separate from the Other-NHS routes, for the purposes of GASB 34 Minnesota will continue with reporting by PA and NPA.

As shown in Figure 14, both the PA and NPA systems are expected to be safely above the GASB 34 minimum thresholds throughout the entire STIP with little to no reduction.

ADDITIONAL INFORMATION

Additional information about the condition and performance of the state highway system, including color-coded maps of the most recent indices, can be obtained from the Pavement Management Unit's website:

http://www.dot.state.mn.us/materials/pvmtmgmt.html

Or by contacting:

David Janisch, Pavement Management Engineer
MnDOT Office of Materials and Road Research
1400 Gervais Avenue, Mailstop 645
Maplewood, MN 55109
(651) 366-5567
dave.janisch@state.mn.us

Figure 1. MnDOT's Area Transportation Partnership (ATP) Boundaries

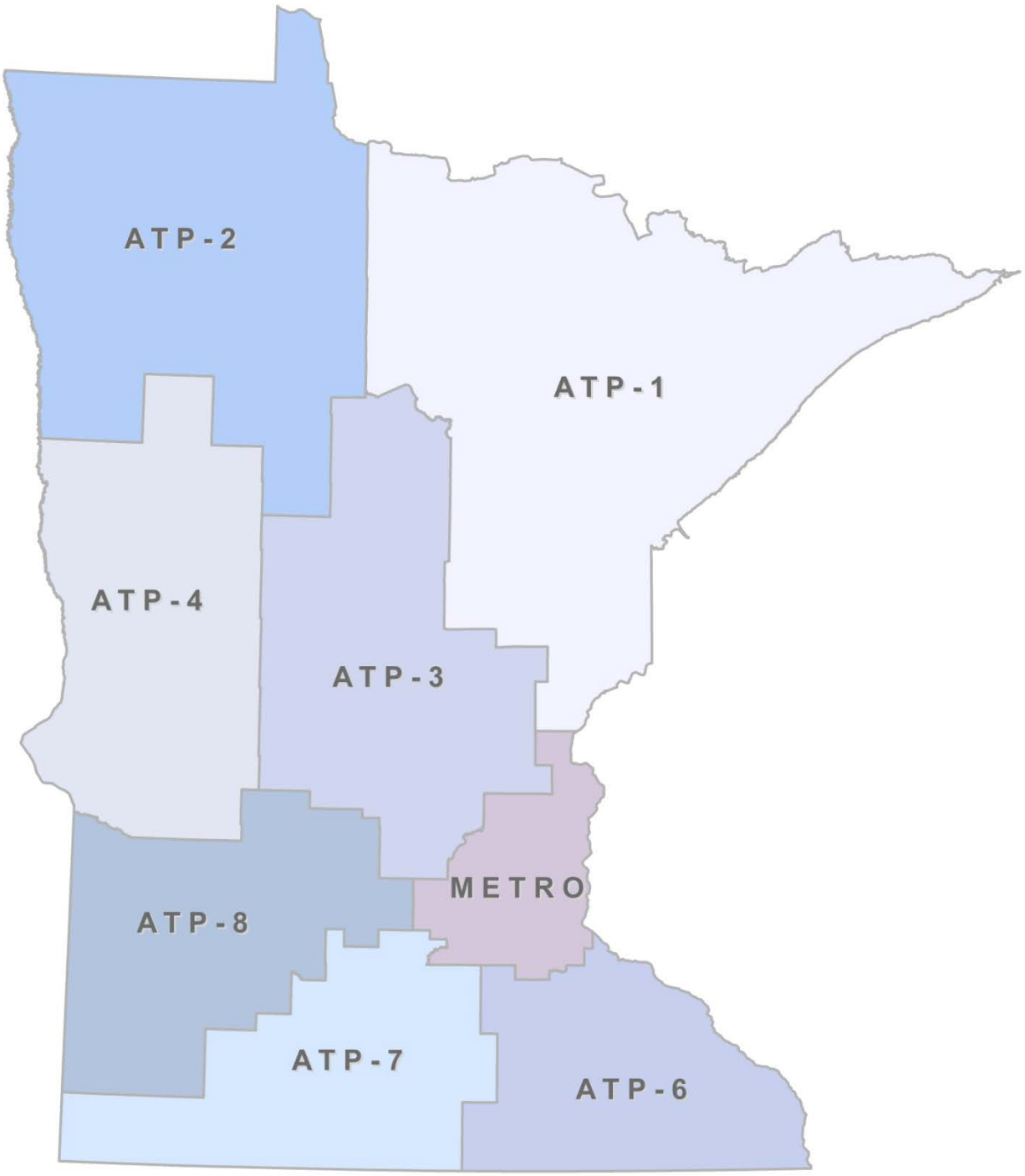
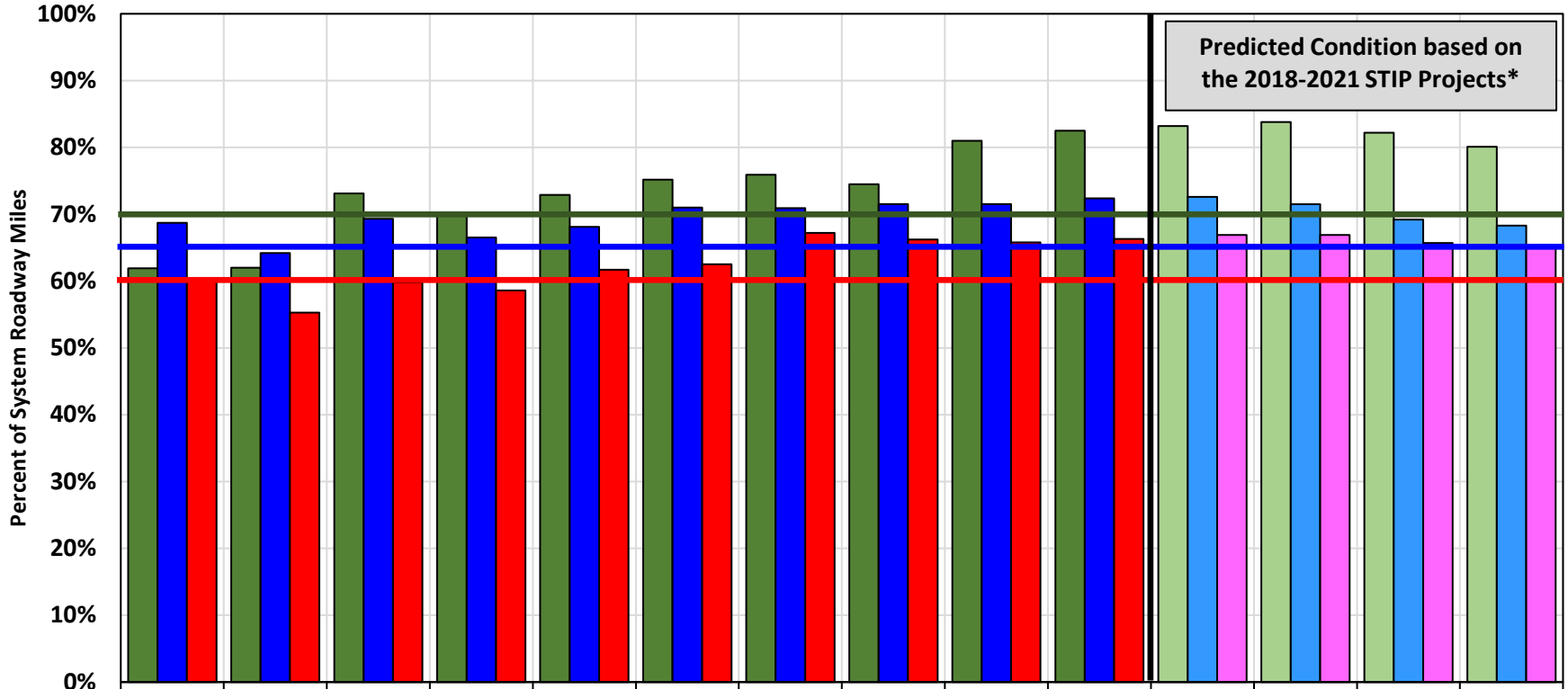


Figure 2

Statewide "Good" Ride Quality Index

(percent of roadway miles with an RQI greater than 3.0)

Actual 2008-2017, Predicted 2018-2021



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Interstate	61.9%	62.0%	73.1%	69.8%	72.9%	75.2%	75.9%	74.5%	81.0%	82.5%	83.2%	83.8%	82.2%	80.1%
Other-NHS	68.7%	64.2%	69.3%	66.5%	68.1%	71.0%	70.9%	71.5%	71.5%	72.4%	72.6%	71.5%	69.2%	68.3%
Non-NHS	60.2%	55.3%	59.8%	58.6%	61.7%	62.5%	67.2%	66.2%	65.8%	66.3%	66.9%	66.9%	65.7%	65.4%

*2016 M-Records with 2018-2021 STIP (w/Chapt.3 & PPM)

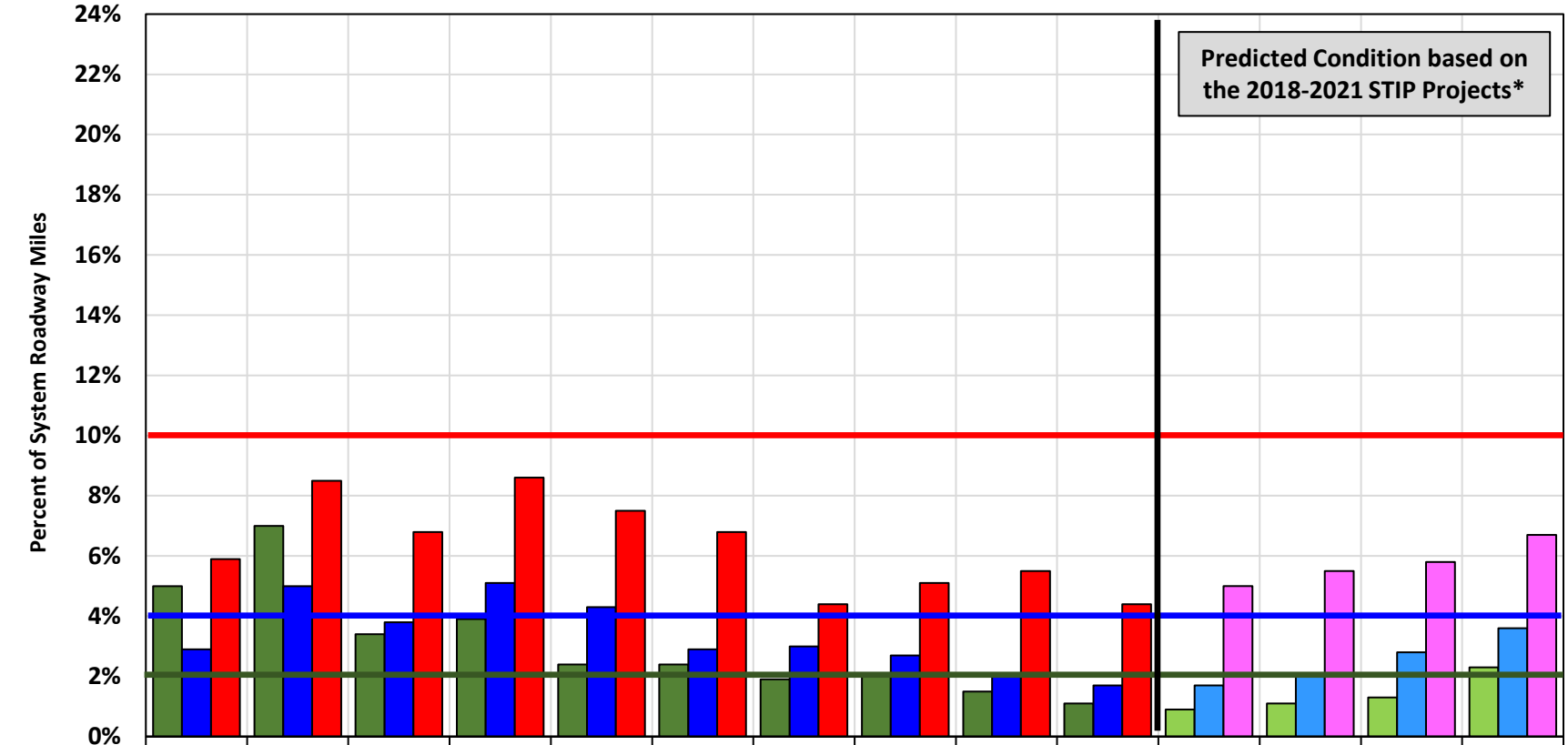
Interstate Target = 70 percent or more
Other-NHS Target = 65 percent or more
Non-NHS Target = 60 percent or more

Figure 3

Statewide "Poor" Ride Quality Index

(percent of roadway miles with an RQI of 2.0 or less)

Actual 2008-2017, Predicted 2018-2021



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Interstate	5.0%	7.0%	3.4%	3.9%	2.4%	2.4%	1.9%	2.1%	1.5%	1.1%	0.9%	1.1%	1.3%	2.3%
Other-NHS	2.9%	5.0%	3.8%	5.1%	4.3%	2.9%	3.0%	2.7%	2.0%	1.7%	1.7%	2.1%	2.8%	3.6%
Non-NHS	5.9%	8.5%	6.8%	8.6%	7.5%	6.8%	4.4%	5.1%	5.5%	4.4%	5.0%	5.5%	5.8%	6.7%

*2016 M-Records with 2018-2021 STIP (w/Chapt.3 & PPM)

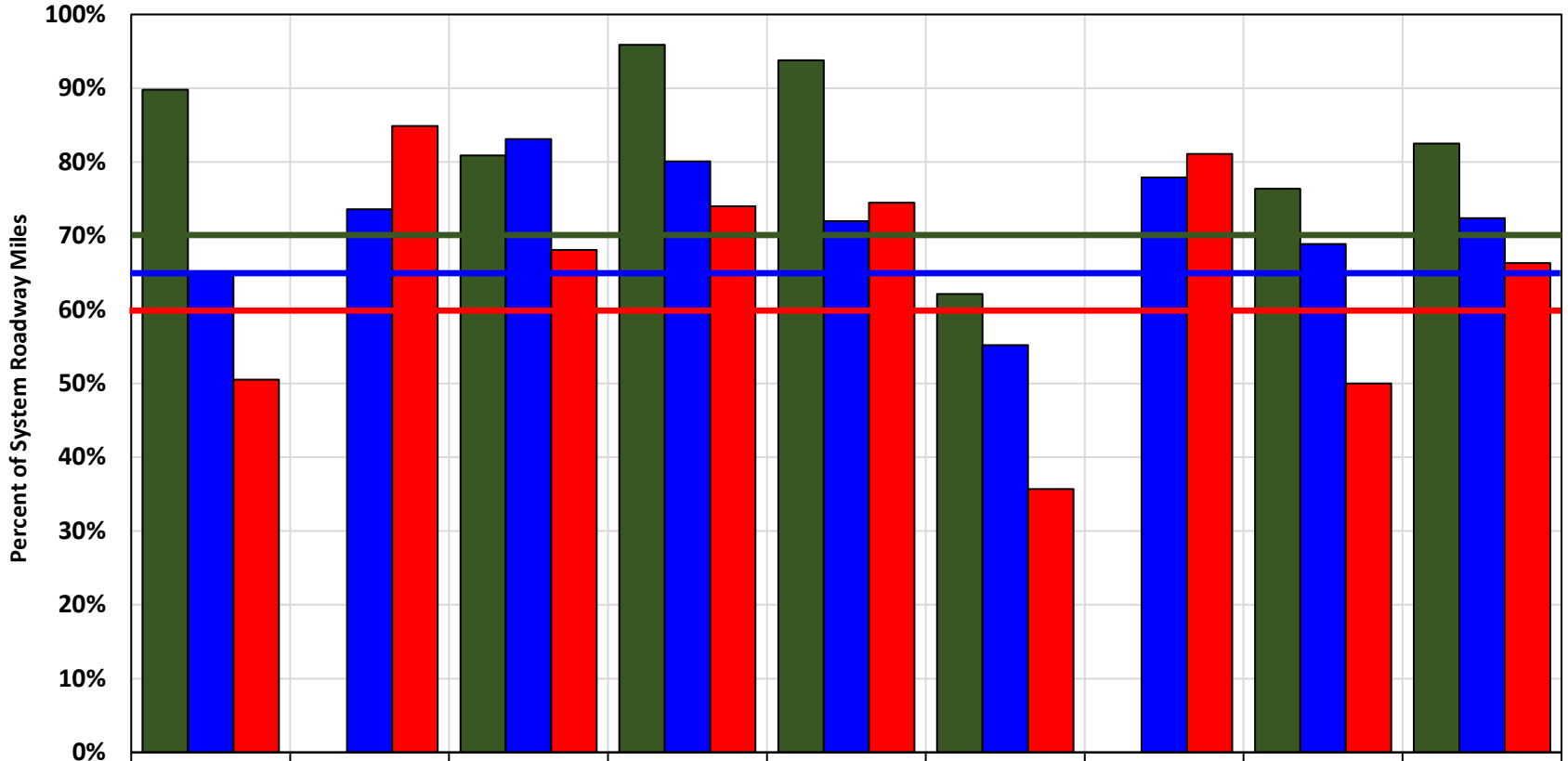
Interstate Target = 2 percent or less
Other-NHS Target = 4 percent or less
Non-NHS Target = 10 percent or less

Figure 4

"Good" Ride Quality Index

(percent of roadway miles with an RQI greater than 3.0)

Comparison of 2017 Data by ATP



	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	Statewide
Interstate	89.8%		80.9%	95.9%	93.8%	62.1%		76.4%	82.5%
Other-NHS	64.9%	73.6%	83.1%	80.1%	72.0%	55.2%	77.9%	68.9%	72.4%
Non-NHS	50.5%	84.9%	68.1%	74.0%	74.5%	35.7%	81.1%	50.0%	66.3%

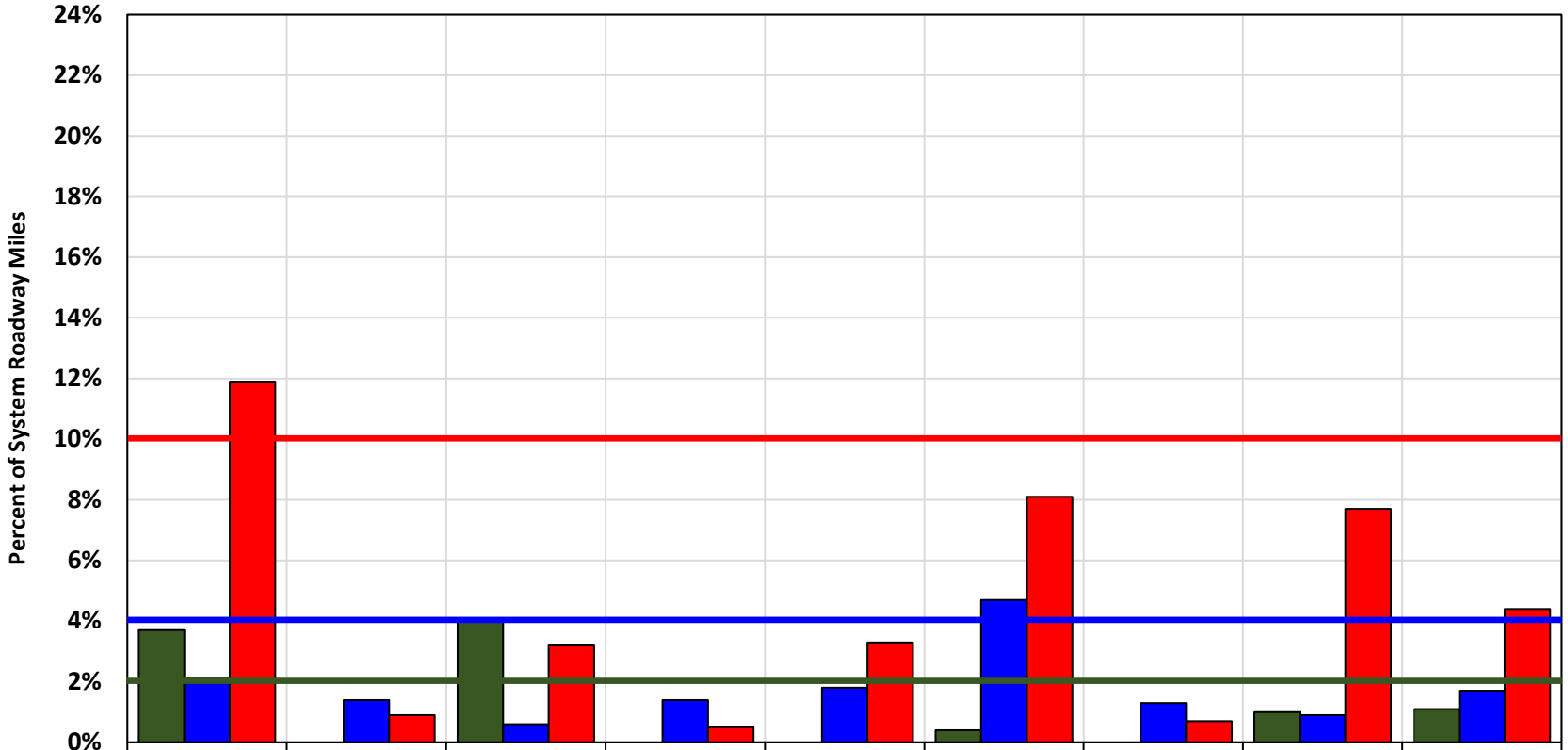
Interstate Target = 70 percent or more
Other-NHS Target = 65 percent or more
Non-NHS Target = 60 percent or more

Figure 5

"Poor" Ride Quality Index

(percent of roadway miles with an RQI of 2.0 or less)

Comparison of 2017 Data by ATP



	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	Statewide
Interstate	3.7%		4.0%	0.0%	0.0%	0.4%		1.0%	1.1%
Other-NHS	2.1%	1.4%	0.6%	1.4%	1.8%	4.7%	1.3%	0.9%	1.7%
Non-NHS	11.9%	0.9%	3.2%	0.5%	3.3%	8.1%	0.7%	7.7%	4.4%

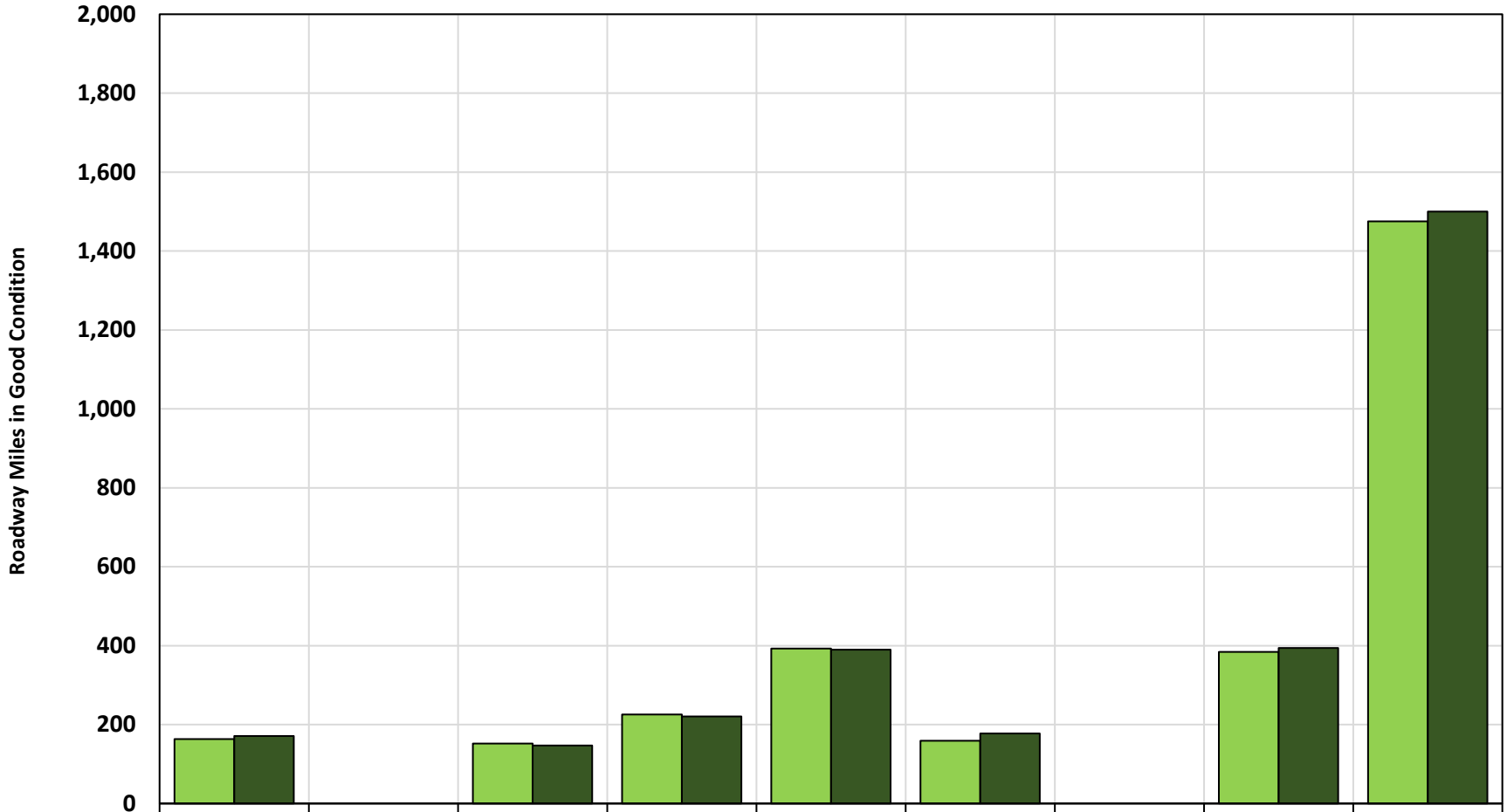
Interstate Target = 2 percent or less
Other-NHS Target = 4 percent or less
Non-NHS Target = 10 percent or less

Figure 6

Comparison of "Good" Ride Quality Index

(roadway miles with an RQI greater than 3.0)

Interstate System, 2016 -vs- 2017 Condition



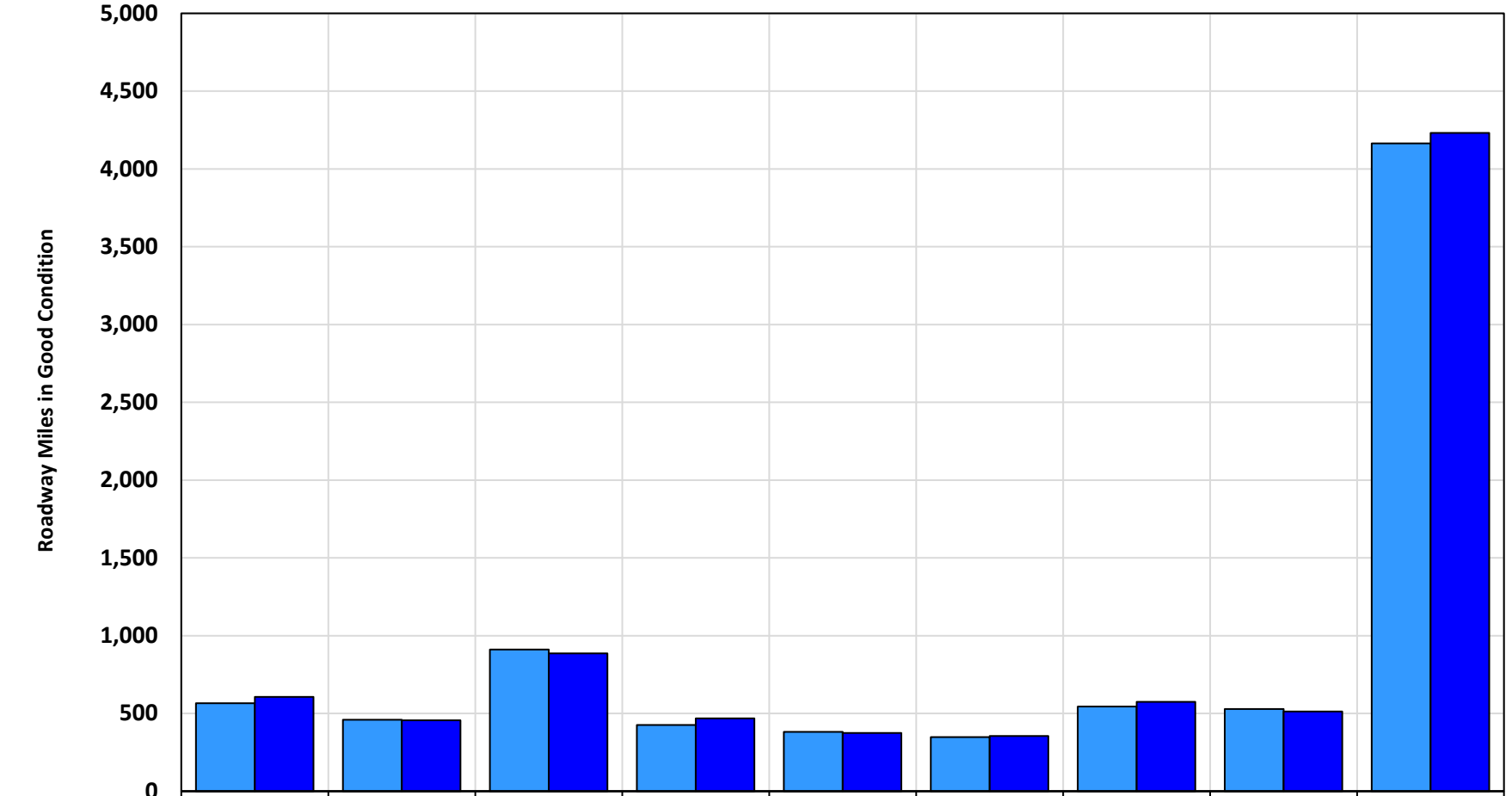
	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	Statewide
2016 Condition	163		152	226	392	159		384	1,475
2017 Condition	171		147	221	390	177		394	1,500

Figure 7

Comparison of "Good" Ride Quality Index

(roadway miles with an RQI greater than 3.0)

Other-NHS System, 2016 -vs- 2017 Condition



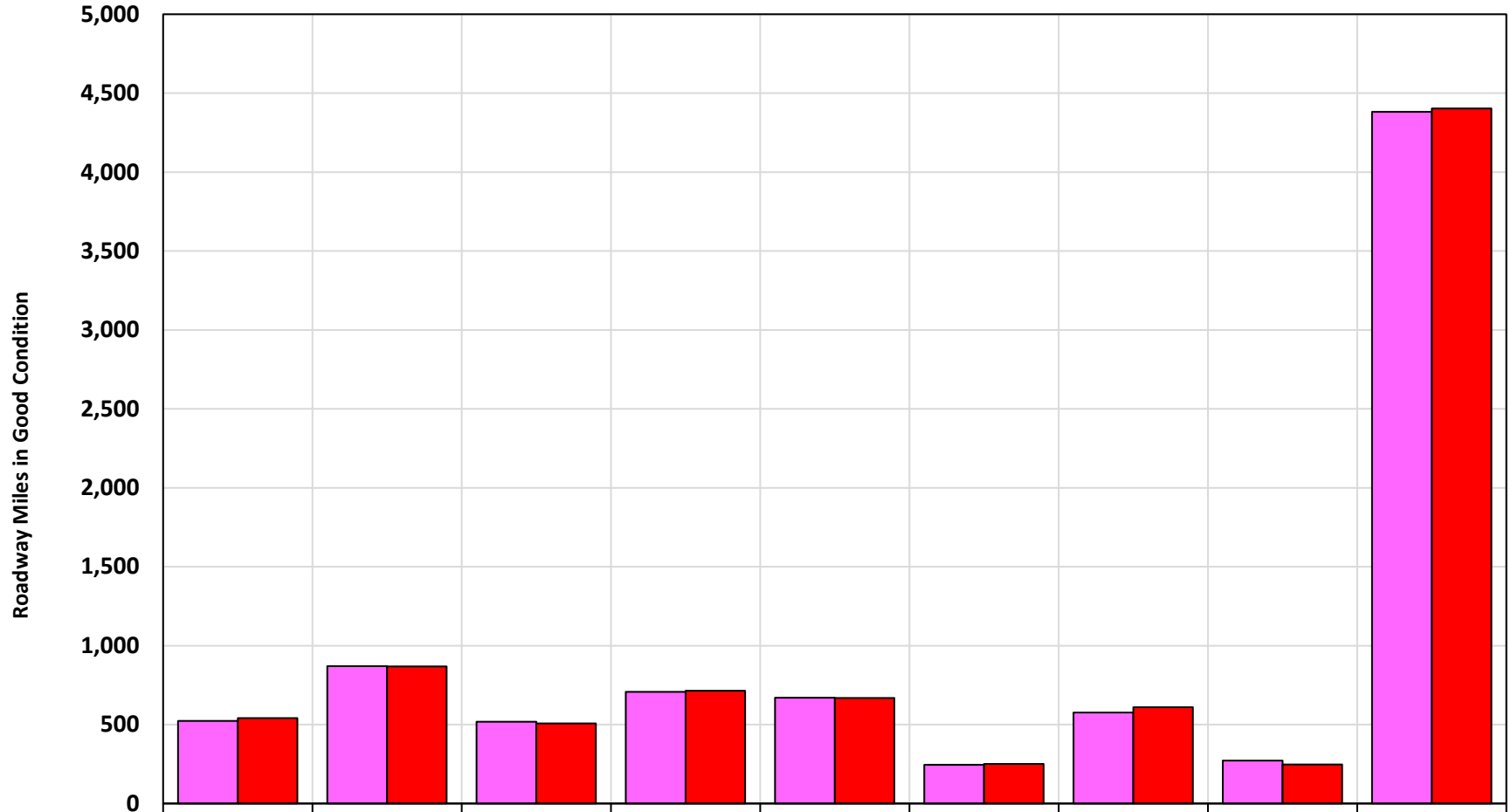
	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	Statewide
2016 Condition	566	460	910	426	381	348	544	529	4,165
2017 Condition	606	455	885	468	374	355	574	513	4,231

Figure 8

Comparison of "Good" Ride Quality Index

(roadway miles with an RQI greater than 3.0)

Non-NHS System, 2016 -vs- 2017 Condition



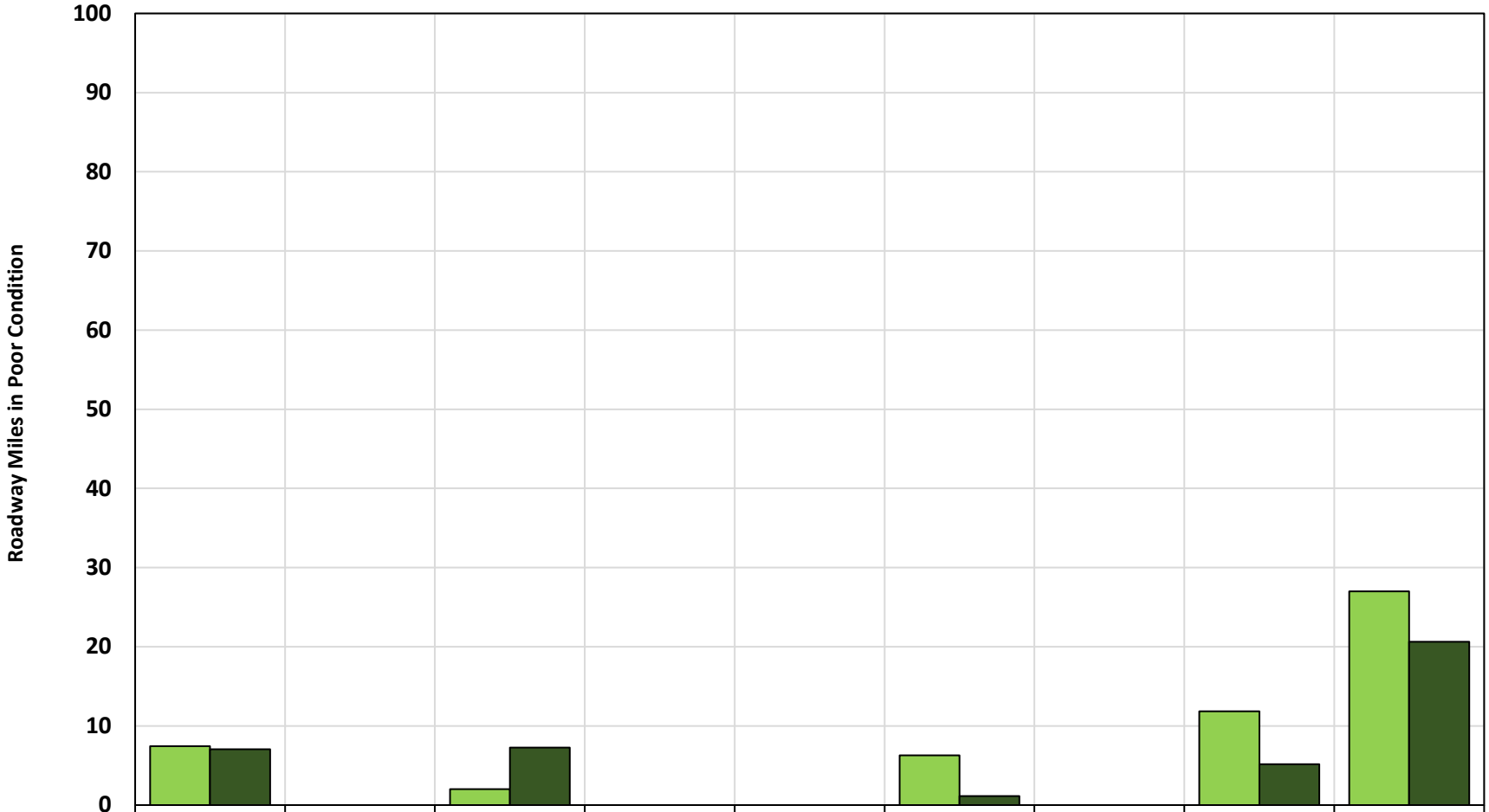
	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	Statewide
2016 Condition	524	870	517	707	670	245	576	271	4,381
2017 Condition	540	868	507	715	668	251	609	247	4,403

Figure 9

Comparison of "Poor" Ride Quality Index

(roadway miles with an RQI of 2.0 or less)

Interstate System, 2016 -vs- 2017 Condition



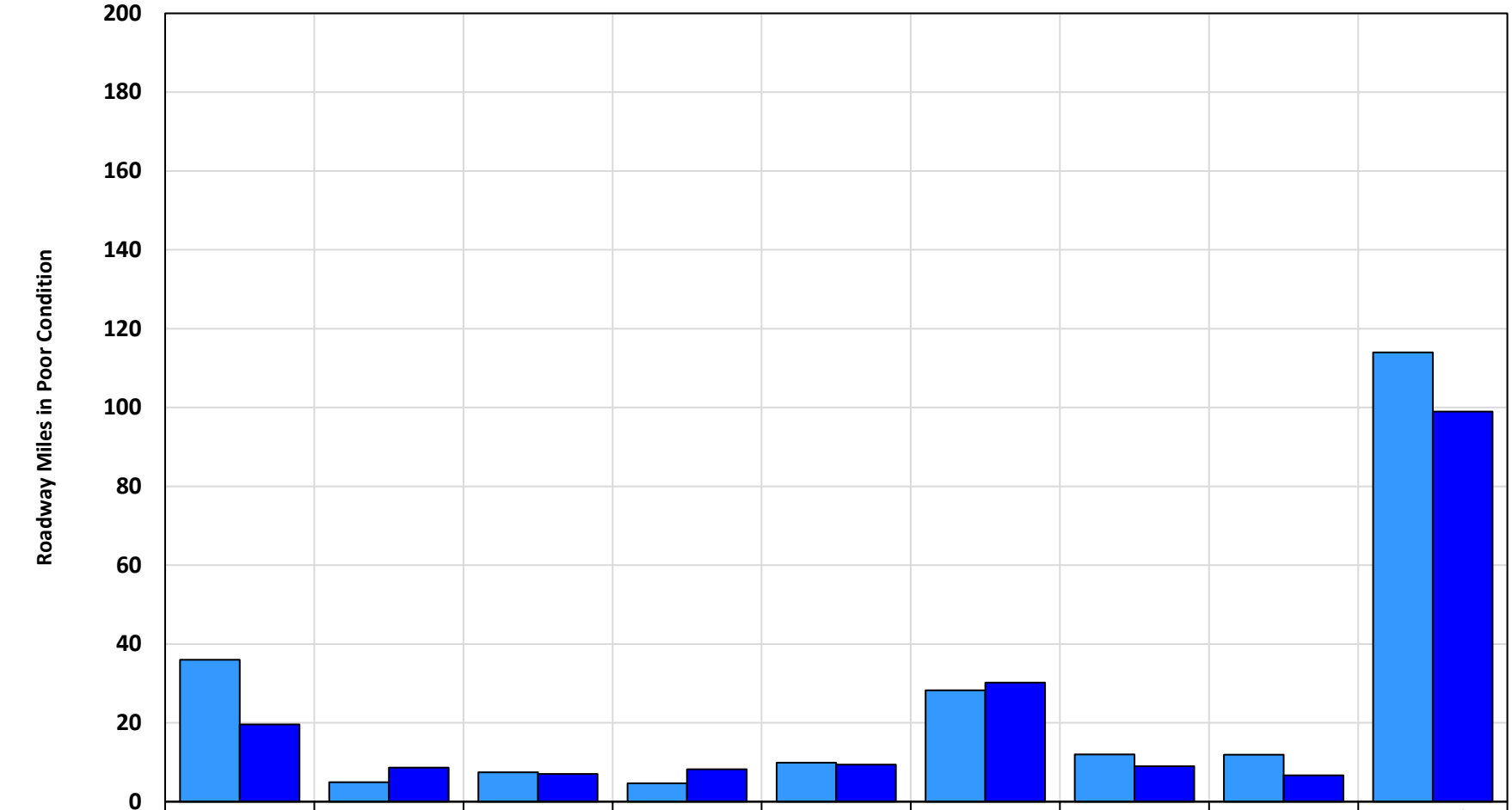
	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	Statewide
2016 Condition	7		2	0	0	6		12	27
2017 Condition	7		7	0	0	1		5	21

Figure 10

Comparison of "Poor" Ride Quality Index

(roadway miles with an RQI of 2.0 or less)

Other-NHS System, 2016 -vs- 2017 Condition



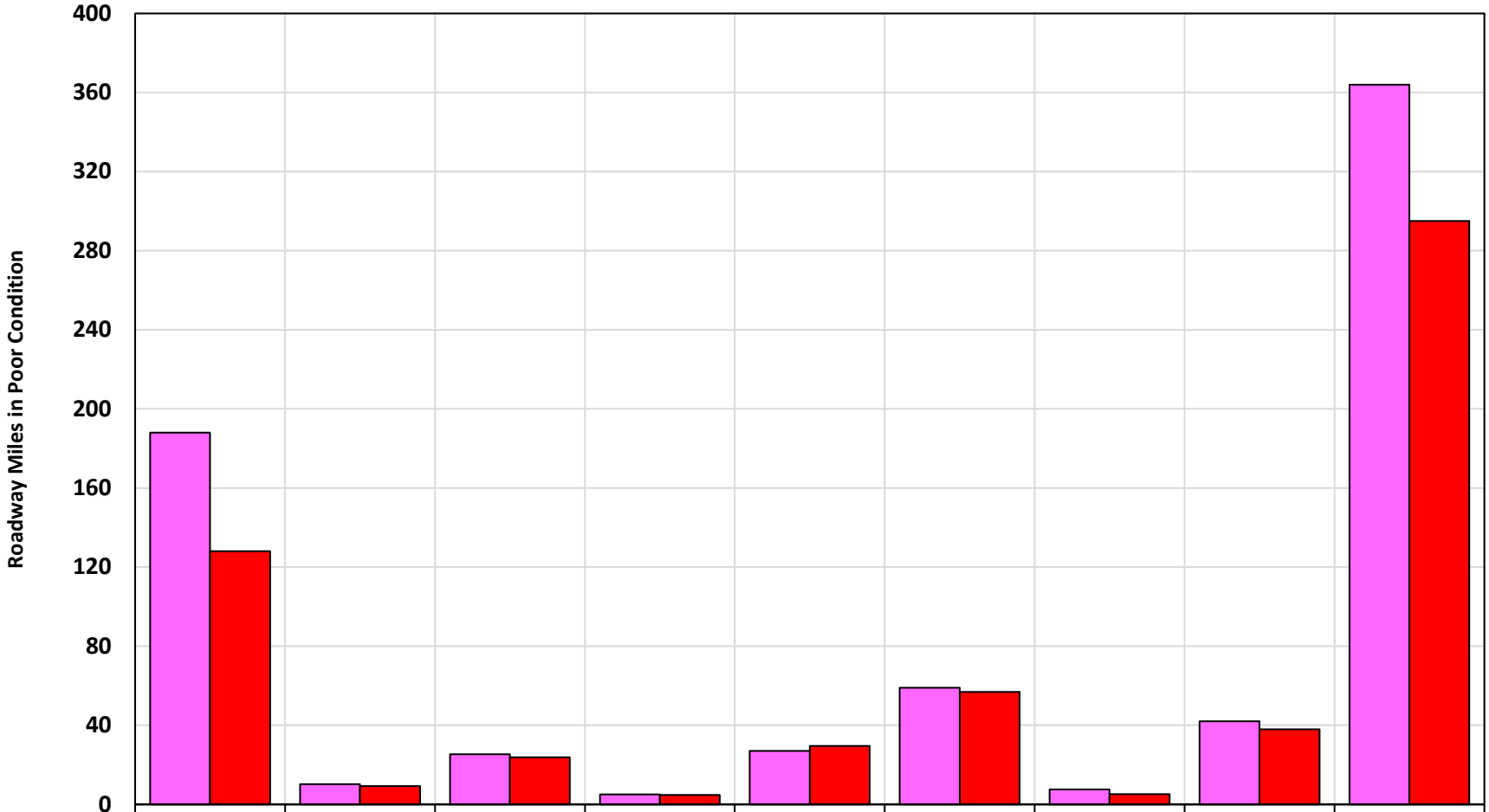
	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	Statewide
2016 Condition	36	5	7	5	10	28	12	12	114
2017 Condition	20	9	7	8	9	30	9	7	99

Figure 11

Comparison of "Poor" Ride Quality Index

(roadway miles with an RQI of 2.0 or less)

Non-NHS System, 2016 -vs- 2017 Condition



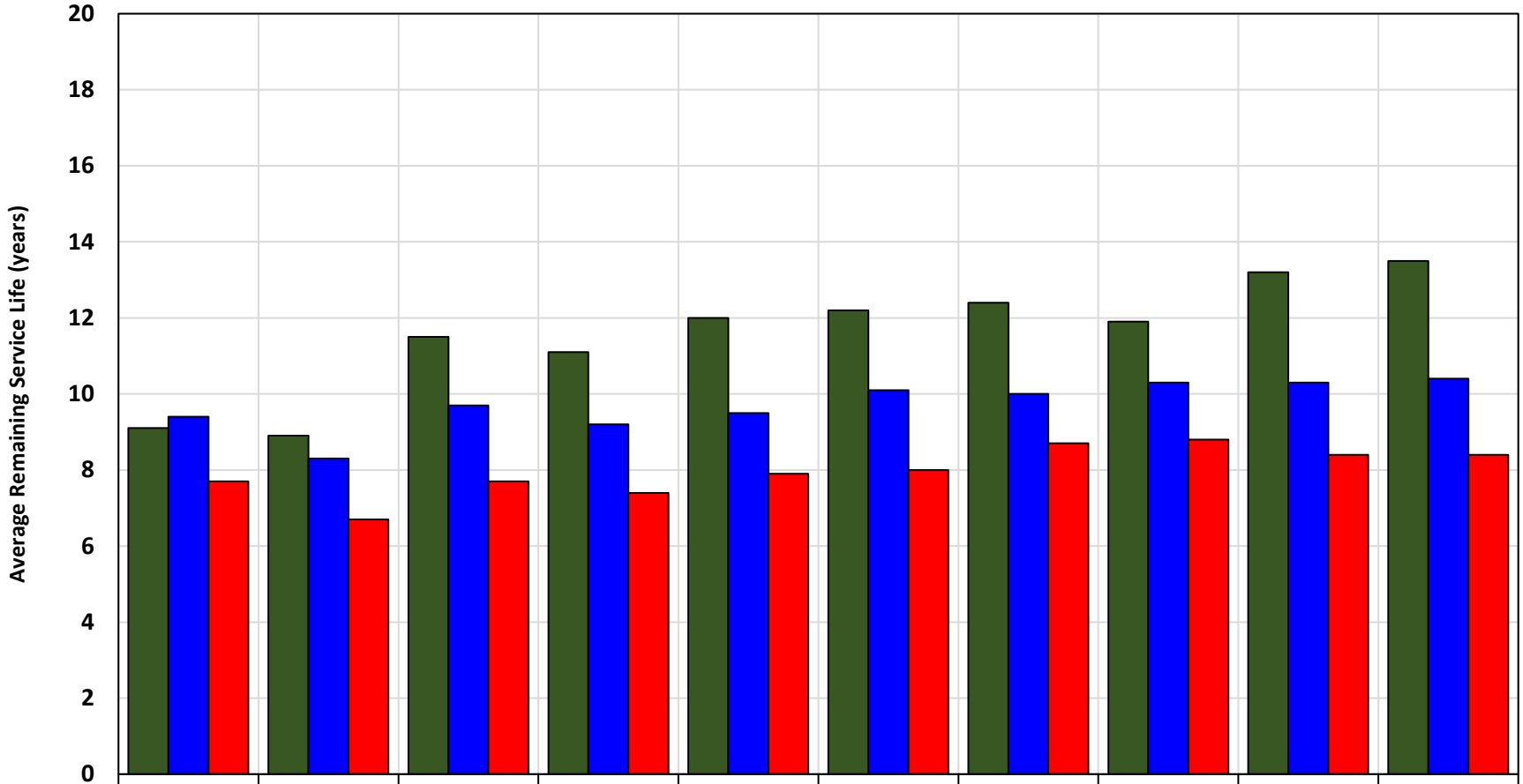
	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	Statewide
2016 Condition	188	10	25	5	27	59	8	42	364
2017 Condition	128	9	24	5	30	57	5	38	295

Figure 12

Statewide Average Remaining Service Life (ARSL)

(years until RQI is predicted to reach 2.5, assuming no future work is done)

Actual 2008-2017 data



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Interstate	9.1	8.9	11.5	11.1	12.0	12.2	12.4	11.9	13.2	13.5
Other-NHS	9.4	8.3	9.7	9.2	9.5	10.1	10.0	10.3	10.3	10.4
Non-NHS	7.7	6.7	7.7	7.4	7.9	8.0	8.7	8.8	8.4	8.4

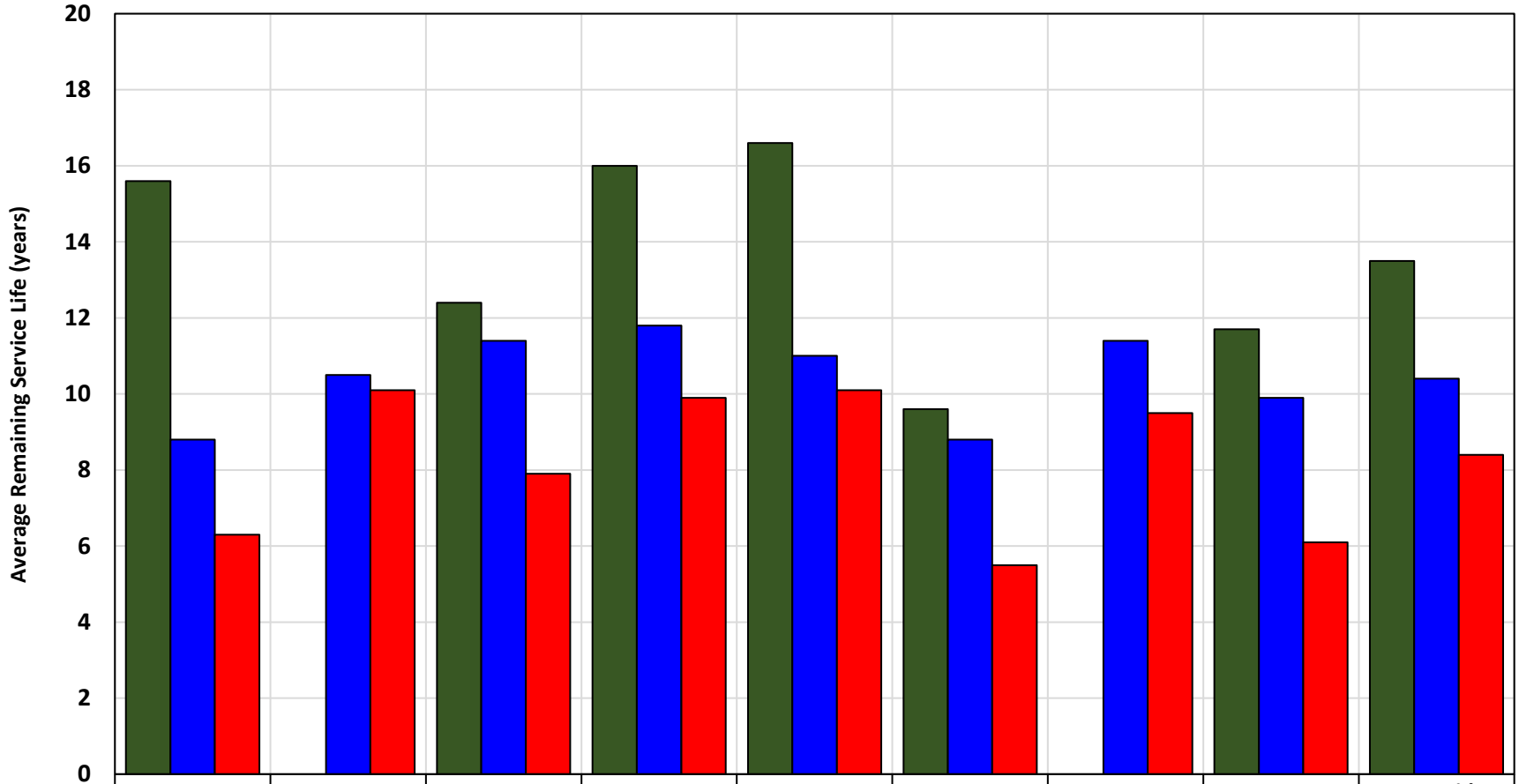
No official targets have been established for ARSL

Figure 13

Average Remaining Service Life (ARSL)

(years until RQI is predicted to reach 2.5, assuming no future work is done)

Comparison of 2017 Data by ATP



	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	Statewide
Interstate	15.6		12.4	16.0	16.6	9.6		11.7	13.5
Other-NHS	8.8	10.5	11.4	11.8	11.0	8.8	11.4	9.9	10.4
Non-NHS	6.3	10.1	7.9	9.9	10.1	5.5	9.5	6.1	8.4

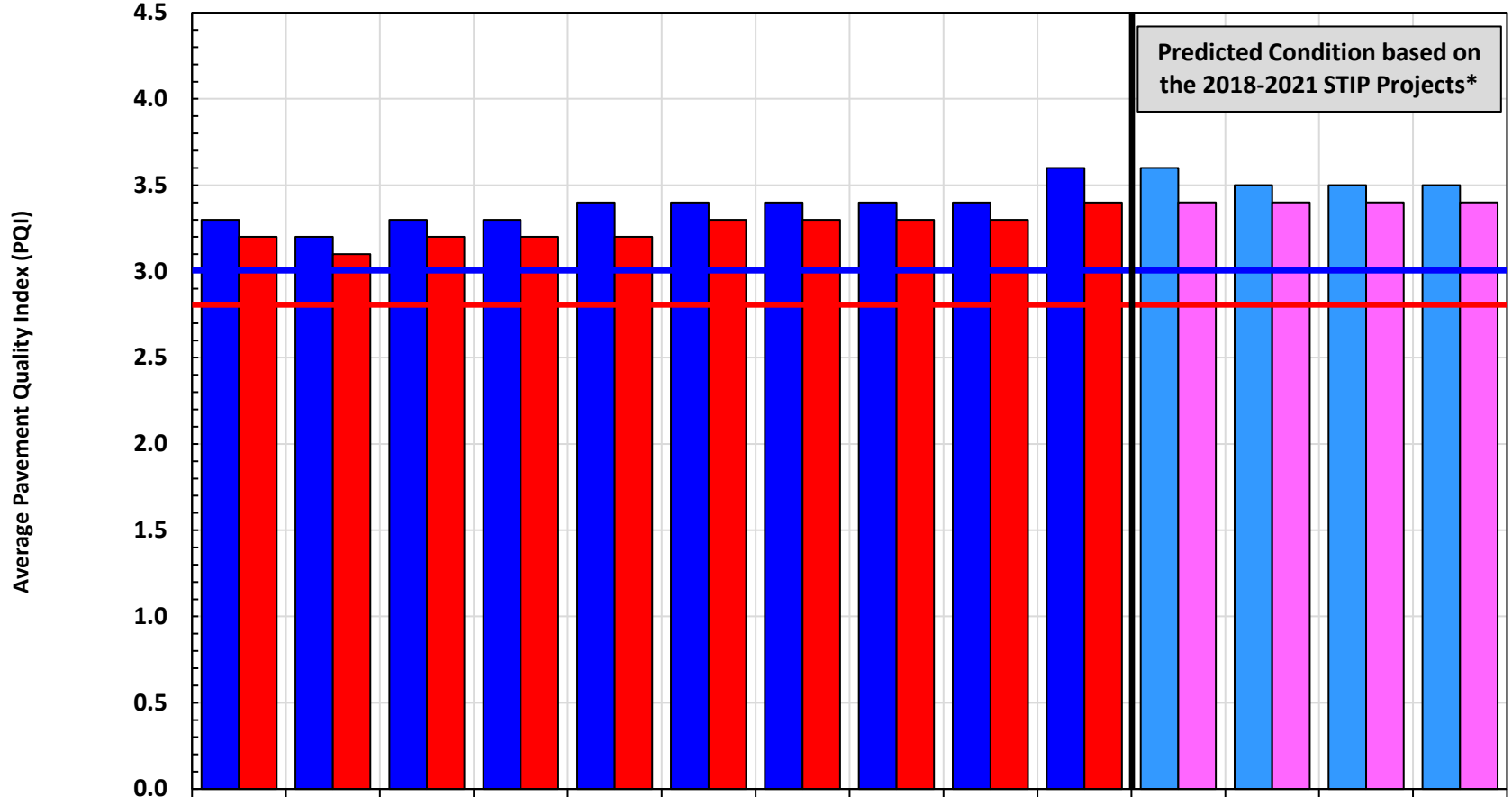
No official targets have been established for ARSL

Figure 14

Statewide Average Pavement Quality Index (PQI)

for GASB 34 Reporting

(PQI = Combined Index of Pavement Smoothness and Cracking)



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Principal Art.	3.3	3.2	3.3	3.3	3.4	3.4	3.4	3.4	3.4	3.6	3.6	3.5	3.5	3.5
Non-Principal Art.	3.2	3.1	3.2	3.2	3.2	3.3	3.3	3.3	3.3	3.4	3.4	3.4	3.4	3.4

*2016 M-Records with 2018-2021 STIP (w/Chapt.3 & PPM)

Principal Arterial Threshold: Average PQI >= 3.0
Non-Principal Arterial Threshold: Average PQI >= 2.8


DEPARTMENT OF
TRANSPORTATION