

NOACA will STRENGTHEN regional cohesion, PRESERVE existing infrastructure and BUILD a sustainable multimodal transportation system to SUPPORT economic development and ENHANCE the quality of life in Northeast Ohio

ROADWAY PAVEMENT MAINTENANCE REPORT



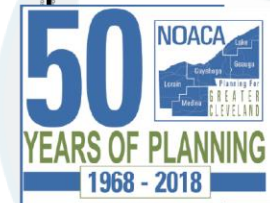
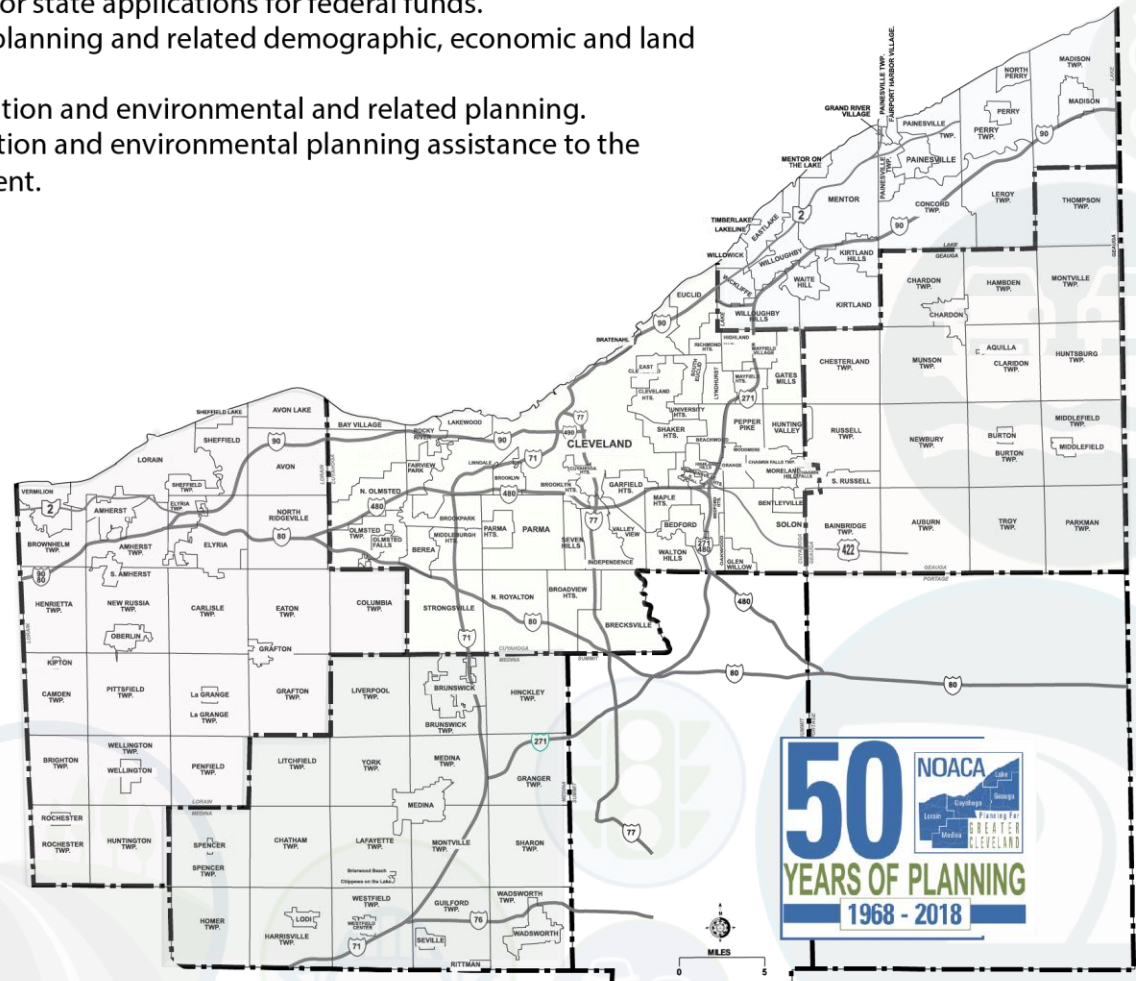
CITY OF AMHERST

The **Northeast Ohio Areawide Coordinating Agency** (NOACA) is a public organization serving the counties of and municipalities and townships within Cuyahoga, Geauga, Lake, Lorain and Medina (covering an area with 2.1 million people). NOACA is the agency designated or recognized to perform the following functions:

- Serve as the Metropolitan Planning Organization (MPO), with responsibility for comprehensive, cooperative and continuous planning for highways, public transit, and bikeways, as defined in the current transportation law.
- Perform continuous water quality, transportation-related air quality and other environmental planning functions.
- Administer the area clearinghouse function, which includes providing local government with the opportunity to review a wide variety of local or state applications for federal funds.
- Conduct transportation and environmental planning and related demographic, economic and land use research.
- Serve as an information center for transportation and environmental and related planning.
- As directed by the Board, provide transportation and environmental planning assistance to the 172 units of local, general purpose government.

The NOACA Board of Directors is composed of 45 local public officials. The Board convenes quarterly to provide a forum for members to present, discuss and develop solutions to local and areawide issues and make recommendations regarding implementation strategies. As the area clearinghouse for the region, the Board makes comments and recommendations on applications for state and federal grants, with the purpose of enhancing the region's social, physical, environmental and land use/transportation fabric. NOACA invites you to take part in its planning process. Feel free to participate, to ask questions and to learn more about areawide planning.

For more information, call (216) 241-2414 or log on at <http://www.noaca.org>



2018 NOACA BOARD OF DIRECTORS

BOARD OFFICERS

President: Armond Budish,
County Executive, Cuyahoga County

First Vice President: Valarie J. McCall,
Chief of Government & International Affairs, City of
Cleveland

Second Vice President: Timothy C. Lennon,
Commissioner, Geauga County

Secretary: Ted Kalo,
Commissioner, Lorain County

Assistant Secretary: Holly C. Brinda,
Mayor, City of Elyria

Assistant Secretary: Michael P. Summers,
Mayor, City of Lakewood

Treasurer: Daniel P. Troy,
Commissioner, Lake County

Assistant Treasurer: James R. Gills, P.E., P.S.,
Lake County Engineer

Assistant Treasurer: Kirsten Holzheimer Gail,
Mayor, City of Euclid

Immediate Past President: Adam Friedrich,
Commissioner, Medina County

BOARD MEMBERS

CUYAHOGA COUNTY

Samuel J. Alai,
Mayor, City of Broadview Heights

Annette M. Blackwell,
Mayor, City of Maple Heights

Pamela Bobst,
Mayor, City of Rocky River

Michael Dylan Brennan,
Mayor, City of University Heights

Tanisha R. Briley,
City Manager, Cleveland Heights

Armond Budish,
County Executive

Glenn Coyne,
Executive Director, Planning
Commission

Timothy J. DeGeeter,
Mayor, City of Parma

Michael W. Dever, MPA
Public Works Director

Kirsten Holzheimer Gail,
Mayor, City of Euclid

Michael D. Gammella,
Mayor, City of Brook Park

Dale Miller,
County Councilman

David H. Roche,
Mayor, City of Richmond Heights

Robert A. Stefanik,
Mayor, City of North Royalton

Michael P. Summers,
Mayor, City of Lakewood

CITY OF CLEVELAND

Anthony Brancatelli,
City Councilman

Freddy L. Collier, Jr.,
Director, City Planning Commission

Blaine A. Griffin,
City Councilman

Frank G. Jackson,
Mayor, City of Cleveland

Martin J. Keane,
City Councilman

Valarie J. McCall,
Chief of Government & International
Affairs

Matthew L. Spronz, P.E., PMP,
Capital Projects Director

GEAUGA COUNTY

Walter "Skip" Claypool,
County Commissioner

Timothy C. Lennon,
County Commissioner

Ralph Spidalieri,
County Commissioner

LAKE COUNTY

Ben Capelle,
General Manager, Laketrans

Jerry C. Cirino,
County Commissioner

James R. Gills, P.E., P.S.,
County Engineer

John Hamercheck,
County Commissioner

Daniel P. Troy,
County Commissioner

LORAIN COUNTY

Holly C. Brinda, Mayor, City of Elyria

Kenneth P. Carney, Sr., P.E., P.S.,
County Engineer

Richard Heidecker,
Trustee, Columbia Township

John D. Hunter,
Mayor, Village of Sheffield

Ted Kalo,
County Commissioner

Matt Lundy,
County Commissioner

Chase M. Ritenauer,
Mayor, City of Lorain

MEDINA COUNTY

Jeff Brandon,
Trustee, Montville Township

Andrew H. Conrad, P.E., P.S.,
County Engineer

Adam Friedrich,
County Commissioner

Patrick Patton,
City Engineer, City of Medina

REGIONAL AND STATE

Greater Cleveland Regional
Transit Authority (GCRTA)
Joseph A. Calabrese,
CEO and General Manager

Northeast Ohio Regional Sewer
District (NEORSDD)
Kyle Dreyfuss-Wells, Chief Executive Officer

Cleveland-Cuyahoga County Port Authority
William D. Friedman, President/CEO

Ohio Department of Transportation (ODOT)
Myron S. Pakush, Deputy Director, District 12

Ex Officio Member:

Kurt Princic, Chief, Northeast District Office,
Ohio Environmental Protection Agency (OEPA)

NOACA DIRECTORS

Grace Gallucci,
Executive Director

Billie Geyer,
Comptroller

Marvin Hayes,
Director of Communications & Public Affairs

Randy Lane,
Director of Programming

Susanna Merlone, EMBA,
Director of Administrative Services

Kathy Sarli,
Director of Planning

Jonathan Giblin,
Associate Director of Compliance

TABLE OF CONTENTS

1. Executive Summary 2

2. Background 3

3. PART I: 2016 Pavement Condition 8

4. PART II: 2018 Current Backlog 13

5. PART III: Maintenance & Rehabilitation (M&R) Program..... 14

6. PART IV: Comparative Analysis 16

7. Appendix..... 20

MAPS

1: City of Amherst Location in the NOACA Region..... 4

2: 2016 City of Amherst Pavement Condition 10

FIGURES

1: 2016 Amherst Pavement Network Condition Chart by Lane-Miles 9

2: The PCR Acceptable Level and “Need Year” Relation 14

3: Average PCR Comparison by the Constraint Scenarios and by Year 18

TABLES

1: Selected Pavement Treatments and Their Planning Level Costs..... 6

2: 2016 Amherst Pavement Network Condition 8

3: 2016 City of Amherst Pavement Condition Listing..... 11

4: Performance Comparison of the Constraint Scenarios..... 17

APPENDIX

The “2018 Current Backlog” Pavement Treatment List 20

The “Maintain 15% Deficiency” Pavement Treatment List..... 21

The “Maintain an Average Network PCR of 80” Pavement Treatment List 22

The “M&R” Pavement Treatment List 25

The “Maintain Lowest Standard PCR” Pavement Treatment List 28

EXECUTIVE SUMMARY

The 2016 Ohio Department of Transportation (ODOT) pavement database has 3,626 segment records for the Northeast Ohio Areawide Coordinating Agency (NOACA) region. The NOACA region has a total of 3,330 centerline miles of roadways including freeways and federal-aid highways which is equivalent to 8,561 lane-miles. The regional segment average Pavement Condition Ratings (PCR) is about 77.

In the City of Amherst there are 16.34 centerline miles of federal-aid roads, which are equivalent to 38.46 lane-miles within the city boundary that include the Ohio Turnpike (I 80) / Interstate 90 (I 90), State Route 2 (SR 2), and State Route 58 (SR 58). The 2016 ODOT pavement database has 30 segment records for the City of Amherst roadway system. Each record comprises of several fields of various information and measures such as Street name, Length (miles), Lane-miles length, Number of Lanes, Function Class, Pavement Condition Ratings (PCR), etc.

According to the PCR measure, about 63 percent of the pavement lane-miles are currently in the “Good” to “Very Good” condition and only a small percent of pavement is in the “Fair to Poor” status and demands some kind of immediate preventive maintenance and /or rehabilitation treatments.

This pavement study includes four parts:

- Part I: The 2016 pavement network condition,
- Part II: The 2018 backlog,
- Part III: The Maintenance and Rehabilitation (M&R) program,
- Part IV: The Comparative analysis.

Considering the five-year study period of 2018 - 2022, this pavement study focuses on the required preventive maintenance treatments and some rehabilitation techniques rather than reconstruction.

Part I of this study analyzes the 2016 pavement network condition and tabulates the important information of all the 30 road segments in the City of Amherst.

In Part II, the backlog is defined as the cost of pavement rehabilitation of all roads within one year (2018) and bringing the average network PCR to 80. Backlog is a “snapshot” or relative measure of outstanding rehabilitation work.

Part III introduces the optimal preventive maintenance and rehabilitation strategy for each segment and its recommended implementation year based on the NOACA maintenance decision tree.

Finally, Part IV compares the backlog and the “M&R” program with the NOACA transportation asset management strategies. All these strategies were compared regarding their costs, the average network PCR and percent of the lane-miles below the acceptable level.

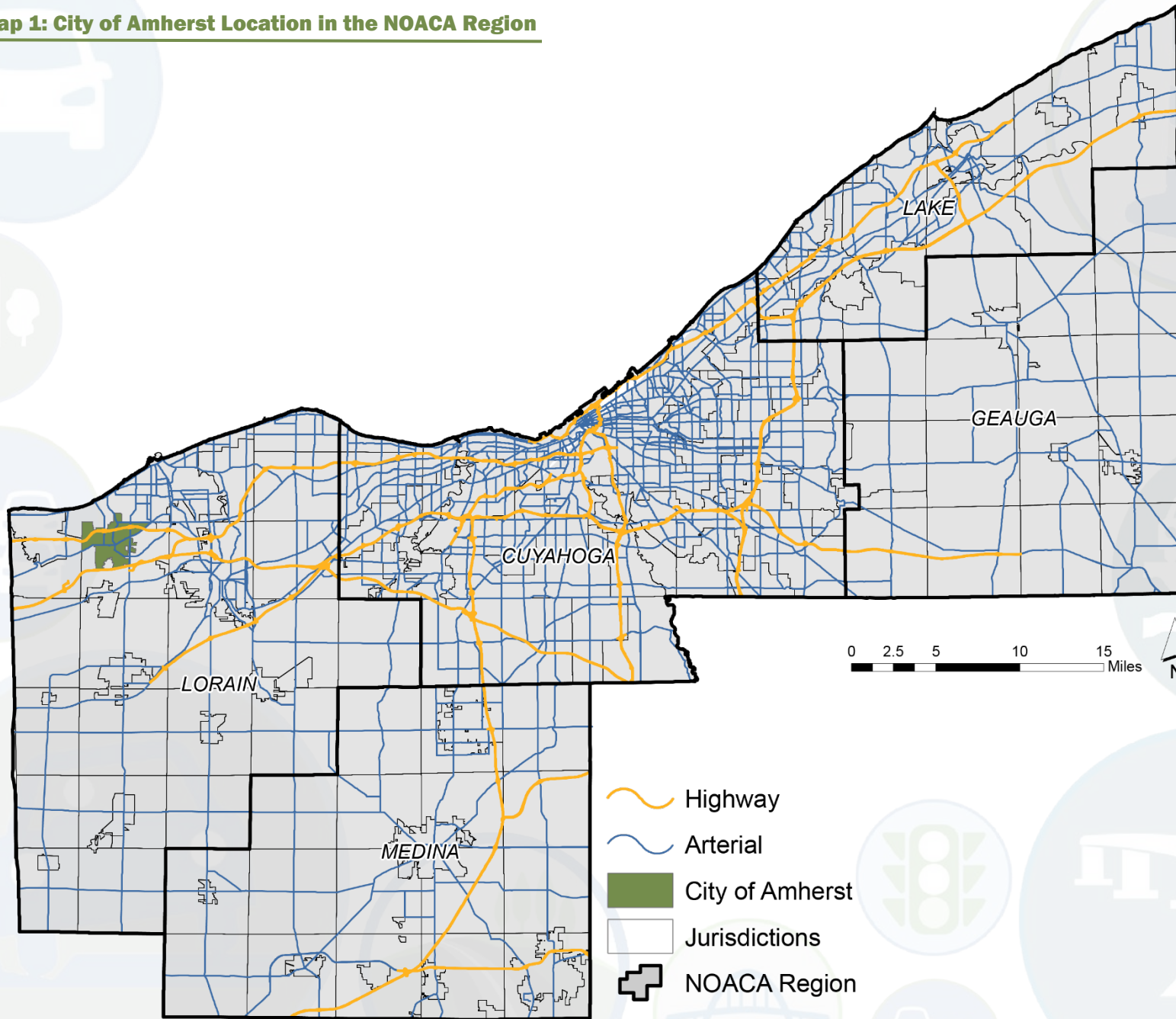
BACKGROUND

The City of Amherst was founded by Josiah Harris who relocated to the area about 1818. It was first known as Amherst Corners in the early 1830's. By the late 1800's it had acquired the title Sandstone Center of the World; many of its early buildings were constructed of native sandstone and the quarries were also an important source of grindstones. There were nine sandstone quarries operating in the area at the peak of production.

As of the Northeast Ohio Areawide Coordinating Agency (NOACA) 2015 estimates, the city had a population of 11,922 and employment of 6,482. The City of Amherst includes the Ohio Turnpike (I 80) / Interstate 90 (I 90), State Route 2 (SR 2), and State Route 58 (SR 58). Cleveland-Hopkins International Airport is the nearest airport.

Map 1 illustrates the City of Amherst location in the NOACA region.

Map 1: City of Amherst Location in the NOACA Region



For the purpose of this study:

Pavement Reconstruction is defined as the replacement or reestablishment of the original pavement structural capacity by the placement of the equivalent or increased pavement structure. Reconstruction may utilize either new or recycle materials for the reconstruction of the complete pavement structure.

Pavement Rehabilitation is defined as resurfacing, restoration, and rehabilitation (3R) work consisting of structural enhancements that extend the service life of an existing pavement and/or improve its structural capacity. Rehabilitation techniques include restoration treatments and/or structural overlays. This may include partial recycling of the existing pavement, placement of additional surface materials, and/or other work necessary to return an existing pavement to a condition of structural or functional adequacy.

Preventive Maintenance is considered as cost effective treatments to an existing roadway system and its appurtenances that preserves the system, delays future deterioration, and maintains or improves the functionality condition of the system without increasing structural capacity. Projects that address deficiencies in the pavement structure or increase the structural capacity of the facility are not considered preventive maintenance.

Maintaining the roadways in a state of good repair is essential and experience has shown that, over time it is less expensive to invest in preventive maintenance and/or rehabilitation in an ongoing basis rather than in reconstruction of pavement that has deteriorated to a poor condition.

This pavement study analyzes the current status of the Amherst pavement network condition and considers the five-year study period of 2018-2022. It mainly focuses on the required roadway pavement preventive maintenance treatments and some rehabilitation techniques rather than reconstruction. The 2016 Ohio Department of Transportation (ODOT) pavement database was used as the input data and RoadMatrix software was utilized as the NOACA Pavement Management platform.

Seven roadway pavement preventive maintenance and rehabilitation treatments were considered in the Amherst pavement network analysis for the study period and Table 1 illustrates the selected treatment and their associated planning level costs.

Table 1: Selected Pavement Treatments and Their Planning Level Costs

Maintenance Treatment Type	Cost per SQ FT (2016\$)	Estimated Cost per 12-FT lane-Mile (2016\$)
Crack Fill	0.08	5,100
Joint Repair	0.24	15,200
Crack Fill and Slurry	0.4	25,300
Preventive Maintenance Minor	0.5	31,700
Micro – Pave Type Surface Treatment	0.722	45,700
Selective Patch, Mill and 1.5” O/L	1.5	95,000
2.0 inch Hot Mix Mill and Overlay	1.9	120,400

Pavement Maintenance Treatment Definitions

Crack Fill: it is the placement of asphalt emulsion into non-working cracks to reduce water infiltration and to reinforce the adjacent pavement.

Slurry Seal: a mixture of fine aggregate, asphalt emulsion, water, and mineral filler, used when the primary problem is excessive oxidation and hardening of the existing surface. Slurry seals are used to retard surface raveling, and improve surface friction.

Joint Repair: used to remove deteriorated concrete pavement long joint/crack repairs. It minimizes infiltration of surface water and incompressible material into the joint system.

Preventive Maintenance (Minor): typically applied to pavements in good condition having significant remaining service life. Examples of minor preventive treatments include asphalt crack sealing, chip sealing, slurry or micro-surfacing, thin and ultra-thin hot-mix asphalt overlay, and concrete joint sealing.

Micro – Pave (Type II Surface Treatment): consist of the application of a mixture of water, asphalt emulsion, aggregate (very small crushed rock), and chemical additives. It is used to treat surfacing and rut filling on roads that get moderate to heavy levels of traffic.

2.0in Hot Mix Mill & Overlay: applied as a maintenance treatment. Thin overlays should only be placed on structurally sound pavements. That is because they offer little structural improvement, but they can renew the surface in terms of functional performance (i.e., ride quality).

Selective Patching, Mill & 1.5 O/L: it is primarily done to extend the life of a roadway. Patch mill and overlay projects are designed to remove damaged portions of the roadway and replace it with new smooth pavement.

This report includes the following four parts:

- I. The 2016 status of the Amherst pavement network condition,
- II. The 2018 “backlog” treatment list,
- III. The optimal preventive maintenance and rehabilitation strategies, and
- IV. The comparative analysis.

PART I: 2016 PAVEMENT CONDITION

In order to provide an accurate assessment of the current status and further pavement analyses, the pavement network is required to be divided into homogeneous discrete sections in terms of surface distress, traffic volumes, pavement structure, etc. The 2016 ODOT pavement database has 30 segment records for the City of Amherst roadway system. Each record comprises of several fields of various information and measures such as Street name, Length (miles), Lane-miles length, Number of Lanes, Function Class, Pavement Condition Ratings (PCR), etc.

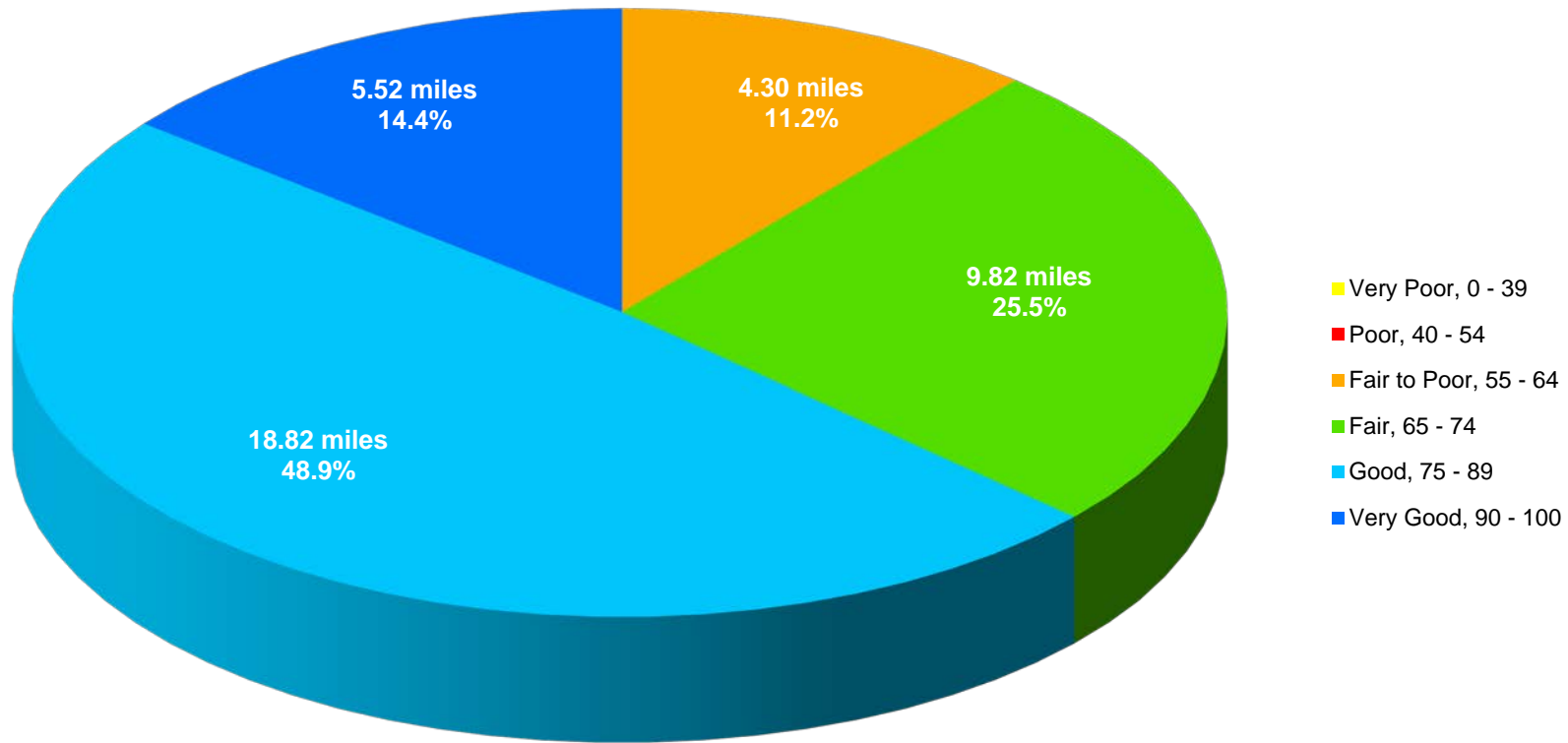
Based on the utilized ODOT database, there are 16.34 centerline miles of federal-aid eligible roads which are equivalent to 38.46 lane-miles in the City of Amherst. The total area of roadway is 2,536,247 Sq. Ft.

The PCR measure is a qualitative description of the structural state of the pavement. The PCR values span a spectrum of descriptive narrative ranging from “Very Good” to “Very Poor”. Each roadway segment is scored from 0 to 100 with 0 representing completely distressed pavement and 100 indicating perfect pavement condition. The lane-mile weighted average of the City of Amherst segment PCRs is about 78. Table 2 and Figure 1 summarize the 2016 Amherst pavement network conditions by percentages of roadway lane-miles length.

Table 2: 2016 Amherst Pavement Network Condition

Pavement Condition	PCR Range	Lane-Miles	Percent of Lane-Miles
Very Poor	0 - 39	0.00	0%
Poor	40 - 54	0.00	0%
Fair to Poor	55 - 64	4.30	11.2%
Fair	65 - 74	9.82	25.5%
Good	75 - 89	18.82	48.9%
Very Good	90 - 100	5.52	14.4%

Figure 1: 2016 Amherst Pavement Network Condition Chart by Lane-Miles



As indicated, about 63 percent of the pavement lane-miles are currently in the “Good” to “Very Good” condition and the lane-mile weighted average PCR also represents a “Good” condition. About 11 percent of the lane-miles are in the “Fair to Poor” status and demand some kind of immediate maintenance and/or rehabilitation treatments.

Map 2 illustrates the 2016 Amherst roadway pavement condition for each segment record and Table 3 tabulates the 2016 Amherst pavement condition listing.

Map 2: 2016 City of Amherst Pavement Condition

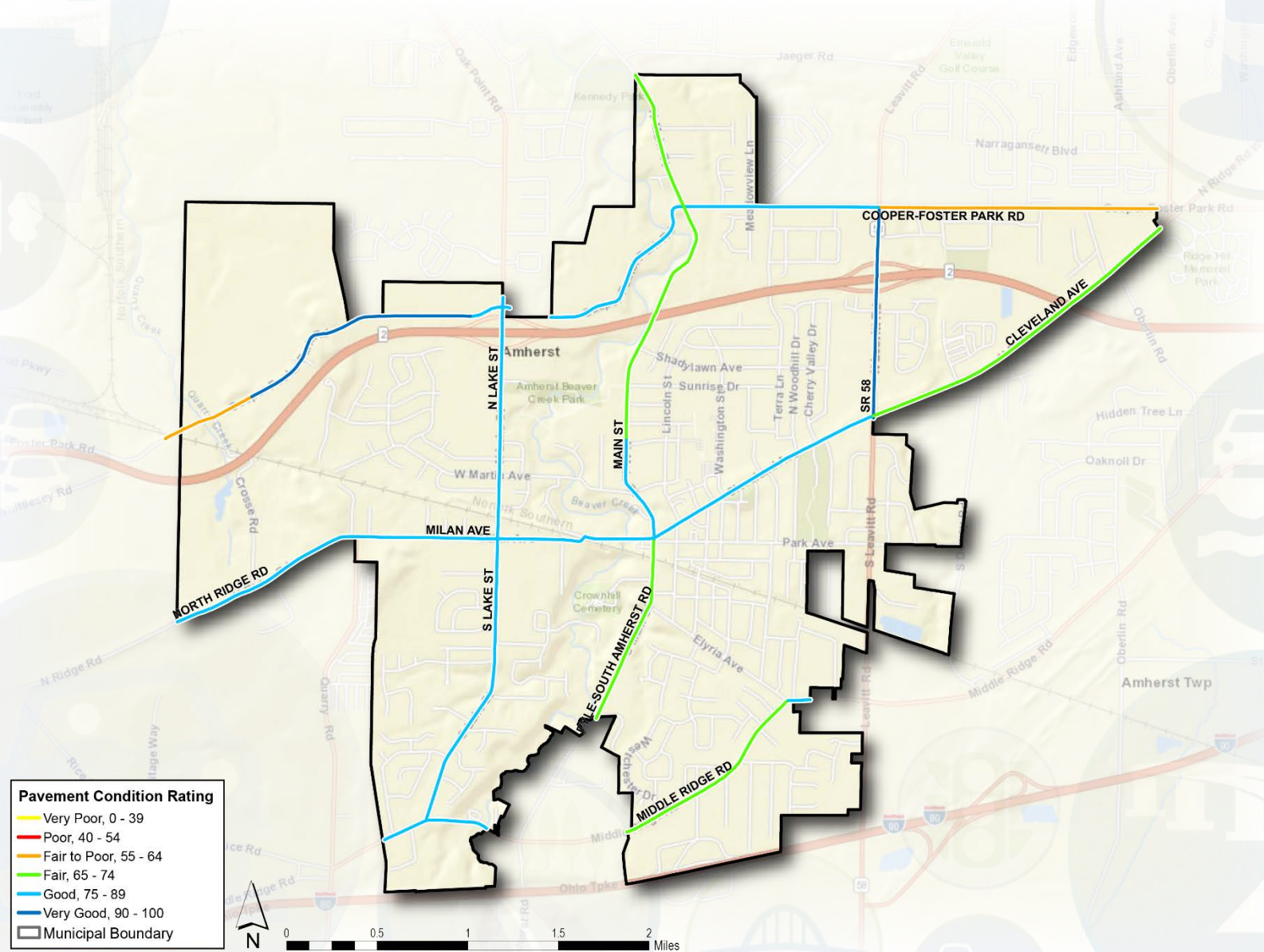


Table 3: 2016 City of Amherst Pavement Condition Listing

ROAD NAME	FROM	TO	FUNCTION CLASS	LANE-MILES	PCR
CLEVELAND AVE	MAIN ST	SR 58	MINOR ARTERIAL	4.16	81
CLEVELAND AVE	SR 58	AMHERST WCL	MINOR ARTERIAL	2.86	73
COOPER-FOSTER PARK RD	0.14 MILES E OF HOLLSTEIN DR	0.30 MILES E OF HOLLSTEIN DR	MINOR ARTERIAL	0.32	79
COOPER-FOSTER PARK RD	0.15 MILES W OF OAK POINT RD	OAK POINT RD	MINOR ARTERIAL	0.34	82
COOPER-FOSTER PARK RD	0.18 MILES E OF CROSS RD	0.14 MILES W OF OAK POINT RD	MINOR ARTERIAL	2.08	96
COOPER-FOSTER PARK RD	0.30 MILES E OF HOLLSTEIN DR	MAIN ST	MINOR ARTERIAL	1.02	85
COOPER-FOSTER PARK RD	GARGASZ DR	AMHERST WCL	MINOR ARTERIAL	1.14	62
COOPER-FOSTER PARK RD	LORAIN ECL /HOLLSTEIN DR	0.14 MILES E OF HOLLSTEIN DR	MINOR ARTERIAL	0.28	84
COOPER-FOSTER PARK RD	LORAIN SCL	0.18 MILES E OF CROSSE RD	MINOR ARTERIAL	0.80	60
COOPER-FOSTER PARK RD	MAIN ST	SR 58 (LEAVITT RD)	MINOR ARTERIAL	1.62	82
COOPER-FOSTER PARK RD	SR 58	GARGASZ DR	MINOR ARTERIAL	2.36	61
MAIN ST	FRANKLIN ST	NORFOLK SOUTHERN RAILROAD	MINOR ARTERIAL	0.28	66
MAIN ST	MARTIN AVE	SIPPLE AVE	MINOR ARTERIAL	0.50	81
MAIN ST	NORFOLK SOUTHERN RAILROAD	PARK AVE	MINOR ARTERIAL	0.36	66
MAIN ST	PARK AVE	MARTIN AVE	MINOR ARTERIAL	0.88	75
MAIN ST	SIPPLE AVE	AMHERST SCL	MINOR ARTERIAL	3.28	74
MIDDLE RIDGE RD	AMHERST TWP ECL	ELYRIA AVE	MINOR ARTERIAL	1.74	72
MIDDLE RIDGE RD	AMHERST WCL	S LAKE ST	MINOR ARTERIAL	0.38	83

Table 3: 2016 City of Amherst Pavement Condition Listing (Continued)

ROAD NAME	FROM	TO	FUNCTION CLASS	LANE-MILES	PCR
MIDDLE RIDGE RD	ELYRIA AVE	AMHERST ECL	MINOR ARTERIAL	0.18	77
MIDDLE RIDGE RD	S LAKE ST	AMHERST ECL	MINOR ARTERIAL	0.52	78
MILAN AVE	N LAKE ST	MAIN ST	MINOR ARTERIAL	1.32	77
MILAN AVE	QUARY RD	N LAKE ST	MINOR ARTERIAL	1.18	75
N LAKE ST	MILAN AVE	SR 2 SOUTH RAMPS	MAJOR COLLECTOR	1.32	77
N LAKE ST	SR 2 SOUTH RAMPS	COOPER FOSTER PARK RD	MAJOR COLLECTOR	0.68	80
NORTH RIDGE RD	BROWNHELM TWP ECL	QUARY RD	MINOR ARTERIAL	1.64	75
PYLE-SOUTH AMHERST RD	COVENTRY WAY	ELYRIA AVE	MINOR ARTERIAL	0.94	67
PYLE-SOUTH AMHERST RD	ELYRIA AVE	FRANKLIN ST	MINOR ARTERIAL	0.36	66
S LAKE ST	BEECH CLIFF DR	MILAN AVE	MAJOR COLLECTOR	1.32	76
S LAKE ST	MIDDLE RIDGE RD	BEECH CLIFF DR	MAJOR COLLECTOR	1.16	83
SR 58	CLEVELAND AVE	COOPER FOSTER PARK RD	MINOR ARTERIAL	3.44	100

PART II: 2018 CURRENT BACKLOG

The backlog is defined as the cost of pavement rehabilitation of all roads within the current year (2018) and bringing the average network PCR to 80. Backlog is a “snapshot” or relative measure of outstanding rehabilitation work. The backlog not only represents how far behind the pavement network is in terms of its present physical condition, but also its cost value serves as a benchmark to measure the impact of various funding strategies. Additionally, the current backlog offers a basis for comparison to future and/or past year’s backlogs.

The backlog strategy does not utilize any pavement preventive maintenance treatments, but instead considers rehabilitation or reconstruction treatments. This strategy achieves the average network PCR 80, and also maintains all the pavement conditions above the minimum acceptable level. In this study, the minimum acceptable PCR for the arterial roadway function class is 55 and for the major and minor collector is 50.

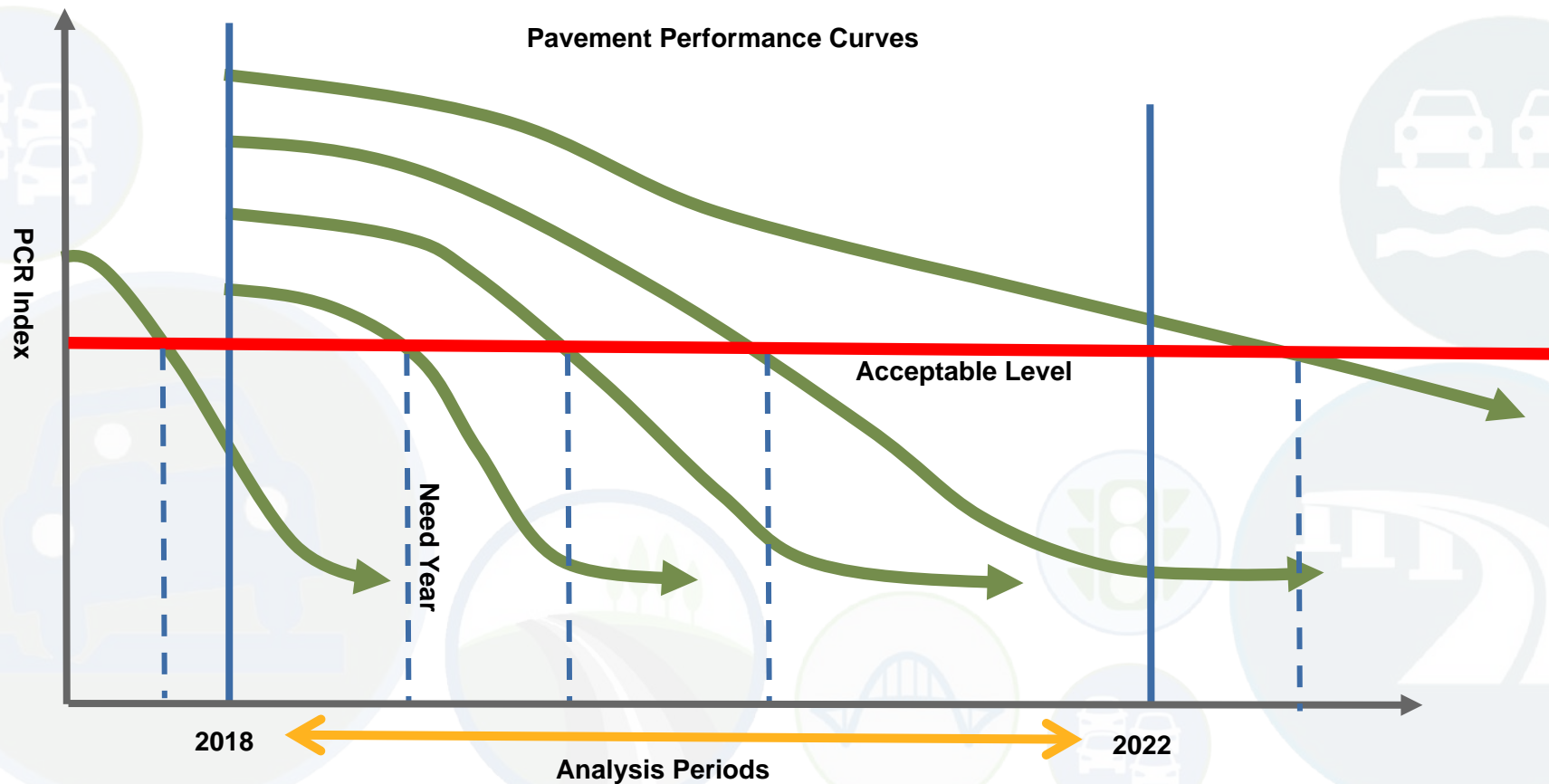
The Appendix includes all the backlog pavement treatments. As illustrated, the 2018 backlog treatment list includes segments which their 2018 PCRs are below the minimum acceptable level and are recommended with various reconstruction treatments. There are three segments in the 2018 backlog list with the total of 4.30 lane-miles. The 2018 backlog cost of the recommended treatments is about 2.7 million dollars.

PART III: MAINTENANCE & REHABILITATION (M&R) PROGRAM

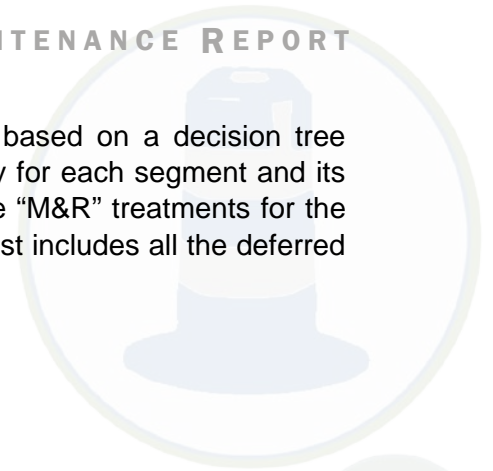
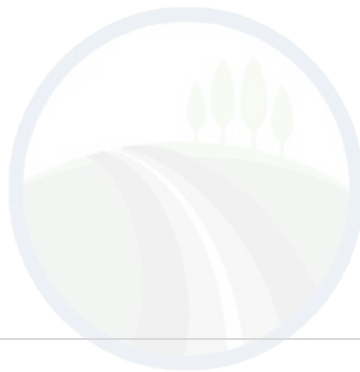
In order to estimate the preventive maintenance and rehabilitation requirements of a pavement network over a period of time, the first step is to determine the “Need Year” or when a pavement segment requires rehabilitation. The “Need Year” of a pavement is defined as the year in which the pavement condition falls below a critical level. Pavement condition of a road segment deteriorates under traffic, climate, etc. and consequently its PCR value is reduced. Without any treatments and depending on the deteriorating factors, pavements perform differently and Figure 2 depicts the typical acceptable level and “Need Year” relation for several road segments. As shown, the definition of the acceptable level is a critical factor in determining the “Need Year” for any road segment.

In this study, the critical level is set by the minimum acceptable PCR. As mentioned earlier, In the NOACA region, the minimum acceptable PCR for the arterial roadway function class is 55 and for the major and minor collector is 50.

Figure 2: The PCR Acceptable Level and “Need Year” Relation



The second step is to determine any feasible preventive maintenance and/or rehabilitation strategies based on a decision tree approach. The “M&R” program determines the optimal preventive maintenance and rehabilitation strategy for each segment and its recommended implementation year based on the considered decision tree. The Appendix includes all the “M&R” treatments for the identified segments with the implementation year in the period of 2018 to 2022 and the “M&R” program cost includes all the deferred maintenance cost.



PART IV: COMPARATIVE ANALYSIS

The current NOACA transportation asset management policy includes two strategies

- Maintain 15% Deficiency: this strategy attempts to maintain the total lane-miles with PCR below the acceptable level no more than 15%.
- Maintain an Average Network PCR of 80: applies a set of maintenance treatments in order to keep the roadway network average PCR more than, or equal to 80 over the study period.

This section compares the discussed backlog and the “M&R” program treatments with the NOACA transportation asset management strategies.

In addition to the above strategies, this comparative analysis considers another scenario as the minimum benchmark. The “Maintain Lowest Standard PCR” treatment strategy is based on the minimum PCR thresholds of 55 for arterials and 50 for collectors and a set of annual budget constraints. The annual budget constraints are calculated in three steps: First, the segments with the “M&R” recommended implementation in each specific analysis year are selected. Second, a subset of the selected segments which their “Need Years” are in the analysis period are identified. It should be noted that the selected segments with the “Need Year” beyond the analysis period are excluded from the budget constraint calculation. Third, the “M&R” treatment costs for the identified segments in the second step, are added together to provide an annual budget constraint for this scenario.

As discussed, all the above scenarios apply a decision tree approach to determine technically feasible maintenance and rehabilitation strategies for each segment requiring rehabilitation during the five-year period.

Table 4 summarizes the comparison results of all the above scenarios over the five-year period for the City of Amherst. In this table, the “5-Year Total Required Dollars” column shows the accumulation of the annual costs over five years calculated based on inflation-adjusted dollars for each strategy. Also, the Network average PCR is the lane-mile weighted average.

Table 4: Performance Comparison of the Constraint Scenarios

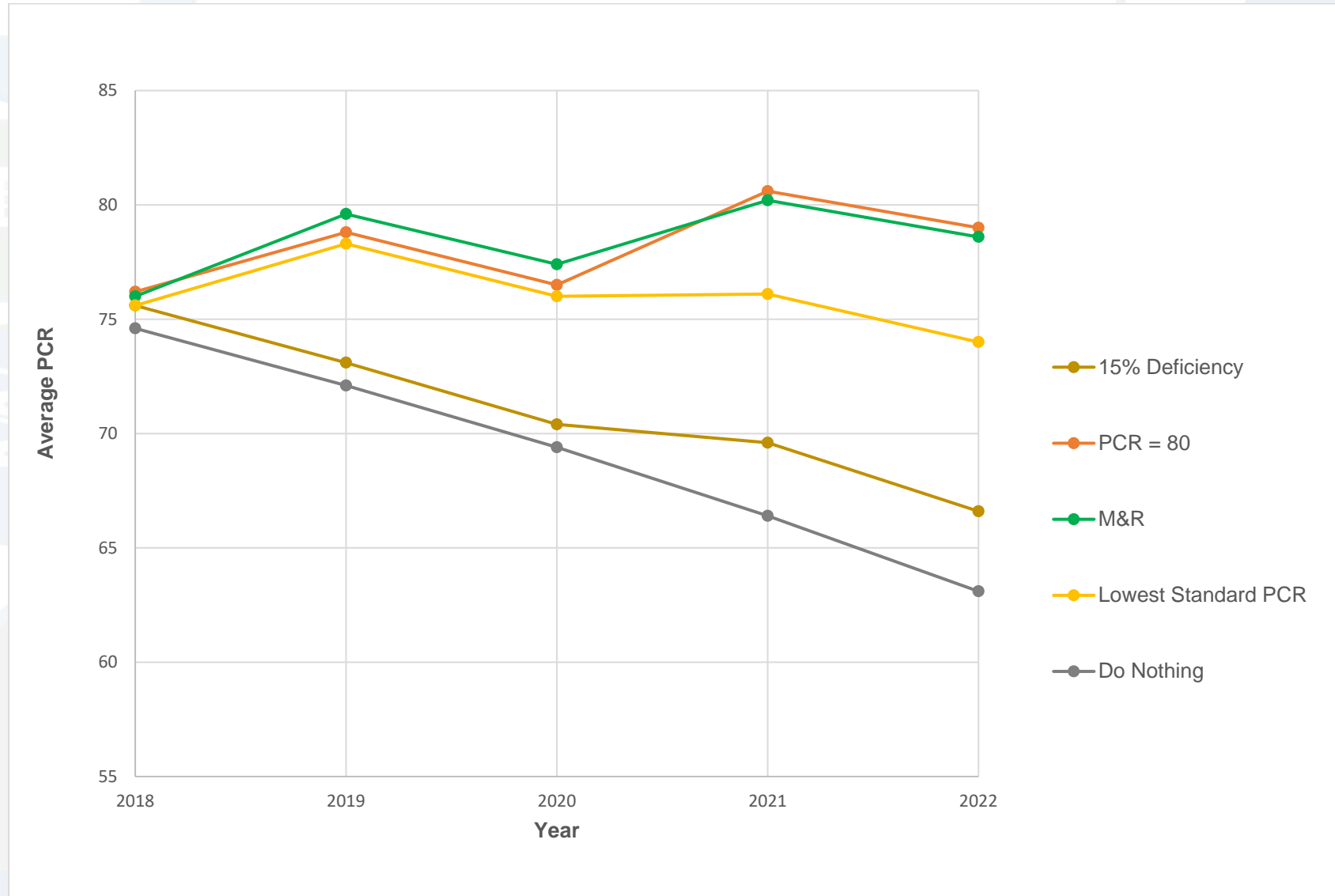
Maintenance Strategy	Strategy Group	5-Year Total Required Dollars	Network Average PCR	Network PCR at the End of the 5-Year Period	Percent of Pavement below the Minimum PCR
2018 Current Backlog	2018 Backlog	2,709,794	80.1	-	0%
Maintain 15% Deficiency	NOACA Transportation Asset Management Targets	134,479	71.1	66.6	14.6%
Maintain an Average Network PCR of 80		1,127,389	78.2	79	0%
M&R Program	Scenarios	1,069,214	78.4	78.7	0%
Maintain Lowest Standard PCR		723,618	76	74	0%

Note: The backlog required budget is for the year of 2018 only.

The Appendix lists all the treatments with their implementation years in the period of 2018 to 2022 for the above maintenance strategies.

Figure 3 illustrates the annual network average PCR for the discussed maintenance and rehabilitation strategies. It should be noted that the backlog scenario has only one value of 80.1 for 2018.

Figure 3: Average PCR Comparison by the Constraint Scenarios and by Year



As expected, the treatments of the “M&R” program maintain the pavement network condition with the highest network average PCR. This strategy requires a budget of over one million dollars during the analysis period. The “Maintain an Average Network PCR of 80” scenario provides almost the same level of condition with a similar budget requirement. Most segments have fairly good pavement conditions and therefore the scenarios of “Maintain 15% deficiency” requires a low budget.

The “Maintain Lowest Standard PCR” scenario offers a slightly lower network pavement conditions with almost three quarter of the “M&R” program budget. In all the discussed scenarios no pavement will be below the minimum PCR except the low budget scenario of “Maintain 15% deficiency”.

It should be noted that the backlog cost as the benchmark is two and half times more than the “M&R” program cost and both strategies have a similar network average PCR. This comparison indicates that the annual maintenance investment provides a better pavement management policy with much smaller budget than the reconstruction treatments with high costs.

APPENDIX

2018 Current Backlog

Pavement Treatment List

ROAD NAME	FROM	TO	RECOMMENDATION TREATMENT	LANE-MILES	TREATMENT COST
COOPER-FOSTER PARK RD	GARGASZ DR	AMHERST WCL	MINOR REHAB WITH REPAIRS (AC)	1.14	960,859
COOPER-FOSTER PARK RD	LORAIN SCL	0.18 MILES E OF CROSSE RD	MINOR REHAB WITH REPAIRS (AC)	0.80	505,716
COOPER-FOSTER PARK RD	SR 58	GARGASZ DR	MINOR REHAB WITH REPAIRS (AC)	2.36	1,243,219
REQUIRED BACKLOG BUDGET (2018\$)					\$2,709,794

Maintain 15% Deficiency

Pavement Treatment List

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
COOPER-FOSTER PARK RD	MAIN ST	SR 58 (LEAVITT RD)	JOINT REPAIR	1.62	32,485	2021
MAIN ST	FRANKLIN ST	NORFOLK SOUTHERN RAILROAD	SELECTIVE PATCH, MILL & 1.5" O/L	0.28	30,079	2021
MAIN ST	NORFOLK SOUTHERN RAILROAD	PARK AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.36	43,507	2021
N LAKE ST	SR 2 SOUTH RAMPS	COOPER FOSTER PARK RD	PREVENTATIVE MAINTENANCE MINOR	0.68	28,408	2021
THE 2021 REQUIRED BUDGET FOR THE "MAINTAIN 15% DEFICIENCY" STRATEGY					\$134,479	

Note: The "Maintain 15% Deficiency" strategy does not have any pavement maintenance treatments with the recommended implementation years of 2018, 2019, 2020 and 2022.

THE CITY OF AMHERST ROADWAY PAVEMENT MAINTENANCE REPORT

Maintain an Average Network PCR of 80

Pavement Treatment List

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2018\$)	YEAR
MIDDLE RIDGE RD	ELYRIA AVE	AMHERST ECL	PREVENTATIVE MAINTENANCE MINOR	0.18	6,488	2018
MILAN AVE	N LAKE ST	MAIN ST	PREVENTATIVE MAINTENANCE MINOR	1.32	43,917	2018
S LAKE ST	MIDDLE RIDGE RD	BEECH CLIFF DR	CRACK FILL & SLURRY	1.16	28,302	2018
THE 2018 REQUIRED BUDGET FOR THE "MAINTAIN AN AVERAGE NETWORK PCR OF 80" STRATEGY					\$78,707	
ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2019\$)	YEAR
COOPER-FOSTER PARK RD	0.14 MILES EAST OF HOLLSTEIN DR	0.30 MILES EAST OF HOLLSTEIN DR	PREVENTATIVE MAINTENANCE MINOR	0.32	10,911	2019
COOPER-FOSTER PARK RD	GARGASZ DR	AMHERST WCL	SELECTIVE PATCH, MILL & 1.5" O/L	1.14	155,477	2019
COOPER-FOSTER PARK RD	SR 58 (LEAVITT RD)	GARGASZ DR	SELECTIVE PATCH, MILL & 1.5" O/L	2.36	201,166	2019
MIDDLE RIDGE RD	S LAKE ST	AMHERST ECL	PREVENTATIVE MAINTENANCE MINOR	0.52	17,730	2019
N LAKE ST	MILAN AVE	SR 2 SOUTH RAMPS	PREVENTATIVE MAINTENANCE MINOR	1.32	45,007	2019
S LAKE ST	BEECH CLIFF DR	MILAN AVE	PREVENTATIVE MAINTENANCE MINOR	1.32	41,256	2019
THE 2019 REQUIRED BUDGET FOR THE "MAINTAIN AN AVERAGE NETWORK PCR OF 80" STRATEGY					\$471,547	

Maintain an Average Network PCR of 80

Pavement Treatment List (Continued)

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
CLEVELAND AVE	MAIN ST	SR 58 (LEAVITT RD)	PREVENTATIVE MAINTENANCE MINOR	4.16	99,307	2021
COOPER-FOSTER PARK RD	0.15 MILES WEST OF OAK POINT RD	OAK POINT RD	PREVENTATIVE MAINTENANCE MINOR	0.34	12,175	2021
COOPER-FOSTER PARK RD	LORAIN SCL	0.18 MILES EAST OF CROSSE RD	SELECTIVE PATCH, MILL & 1.5" O/L	0.80	85,939	2021
COOPER-FOSTER PARK RD	MAIN ST	SR 58 (LEAVITT RD)	JOINT REPAIR	1.62	32,485	2021
MAIN ST	FRANKLIN ST	NORFOLK SOUTHERN RAILROAD	SELECTIVE PATCH, MILL & 1.5" O/L	0.28	30,079	2021
MAIN ST	MARTIN AVE	SIPPLE AVE	PREVENTATIVE MAINTENANCE MINOR	0.50	17,904	2021
MAIN ST	NORFOLK SOUTHERN RAILROAD	PARK AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.36	43,507	2021
N LAKE ST	SR 2 SOUTH RAMPS	COOPER FOSTER PARK RD	PREVENTATIVE MAINTENANCE MINOR	0.68	28,408	2021
PYLE-SOUTH AMHERST RD	COVENTRY WAY	ELYRIA AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.94	117,809	2021
PYLE-SOUTH AMHERST RD	ELYRIA AVE	FRANKLIN ST	SELECTIVE PATCH, MILL & 1.5" O/L	0.36	24,976	2021
S LAKE ST	MIDDLE RIDGE RD	BEECH CLIFF DR	CRACK FILL & SLURRY	1.16	30,461	2021
THE 2021 REQUIRED BUDGET FOR THE "MAINTAIN AN AVERAGE NETWORK PCR OF 80" STRATEGY					\$523,050	

Maintain an Average Network PCR of 80

Pavement Treatment List (Continued)

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2022\$)	YEAR
COOPER-FOSTER PARK RD	0.14 MILES EAST OF HOLLSTEIN DR	0.30 MILES EAST OF HOLLSTEIN DR	CRACK FILL & SLURRY	0.32	9,394	2022
COOPER-FOSTER PARK RD	GARGASZ DR	AMHERST WCL	CRACK FILL	1.14	8,924	2022
COOPER-FOSTER PARK RD	LORAIN ECL / HOLLSTEIN DR	0.14 MILES EAST OF HOLLSTEIN DR	PREVENTATIVE MAINTENANCE MINOR	0.28	10,275	2022
COOPER-FOSTER PARK RD	SR 58 (LEAVITT RD)	GARGASZ DR	CRACK FILL	2.36	11,547	2022
MIDDLE RIDGE RD	AMHERST WCL	S LAKE ST	PREVENTATIVE MAINTENANCE MINOR	0.38	13,945	2022
THE 2022 REQUIRED BUDGET FOR THE “MAINTAIN AN AVERAGE NETWORK PCR OF 80” STRATEGY					\$54,085	

Note: The “Maintain an Average Network PCR of 80” strategy does not have any pavement maintenance treatments with the recommended implementation year of 2020.

M&R Program

Pavement Treatment List

ROAD NAME	FROM	TO	M&R TREATMENT RECOMMENDATION	LANE-MILES	IMPLEMENTATION	
					COST (2018\$)	YEAR
MIDDLE RIDGE RD	ELYRIA AVE	AMHERST ECL	PREVENTATIVE MAINTENANCE MINOR	0.18	6,488	2018
MILAN AVE	N LAKE ST	MAIN ST	PREVENTATIVE MAINTENANCE MINOR	1.32	43,917	2018
THE 2018 REQUIRED BUDGET FOR THE "M&R" PROGRAM					\$50,405	
ROAD NAME	FROM	TO	M&R TREATMENT RECOMMENDATION	LANE-MILES	IMPLEMENTATION	
					COST (2019\$)	YEAR
COOPER-FOSTER PARK RD	0.14 MILES EAST OF HOLLSTEIN DR	0.30 MILES EAST OF HOLLSTEIN DR	PREVENTATIVE MAINTENANCE MINOR	0.32	10,911	2019
COOPER-FOSTER PARK RD	GARGASZ DR	AMHERST WCL	SELECTIVE PATCH, MILL & 1.5" O/L	1.14	155,477	2019
COOPER-FOSTER PARK RD	LORAIN SCL	0.18 MILES EAST OF CROSSE RD	SELECTIVE PATCH, MILL & 1.5" O/L	0.80	81,830	2019
COOPER-FOSTER PARK RD	SR 58 (LEAVITT RD)	GARGASZ DR	SELECTIVE PATCH, MILL & 1.5" O/L	2.36	201,166	2019
MIDDLE RIDGE RD	S LAKE ST	AMHERST ECL	PREVENTATIVE MAINTENANCE MINOR	0.52	17,730	2019
N LAKE ST	MILAN AVE	SR 2 SOUTH RAMPS	PREVENTATIVE MAINTENANCE MINOR	1.32	45,007	2019
S LAKE ST	BEECH CLIFF DR	MILAN AVE	PREVENTATIVE MAINTENANCE MINOR	1.32	41,256	2019
THE 2019 REQUIRED BUDGET FOR THE "M&R" PROGRAM					\$553,377	

M&R Program

Pavement Treatment List (Continued)

ROAD NAME	FROM	TO	M&R TREATMENT RECOMMENDATION	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
CLEVELAND AVE	MAIN ST	SR 58 (LEAVITT RD)	PREVENTATIVE MAINTENANCE MINOR	4.16	99,307	2021
COOPER-FOSTER PARK RD	0.15 MILES WEST OF OAK POINT RD	OAK POINT RD	PREVENTATIVE MAINTENANCE MINOR	0.34	12,175	2021
COOPER-FOSTER PARK RD	MAIN ST	SR 58 (LEAVITT RD)	JOINT REPAIR	1.62	32,485	2021
MAIN ST	FRANKLIN ST	NORFOLK SOUTHERN RAILROAD	SELECTIVE PATCH, MILL & 1.5" O/L	0.28	30,079	2021
MAIN ST	MARTIN AVE	SIPPLE AVE	PREVENTATIVE MAINTENANCE MINOR	0.50	17,904	2021
MAIN ST	NORFOLK SOUTHERN RAILROAD	PARK AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.36	43,507	2021
N LAKE ST	SR 2 SOUTH RAMPS	COOPER FOSTER PARK RD	PREVENTATIVE MAINTENANCE MINOR	0.68	28,408	2021
PYLE-SOUTH AMHERST RD	COVENTRY WAY	ELYRIA AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.94	117,809	2021
PYLE-SOUTH AMHERST RD	ELYRIA AVE	FRANKLIN ST	SELECTIVE PATCH, MILL & 1.5" O/L	0.36	24,976	2021
THE 2021 REQUIRED BUDGET FOR THE "M&R" PROGRAM					\$406,650	

M&R Program

Pavement Treatment List (Continued)

ROAD NAME	FROM	TO	M&R TREATMENT RECOMMENDATION	LANE-MILES	IMPLEMENTATION	
					COST (2022\$)	YEAR
COOPER-FOSTER PARK RD	0.14 MILES EAST OF HOLLSTEIN DR	0.30 MILES EAST OF HOLLSTEIN DR	CRACK FILL & SLURRY	0.32	9,394	2022
COOPER-FOSTER PARK RD	GARGASZ DR	AMHERST WCL	CRACK FILL	1.14	8,924	2022
COOPER-FOSTER PARK RD	LORAIN ECL / HOLLSTEIN DR	0.14 MILES EAST OF HOLLSTEIN DR	PREVENTATIVE MAINTENANCE MINOR	0.28	10,275	2022
COOPER-FOSTER PARK RD	LORAIN SCL	0.18 MILES EAST OF CROSSE RD	CRACK FILL	0.80	4,697	2022
COOPER-FOSTER PARK RD	SR 58 (LEAVITT RD)	GARGASZ DR	CRACK FILL	2.36	11,547	2022
MIDDLE RIDGE RD	AMHERST WCL	S LAKE ST	PREVENTATIVE MAINTENANCE MINOR	0.38	13,945	2022
THE 2022 REQUIRED BUDGET FOR THE "M&R" PROGRAM					\$58,782	

Note: The "M&R" program does not have any pavement maintenance treatments with the recommended implementation year of 2020.

Maintain Lowest Standard PCR

Pavement Treatment List

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2019\$)	YEAR
COOPER-FOSTER PARK RD	GARGASZ DR	AMHERST WCL	SELECTIVE PATCH, MILL & 1.5" O/L	1.14	155,477	2019
COOPER-FOSTER PARK RD	LORAIN SCL	0.18 MILES EAST OF CROSSE RD	SELECTIVE PATCH, MILL & 1.5" O/L	0.80	81,830	2019
COOPER-FOSTER PARK RD	SR 58 (LEAVITT RD)	GARGASZ DR	SELECTIVE PATCH, MILL & 1.5" O/L	2.36	201,166	2019
THE 2019 REQUIRED BUDGET FOR THE "MAINTAIN LOWEST STANDARD PCR" STRATEGY					\$438,473	
ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
MAIN ST	FRANKLIN ST	NORFOLK SOUTHERN RAILROAD	SELECTIVE PATCH, MILL & 1.5" O/L	0.28	30,079	2021
MAIN ST	NORFOLK SOUTHERN RAILROAD	PARK AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.36	43,507	2021
MAIN ST	PARK AVE	MARTIN AVE	MICRO - PAVE (TYPE II SURF. TR.)	0.88	43,606	2021
PYLE-SOUTH AMHERST RD	COVENTRY WAY	ELYRIA AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.94	117,809	2021
PYLE-SOUTH AMHERST RD	ELYRIA AVE	FRANKLIN ST	SELECTIVE PATCH, MILL & 1.5" O/L	0.36	24,976	2021
THE 2021 REQUIRED BUDGET FOR THE "MAINTAIN LOWEST STANDARD PCR" STRATEGY					\$259,977	

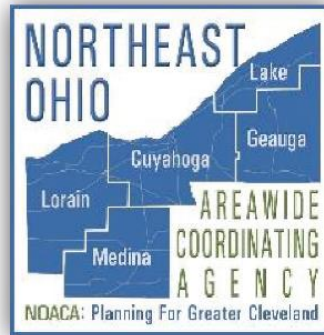
Maintain Lowest Standard PCR

Pavement Treatment List (Continued)

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2022\$)	YEAR
COOPER-FOSTER PARK RD	GARGASZ DR	AMHERST WCL	CRACK FILL	1.14	8,924	2022
COOPER-FOSTER PARK RD	LORAIN SCL	0.18 MILES EAST OF CROSSE RD	CRACK FILL	0.80	4,697	2022
COOPER-FOSTER PARK RD	SR 58 (LEAVITT RD)	GARGASZ DR	CRACK FILL	2.36	11,547	2022
THE 2022 REQUIRED BUDGET FOR THE “MAINTAIN LOWEST STANDARD PCR” STRATEGY					\$25,168	

Note: The “Maintain Lowest STANDARD PCR” strategy does not have any pavement maintenance treatments with the recommended implementation years of 2018 and 2020.

This page has been intentionally left blank.



NORTHEAST OHIO
AREAWIDE
COORDINATING
AGENCY
1299 Superior Ave.
Cleveland, Ohio 44114

Phone: 216-241-2414 FAX: 216-621-3024

www.noaca.org

 noaca.org  [@noaca_mpo](https://twitter.com/noaca_mpo)

The preparation of this publication was financed through grants received from the Federal Highway Administration and the Ohio Department of Transportation, and appropriations from the counties of and municipalities within Cuyahoga, Geauga, Lake, Lorain and Medina. The contents do not necessarily reflect official views or policies of the U.S. Department of Transportation or the Ohio Department of Transportation. This document does not constitute a standard or regulation.

NOACA will STRENGTHEN regional cohesion, PRESERVE existing infrastructure, and BUILD a sustainable multimodal transportation system to SUPPORT economic development and ENHANCE the quality of life in Northeast Ohio. NOACA will STRENGTHEN regional cohesion, PRESERVE existing infrastructure, and BUILD a sustainable multimodal transportation system to SUPPORT economic development and ENHANCE the quality of life in Northeast Ohio.