Paving the Way to a Better New York

A 20-Year Needs Study of New York State Department of Transportation Pavements



PREPARED FOR

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PREPARED BY

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applied pavement TECHNOLOGY

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DISCLAIMER

The data provided by NYSDOT were collected as part of the agency's regular annual pavement data collection program but does not represent official published data. As a result, the condition summaries calculated though this research may vary slightly from official condition measures published by NYSDOT. These differences are expected to be minor and inconsequential to the scale of a statewide 20-year needs assessment.

ABOUT THE ANALYSIS TEAM

Applied Pavement Technology, Inc.

Founded in 1994, Applied Pavement Technology, Inc. (APTech), has provided its clients with the expertise required to develop practical, innovative solutions in the areas of transportation asset management, highway maintenance management, pavement management, and pavement engineering. APTech's asset management activities focus on making the best use of agency resources and aligning business processes and tools with agency objectives. APTech is a recognized leader in the asset management community, due in no small part to the prominent reputation of its professional staff.

Since 2018, APTech has led or supported the development of 33 State transportation asset management plans (TAMP) that have been certified by the Federal Highway Administration (FHWA). APTech staff have led national research efforts to develop guidance for State Departments of Transportation (DOTs) on all aspects of transportation asset management, including life-cycle planning, financial planning, and risk management. APTech coauthored the new American Association of State Highway and Transportation Officials (AASHTO) *Guide to Transportation Asset Management: A Focus on Implementation* (www.tamguide.com) and is currently leading National Cooperative Highway Research Program (NCHRP) Project 10-139 to update the AASHTO *Pavement Management Guide*.

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Brad Allen is the Asset Management Program Manager at APTech and brings more than 30 years of transportation management and engineering experience. Mr. Allen's work at APTech focuses on connecting financial and engineering data and analysis results highway investment decisions. Since joining APTech in 2016, Mr. Allen has been involved with developing TAMPs for 16 States. Moreover, he served as the Principal Investigator for developing NCHRP Report 1076, *A Guide for Incorporating Maintenance Costs in a TAMP,* and is currently the Principal Investigator for NCHRP 10-139, *Enhancing the Pavement Management Guide for AASHTO*. During his previous employment, Mr. Allen worked for the New York State Department of Transportation (NYSDOT) for over 21 years. From 2014 to 2016, he served as Director of NYSDOT's Program Management Bureau, where he managed Federal and State funding for

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INTRODUCTION

The New York State Department of Transportation (NYSDOT) manages a complex network of highways consisting of more than 38,000 lane-miles of pavement, much of which was built before or during the Eisenhower Interstate era (NYSDOT 2022). NYSDOT's highway network, which includes the non-toll portion of the Interstate system and all major Parkways in the State, enables the safe and efficient moment of people and goods within and across New York. As the owner and operator of the majority of Interstate and National Highway System (NHS) pavements in the State of New York, NYSDOT is charged with ensuring the long-term condition and financial stability of this network.

The State highway network is also a major driver for economic activity. According to the most recent commodity flow survey conducted by the Federal government, almost $1.5 trillion in goods are shipped annually by truck to and from sites located in New York State, most of which occurs over the State highway system (USDOT 2026). Simply put, State highways are critical to the economic well-being of New York State.

The importance of the New York State highway system requires that it be maintained in a state of good repair to maximize system reliability and minimize future costs for both the State and system users. "The state of good repair is the condition that the State system can be maintained in perpetuity at the lowest annual cost" (NYSDOT 2022). As network conditions decline, future costs to the State increase due to increasing construction costs to address deteriorating conditions and growing work backlogs. Declining pavement conditions also increase costs to highway users due to greater fuel consumption, additional wear and tear on vehicles, and increased traffic delays.

NYSDOT's pavement condition reports indicate a slow but steady increase in *Poor* pavement over the past decade. Based on data provided by NYSDOT, State pavement conditions fail to meet the agency's own published desired state of good repair. As a result, NYSDOT is forced to invest suboptimally in its pavements. As the population of *Poor* pavements grows, so do needed expenditures for pothole patch and other maintenance treatments that keep the system safe and operable but do not address the underlying deterioration. *Poor* pavements also significantly more per mile to fix, meaning NYSDOT is forced to pave fewer miles with its available budget. These factors create a feedback loop of declining conditions and an increasing backlog of needed renewal work, with rapidly increasing costs being passed to future taxpayers.

Recent increases in construction costs are putting additional pressure on NYSDOT to bring the system into a sustainable condition state and end the cycle of increasing pavement backlog. This report provides an analysis of NYSDOT pavements over the next 20 years to quantify the funding needed to bring the State highway system into a state of good repair and demonstrate the future cost savings that would be generated by such an effort. This report includes both a statewide assessment of needs and more detailed assessments of the long-term pavement needs of each of NYSDOT's 11 Regions.

BACKGROUND

Historical Condition Trends

NYSDOT conducts annual assessments of pavement conditions across the entire State highway system. Interstate pavement conditions are updated annually, while the remainder of the State system is updated every 2 years. Data are collected using traffic-speed data collection vans that process data on several key distresses (deterioration modes) including cracking, wheelpath rutting, faulting, and ride quality (NYSDOT 2022). To assess network-level conditions and identify the types and amount of needed pavement work, NYSDOT uses a composite measure of overall cracking, called surface rating (SR), along with a measure of ride quality, International Roughness Index (IRI).

SR is a measure of pavement condition that has been developed and used by NYSDOT for decades. It is based on the overall severity, extent, and location of cracking and is expressed in a 10-point scale, as shown in Figure 1.

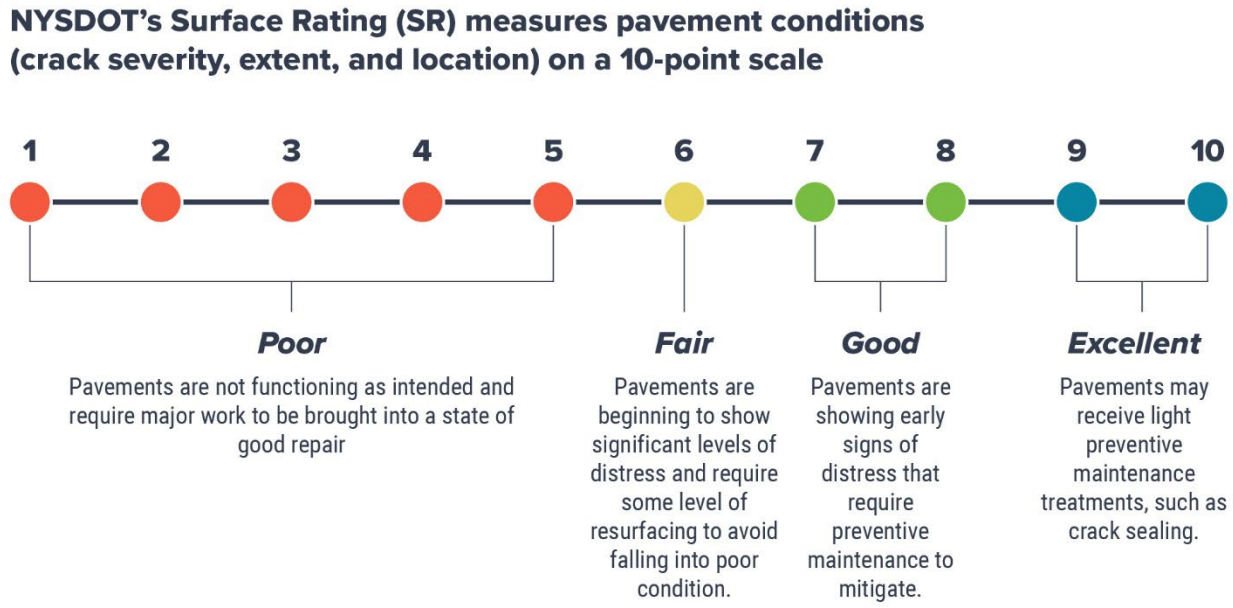


Figure 1. NYSDOT's surface rating classifications.

In addition to SR, NYSDOT uses the IRI to assess overall rideability and to inform the selection of appropriate pavement treatments. IRI indicates the ride quality of pavement by reporting the cumulative number of inches one wheel of a typical passenger car would move vertically while traveling over a 1-mile stretch of a pavement in a given condition. IRI is reported as inches/mile.

Figure 2 presents the 20-year pavement condition trend in terms of the percentage of the State highway system in *Poor* or *Fair* condition based on data from NYSDOT (n.d.). It should be noted that the 2025 condition survey results were not available for this analysis.

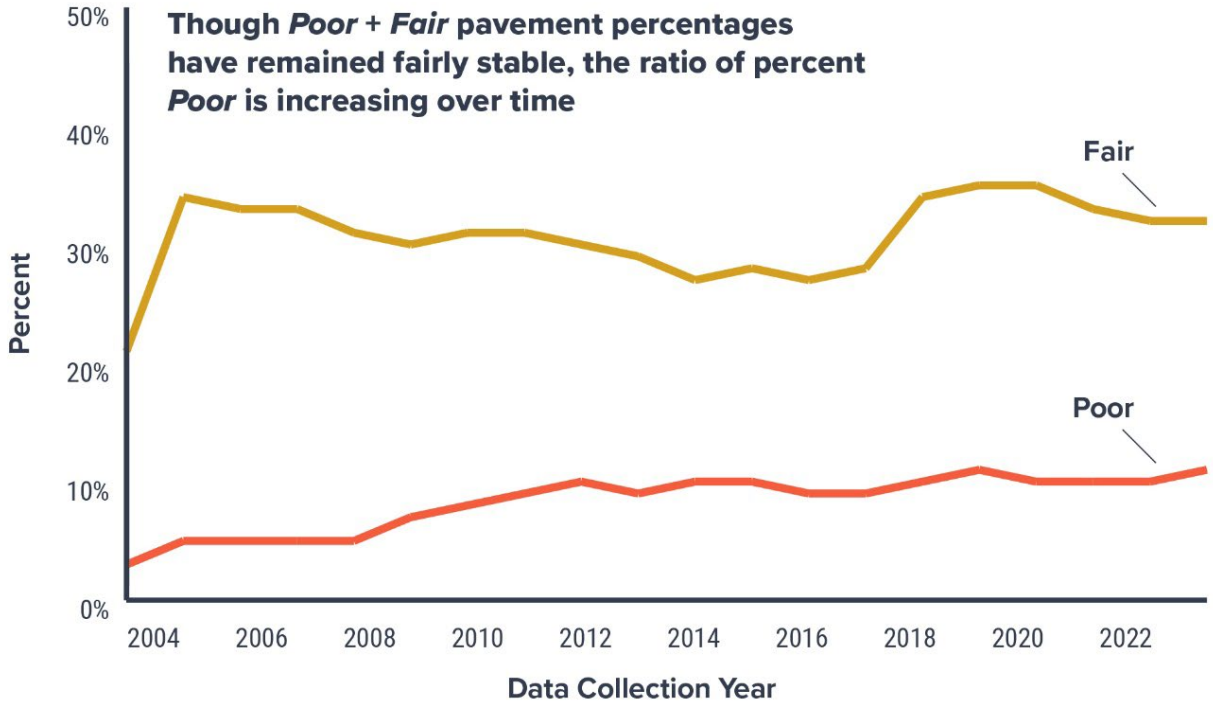


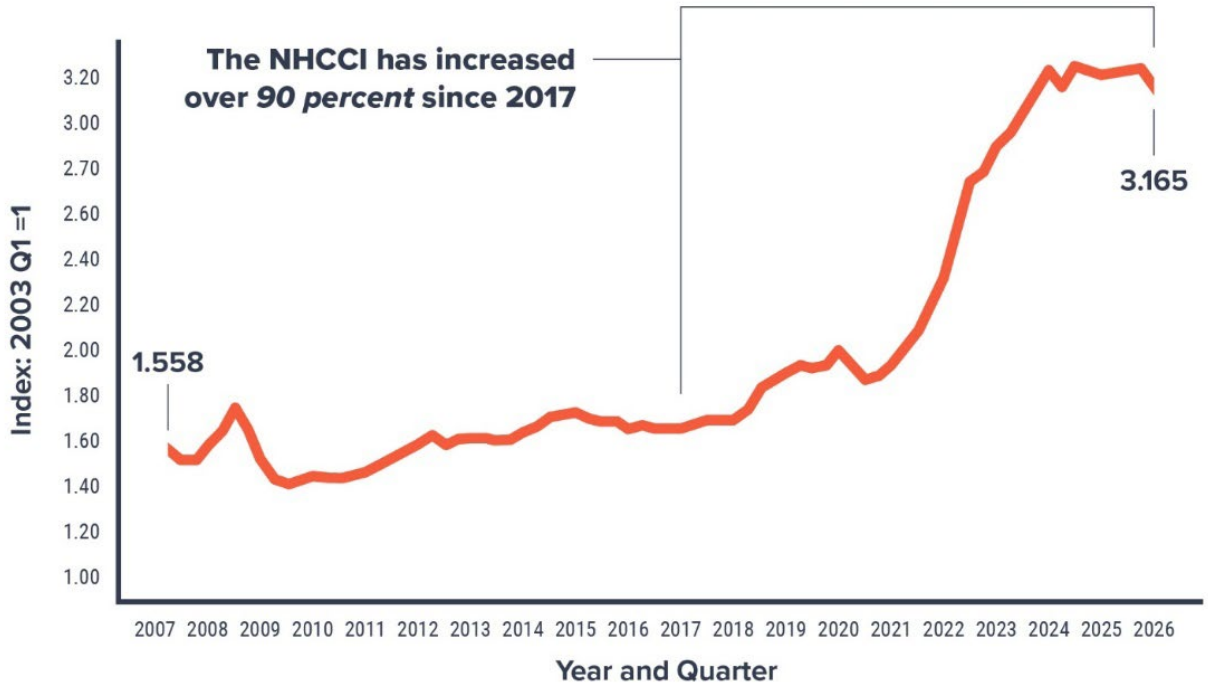
Figure 2. State highway pavement condition trends (based on data from NYSDOT n.d.).

As shown in Figure 2, the overall percentage of pavements rated Poor and Fair has remained relatively high, between approximately 35 and 40 percent, over the past 20 years. This illustrates the persistent challenge of maintaining and improving overall pavement conditions. Despite advances in NYSDOT's life-cycle management strategies, improved materials and construction practices, and periodic funding infusions such as from the New York Works Program, a substantial portion of the highway network continues to require repair, rehabilitation, or replacement. Of particular concern is that percentage of pavements rated *Poor* has more than doubled. This persistent deterioration of system conditions represents a growing financial burden for NYSDOT, as renewing the condition of pavements in *Poor* condition requires rehabilitation or reconstruction which is much more costly than managing pavements in *Good* and *Fair* condition through timely preventive maintenance and overlays.

NYSDOT annually computes the cost to repair the entire backlog of work required by State highways. The backlog is estimated using the SR and other condition variables for each highway section as well as an agency-specified treatment matrix and the most recent repair costs. In 2024, the cost to repair the backlog was estimated at $10.3 billion, which represents more than a 100 percent increase from the $4.3 billion backlog in 2014. This increase is due to both declining pavement conditions and increasing costs for construction work.

Historical Highway Construction Cost Trends

The impact of increasing construction costs over recent years cannot be ignored. After a decade of relatively stable costs, the Federal Highway Administration's (FHWA's) National Highway Construction Cost Index (NHCCI) has increased over 90 percent since the beginning of 2017 and 70 percent since 2021, as shown in Figure 3 (FHWA n.d.). While costs appear to have stabilized since the start of 2024, recent spikes in fuel costs suggest additional cost increases moving forward.



Source: FHWA.

Figure 3. NHCCI 20-year trend (FHWA n.d.).

The cost increases over the past 10 years represent a missed opportunity for prior capital programs. Had increased pavement funding been allocated to NYSDOT in 2017 or 2022, the current backlog would be significantly lower than it currently is. This demonstrates the urgency to address pavement conditions before they worsen, and the associated treatment costs increase even further.

NYSDOT Pavement Condition Forecast

NYSDOT has not published a recent 20-year forecast of expected pavement conditions. However, as part of their Transportation Asset Management Plan (TAMP) developed in 2022, NYSDOT included a 10-year forecast of pavement conditions based on expected funding levels and provided an estimated need to sustain pavement conditions on Interstate and NHS highways in New York State. All State DOTs are required to prepare a risk-based TAMP by Federal regulation (23 CFR part 515) and must include all Interstate and non-Interstate NHS pavements. Because of this requirement, the TAMP includes all Interstate and non-Interstate pavement in New York State, regardless of ownership.

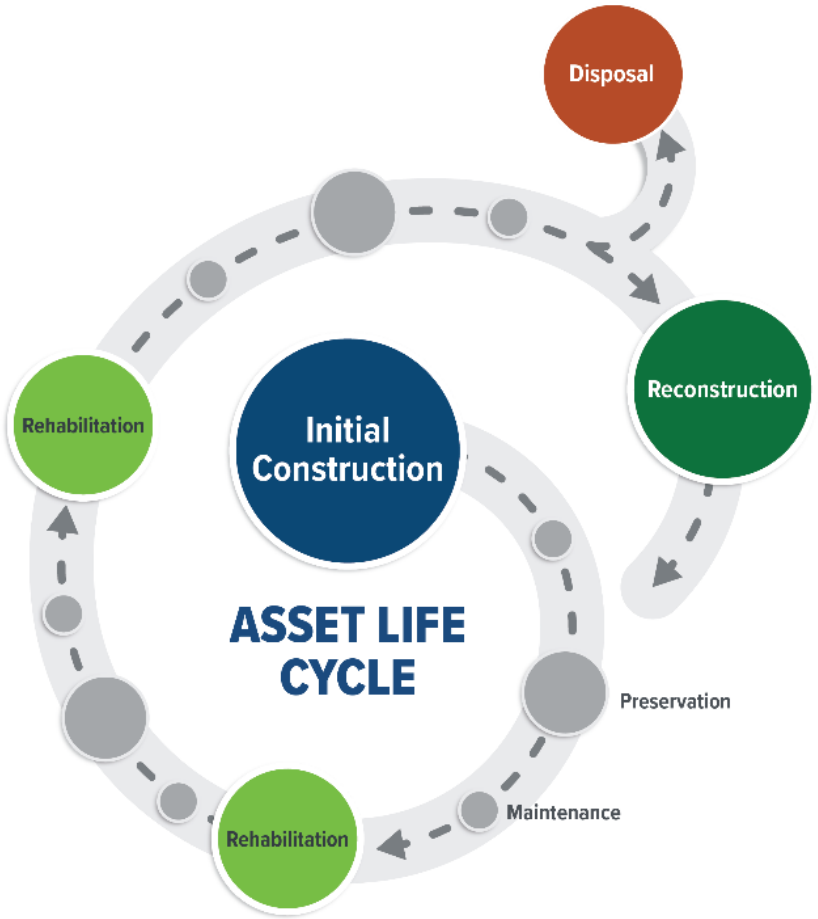
The TAMP needs analysis forecast conditions for Interstate and Non-Interstate pavements at a combined average investment level of $450 million per year by NYSDOT and the New York State Thruway Authority (NYSTA). This investment level represented the expected level of pavement investments by the two agencies from 2021 to 2030. The resulting forecasts indicated that Interstate pavement conditions would decline from 1.1 percent *Poor* in 2020 to 5.9 percent *Poor* in 2030. Non-Interstate NHS pavement conditions would decline from 7.6 percent *Poor* to 31.1 percent *Poor* in the same period. According to the 2022 TAMP, NYSDOT estimated at least $1.1 billion is needed to achieve a state of good repair on Interstates and other NHS pavements in New York (NYSDOT 2022). Inflated to 2027 costs, that represents a need of $1.87 billion per year for only the highest functional classes of pavements.

Because the TAMP needs analysis includes NYTA pavements and excludes non-NHS State roads, it does not represent NYSDOT's full funding need to achieve and sustain a state of good repair on the State highway network. The TAMP is also 4 years old; during that time, construction costs have continued to rise. This study was conducted to provide a more comprehensive and current assessment of the costs related to NYSDOT's backlog of needed pavement work.

ANALYSIS APPROACH

Pavement Life-Cycle Management

Over the past 20 years, NYSDOT has transformed its pavement management practices from a traditional system based primarily on the application of hot-mix asphalt (HMA) overlays of varying thicknesses applied based on an expected cycle to a whole-life approach that focuses on delivering the right treatment to the right pavement at the right time. This approach is based on the premise that as a pavement ages, different treatments may be appropriate to more cost-effectively extend the service life. Figure 4 illustrates how different types of treatment are more appropriate at different points in the life of the pavement, from their initial construction to their eventual replacement/reconstruction. This approach maximizes the assets' service life and minimizes overall life-cycle costs, as described in *Using a Life Cycle Planning Process to Support Asset Management* (FHWA 2017).



Source: FHWA.

Figure 4. Asset life cycle (FHWA 2017).

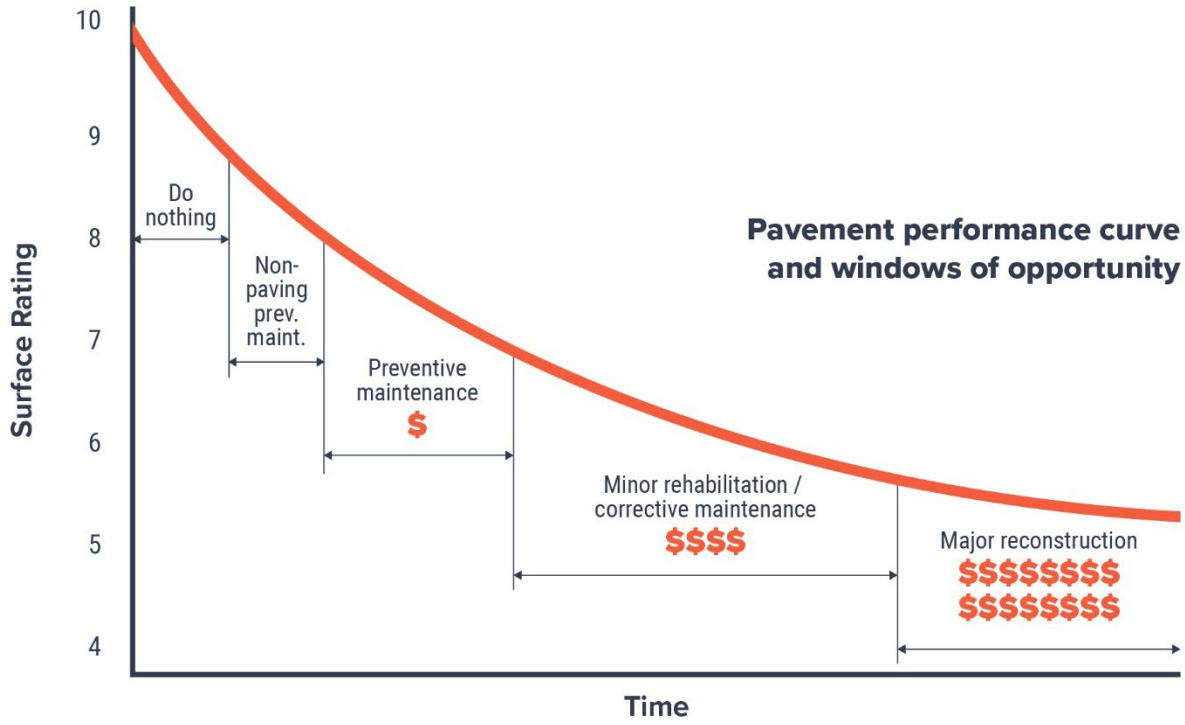
The transition to a whole-life approach has helped NYSDOT use available funding more efficiently. However, as shown in Figure 2, without sufficient funding, even these data-driven strategies have not been enough to reverse the trend of worsening conditions.

For this study, the analysis team modeled NYSDOT's life-cycle approach using the most current pavement conditions, treatment types, unit costs, and treatment selection rules discernable from data and reports made available by NYSDOT.

Windows of Opportunity

NYSDOT's pavement management strategy, as described in the agency's 2022 transportation asset management plan, is based on the concept of windows of opportunity, summarized in Figure 5. This approach is based on two principles:

1. Pavements begin at a high SR condition level but over time deteriorate in a predictable way through various stages of condition. In each successive stage of poorer condition, pavements require more extensive treatments to slow further condition or bring the pavement back to a state of good repair.
2. Each successively more extensive set of treatment options is increasingly more expensive than the previous.



Source: NYSDOT.

Figure 5. Pavement performance windows of opportunity (NYSDOT 2022).

The combined implication of these principles is that the most cost-effective long-term strategy for managing pavements is to address pavement distress at the earliest possible stage (the "window of opportunity"). This minimizes the pavements that fall from one condition state to the next lower one each year. However, the approach also recognizes that some pavements in *Poor* condition must also be addressed to ensure the system remains safe and operable for highway users. Over the past 20 years, NYSDOT has been faced with the challenge of balancing pavement needs without sufficient funding. Applying its funding in the most cost-effective manner would lead some pavements to fall into unacceptable levels of disrepair. Unfortunately, the level of funding needed to address 1 mile of *Poor* pavement means up to 10 miles of *Good* or *Fair* pavement may deteriorate out of their current windows of opportunity.

Model Development

Information gathered from NYSDOT was used to build a model of pavement performance potential investment strategies, following NYSDOT's whole-life approach. This model was then used to assess the cost of achieving and sustaining NYSDOT's pavement network in a state of good repair for the State highway system over the next 20 years. This approach established objectives for system conditions, applied treatments defined by NYSDOT, assumed NYSDOT's historical costs increased with the NHCCI, and assumed historical pavement performance models for deterioration and treatment benefits will hold true in the future.

Objectives

In measurable terms, NYSDOT's state of good repair is defined as less than 1 percent of Interstate pavements in *Poor* condition and less than 3 percent of non-Interstate NHS pavements in *Poor* condition (NYSDOT 2022). Because this study includes all State highway system pavements, not just the NHS, a slightly different desired state of good repair was established as the basis for determining funding needs. This analysis sought to determine the annual funding needed to achieve the following conditions within 5 years and sustain them for the remainder of the 20-year period.

- No more than 2 percent of Interstate pavements in *Poor* condition.
- No more than 5 percent of non-Interstate pavements in *Poor* condition.

Treatments

Information on NYSDOT's pavement treatments and their appropriate use was gathered from the 2022 TAMP. These are summarized in Table 1. As can be seen in Table 1, each treatment has a specific window of opportunity based on SR (primarily) and IRI.

Table 1. Pavement treatment type by condition level.

Condition Group	SR Window of Opportunity	Assumed Treatment Type	Work Category	Description
Very Good	8, 9, or 10	No work or crack seal	Preventive maintenance	–
Good	7	Thin overlay	Preventive maintenance	Overlay <1 inch
Fine	6 and IRI <125	Corrective overlay	Corrective maintenance	Overlay ≤2 inches
Fair	6 and IRI ≥125	Minor rehabilitation	Renewal	Mill or recycle and single-course overlay
Poor	4 or 5	Major rehabilitation	Renewal	Mill or recycle and multicourse overlay
Very Poor	1, 2, or 3	Reconstruction	Renewal	Remove and replace

In the analysis, treatments were applied only within their appropriate window of opportunity. Applying a treatment outside of its window leads to inefficient use of funding; for example, applying treatments too early means the State does not receive the full value of the prior treatment, whereas applying treatments too late means the treatment is insufficient to address the existing pavement distresses and will fail early.

Development of Pavement Treatment Costs

Pavement treatment costs were developed based on unit cost information from NYSDOT's TAMP, adjusted for regional differences and construction cost inflation. The analysis considered the range of pavement treatments described in Table 1, including preventive maintenance, corrective overlays, minor rehabilitation, major rehabilitation, and reconstruction.

Costs were calculated on a per-lane-mile basis for three geographic areas: Upstate, Downstate, and New York City. NYSDOT's 2022 baseline costs were adjusted to 2027 using the National Highway Construction Cost Index (NHCCI), with an additional 5% annual inflation factor applied over the remaining analysis period.

Pavement Deterioration

For the most part, all pavements on the New York State highway system deteriorate over time in the same general trend. This is because pavements are typically designed for the pavement loading that they are subjected to, meaning that pavements carrying both high and low volumes of traffic will typically need similar types of work within similar time frames. Figure 6 summarizes the deterioration rates assumed for this analysis, based on information gathered from NYSDOT's 2022 TAMP. A surface rating of 3 is considered end of life for NYSDOT pavements. Deterioration beyond that point results in a pavement surface that is not safe and cannot be properly plowed during winter storm operations. In practice, NYSDOT pavements rarely reach and are not allowed to deteriorate below a surface rating of 3. Therefore, we did not consider numerical ratings lower than 3 in this analysis.

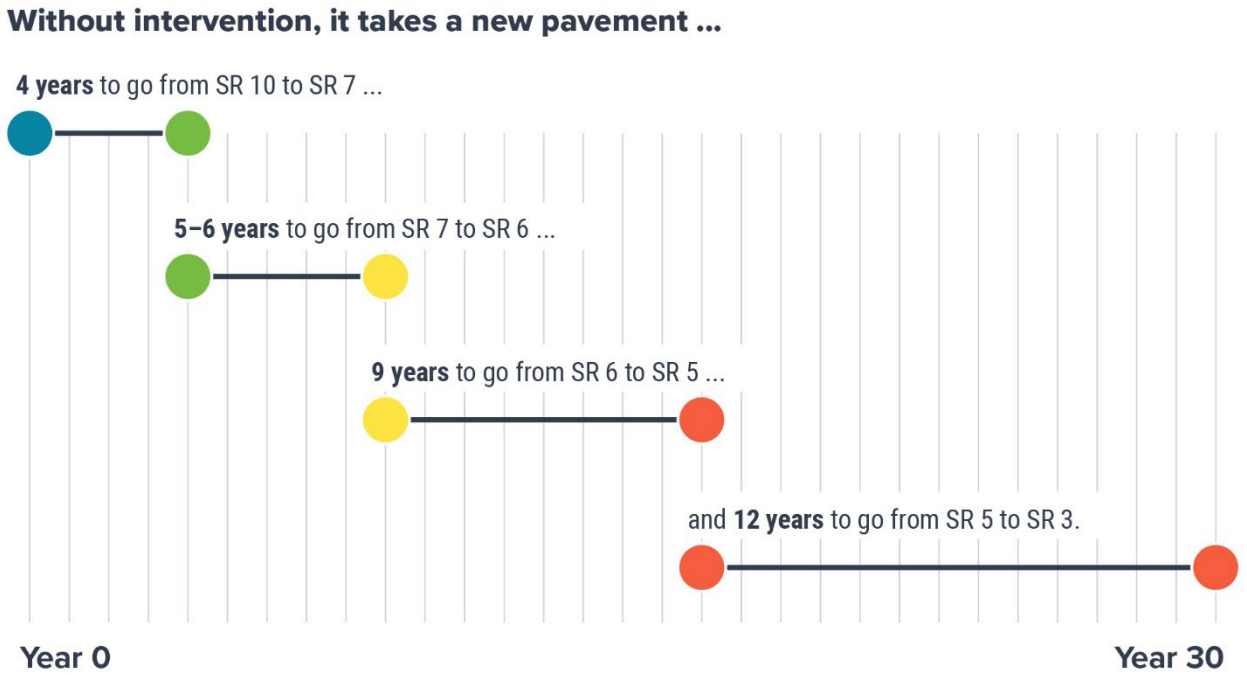


Figure 6. Timeline of surface rating deterioration rates.

Treatment Benefits

When treatments are applied, they counteract pavement deterioration. Some light treatments, like crack seal, only delay further deterioration. More substantial treatments overlay or replace the pavement surface and thus restore the pavement to a higher level of condition. The following rules were used to model the expected benefits of each treatment in the analysis. These rules represent the benefits provided by each treatment, assuming the treatments are placed on appropriate candidates.

- Crack seal: No deterioration in the next year.
- Thin overlay: Restored to an effective age of 3.
- Corrective overlay: Restored to an effective age of 2.
- Minor rehabilitation: Restored to an effective age of 2.
- Major rehabilitation and reconstruction: Restored to an effective age of 0.

Analysis Methodology

An analysis was conducted to determine the level of funding needed to address the needs of pavements at all appropriate life-cycle stages. Pavement data were obtained from NYSDOT with a Freedom of Information Law (FOIL) request by which NYSDOT provided the analysis team with 2024 pavement conditions for all NYSDOT-maintained pavements. This included the SR and IRI values, locations, traffic counts, and other pertinent data. The analysis was performed using a spreadsheet tool, developed by the analysis team for this effort.

Starting with the 2024 conditions, the deterioration and treatment benefit models were applied to each pavement segment as described in the previous sections of this report. The analysis team varied the level of budget for each year of the analysis, each treatment category, and each Region to determine the funding needed to achieve and sustain the desired state of good repair for NYSDOT's pavements over the next 20 years. The analysis tool would not allow funding to be applied to treatments outside of their window of opportunity (e.g., a thin overlay would not be applied to pavement in *Poor* condition, and pavement in *Good* condition would not receive a major rehabilitation).

The analysis tool was configured to provide statewide performance forecasting results as well as Regional funding for Interstate and non-Interstate pavements on a prorated basis. Two scenarios were explored under the 20-year needs model. The first scenario considers what level of funding would be required to reach a state of good repair within 5 years. The second scenario considers a timeline of 10 years to reach the same state of good repair. For each analysis, the needed budget was determined to bring each highway type into a state of good repair in each Region along the same timeline. This approach ensures fair and equitable delivery of benefits to all highway users and New York State taxpayers.

Analysis Outputs

The primary analysis outputs are the funding levels required to achieve the state of good repair within the selected time frame and the resulting work that would be delivered with that funding. Funding and work output levels were developed based on each specific year, Region, and treatment included in the analysis, as described earlier in this section.

All analyses were performed on a statewide basis to bring NYSDOT's overall pavement conditions to the desired state of good repair within the specified time frame. The Regional funding needs, presented in later sections of this report, were obtained by filtering statewide results to extract the recommended funding levels and treatment recommendations for each specific Region. As a result of this approach, the time required for each Region to achieve a state of good repair may vary based on each Region's starting conditions and the cost-effectiveness of potential treatments. This approach was selected to optimize cost-effectiveness statewide and minimize overall costs.

All of the needs analysis results, recommendations, and conclusions presented in the remainder of the report were developed through the methodology described in this section.

ANALYSIS RESULTS

Significant funds are needed to achieve the desired state of good repair, with large up-front investment in renewal activities for the first several years of the analysis period. The following two scenarios were evaluated to determine incremental cost of achieving the state of good repair within a single capital program period versus achieving it over two periods.

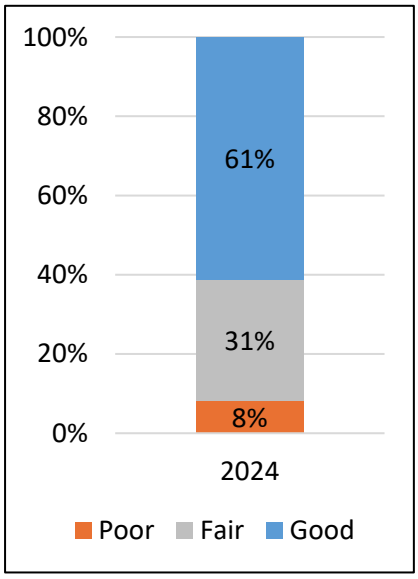


Figure 7. 2024 statewide conditions.

Achieving the Desired State of Good Repair in 5 Years

Based on the data provided by NYSDOT, as shown in Figure 7, approximately 8 percent the State pavements are in *Poor* condition. Addressing these *Poor* pavements is necessary to achieve a state of good repair. This scenario identified a statewide annual funding need of approximately $5.9 billion to address pavements currently in *Poor* condition to achieve the desired state of good repair for each subnetwork of NYSDOT's system while also ensuring these conditions would be sustained for the remainder of the 20-year analysis. The resulting pavement conditions from this analysis are shown in Figure 7.

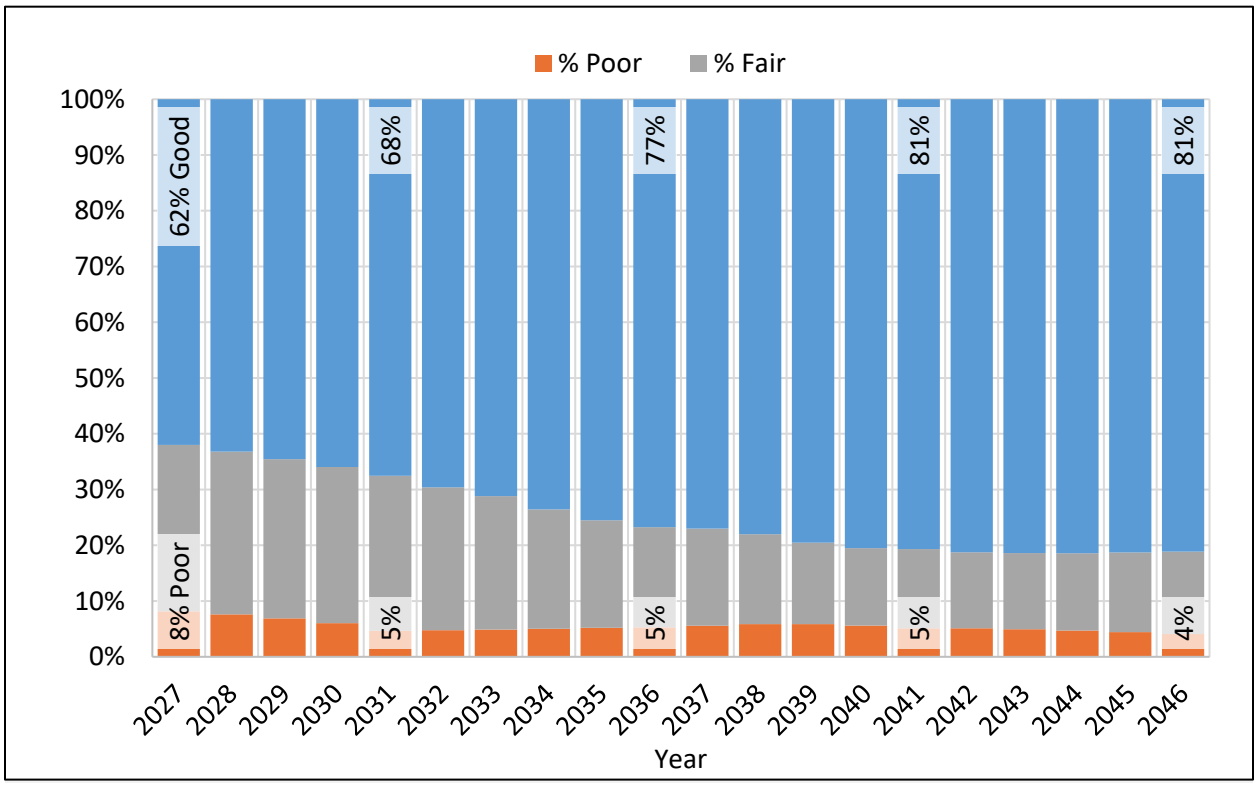


Figure 8. Pavement conditions resulting from 5-year state of good repair scenario.

The total and average annual investment needs for each 5-year period of the analysis are summarized in Table 3. It should be noted that once the state of good repair is achieved, the annual need drops in each successive 5-year period, even after factoring in a 5 percent annual inflation.

Table 3. Funding needs by period, identified in 5-year state of good repair scenario ($ billion).

Need Type	2027–2031	2032–2036	2037–2041	2042–2046	Overall 20-Year Period
Average Annual Funding Need	$5.9	$5.4	$5.2	$4.2	$5.5
5-Year Funding Need	$29.5	$27.1	$25.8	$21.2	$103.5

Achieving the Desired State of Good Repair in 10 Years

The analysis was repeated to determine whether there was a substantial financial advantage to achieving the desired state of good repair over a longer period. In this second scenario, budgets were developed to achieve the desired state of good repair across each subnetwork within the first 10 years and then sustain those conditions for the remainder of the analysis period, as shown in Figure 9.

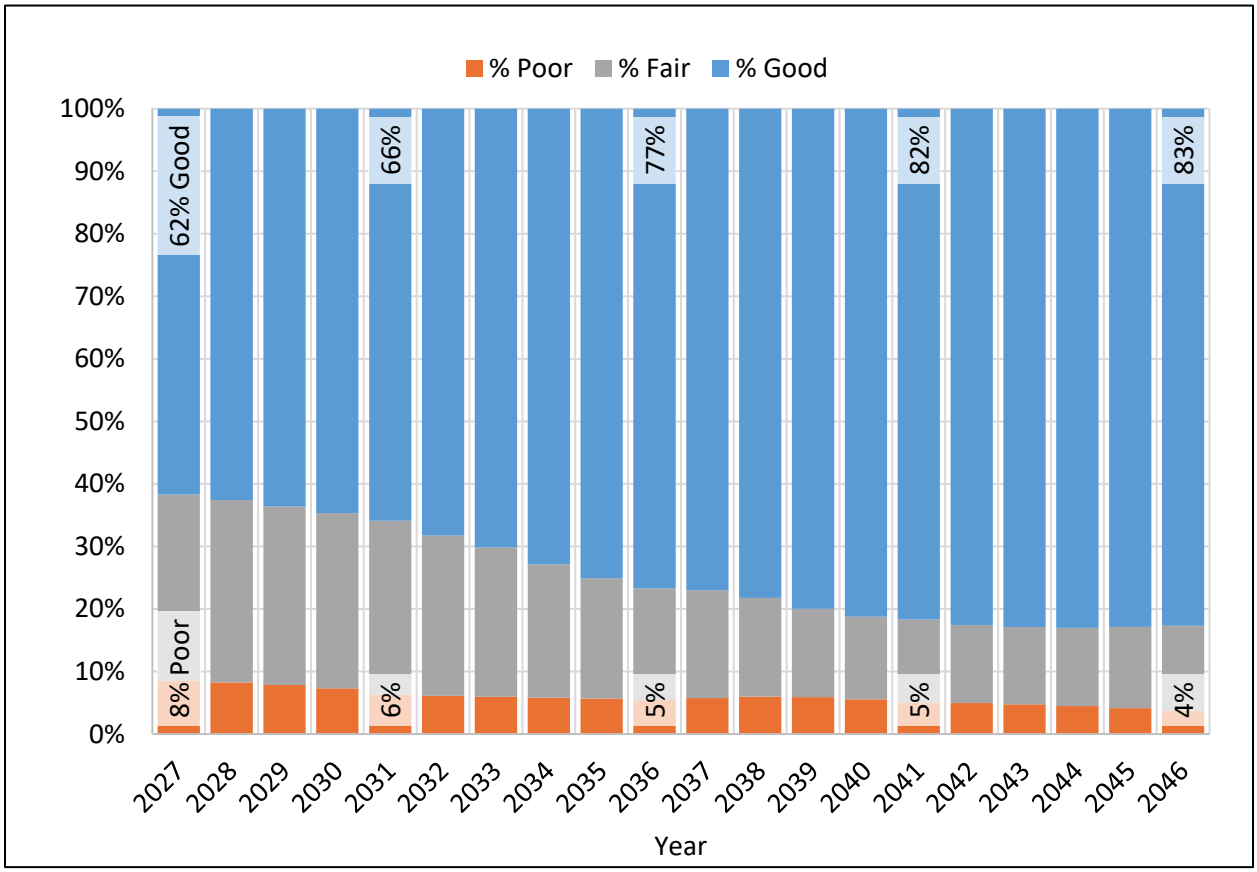


Figure 9. Pavement conditions resulting from 10-year state of good repair scenario.

The funding needs determined by this scenario are shown in Table 4. This scenario identified a need of $5.3 billion per year during the first 5-year period of the analysis. It should be noted that, unlike in the 5-year scenario, the funding need increases for years 6 through 10, to an average of nearly $6.1 billion per year. Again, once the state of good repair is achieved, the average annual need declines for the remainder of the analysis period. Overall, the total cost of this scenario is slightly greater than that of the 5-year scenario. This demonstrates how delaying the achievement of a state of good repair for NYSDOT pavements increases future costs to the Department.

Table 4. Funding needs by period identified in 10-year state of good repair scenario ($ billion).

Need Type	2027–2031	2032–2036	2037–2041	2042–2046	Overall 20-Year Period
Average Annual Funding Need	$5.3	$6.1	$5.3	$4.3	$5.9
5-Year Funding Need	$26.7	$30.4	$26.3	$21.6	$105.0

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR NYSDOT PAVEMENTS

Introduction

Based on a comparison of the 5-year and 10-year scenarios, it is recommended that NYSDOT bring pavements on the State Highway System to a state of good repair by 2032. The recommended funding levels to achieve this are presented in this section.

Current Needs

As illustrated in Figure 2, the percentage of NYSDOT pavements rated *Poor* and *Fair* has remained persistently high, generally ranging from 35 to 40 percent. The most recent official NYSDOT data indicate an accelerating decrease in the number of pavements rated *Good*, raising concerns about the continued deterioration of the State highway system. Figure 10 presents the 2024 State pavement conditions, both statewide and by highway type.

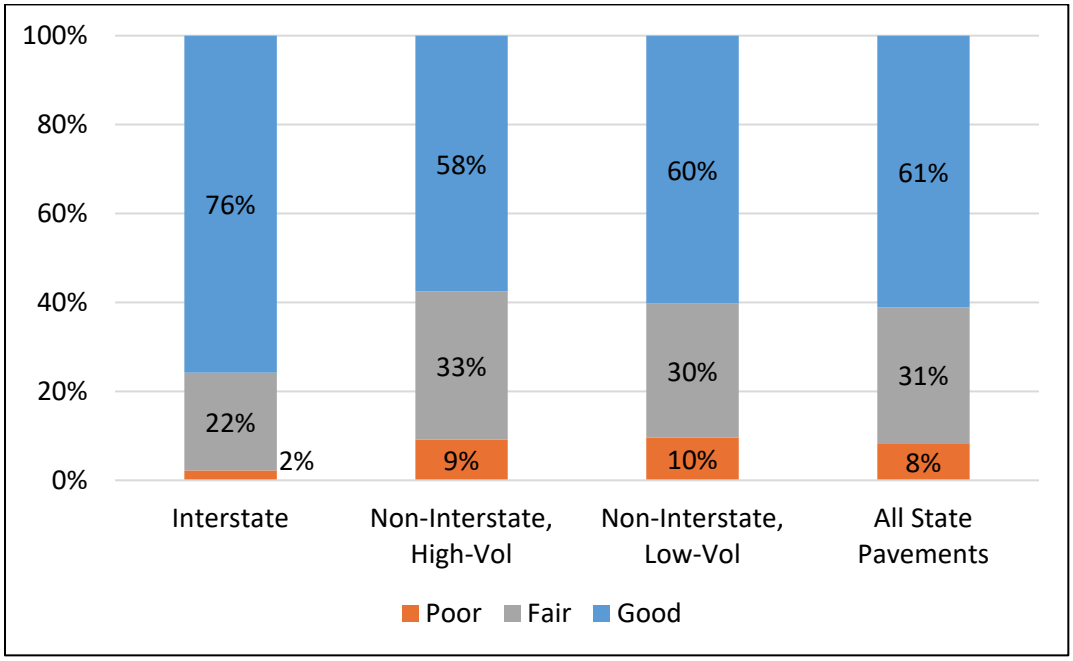


Figure 10. 2024 NYSDOT pavement conditions by network (unofficial).

The increase in *Fair* and *Poor* pavement has created a need for more corrective overlay and renewal work to achieve a state of good repair for the State network. Because costs have increased significantly in recent years, delaying this work will only cause the cost of recovering network conditions to rise. At the same time, NYSDOT must maintain its commitment to pavement preservation to ensure pavements currently in *Good* condition do not fail prematurely.

Recommended Investment Levels

Table 5 shows the recommended 20-year pavement investment levels, based on the 5-year scenario, broken down by work type. These investments would be expected to achieve the desired state of good repair within 5 years and sustain that condition for another 15. The impact of the whole-life investment strategy, defined in NYSDOT's asset management plan, would lead to a reduced funding need in each successive 5-year block, even when a 5 percent annual inflation rate is factored in.

Table 5. Statewide recommended average annual investments by period and by work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	Overall 20-Year Period
PM–Crack Seal	$53	$81	$104	$132	$75
PM–Thin Overlay	$103	$283	$361	$396	$243
Corrective Overlay	$227	$529	$698	$1,249	$462
Renewal	$5,520	$4,518	$3,987	$2,469	$4,759
Total	**$5,903**	**$5,411**	**$5,150**	**$4,246**	**$5,540**

The impact of NYSDOT's whole-life pavement strategy is further demonstrated in Table 6, which shows the number of lane-miles recommended to be treated in each work type over the analysis period. These proposed investments represent the work that would be accomplished with the investment levels derived from the 5-year needs scenario.

During the first 5-year block, the majority of work is needed in the renewal category. This is to recover the pavement that is already in *Poor* condition or expected to decline to *Poor* condition during this period. Once the *Poor* pavements are addressed, starting in 2032, most of the paving needs are expected to be in the PM–thin overlay category. As overall pavement conditions improve, NYSDOT would have fewer candidates for corrective overlay and renewal. Since corrective overlay and renewal treatments are several times more expensive than PM–thin overlays, overall costs to sustain conditions decrease, even as the number of lane-miles treated each year increases.

Table 6. Statewide recommended average annual lane-miles to be treated by period by work type.

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	Overall 20-Year Period
PM–Crack Seal	3,252	4,151	4,172	4,182	3,939
PM–Thin Overlay	648	1,323	1,325	1,176	1,118
Corrective Overlay	539	1,034	1,057	1,541	1,043
Renewal	1,392	881	593	342	802
Total	**5,831**	**7,389**	**7,147**	**7,241**	**6,902**

Starting in year 6 of this analysis, NYSDOT should be paving (thin overlay, corrective overlay, and renewal) approximately 3,000 lane-miles per year. This represents slightly less than 8 percent of NYSDOT's system that is treated with some sort of resurfacing action every year. This rate of resurfacing corresponds to approximately a 12-year paving cycle. This production rate remains relatively stable for the remainder of the analysis period.

Failing to follow this strategy and resorting to a worst-first approach that focuses only on addressing *Poor* pavements will require significantly greater investment levels to achieve the same overall network performance. Failing to provide adequate funding will lead to continued declining conditions and an increasing backlog of costs.

The following sections of the report provide details of the assessed needs and recommended investment levels for each of the 11 NYSDOT Regions.

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 1 (ALBANY)

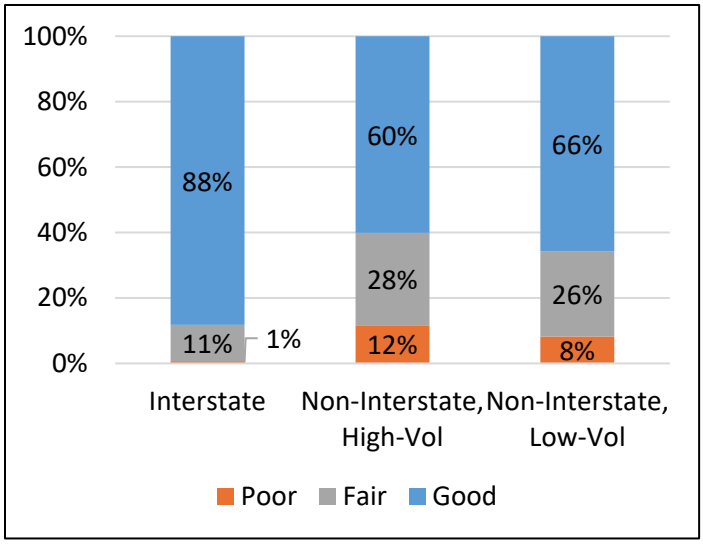


Figure 11. 2024 conditions of Region 1 pavements by network.

While Region 1 has been able to keep its Interstates in a state of good repair, there is a significant buildup of *Poor* pavements on low-volume roadways. As of 2024, Region 1 has 12 percent of its low-volume pavements and 8 percent of its high-volume non-Interstate pavements in *Poor* condition (Figure 11).

Table 7 shows the 20-year average annual investments needed to achieve and sustain a state of good repair for Region 1 pavements. Investments in the first 5 years are primarily to recover the condition of non-Interstate pavements that have fallen into disrepair. If these investments are made, the annual need to sustain a state of good repair is reduced in each successive 5-year block of the analysis period. Region 1 has considerable renewal needs throughout the 20-year period. The renewal needs in the first 5-year period alone total over $3.2 billion ($652 million per year).

Table 7. Region 1 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$4	$7	$9	$11	$8
PM–Thin Overlay	$12	$27	$34	$43	$29
Corrective Overlay	$13	$36	$47	$93	$47
Renewal	$623	$526	$464	$364	$494
Total Annual Need	**$652**	**$596**	**$554**	**$511**	**$578**

Table 8 presents Region 1's average annual investment need by system type. This table shows how Region 1's past investment in Interstate pavements has reduced the level of investment needed in that portion of the system; the majority of the future needs, identified in this analysis, are on the non-Interstate system.

Table 8. Region 1 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$37	$48	$30	$33	$37
Non-Interstate	$615	$548	$524	$478	$541
Total Annual Need	**$652**	**$596**	**$554**	**$511**	**$578**

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 2 (UTICA)

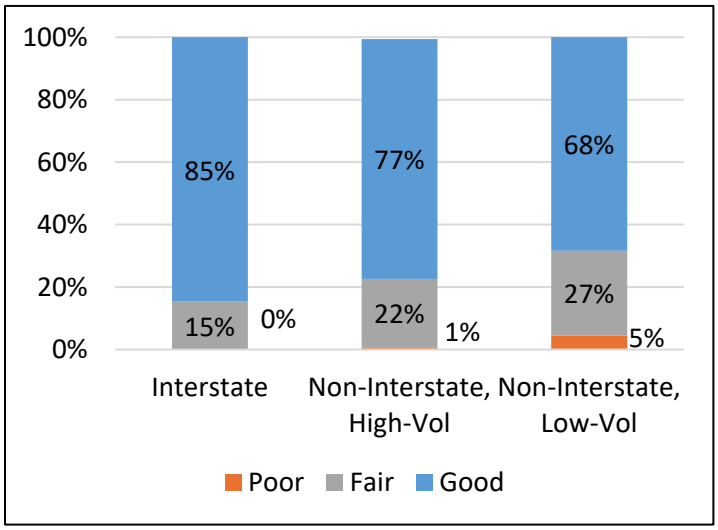


Figure 12. 2024 conditions of Region 2 pavements by network.

Based on 2024 conditions, Region 2 pavements are currently in a state of good repair (Figure 12). The Region has very little Interstate pavement, which means the cost to maintain its network is relatively low.

Table 9 presents the recommended average annual investments for Region 2. As shown in this table, the majority of the Region's investment needs in the next 5 years are to renew pavements in *Poor* condition, while the longer-term needs are more evenly distributed among work types. The fact that Region 2 has a relatively high renewal need in the near term, while currently having less than 5 percent of its pavement in *Poor* condition, suggests a significant number of lane-miles will deteriorate from *Fair* to *Poor* without significant and immediate investment.

Table 9. Region 2 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$2	$4	$5	$6	$4
PM–Thin Overlay	$10	$30	$38	$48	$32
Corrective Overlay	$9	$29	$37	$75	$37
Renewal	$156	$121	$98	$111	$122
Total	$178	$183	$177	$240	$194

Table 10 presents the average annual investments by system type and shows that non-Interstate pavements make up the majority of the Region's needs throughout the analysis period. Renewing low-volume roads can be done with relatively less expensive options for corrective overlays and renewal, such as cold in-place recycling with single or multicourse overlays. Because of this, the cost to fully recover the condition of Region 2's pavements in years 1 to 5 is similar to the cost of sustaining that state of good repair for years 6 to 20.

Table 10. Region 2 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$0	$1	$1	$1	$1
Non-Interstate	$177	$182	$177	$240	$194
Total	$178	$183	$177	$240	$194

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 3 (SYRACUSE)

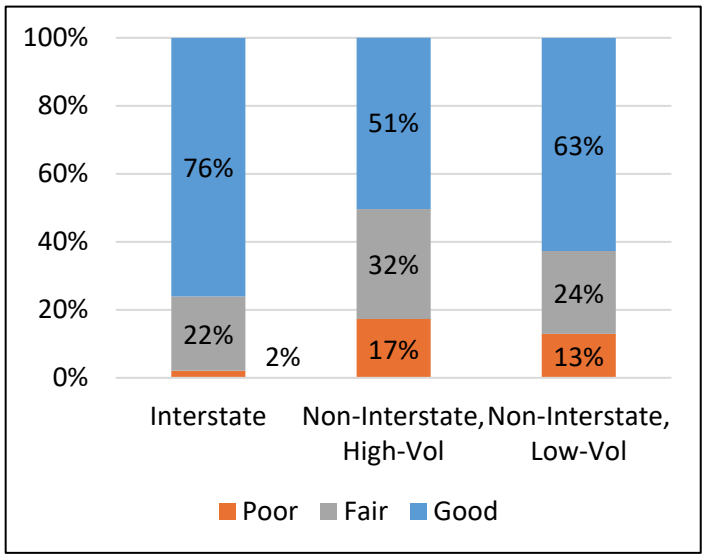


Figure 13. 2024 conditions of Region 3 pavements by network.

Region 3 is currently in the middle of a multi-year, multi-billion-dollar reimagining of the I-81 corridor through Syracuse, which has been the driving factor behind most of the Region's capital programing decisions in recent years. As seen in Figure 13, the Region currently has a significant amount of pavement in *Poor* condition. This is likely due to such a significant investment in I-81 drawing resources from the rest of the system.

The completion of the ongoing I-81 viaduct project may result in a significant increase in pavement needs for the Region, which is not captured in this analysis. The I-81 viaduct project will eliminate a significant number of bridges and replace them with pavements. Achieving a state of good repair for Region 3's current network now will help ensure sufficient funds are available to also maintain the new trunkline through the City of Syracuse. Table 11 shows the recommended average annual investments needed to achieve and sustain a state of good repair for Region 3's pavements.

Table 11. Region 3 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$4	$6	$7	$9	$6
PM–Thin Overlay	$4	$10	$13	$17	$11
Corrective Overlay	$19	$53	$70	$136	$70
Renewal	$577	$505	$418	$302	$451
Total	$605	$574	$509	$464	$538

As can be seen in Table 12, the bulk of this need is for non-Interstate pavements. Approximately $3 billion is needed in the first 5 years ($605 million per year) to achieve a state of good repair. Starting in year 6, the funding needed to sustain conditions drops in each successive 5-year period, even when factoring in the estimated 5 percent inflation.

Table 12. Region 3 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$39	$50	$33	$35	$39
Non-Interstate	$566	$523	$476	$430	$499
Total	**$605**	**$574**	**$509**	**$464**	**$538**

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 4 (ROCHESTER)

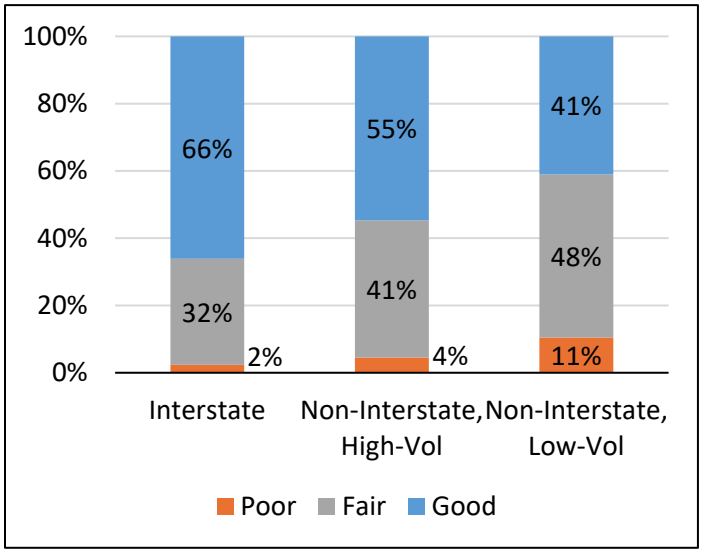


Figure 14. 2024 conditions of Region 4 pavements by network.

Region 4 has managed to keep its Interstate and high-volume non-Interstate pavements in a state of good repair (Figure 14). However, the Region has a significant need for renewal of low-volume roadways.

Table 13 shows the annual average cost of achieving and sustaining a state of good repair for Region 4's pavements, indicating a significant need for renewal work. In total, Region 4 needs approximately $2.5 billion from 2027 to 2031 to achieve a state of good repair ($499 million per year). That need remains relatively stable over the 20-year analysis period, even after factoring in 5 percent inflation.

Table 13. Region 4 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$2	$3	$4	$5	$4
PM–Thin Overlay	$9	$25	$32	$41	$27
Corrective Overlay	$31	$89	$116	$230	$116
Renewal	$456	$382	$302	$277	$354
Total	**$499**	**$500**	**$455**	**$553**	**$502**

Table 14 shows Region 4's 20-year pavement needs by system type. While Region 4 has over 400 lane-miles of Interstate pavements, the overall need for these pavements remains relatively low throughout the analysis period. The majority of the Region's investment needs are for the renewal and preservation of non-Interstate pavements.

Table 14. Region 4 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$46	$58	$35	$37	$44
Non-Interstate	$453	$441	$420	$516	$458
Total	**$499**	**$500**	**$455**	**$553**	**$502**

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 5 (BUFFALO)

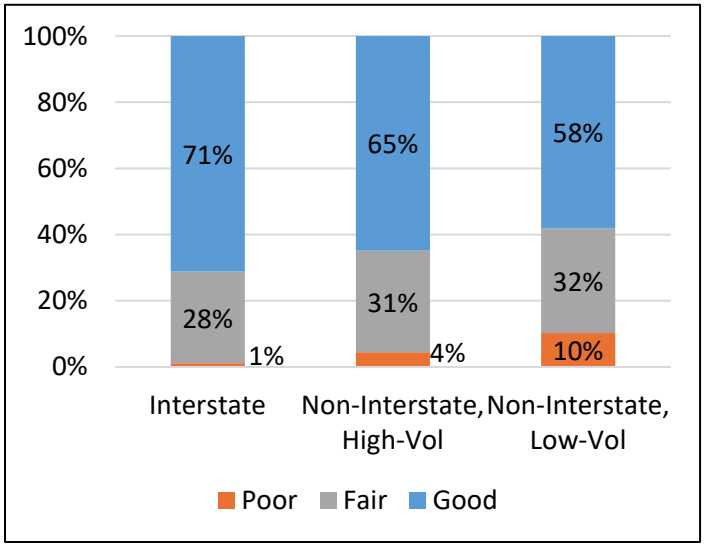


Figure 15. 2024 Pavement conditions for Region 5 by network.

Based on the data provided by NYSDOT, Region 5 has kept its Interstate and high-volume non-Interstate pavements in a state of good repair but has built up a significant backlog of *Poor* low-volume pavements (Figure 15).

Table 15 shows the annual average cost of achieving and sustaining a state of good repair for Region 5's pavements by work type, indicating a significant need for renewal work. While slightly more than $2 billion is needed for renewal work in the next 5 years ($415 million per year), that need would drop in future periods, if the state of good repair can be achieved.

Table 15. Region 5 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$3	$4	$5	$7	$5
PM–Thin Overlay	$10	$27	$34	$44	$29
Corrective Overlay	$19	$46	$62	$126	$63
Renewal	$383	$317	$264	$233	$299
Total	**$415**	**$393**	**$365**	**$409**	**$396**

Table 16 shows Region 5's pavement needs broken down by system type and investment period. While Region 5 has over 500 lane-miles of Interstate pavements, the overall need for these pavements remains relatively low throughout the analysis period. The majority of the Region's investment needs are for the renewal and preservation of non-Interstate pavements. In total, Region 5 needs approximately $2.1 billion from 2027 to 2031 to achieve a state of good repair ($415 million per year). That need remains relatively stable.

Table 16. Region 5 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$34	$43	$31	$36	$36
Non-Interstate	$381	$350	$334	$373	$360
Total	**$415**	**$393**	**$365**	**$409**	**$396**

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 6 (HORNELL)

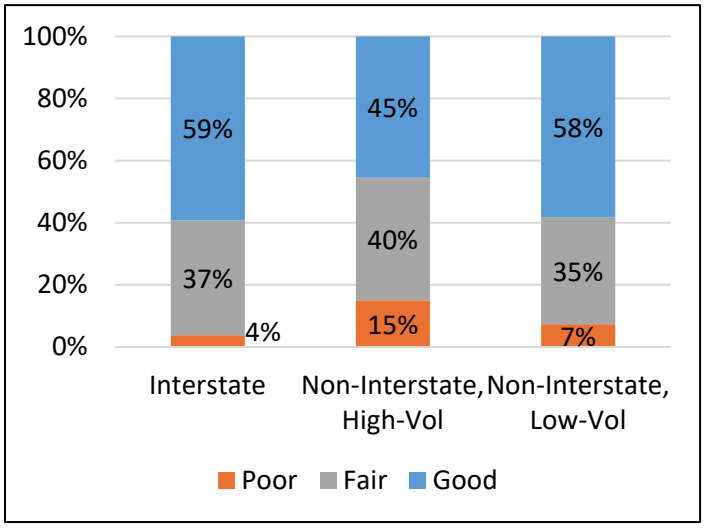


Figure 16. 2024 conditions for Region 6 pavements by network.

Region 6 has failed to maintain a state of good repair for any portion of its pavement network (Figure 16).

Table 17 shows Region 6's 20-year pavement needs broken down by work type and investment period. To achieve a state of good repair, Region 6 will require nearly $1.5 billion ($295 million per year) invested in pavements. This need remains relatively stable throughout the analysis period, both in size and distribution by work type.

Table 17. Region 6 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$2	$3	$3	$4	$3
PM–Thin Overlay	$6	$12	$15	$19	$13
Corrective Overlay	$25	$56	$79	$137	$74
Renewal	$262	$241	$191	$146	$210
Total	**$295**	**$311**	**$288**	**$306**	**$300**

Table 18 shows Region 6's statewide needs broken down by system type. When compared to the other upstate Regions, Region 6 has a significant need to invest in Interstate pavements throughout the analysis period. This is because nearly 30 percent of Region 6's lane-miles (702 out of 2,361 lane-miles) are on the Interstate and Region 6 has the second most lane-miles of Interstate pavement in *Poor* condition. Based on the data provided by NYSDOT, Region 6 has more Interstate in *Poor* condition (26.66 lane-miles) than Regions 1, 2, 4, 8, 10, and 11 have combined (16.22 lane-miles).

Table 18. Region 6 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$67	$85	$71	$78	$75
Non-Interstate	$228	$226	$217	$227	$225
Total	**$295**	**$311**	**$288**	**$306**	**$300**

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 7 (WATERTOWN)

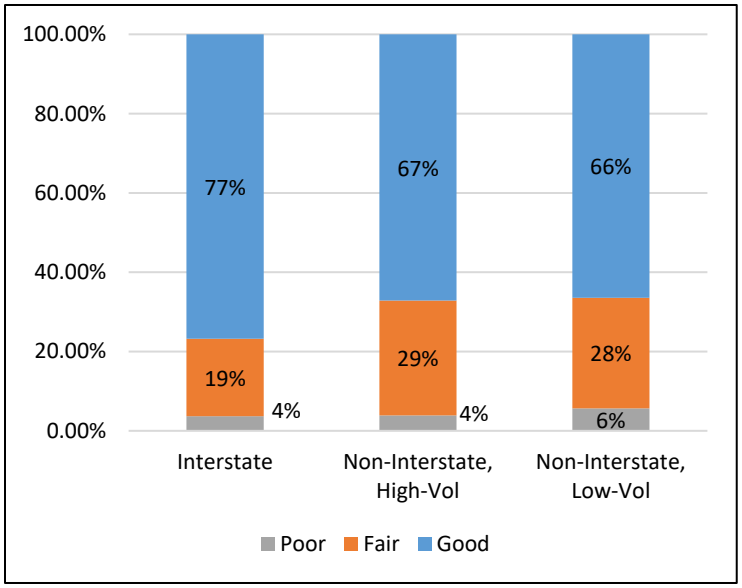


Figure 17. 2024 conditions of Region 7 pavements by network.

Region 7 is close to having a state of good repair for its non-Interstate pavements (Figure 17). This is reflected in the relatively low average annual funding needs over the next 5 years, shown in Tables 19 and 20. There is a backlog of pavements in need of renewal, particularly on the Interstates, requiring an average investment need of approximately $1.2 billion in the first 5 years ($329 million per year).

Region 7 is one of two Regions showing increasing future needs (Region 11 is the other). As shown in Table 19, Region 7's future costs are expected to initially decline, once the state of good repair is achieved, but then increase in the final 5-year period (2042 to 2046). This is a function of the Region's pavements currently being in relatively *Good* condition, leading to a large number of pavements requiring corrective overlay toward the end of the analysis period. Overall, Region 7's need is expected to remain relatively stable over the next 20 years if the Region is able to achieve a state of good repair by 2031.

Table 19. Region 7 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$3	$4	$6	$7	$5
PM–Thin Overlay	$10	$22	$28	$36	$24
Corrective Overlay	$21	$62	$81	$153	$79
Renewal	$206	$182	$132	$117	$159
Total	**$239**	**$270**	**$246**	**$313**	**$267**

Table 20. Region 7 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$29	$37	$29	$30	$31
Non-Interstate	$210	$233	$217	$283	$236
Total	**$239**	**$270**	**$246**	**$313**	**$267**

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 8 (POUGHKEEPSIE)

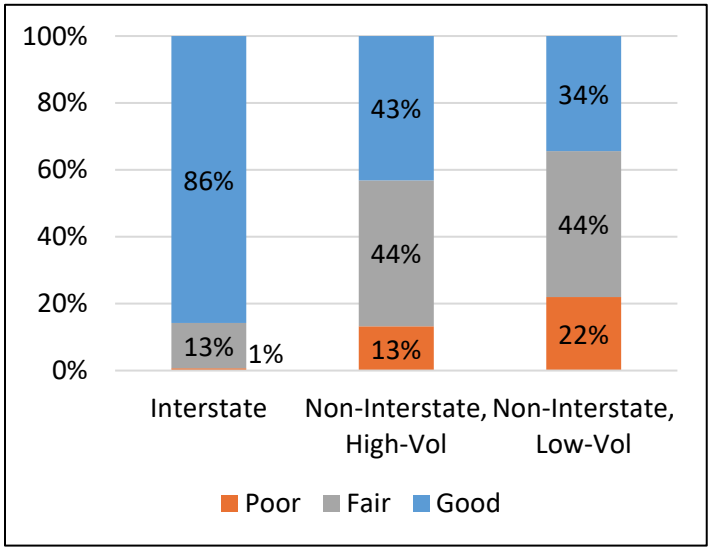


Figure 18. 2024 conditions of Region 8 pavements by network.

Region 8 has a very large pavement network of more than 5,700 lane-miles, of which a significant amount is in *Poor* condition (Figure 18). While the Region has maintained a state of good repair on its Interstate pavements, the remainder of the system has some of the worst conditions in the State. With more than 770 lane-miles of pavement in *Poor* condition, Region 8 has by far the most pavement needing renewal. As shown in Table 21, Region 8 will require more than $9 billion ($1.811 million per year) to achieve a desired state of good repair by 2031. This represents more than one-third of all NYSDOT pavement needs in that period.

Table 21. Region 8 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$11	$18	$23	$29	$20
PM–Thin Overlay	$17	$60	$76	$61	$54
Corrective Overlay	$43	$79	$98	$120	$85
Renewal	$1,740	$1,290	$1,269	$388	$1,172
Total	**$1,811**	**$1,447**	**$1,465**	**$599**	**$1,331**

Table 22 shows that the majority of Region 8's investment needs are off the Interstate system. Although Region 8's investment needs to achieve a state of good repair are significant, the future dividends of this investment are equally significant. If Region 8 can achieve a state of good repair, its future pavement needs would decrease by nearly 67 percent by 2042.

Table 22. Region 8 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$46	$75	$72	$74	$67
Non-Interstate	$1,765	$1,372	$1,393	$525	$1,264
Total	**$1,811**	**$1,447**	**$1,465**	**$599**	**$1,331**

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 9 (BINGHAMTON)

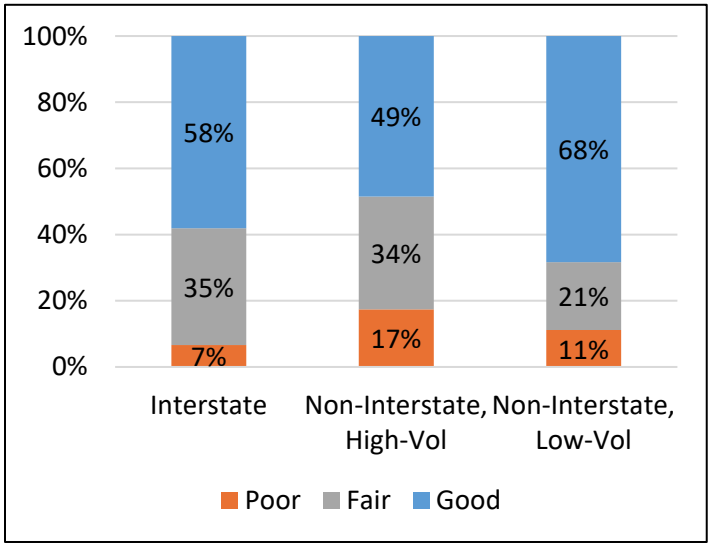


Figure 19. 2024 conditions of Region 9 pavements by network.

Region 9 encompasses mostly rural areas. As a result, more than half of its pavement network is low volume. Currently, no part of Region 9's network is in a state of good repair, as shown in Figure 19. The Region's 7 percent of Interstates and 17 percent of high-volume non-Interstate *Poor* pavement are the highest percentages of any Region. The result of these conditions is that Region 9 has a greater renewal need over the next 5 years than any other upstate Region (Regions managing with similar unit costs).

Table 23 shows Region 9's 20-year average annual funding needs to achieve and sustain pavements in a state of good repair by work type. More than $3.6 billion ($734 million per year) is needed for Region 9 pavements over the next 5 years. As shown in Table 23, the majority of that need is to recover the condition of pavements in *Poor* condition. If that initial need can be met, average annual funding requirements decline over the following 15 years, even after factoring for inflation.

Table 23. Region 9 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$3	$5	$6	$8	$5
PM–Thin Overlay	$11	$24	$31	$39	$26
Corrective Overlay	$22	$47	$67	$127	$66
Renewal	$698	$624	$510	$381	$553
Total	**$734**	**$701**	**$613**	**$555**	**$651**

Table 24 shows Region 9's pavement needs by system type. The majority of the Region's needs are off the Interstate system. However, Region 9's $94 million annual need in the initial 5-year period is the most for any Region.

Table 24. Region 9 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$94	$120	$85	$84	$96
Non-Interstate	$640	$580	$528	$472	$555
Total	**$734**	**$701**	**$613**	**$555**	**$651**

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 10 (HAUGPAUGUE)

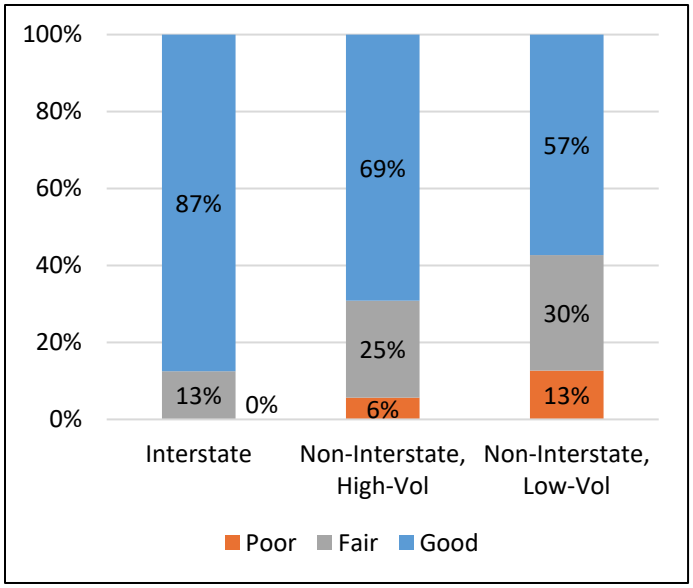


Figure 20. 2024 conditions of Region 10 pavements by network.

Figure 20 shows Region 10's conditions in 2024. Region 10 has excellent Interstate conditions, but there is a substantial backlog in *Poor* low-volume pavement.

Table 25 details the 20-year funding needs to achieve and sustain Region 10's pavements in a state of good repair, broken down by work type. Overall, the Region needs approximately $1.6 billion ($401 million per year) over the next 5 years to fully achieve a state of good repair. This is relatively low, compared to the rest of the State, particularly considering the higher unit costs that Region 10 is faced with when contracting work.

Table 25. Region 10 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$6	$10	$13	$17	$12
PM–Thin Overlay	$10	$39	$50	$34	$33
Corrective Overlay	$7	$13	$15	$18	$13
Renewal	$377	$292	$294	$92	$264
Total	**$401**	**$354**	**$372**	**$161**	**$322**

Table 26 shows Region 10's 20-year pavement needs broken down by network type. Overall, the Region's needs are relatively low due to the excellent condition of its Interstate and the near state of good repair of its non-Interstate high-volume pavement. The latter includes the Parkway system, which is managed similarly to Interstate pavements. If a state of good repair can be achieved, future needs drop by more than 50 percent by 2042, even when factoring for inflation.

Table 26. Region 10 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$15	$37	$38	$31	$30
Non-Interstate	$385	$318	$334	$130	$292
Total	**$401**	**$354**	**$372**	**$161**	**$322**

RECOMMENDED 20-YEAR RESOURCE NEEDS FOR REGION 11 (NEW YORK CITY)

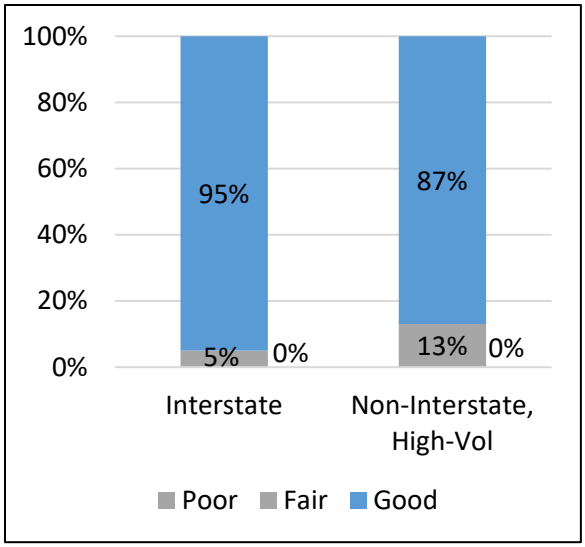


Figure 21. 2024 conditions of Region 11 pavements by network.

Region 11 manages a unique inventory primarily composed of Interstate pavements and Parkways. The Region does not manage any low-volume pavements. Figure 21 shows Region 11's conditions in 2024. Overall, the Region's network is in excellent condition, far exceeding the state of good repair thresholds adopted for this study.

Table 27 shows the 20-year funding needs to sustain Region 11's pavements in a state of good repair, broken down by work type. Overall, these funding levels are low compared to other Regions because Region 11 has very few renewal needs.

Table 27. Region 11 recommended average annual investments by period and work type ($ million).

Work Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
PM–Crack Seal	$13	$18	$23	$29	$21
PM–Thin Overlay	$4	$8	$10	$13	$9
Corrective Overlay	$17	$21	$27	$34	$25
Renewal	$41	$36	$46	$59	$45
Total	**$75**	**$83**	**$105**	**$134**	**$99**

Table 28 shows Region 11's 20-year pavement needs broken down by system type. Unlike most other Regions, Region 11's costs increase throughout the analysis period. This is because Region 11's pavements are already in a state of good repair. As a result, the mix of work needs remains relatively stable over time, and costs increase with inflation.

Table 28. Region 11 recommended average annual investments by period and system type ($ million).

System Type	2027–2031	2032–2036	2037–2041	2042–2046	20-Year Average
Interstate	$28	$31	$40	$51	$37
Non-Interstate	$47	$51	$66	$84	$62
Total	**$75**	**$83**	**$105**	**$134**	**$99**

CONCLUSIONS

It is the conclusion of this analysis team that NYSDOT requires a significant increase in funding to achieve a state of good repair for its pavements. This increase in funding will result in reduced user costs for drivers and commercial shippers and reduce NYSDOT's long-term costs. This is accomplished by employing a whole-life strategy to pavement management that is already documented in NYSDOT's asset management plan.

NYSDOT's pavements have been declining in recent years, and costs are growing rapidly. As a result of these two factors, further delays in providing adequate funding will only serve to increase the burden on future New York taxpayers and drivers. A total of $29.5 billion is needed in the next 5 years to stabilize New York's pavement. Table 29 provides a summary of those needs by NYSDOT Region

Table 29. Summary of NYSDOT 20-year pavement needs ($ million).

Region	Average Annual Need 2027–2031	Total Need 2027–2031	Average Annual 20-Year Need	Summary
1	$652	$3,260	$578	Backlog of renewal needs on non-Interstate pavements.
2	$178	$890	$194	Near state of good repair. Minor backlog on low-volume pavements.
3	$605	$3,025	$538	Backlog of renewal needs on non-Interstate pavements.
4	$499	$2,495	$502	Backlog of renewal needs on low-volume pavements.
5	$415	$2,075	$396	Backlog of renewal needs on low-volume pavements.
6	$295	$1,475	$300	Backlog of needs on all system types.
7	$239	$1,195	$267	Minor backlogs on Interstates and low-volume pavements.
8	$1,811	$9,055	$1,331	Largest backlog, entirely on non-Interstate pavements.
9	$734	$3,670	$851	Backlog of needs on all system types.
10	$401	$2,005	$322	Backlog of needs on low-volume pavements.
11	$75	$375	$99	Pavements are in a state of good repair
Total	$5,904	$29,520	$5,378	Significant backlog of needs, primarily on non-Interstate pavements.

Applying a whole-life strategy is the most cost-effective approach but cannot fully reverse declining pavement condition trends without significant additional funding. Investing now to address *Poor* pavements, coupled with sustaining NYSDOT's robust pavement preservation program, can stabilize New York's pavement conditions and reduce future costs. Thos future cost savings can then be used to address other transportation problems such as broader system renewal and multimodal expansions.

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