5

STEWARDSHIP OF THE TRANSPORTATION SYSTEM

5.1 STEWARDSHIP OF THE TRANSPORTATION SYSTEM

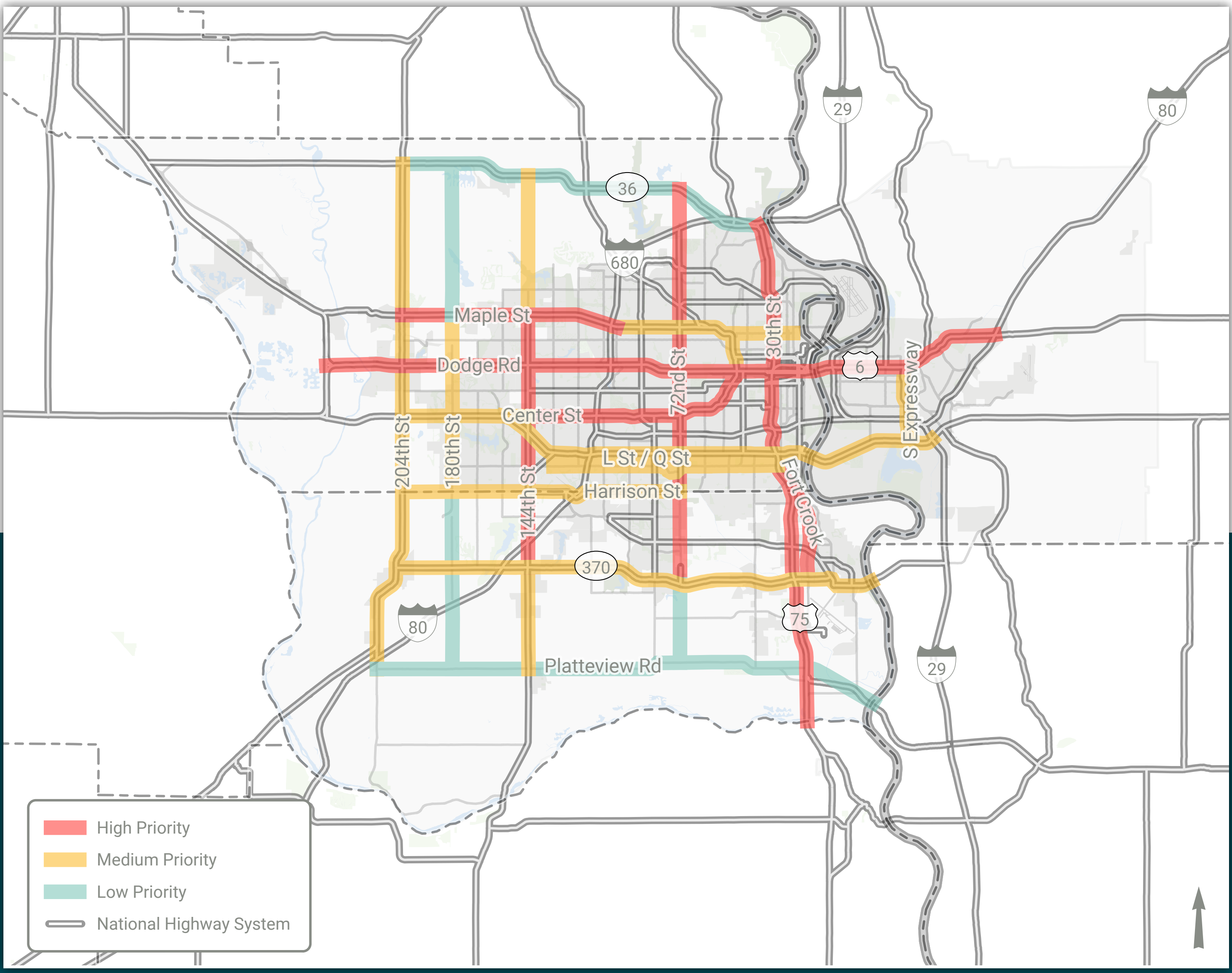
Maintaining a “state of good repair” for the region’s transportation system is a priority issue for both local leaders and the public. To many, the responsibility of maintaining our transportation assets is the most fundamental responsibility of our local and state transportation agencies. Each spring potholes and other breakdowns in our roadway system are visible reminders that maintenance of the system is a continuous effort. Less visible is the burden that aging transit vehicles and facilities place on transit agencies to provide reliable service and to plan for future service expansions. Most local agencies face infrastructure needs currently that outstrip the funding available to keep up with preservation activities and to catch up after decades of deferred maintenance.

The factors that impact the region’s ability to maintain the transportation system exceed the funding allocated for such activities. For example, if the Omaha-Council Bluffs region continues to grow with the predominantly low-density pattern of development that we have experienced during the last 40 years, the Heartland 2050 vision estimates that communities in our region will face a $1.3 billion budget shortfall for the infrastructure necessary to support that growth. Additionally, the costs associated with major transportation investments are estimated typically based on the up-front capital costs of building or purchasing the infrastructure. However, this approach neglects the ongoing operations and maintenance costs associated with such investments, masking their true “lifecycle costs” over the long-term. Because of these interrelated issues, system preservation has been a focal point of both the MTIS and ConnectGO–elevating these issues to a much more prominent place in the regional transportation planning process in the last several years.

As the region plans for the year 2050, it’s impossible to ignore the potential for existing and emerging technologies to change how goods and people move through the region. Today, planners and engineers recognize the value that technology investments like a modern traffic signal system can play in reducing congestion and keeping the economy moving. Likewise, as state and local leaders consider the impacts of emerging technologies such as autonomous vehicles, it’s important to weigh both the benefits and burdens of such shifts and the uncertainty that exists currently in planning for such changes. However, these planning efforts provide an opportunity to reconsider our traditional approaches to mitigating congestion in the region while ensuring that adequate resources exist to maintain the system of today and tomorrow.

System Preservation in the Metro Travel Improvement Study (MTIS)

Figure 5.1: MTIS Study Area Corridor Map



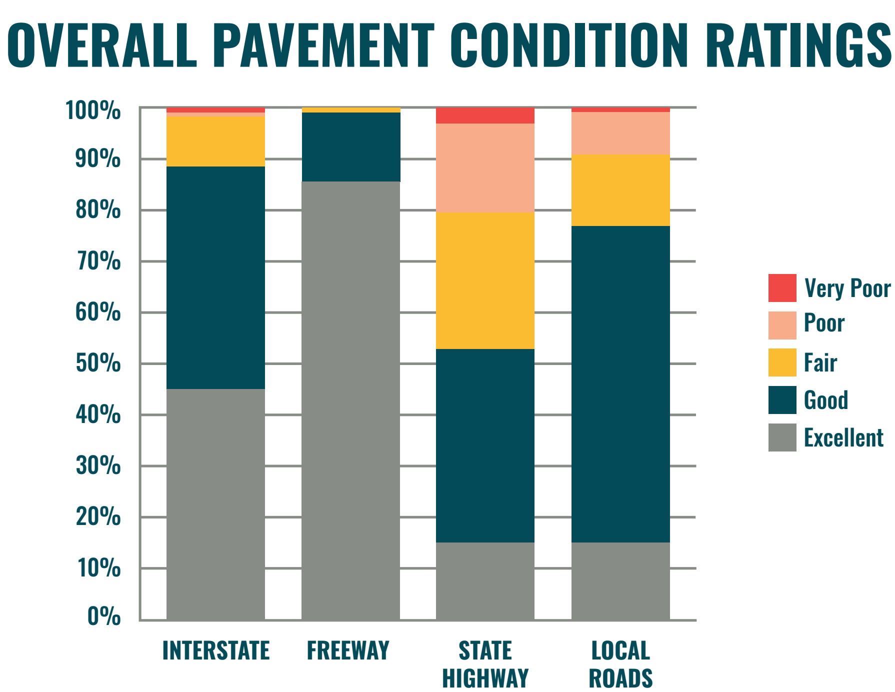
The Metro Area Travel Improvement Study (MTIS) was a collaborative effort between the Nebraska Department of Transportation (NDOT) and the Metropolitan Area Planning Agency (MAPA) to develop a comprehensive strategy for freeways, major roadways, and the transit system within the Omaha-Council Bluffs region. This effort implemented a performance-based planning approach for the first time in the MAPA region and provided community leaders with new tools to analyze future needs and compare different strategies. Additionally, the focus on major roadway corridors allowed MAPA and its partners to compare and monitor regionally significant corridors across state lines and set performance targets for an entire regional system.

To plan for the region's system preservation needs, the MTIS inventoried the condition of pavements and bridges on the National Highway System (NHS) roadways as well as other major roadways that serve as MAPA's Regional Priority Corridors. This network accounts for approximately 46% of the total freeway, arterial, and collector lane-mileage in the study area, but represents the vast majority of Vehicle Miles Traveled for drivers in the region, as well as highest levels of truck traffic in the region. Additionally, utilizing the NHS as the basis for this network aligned the MTIS with the federal performance measures that were instituted during the development of the study. Appendix B includes a more detailed profile of the condition of the transportation system.

Pavement Condition

Pavements deteriorate over time due to truck loads, severe weather, and other factors. Both Iowa DOT and NDOT conduct annual assessments of the NHS pavements to monitor the condition of the system. At the time of the MTIS analysis in 2014, Interstates and Freeways were the only functional classes of

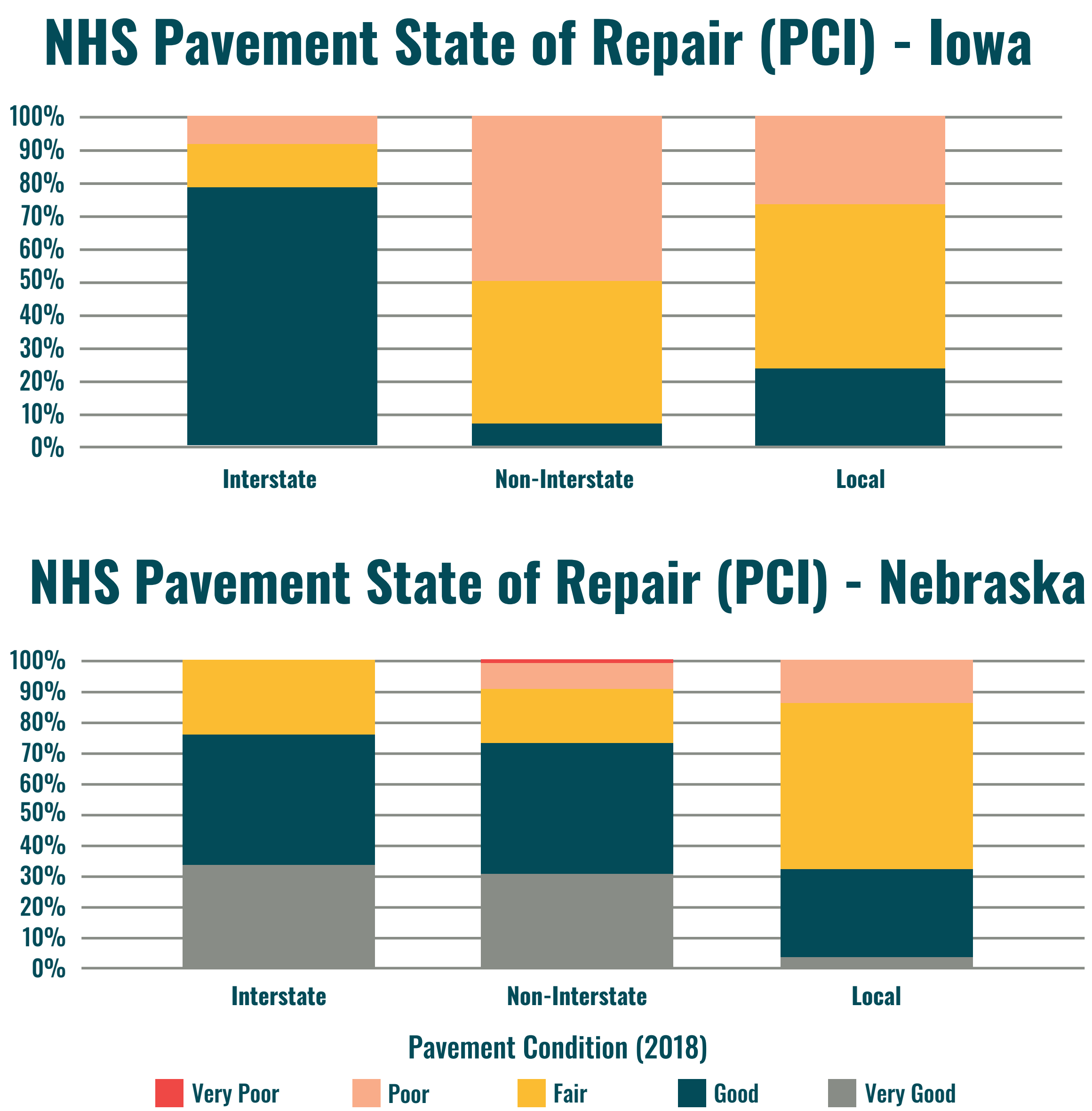
Figure 5.2: NHS Pavement Condition by State



Overall pavement condition ratings on study roadways in the MTIS study area roadways within the study area that currently meet the performance target of 84% "good" or better condition developed as part of the study.

By 2018 the condition of the region's roadways had remained relatively stable, with some notable declines in condition. Since this data was collected, several portions of these MTIS corridors suffered damage from the 2019 historic flooding or deterioration from the winter and spring of 2019. Major investments in the repairs have been made, in particular to shore up flood damaged infrastructure. Additionally, a major portion of the Council Bluffs Interstate System has been constructed as well as three planned phases off West Broadway in Council Bluffs. Generally; however, the trend of overall pavement condition since the MTIS study period has been downward, with less than 80% of the region's NHS having a condition of "good" or better. The maps and tables that follow detail the pavement condition of MTIS corridors in 2018.

Figure 5.3: NHS Pavement Condition by State



Without preventative maintenance or rehabilitation pavements will deteriorate over time to a point where they are no longer serviceable and require reconstruction. Future forecasts for pavement needs show by 2033 no study area roadways are expected to be in "good" or better condition unless pavement treatments are applied. This is crucial for local and state agencies to continue high-levels of investment to keep up with emerging needs while also catching up with the backlog of roadways not in good condition currently. It is noteworthy that in May 2020, City of Omaha voters overwhelmingly passed a bond issue allocating $200 million over five years that will be dedicated to system preservation (see page 5-9 below).

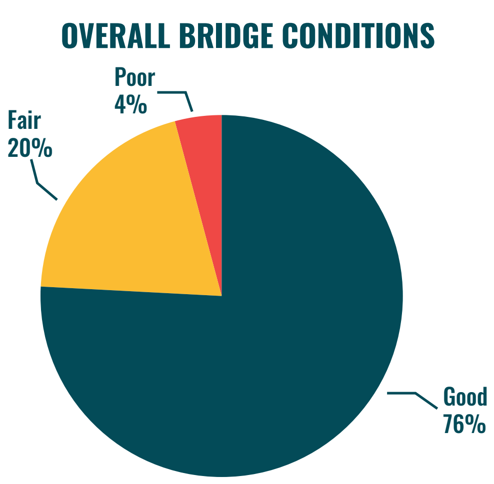
Bridge Conditions

A total of 393 bridges were included in the MTIS bridge analysis. This represents about 40% of the total bridge structures in the region, and the bridges which carry most of the region's traffic. On average, bridges evaluated in MTIS were 23 years old, with many reaching the end of their useful life during the planning period. Bridge inspections are conducted by state and local agencies every two years to monitor the changing conditions of these crucial pieces of infrastructure.

The analysis of the bridge conditions shows that 76% of bridges in the MTIS study area are in good condition, 20% in fair condition, and the remaining 4% are in poor condition. By 2040, the number of bridges anticipated to be structurally deficient rises to to 30% without continued investment in bridge preservation and rehabilitation. Structurally deficient bridges have components that have deteriorated below a particular threshold and require major rehabilitation or replacement

Similar to pavements on MTIS corridors, the condition of bridges in the region has declined between 2014 and 2019 as well. The ongoing Council Bluffs Interstate System project has replaced many bridges that had been in fair or poor condition previously in the Iowa portion of the TMA as new segments of those freeways have been constructed . Overall, this comparison allows us to compare 364 bridges directly and monitor the condition of these bridges as part of MAPA's performance management process.

Figure 5.4: MTIS Corridor Bridge Condition by Deck Area, 2014



Existing overall bridge ratings on study roadways in the MTIS study area

Figure 5.5: MTIS Corridor Bridge Condition by Deck Area, 2014 vs 2019

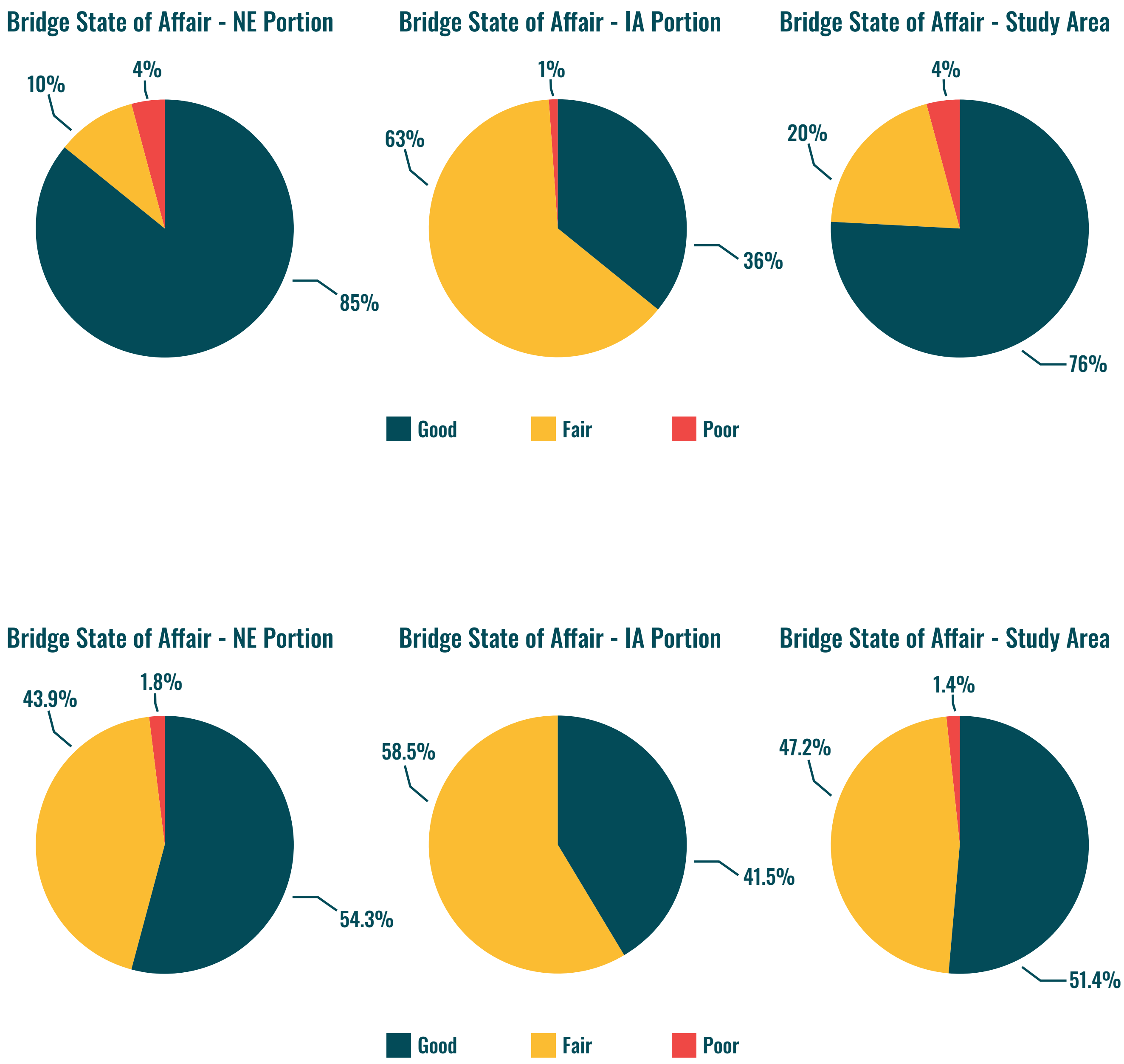
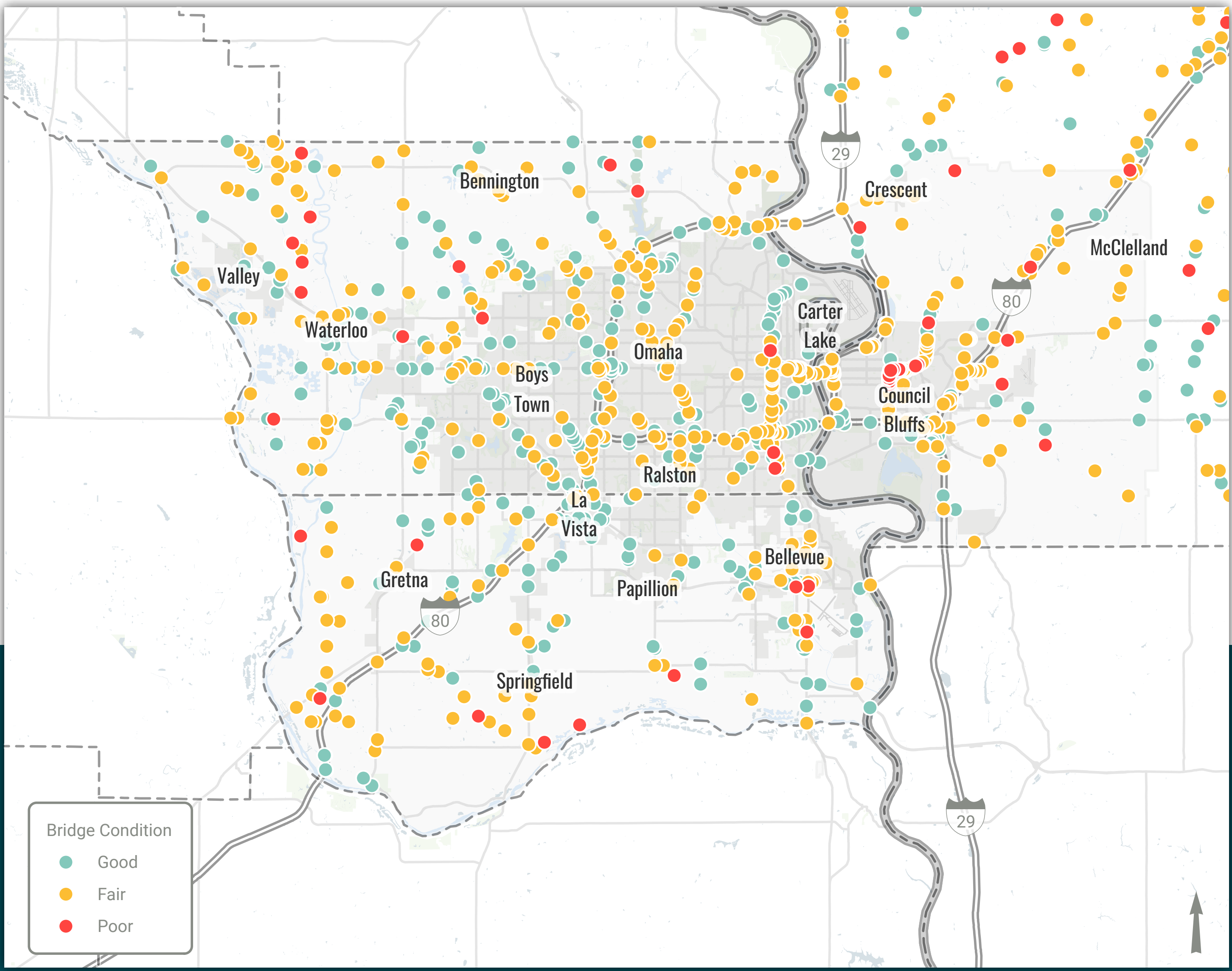


Figure 5.6: Condition of NHS Bridges in the MAPA Region 2019



State DOT Asset Management Planning

As a Transportation Management Area (TMA), MAPA has a role in identifying and selecting the projects that are included in the annual Transportation Improvement Program (TIP) in consultation with Nebraska and Iowa Departments of Transportation (DOT). However, the federal regulations that govern MAPA's transportation planning process (23 CFR 134(k)(4)) state that DOTs are responsible ultimately for selecting projects on NHS corridors.

> *(B)National highway system projects.*
> *Projects carried out within the boundaries of a metropolitan planning area serving a transportation management area on the National Highway System shall be selected for implementation from the approved TIP by the State in cooperation with the metropolitan planning organization designated for the area.*

Because States play such a key role in selecting projects on the NHS and prioritizing investments in these corridors, the DOT asset management programs are very important to making progress towards improved pavement and bridge condition in the MAPA region. Both Iowa DOT and NDOT have extensive asset management programs that monitor pavement conditions on the NHS. MAPA has adopted both Iowa DOT and NDOT's NHS pavement and bridge performance targets as part of its performance management process

Coordination with Local Agencies

For roads on the local NHS system within Nebraska, NDOT has provided a suggested 10-year pavement and bridge candidate list. This program of projects would allow these local NHS roads to reach a target NSI of 84.7 in ten years. This program covers 360 lane-miles, or slightly more than 86% of the local NHS. The estimated cost for this 10-year pavement program is nearly $65M. The breakdown by community is shown in the table below. The proposed schedule supports NDOT progress towards pavement condition performance targets utilizing current pavement degradation curves and procedures outlined in the NDOT Transportation Asset Management Plan (TAMP). MAPA will work with the local communities and NDOT to identify scheduling which meets each organizations' needs.

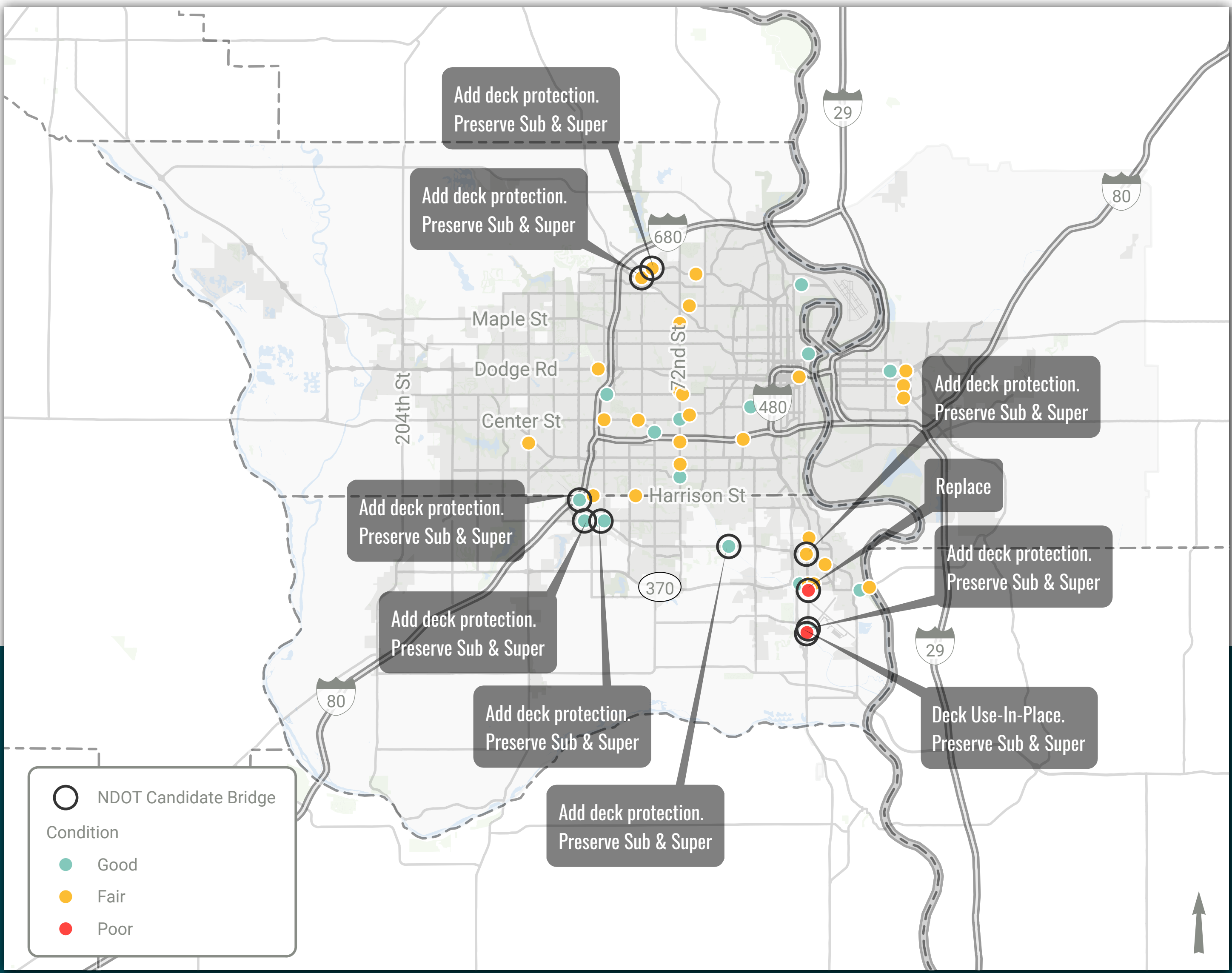
Table 5.1: Nebraska 2020 TAMP Pavement Investments, Local NHS

Jurisdiction	Pavement Program Costs (Est)	Total Centerline Miles	Total Lane Miles
Bellevue	$560,000	1.4	2.8
Bellevue/Omaha	$2,773,000	9.4	18.8
La Vista/Omaha	$744,000	1.86	3.72
Omaha	$42,171,475	109.66	233.813
Omaha/ Boys Town	$2,076,000	3.46	10.38
Omaha/ Douglas County	$1,560,000	3.9	7.8
Omaha/ La Vista	$3,120,000	7.8	15.6
Papillion	$5,008,000	12.52	25.04
Sarpy County/ Bellevue	$480,000	1.2	2.4
Sarpy County/ Bellevue/ Omaha	$5,894,100	13.32	39.96
Grand Total	$64,386,575	164.52	360.313

This proactive approach is helpful—providing local communities with a long-term plan to help the state meet its Federal Performance Measure targets. Numerous communities have begun already to address these roadways as their local funding and planning allow.

A total of 51 bridges on the National Highway System are the responsibility of the local jurisdictions in which they exist (46 in Nebraska and 5 in Iowa). As part of its TAMP, NDOT provides MAPA with the current condition of bridges and pavement on the local NHS, to include recommended maintenance activities and associated estimated costs. For this reporting period 46 bridges have recommended maintenance items, with one bridge being recommended for replacement–a total of $9 million of investment in these structures. Unlike the pavement management process, NDOT has not targeted a year for these improvements, but is coordinating closely with local jurisdictions to ensure that these improvements occur along with other planned highway work. This coordination provides a strong foundation for maintaining the NHS system and gives local communities important information to plan these improvements along with other local needs.

Figure 5.7: NDOT TAMP Bridge Candidates for Local Jurisdictions



Local Asset Management Planning

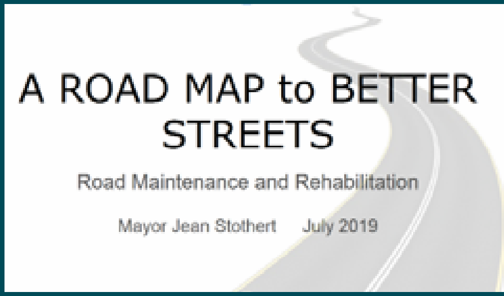
The status of asset management activities varies significantly at the local level in the MAPA region. Communities in Nebraska, in particular, utilize different approaches to collecting pavement data and making local asset management decisions. The City of Omaha utilizes engineering firms to collect Pavement Surface and Evaluation Rating (PASER) through visual inspections while the City of Papillion utilizes the Pavement Condition Index (PCI) to prioritize its street maintenance programs. Other communities rely on the field observations of local street maintenance staff and citizen complaints to identify and respond to issues that arise.

In Iowa, communities in MAPA's region benefit from Iowa DOT's Pavement Management Program (IPMP). In the past this program collected pavement data every two years for all federal-aid eligible roadways across the state. Going forward MPOs like MAPA can contribute funding to participate in the two-year data collection cycle, or continue to receive updated data every four years. The most recent data collected for non-NHS roadways in Iowa was collected in 2018, with the next planned cycle in 2022.

The lack of uniform pavement data collection for communities in the MAPA region presents a challenge to understanding and monitoring trends on non-NHS roadways. One potential solution is to develop a regional program of pavement data collection to give community leaders better tools to make pavement management decisions. This type of program could supplement local pavement management programs in place already, and provide a unified set of data to track over time. Through the ConnectGO initiative, MAPA and its project partners are also working to better understand the current levels of spending on maintenance and preservation activities at the local level to benchmark local spending against national best practices. One such strategy is developing metrics for spending per lane mile by community in the region. This performance measure is useful in being responsive to both increases in spending, but also increases in the size of the roadway network. As the final ConnectGO strategy is developed, MAPA will work with local agencies to monitor and track these spending levels to ensure that the region is making progress towards these important goals.

Omaha - Road Map to Better Streets

Omaha's Mayor held a service of town halls in July of 2019 to announce her plans for improving the condition of Omaha's streets, and closing funding gaps that had plagued past progress. These efforts resulted in the approval of new bonds by public vote in May of 2020 to address a shortfall in pavement management funding. This $200M bond will fund the city's first Pavement Management Program—an established method of rehabilitation, reconstruction, and new construction to maintain the 5,000 miles of the city's roads. Following an analysis of existing infrastructure value and historical annual budgets, the City of Omaha has committed to spending $75M/year on pavement resurfacing and rehabilitation. Established as 5% of the $1.5B current value of these roads, this will provide for an average of 250 lane-miles of resurfacing a year, ensuring all roads are maintained within their planned 20-year life. Given the current road network of 5,000 lane-miles approximately, an estimated $15,000 per lane-mile cost can be determined.



Traffic Signal Infrastructure & Coordination

Signalized intersections are incredibly important aspects of the transportation system, improving the safety of the traveling public significantly. While they are one of the most recognizable and visible symbols of "transportation," they are often not recognized as the complex system of computers, sensors and communications technology that they truly are. In the last decade significant efforts have been undertaken to improve the region's traffic signal infrastructure. Notably, the City of Omaha undertook a Signal System Master Plan. This plan identified 10 total phases of updates to the city's traffic signal controllers and interconnecting traffic signals throughout the city to allow for better coordination between the traffic signals.

Additionally, MAPA coordinated the development of systems engineering documentation for Adaptive Signal Control Technology (ASCT) corridors throughout the region. ASCT corridors allow for traffic signals to monitor traffic patterns using sensors and adjust the timing of signals in real time to improve the flow of traffic. Two corridors are operational currently in Council Bluffs (South Expressway and West Kanesville) while the City of Omaha has deployed two corridors (Dodge Street and 84th Street) with two additional corridors planned for construction in the next year along the 132nd Street and 144th Street corridors.

The City of Omaha was recently awarded Congestion Management and Air Quality (CMAQ) funding to deploy phases of its Traffic Signal Master Plan and to conduct signal coordination studies along key corridors in the region. These coordination studies allow for interconnected traffic signals to be timed that helps reduce delays to motorists and truck drivers during peak periods and other times of day when motorists experience slow downs. The Metro Travel Improvement Study recommended these types of coordination studies along major corridors which parallel the Dodge Expressway and Highway 370 to provide alternative routes for motorists across the region. These efforts to better coordinate signals are low-cost strategies to leverage existing infrastructure and benefit major corridors where major capital projects are very costly.

Papillion - Pavement Management Program

Through the Papillion Pavement Condition Index Report the City of Papillion documented its pavement condition using the national standard of Pavement Condition Index (PCI). The city is responsible for 301.6 lane miles comprising 268 miles of concrete roadways, 32 miles of asphalt, and 1.6 miles of gravel roads. Currently the asphalt streets in the city are in Fair condition overall, and the concrete roads are Satisfactory condition as a whole, with 19% of streets total in Fair or below condition. Using predictive modeling of road deterioration it is forecasted through PAVER metrics that during the next 5 years the percentage of roads in Fair or Poor condition will jump to 28% with current replacement and maintenance schedules. The City of Papillion is focused on keeping its decent streets in good condition through regular maintenance, and is looking to implement new methods of repair to rehabilitate failing street surfaces.

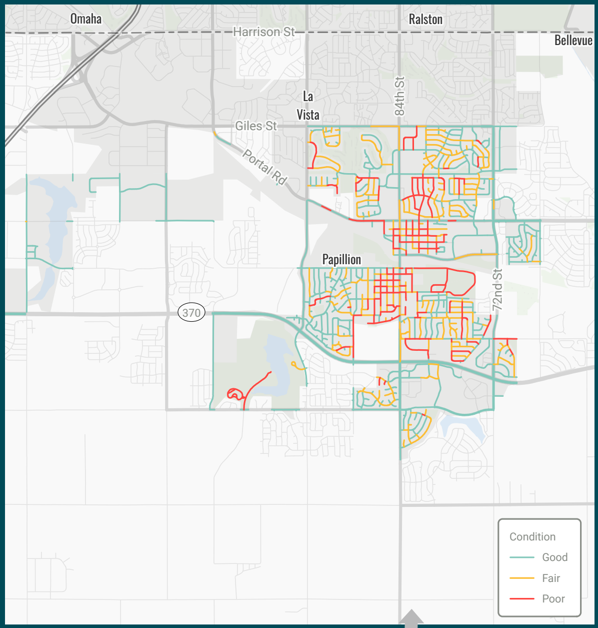
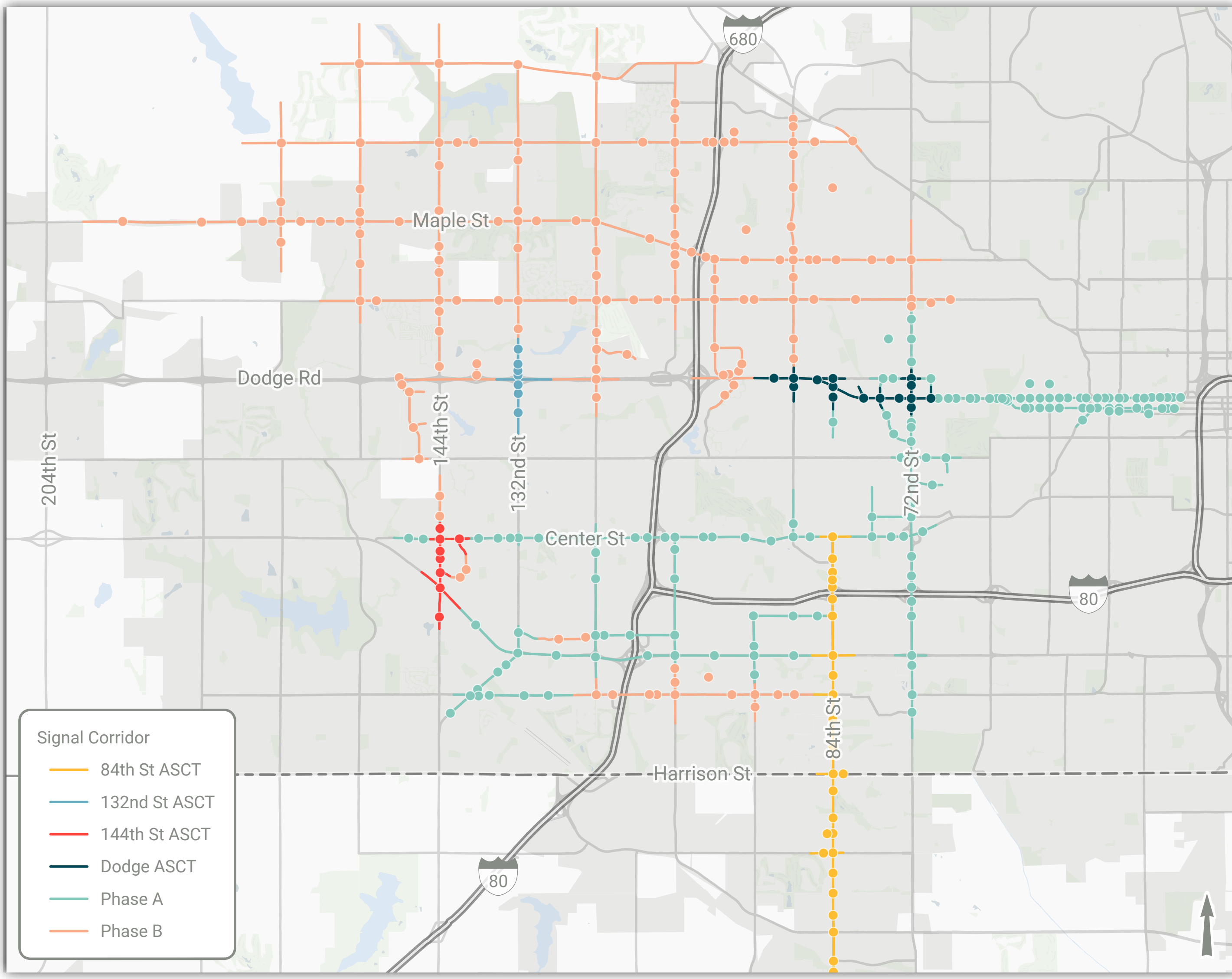


Figure 5.8: City of Omaha Signal System Master Plan



Overall, investments in traffic signal infrastructure are highly cost-effective and help maximize communities' existing investment in the roadways. As compared to widening projects, improvements to traffic signal technology and coordination can improve the flow of traffic during peak periods when the system is strained. Unlike major capital investments like widening; however, upgrades to traffic signal technology do not have major right-of-way impacts and can be coordinated with the expansion of private data networks from local internet service providers and communication firms. The Metro Travel Improvement Study (MTIS) estimated that improved signal coordination and the deployment of adaptive signal technology could reduce delay by up to 15% on certain corridors. The preferred strategy package recommended by stakeholders and the public recommended major investments in upgrades to traffic signal technology on corridors throughout the MAPA region. Thus, these strategies are important tools for communities in the MAPA region which have limited resources with which to expand the transportation system.

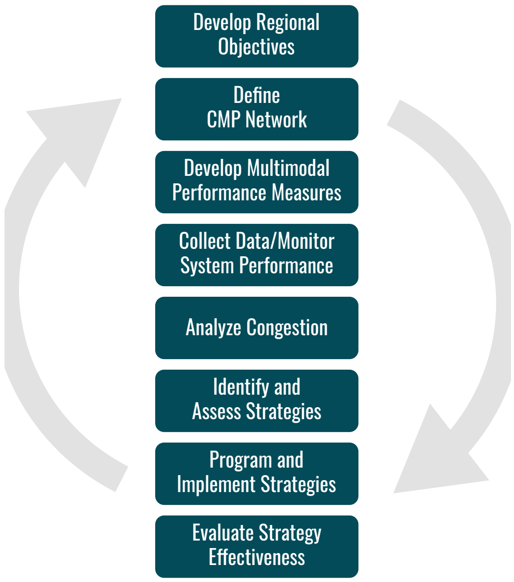
Furthermore, upgrades to these infrastructure systems are important to preparing for many of the changes to transportation technology during the next 20 years. Automakers and federal regulators are coordinating currently on protocols for Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication protocols that allow for vehicles equipped with these technologies to communicate with each other and with sensors along the roadway. In 2019 the Nebraska Department of Transportation declared Highway 370 in the MAPA region as "Nebraska's Smartest Corridor" as part of a national challenge to deploy dedicated short-range communication (DSRC) devices to provide real-time information from signalized intersections. These efforts illustrate the shifts underway currently to retrofit corridors with new sensors to keep pace with the innovations anticipated over the next 20 years.

Congestion Management Process

MAPA, as a Transportation Management Area, is charged with developing a Congestion Management Process (CMP). This process is developed, established, and implemented as part of the LRTP planning process and includes coordination with transportation system management and operations activities. The CMP process, identified by FHWA and illustrated in the figure below, forms the framework for the iterative planning and performance management activities at MAPA. In general, MAPA has utilized this process to develop its CMP and worked with partner agencies to continue improving the quality and reach of the data used in CMP analyses. This process also identified stakeholders involved already in implementing strategies, as well as additional organizations to involve in the CMP. MAPA's Congestion Management Process (CMP) is designed to establish a systematic process through which all modes of transportation are considered and utilized to ensure efficient and safe operations of the region's multimodal transportation system. The CMP provides local and regional stakeholders with the data and tools to make decisions about investments affecting congestion on the region's roadways.

Many changes have occurred in the five years since MAPA's most recent Congestion Management Process in its 2040 Long Range Transportation Plan (LRTP). These changes include:

- Significant flooding and extreme winter weather affecting infrastructure negatively and disrupting traffic patterns
- An explosion in the volume and applicability of big data and smart traffic infrastructure
- A growing concern in the region's ability to attract and retain a skilled workforce
- Launch of the ConnectGO Regional Transportation Strategy development in coordination with the Greater Omaha Chamber of Commerce
- Dramatic decrease in automobile traffic and a significant surge in the use of regional trail networks in response to the COVID-19 pandemic



In the midst of these disruptions, an opportunity exists to assess progress -- and the continued efficacy -- of the initial CMP goals. New data sources provide the opportunity to measure, assess, and and mitigate more effectively disruptive aspects of our transportation system; providing the opportunity to address congestion issues with more non-traditional methods. These new means of measuring performance will result in the addition of new goals to provide a safe, efficient, and equitable regional transportation system.

While managing congestion was a lower priority for most respondents to the surveys for the LRTP and ConnectGO, a majority of respondents identified "driving alone" as their preferred means of transportation. As such, focusing on the performance of the transportation system and focusing on the reliability of trips in the Omaha-Council Bluffs region are important efforts in the transportation planning process. These efforts mirror the implementation of MAPA's regional system reliability performance measures that help track bottlenecks in the regional transportation system. More information system reliability and its impacts on the region's economy can be found in *Economic Growth Throughout the Region* chapter.

Planning for Autonomous Vehicles

There are a number of companies currently testing autonomous and connected vehicles (AV/CV) and planning to bring them to market in the next five years. The range of AV/CVs being tested for near term implementation includes commercial trucks, transit buses, and personal automobiles. When widely adopted, these technologies have the capability to radically impact our transportation system in a range of ways, both positively and negatively. While it's presently unclear how quickly such technologies will be adopted, the transformative nature of these technologies is very important to consider as a broader vision for transportation investment.

Potential Benefits

- **Improved Safety:** More than 90% of traffic crashes are the result of human error. When AV/CV technology is adopted throughout the vehicle fleet, the incidence of serious and fatal crashes is anticipated to drop dramatically.
- **Reduced Driver Costs:** There are several factors that are anticipated to reduce driver costs, including improved fuel efficiency from fewer "start and stop" conditions on roadways. Additionally, the improved safety features of AV/CVs could reduce the personal vehicle insurance rates. AV/CVs also have the potential to reduce personal vehicle ownership, create more ride-hailing services, and allow people to pay only for automobiles when they need them.
- **Allow for "Productive Commutes":** When cars do all of the driving tasks for their occupants, commuters who drove themselves to work previously have found new time for work or leisure.
- **Wider-Reaching Mobility:** Statistics vary, but approximately 1/3 of Americans are believed to be unable to drive due to age or disability. Many of those Americans live in areas with limited transit service. AV/CVs have the potential to provide much greater mobility to these residents and reduce the operational costs of transit–potentially allowing for expanded service areas.
- **Efficient Roadway Use:** There are several ways in which AV/CVs will make more efficient use of our current roadway pavement. These more efficient use of existing roadways rely on automated vehicles being more accurate than human drivers. This could allow for less distance between vehicles traveling in the same direction, as well as the potential for narrower travel lanes.

Potential Burdens

- **New Trips:** As travel becomes more efficient and more accessible, there is the potential that more trips will be made. People who drive currently will make more trips potentially, and people who are too young currently or are unable to drive will make more trips.
- **Empty Car Trips:** As cars can drive themselves without human interaction, there are several reasons why they might be traveling without people in them.
- **Remote Parking:** It might become cheaper for people to travel to a high land-rent part of the city (like downtown), get dropped off at their destination, and then send their car to a lower land-rent part of the city to park. This "deadheading" trip by the car is a type of travel that cannot and does not happen currently.
- **Car-Sharing Circulation Trips:** As cars are able to park themselves and pick up passengers efficiently, many residents will have fewer incentives to own a car. A shift from a car-ownership to car-sharing model will likely lead to additional driver-less circulation trips for cars picking up passengers.
- **Less of a Time "Cost" to Traveling:** As drivers are responsible for fewer and fewer of the core tasks of driving, they can spend their commute time on work or leisure tasks. This could shift perceptions about the negative aspects of driving. This could lead to people choosing longer trips and the potential to live farther from work or school–increasing VMT and average trip lengths.

As part of the Metro Travel Improvement Study (MTIS), MAPA utilized its Travel Demand Model to weigh these benefits and burdens of AV/CV technology and begin to understand the impacts that they may have in our region. The MTIS Study Team consisting of MAPA and NDOT staff developed six scenarios: two that tested the impacts of improved roadway capacity from AVs, and four additional scenarios that added potential negative impacts of AV/CV adoption. Using the various elements within the travel demand model allowed the Study Team to explore the potential impacts that AV/CV could have on the implementation of projects in the preferred strategy scenario.

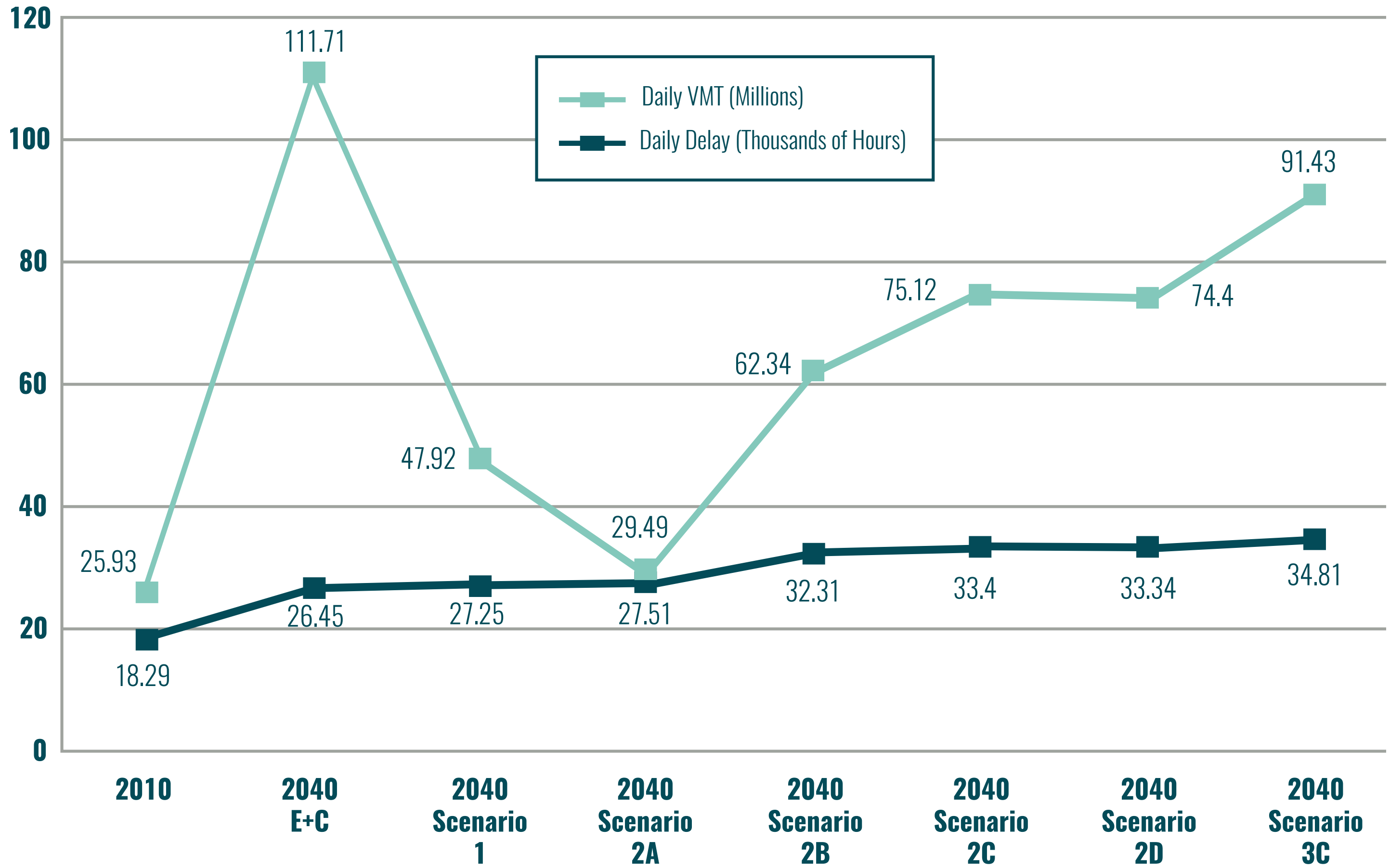
MTIS Autonomous Vehicle Modeling Scenarios

- Scenario 1: AV market penetration allows systemwide capacity increase by 30%
- Scenario 2: Higher market penetration than Scenario 1; 2040 roadway capacity increases by 50%.
  - Scenario 2B: Improved personal mobility leads to induced trips; systemwide trips are increased by 3%, Car sharing/remote parking become more widespread, lead to more "deadheading" trips; VMT is increased by 15%
  - Scenario 2C: Improved personal mobility leads to induced trips; systemwide trips are increased by 3%;"deadheading" causes VMT to increase by 15%; travel is perceived as less costly; the perceived value of time is reduced by 20%
  - Scenario 2D: Improved personal mobility leads to induced trips; systemwide trips are increased by 3%; "deadheading" causes VMT to increase by 15%, people value their time 20% less; transit vehicle automation leads to reduced bus system costs, allowing increased transit service; headways ½ of current conditions)
- Scenario 3C: Same as scenario 2C, except systemwide induced trips were increased by 15% instead of 3%; assumes tremendous increase in the amount of traveling people are willing to do with Autonomous Vehicles

Table 5.2: MTIS Modeling Scenarios for Autonomous Vehicles

Variables	Scenario						
	Base	1	2A	2B	2C	2D	3C
Induced Trips Change	-	-	-	+4%	+4%	+4%	+15%
Deadhead VMT Change	-	-	-	+15%	+15%	+15%	+15%
Value of Time Change	-	-	-	-	-20%	-20%	-20%
Capacity Change	-	+30%	+50%	+50%	+50%	+50%	+50%
Transit Frequency	-	-	-	-	-	+100%	-

Figure 5.9: MTIS Modeling Results for Autonomous Vehicles Scenarios



These autonomous vehicles and connected vehicle AV/CV scenario tests revealed that not all of our congestion issues are likely to be solved by AV/CVs. While AV/CVs will allow more cars to use the same roadways efficiently, AV/CVs are also expected to create the demand for more trips and longer trips. With the expected increase in Vehicle Miles Traveled associated with AV/CV, some of the capacity benefits from AV/CVs will be reduced by new, induced trips.

Additionally, the overall amount of delay that people experience while sitting in traffic may well explode in some of these scenarios. These modeling scenarios are an initial effort to understand the role that these technologies may play in the future of our transportation system, and will be reviewed and revisited continually as technology evolves and more is learned about the technologies during the next five years.