NEVADA DEPARTMENT OF TRANSPORTATION

2021 NEVADA STATE PRESERVATION REPORT

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Kristina L. Swallow, P.E.
Director

State of Nevada
Department of Transportation

Steve Sisolak
Governor

State Highway Preservation Report

Report to the 2021 Legislature
As Required by Nevada Revised Statute 408.203 (3)

February 2021
(Biennium 2019-2020)

Nevada Revised Statute 408.203(3)

The director of the Nevada Department of Transportation shall report to the Legislature by February 1 of odd-numbered years the progress being made in the Department's 10-year plan for the resurfacing of state highways. The report must include an accounting of revenues and expenditures in the preceding two fiscal years, a list of the projects which have been completed, including mileage and cost, and an estimate of the adequacy of projected revenues for timely completion of the plan.

State of Nevada

Department of Transportation

Mission

Provide, operate, and preserve a transportation system that enhances safety, quality of life and economic development through innovation, environmental stewardship and a dedicated workforce.

Vision

To be a leader and partner in delivering effective transportation solutions for a safe and connected Nevada.

Core Values

- Respect – Treat others with dignity and value their contributions
- Integrity – Do the right thing
- Accountability – Take pride in our work and be accountable for our actions.
- Communication – Communicate with transparency and responsiveness both internally and externally
- Teamwork – Foster collaborative and effective partnerships both internally and externally
- Flexibility – Be responsive to changing conditions and open to new ideas

Goals

- Safety first
- Cultivate environmental stewardship
- Efficiently operate and maintain the transportation system in Nevada
- Promote internal and external customer service
- Enhance organizational and workforce development

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EXECUTIVE SUMMARY

The Nevada Department of Transportation (NDOT) publishes the *State Highway Preservation Report* biennially to summarize the work performed and anticipated workload required to preserve the state-maintained roadway network and bridge infrastructure assets. This report provides the Nevada Legislature with 2019-2020 information that can be used to determine whether future revenues are adequate to maintain and preserve the infrastructure assets at an acceptable level.

NDOT is responsible for maintaining 5,365 centerline miles (13,505 lane miles) of roads and 1,221 bridges. Although the state-maintained roadway network consists of only 14% of the roads in Nevada, the network is overwhelmingly important as 49% of all automobile traffic and 68% of all heavy truck traffic travel on these roads.

Transportation infrastructure funding, including highway preservation funding, is in short supply nationwide including Nevada. Article 9, Section 5 of the Nevada constitution created the State Highway Fund with proceeds from licensing, registration, and other charges with respect to the operation of any motor vehicle upon any public highway in this state plus excise taxes on fuel minus administrative costs. This fund is reserved exclusively for the construction, maintenance, and repair of public highways in Nevada. The Nevada Department of Transportation (NDOT) is funded primarily with a mixture of fuel taxes, which was last increased in 1992, and related user fees as noted above plus federal aid and typically does not utilize any general funds. A safe, efficient and reliable roadway network is important, and it promotes the general welfare of all the people in the State of Nevada. Adequate preservation funding is necessary since deteriorated roads and bridges can impede the general economic and social progress of the State. Investment in infrastructure will boost market economy, advance travel and trade, and provide a legacy from which future generations can prosper.

Pavement and bridge preservation for fiscal years 2019 and 2020 were analyzed and presented in this report. Major findings and conclusions are summarized in the Pavement and Bridge Preservation Synopsis sections.

PAVEMENT PRESERVATION SYNOPSIS

NDOT's Pavement Management System (PMS) is used to help make decisions on how best to maintain and improve the condition of the entire state-maintained roadway network. This network consists of 5,365 centerline miles (13,505 lane miles) of roadway that is classified into five separate road prioritization categories. Each road prioritization category consists of pavements that share similar traffic volumes or loadings, resulting in similar rates of deterioration that require similar timing for maintenance and rehabilitation repair work. The pavement in each road prioritization category is objectively rated and quantified using the Present Serviceability Index (PSI) pavement condition rating system. This rating system is divided into six sections that correspond to pavement in very good, good, fair, mediocre, poor, and very poor or failed condition.

Various repair strategies are implemented to improve pavement condition. Maintenance repair strategies include work such as chip seals, filling potholes, and patching. Preservation mostly involves thin overlays and mill and fills used to maintain surface quality. Rehabilitation repair strategies include plant-mix overlays, mill and fills, and cold in place recycling with a plant mix overlay. Reconstruction usually involves a roadbed modification followed by the placement of new bound layers. The cost and construction timing for the various repair strategies can be significantly different and are contingent on the pavement condition at the time of the repair. Significant cost savings are possible when pavement is proactively treated while in fair condition as compared to reactively reconstructed in very poor condition. Repairing pavement in very poor or failed condition requires major reconstruction that costs significantly more than the less invasive techniques that can be used when pavement is in fair or better condition.

$317.69 million was invested for maintenance and rehabilitation repair work in fiscal years 2019 and 2020. This expenditure included $183.12 million investment of state funds, $131.21 million investment of federal funds, and $3.37 million investment of funds from other sources. More than $283 million of repair work was contracted out to private contractors and $34.5 million of repair work was performed by NDOT Maintenance personnel. The $283 million of contracted repair work restored 624 centerline miles (1,445 lane miles) of pavement to acceptable condition levels. Maintenance repair work was performed on 488 centerline miles (1,007 lane miles) and rehabilitation repair work was constructed on 136 centerline miles (438 lane miles).

The PSI pavement condition rating system was used to determine if long-term pavement preservation expenditures were adequate to maintain or improve the roadway network to acceptable condition levels. Results show that long-term historical funding has not been adequate. At these historical funding levels, it is anticipated that the overall average condition of the state-maintained roadway network would deteriorate but remain in fair condition for the near future.

Previously, a pavement condition goal to maintain a minimum of 95% of roads in fair or better condition in each road prioritization category was established to provide a measure of the effectiveness of the maintenance and rehabilitation repair work performed on state roads. Recognizing the challenge to achieve that goal with limited resources, in 2020, new performance goals were put in place that are both achievable and provide levels of service appropriate for each category. The current goal is 95% fair or better for category 1, 90% for category 2, 85% for category 3, 75% for category 4, and 50% for category 5. Category 1, 3, and 4 currently meet or exceeds these revised goals. Road prioritization categories 2 and 5 roads fail to meet the established pavement condition goal.

An estimate of the adequacy of projected spending for the timely completion of the resurfacing plan was ascertained. Historical spending is not adequate to meet the established performance goal, and an additional expenditure of $100 million is required each year in addition to the long-term historical average expenditure of $103 million per year. Projected expenditure of $203 million is required each year to maintain the roadway network at acceptable condition levels consistent with the goals.

The progress in the 10-year plan for resurfacing of state highways was examined and different budget scenarios were investigated. The investigation included the comparison of the predicted percentage of roads in fair or better condition for years 2021 through 2031 with budget scenarios of $203 million and $103 million per year expenditures for pavement preservation repair work.

- The first budget scenario included an average $203 million per year expenditure for pavement preservation repair work. This budget scenario represents the current planned spending level, which will maintain a consistent pavement condition of 75% of roads in fair or better condition and allow each category to meet or exceed the established percent fair or better target.

- The second budget scenario consisted of an average $103 million per year expenditure for pavement preservation repair work. This budget is the average expenditure for pavement preservation work from 2013 through 2020. This budget scenario would result in the average percentage of roads in fair or better condition deteriorating from 75% in the year 2019 to approximately 65% by the year 2031.

FIGURE E1 illustrates the comparison of the predicted percentage of roads in fair or better condition spending either $203 million or $103 million per year expenditures for pavement repair work.

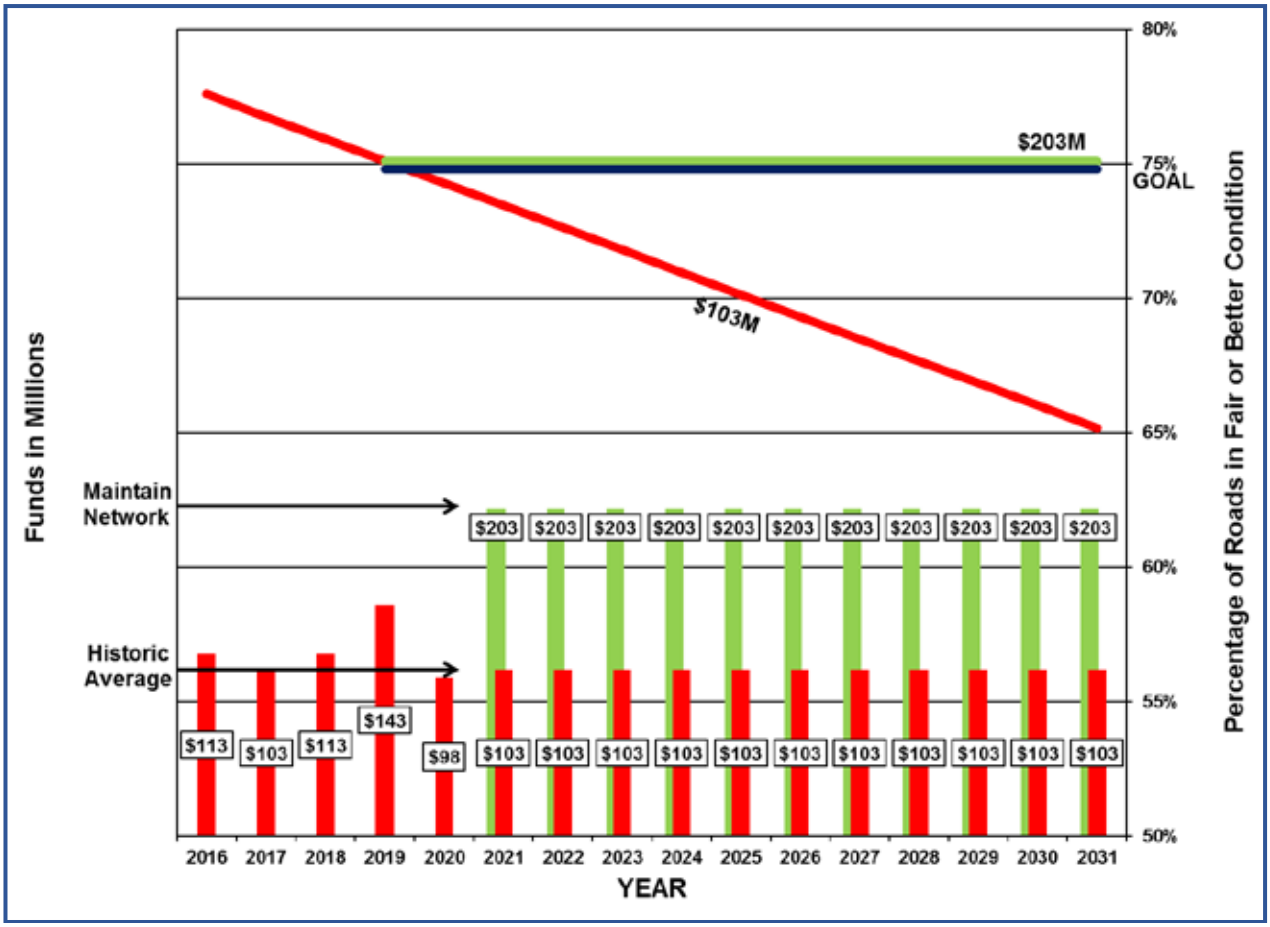

FIGURE E1. Future State-maintained Roadway Network Funding Alternatives

BRIDGE PRESERVATION SYNOPSIS

The Nevada Department of Transportation is responsible for inspecting and reporting the condition of all the bridges open to the public in Nevada, except bridges on federal lands. There are currently 2,107 public bridges in the NDOT bridge inventory. NDOT maintains 1,221 bridges; county and city governments maintain 815 bridges; other local agencies maintain 48 bridges; private entities maintain 11 bridges; railroad maintains 6 bridges; and other state agencies maintain 6 bridges. The bridge inventory data, together with other factors, allow NDOT to identify preservation priorities and monitor the state's effort to maintain bridges in a structurally sound, functional, and safe condition.

The Sufficiency Ratings are numerical ratings used to assess the overall condition of a bridge and assists in the prioritization of bridge preservation efforts. Generally, bridges with Sufficiency Ratings more than 80 (Condition Ratings for critical components of 7 or greater) are considered "good", those with Sufficiency Ratings between 50 and 80 (Condition Ratings of 5 to 6) are considered "fair", and those with Sufficiency Ratings less than 50 (Condition Ratings of 4 or less) are considered "poor". Of the 1,221 bridges maintained by NDOT, only 12 or 1% have a Condition Rating of a critical component of less than 5 and is considered to be in poor condition.

Structures with low condition or load ratings may be classified as Structurally Deficient. Structurally Deficient bridges are not necessarily unsafe or dangerous. Rather, these bridges become a priority for corrective measures, and may be posted to restrict the weight of vehicles using them. If a deficiency is determined to be severe, or the load carrying capacity is extremely low, the bridge would be closed to protect the travelling public. Of the 1221 bridges maintained by NDOT, only 12 or 1% are considered to be Structurally Deficient.

Currently, Nevada bridge conditions compare very favorably to the bridge conditions in many other states, even though more than half of NDOT's bridges are more than 40 years old. However, since older bridges generally have a useful service life of 50 to 75 years, many of NDOT's bridges will require more frequent rehabilitation and replacement in the near future.

When bridges deteriorate and require closure, the resulting detours can be very disruptive to traffic. In both rural and urban bridge closures, the user costs associated with detours can often be quite significant until the bridge is reconstructed or repaired. The importance of bridge maintenance and rehabilitation cannot be overemphasized.

The Nevada Department of Transportation spent a total of approximately $16 million in fiscal years 2019 and 2020 on bridge preservation while spending on bridge preservation for the previous two years was approximately $12 million total. The increasing need and decreased spending on bridge rehabilitation, seismic retrofit, and replacement for the last two fiscal years increased the backlog of bridge work by over $13 million. An increasing investment in bridge preservation funding will be necessary to alleviate current backlog and address the anticipated growing rehabilitation and replacements needs of the state's aging inventory. The Department has committed to provide additional bridge preservation funding and, through the One Nevada Plans, looks to prioritize and utilize this investment in the most efficient way possible, to preserve the service-life of structures state-wide.

While the need for preservation funding increases every year as the bridge inventory continues to grow, a much greater funding deficiency is likely to occur because of the age of NDOT's bridges. Many of NDOT's bridges are approaching the end of their useful life and the need for bridge preservation funds is expected to increase greatly over the next decade. The majority of the increase in bridge preservation funds needed is an increase in the replacement of old bridges.

Since NDOT already has 507 bridges over 50 years old, the current practice of replacing approximately 3 bridges a year is a replacement rate of 0.6% of the bridges over 50 years old. A replacement rate of 2% a year is necessary to replace the bridges over 50 years old before they reach 100 years old. If a 2% annual replacement rate is reached in ten years and is maintained for another ten years, the number of bridges over 50 years old will begin to stabilize. Twenty years from now, NDOT would have approximately 620 bridges over 50 years old and would be replacing 12 bridges each year.

NDOT's current backlog of bridge preservation work is approximately $171 million. Increased spending in bridge corrective maintenance, rehabilitation, and replacement is necessary to preserve NDOT's bridge assets and to avoid costly bridge closures and emergency bridge replacements.

If bridge preservation spending is increased over the next five years as shown in FIGURE E2, it is anticipated that the Department can address future projected preservation needs and

reduce the current backlog of bridge work. If the funding is gradually increased as shown over the next five years, the forecast bridge preservation cost is expected to level off at approximately $51 million per year.

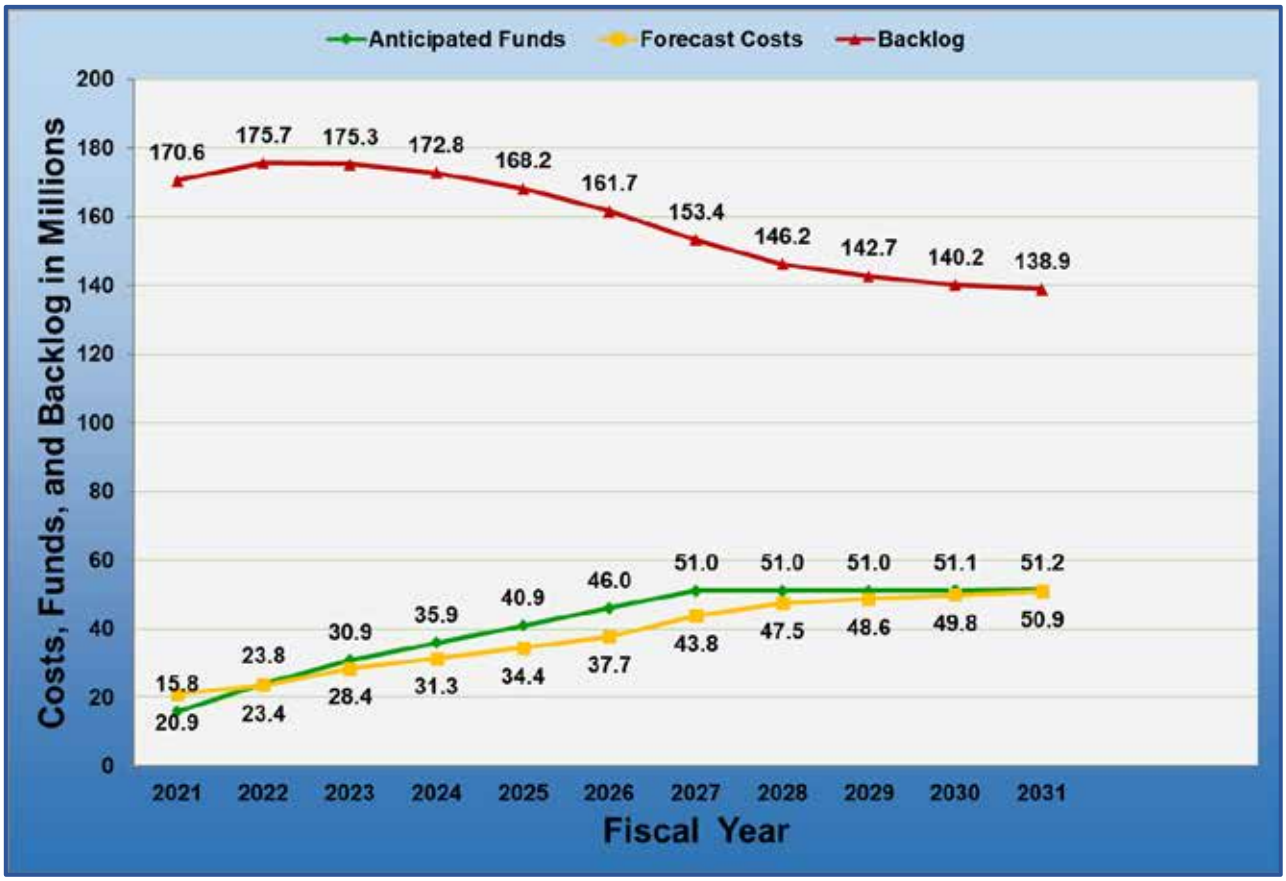

FIGURE E2. Anticipated Costs, Funds and Backlog of Bridge Preservation Work

PAVEMENT PRESERVATION

INTRODUCTION

This report summarizes the Nevada Department of Transportation's (NDOT's) effort to preserve the state-maintained roadway network. The roadway network is vital and one of the state's most valuable assets. Although the roadway network consists of only 14% of the roads in Nevada, approximately 49% of all traffic and 68% of all heavy trucks travel on state-maintained roads. The following discussion explains how NDOT uses its available pavement preservation funds to maintain and rehabilitate the roadway network.

THE PAVEMENT MANAGEMENT SYSTEM

The Pavement Management System (PMS) includes the entire inventory of the state's existing pavement assets and condition. The primary objective of the PMS is to provide information that enables users to make informed decisions about how to maintain and improve the condition of the roadway network while maximizing pavement performance through the practical use of available funds. NDOT's management of the pavement inventory allows maintenance and rehabilitation repair work to be prioritized in an objective and systematic manner. The PMS improves the efficiency of decision making, provides assessment on the consequences of decisions through comparative analysis, and ensures consistency of network and project level activities and results.

ROADWAY NETWORK INVENTORY

The state-maintained roadway network consists of 5,365 centerline miles (13,505 lane miles) of roads. Centerline miles indicate the length of the road, regardless of the number of lanes within each mile. So that the network may be more easily managed, it is classified into five separate road prioritization categories. These road categories are based on heavy truck equivalent single axle loads (ESALs), average daily traffic (ADT), and federal guidelines for highway classification descriptions. The roads within each category have similar in-place pavement thicknesses, similar rates of deterioration, and similar timing for maintenance and rehabilitation repair work.

TABLE 1 lists the five road prioritization categories and their corresponding descriptions. Also listed are several examples of easily recognized roads throughout the state to assist with relating these roads to the assigned categories and descriptions.

TABLE 1. NDOT's Road Prioritization Categories

Road Prioritization Category	[1]Description	Examples
1	Controlled Access Roads	IR015, Clark County IR580, Washoe County IR080, Elko County
2	ESAL > 540 or ADT > 10,000	SR146, St. Rose Parkway, Clark County US050, Lincoln Highway, Carson City SR227, Fifth Street, Elko County
3	540 ≥ ESAL > 405 or 1,600 < ADT ≤ 10,000	SR157, Kyle Canyon Road, Clark County SR028, Lake Tahoe Area, Douglas County SR225, West Urban Limits of Elko, Elko County
4	405 ≥ ESAL > 270 or 400 < ADT ≤ 1,600	SR158, Deer Creek Road, Clark County SR206, Foothill Road/Genoa Lane, Douglas County SR228, Jiggs Road, Elko County
5	ADT ≤ 400	SR156, Lee Canyon Road, Clark County SR121, Dixie Valley Road, Churchill County SR229, Secret Pass Road, Elko County

[1]ESAL is an acronym for "Equivalent Single Axle Load." This engineering concept is the basis for the method used to quantify the pavement loading from trucks and count the heavy trucks that travel on roads. ADT is an acronym for "Average Daily Traffic." The PMS includes the ADT data, as provided by NDOT's Traffic Division, for every road in the state-maintained roadway network.

FIGURE 1 is a map that highlights the state-maintained roadway network inventory identified by NDOT's five road prioritization categories.

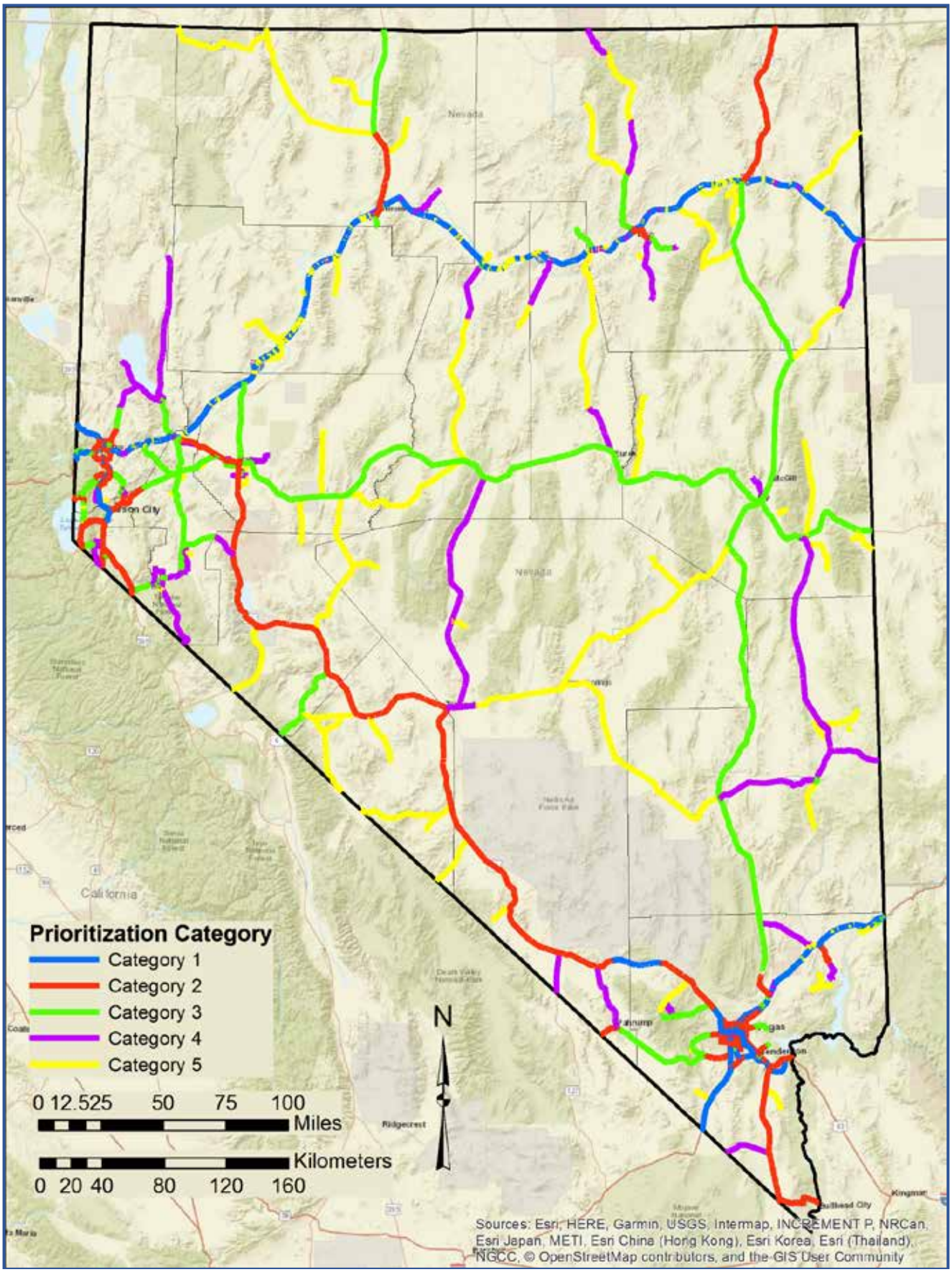

FIGURE 1. Roadway Network Inventory Identified by Road Prioritization Categories

There are numerous methods used to classify roads. The United States Department of Transportation (USDOT) classifies roads for national purposes, while state departments of transportation classify road inventories using methods for state needs and the needs of the individual PMS systems employed. The USDOT system focuses mainly of the purpose of the route, while the NDOT system is largely based on traffic volumes and loading. Despite these differences, the two systems are generally compatible.

TABLE 2 compares the USDOT's classification methodology with NDOT's classification methodology, which will allow individuals familiar with national classification terminology to more easily understand the associated NDOT road prioritization categories.

TABLE 2. Comparison of the USDOT and NDOT Road Classification Systems

USDOT's Functional Classification Category	Description	Examples	NDOT's Road Prioritization Catgegory
1	Interstate	Interstates are the highest classification of arterials and were designed and constructed with mobility and long-distance travel in mind.	1
2	Principal Arterial – Other Freeways and Expressways	The roads in this classification have directional travel lanes and are usually separated by some type of physical barrier. Access and egress points are limited to on-ramp and off-ramp locations, or a very limited number of at-grade intersections.	1 and 2
3	Principal Arterial - Other	The roads in this classification serve major centers of metropolitan areas, provide a high degree of mobility, and can also provide mobility through rural areas.	2
4	Minor Arterial	Minor arterials link cities, larger towns, and other traffic generators such as resorts.	3 and 4
5	Major Collector	Major collector roads provide service to any county seat not on an arterial route, to the larger towns not directly served by higher systems, and to traffic generators of equivalent intra-county importance such as shipping points, parks, important mining, agricultural areas, and more.	4 and 5
6	Minor Collector	Minor collectors distribute and channel trips between local roads and arterials, usually over a distance of less than three-quarters of a mile.	*Not Applicable
7	Local	Local roads are not intended for use in long distance travel, except at the origin or destination end of the trip, due to their provision of direct access to abutting land.	*Not Applicable

*Nevada's state-maintained roadway network serves the broad expanse within the state's boundaries. Several USDOT classifications are developed to describe local county and city roads that are limited for use in long distance travel and do not encompass the types of roads for which NDOT is responsible.

PAVEMENT CONDITION RATING SYSTEM

To help manage pavements so that they can provide a smooth, comfortable, and safe ride, it is useful to have a pavement condition rating system that includes all attributes important to travelers. These attributes include travelers' responses to motion and appearance as demonstrated by a smooth riding surface that is without cracking, rutting, patching, or potholes. NDOT uses a pavement condition rating system called the Present Serviceability Index (PSI) to objectively measures all these important attributes.

The PSI pavement condition rating system uses a value that is calculated using pavement roughness measurements and mathematical formulas that quantify pavement distresses such as cracking, raveling, rutting, and potholes. These measurements and formulas are combined and standardized into an objective rating scale numbered from zero to five. Pavement rated from four to five is interpreted as pavement in new or very good condition with a smooth surface that is without distress or irregularities. Pavement rated less than two is interpreted as pavement in very poor or failed condition with the roughest of surface conditions and no longer navigable at the posted speed limit. The PSI pavement condition rating system is used to quantify the pavement condition for each road within the state-maintained roadway network.

FIGURE 2 demonstrates how the PSI pavement condition rating system is divided into six condition levels that correspond to pavement in very good, good, fair, mediocre, poor, and very poor or failed condition. Descriptions include photographs of what pavement would typically look like in each condition as well as a discussion of the various stages of disrepair as pavement deteriorates over time.

Pavement Condition	PSI Rating Scale	Description of Pavement Condition
Very Good	5.00 to 4.00	 Pavement in very good condition has an excellent, very smooth ride quality and is without any pavement distress. Pavement is in new condition.
Good	3.99 to 3.50	 Pavement in good condition has a very smooth ride quality and begins to show minor distresses that are typically environmental rather than load related. Distresses include minor non-wheelpath longitudinal and transverse cracks as well as minor surface raveling. Pavement in good condition can especially benefit from preventive maintenance such as crack sealing and surface treatments such as chip, slurry, and scrub seals. Surface treatments impede pavement deterioration and protect the pavement structure from water infiltration and weathering.

FIGURE 2. PSI Rating System and Corresponding Pavement Condition

Pavement Condition	PSI Rating Scale	Description of Pavement Condition
Fair	**3.49 to 3.00**	 Pavement in fair condition has a good ride quality except noticeable environmental distress has developed. Non-wheelpath longitudinal and transverse cracks are frequent. There is light surface oxidation and weathering. Structural distress in the wheelpath in the form of ruts and fatigue cracks begin to occur. Pavement in fair condition is a candidate for a surface treatment such as micro-surfacing or double chip seal, and possibly a two inch overlay. An overlay applied on pavement in this condition will prevent the formation of more severe structural distress.
Mediocre	**2.99 to 2.50**	 Pavement in mediocre condition has a barely acceptable ride quality and has accumulated significant environmental and structural distresses. Pavement has non-wheelpath longitudinal cracking and transverse cracks so closely spaced that block cracks develop. Ruts and fatigue cracks in wheelpath are present. Pavement in mediocre condition is candidate for three inch or thicker overlays and may require patching before the new overlay is placed. Pavement structural deterioration is evident.

FIGURE 2. PSI Rating System and Corresponding Pavement Condition (Continued)

Pavement Condition	PSI Rating Scale	Description of Pavement Condition
Poor	2.49 to 2.00	 Pavement in poor condition has a poor ride quality and has accumulated large amounts of environmental and structural-related distresses. The non-wheelpath longitudinal and transverse cracks are severe. The surface is weathered, rutted, and fatigue cracks are widespread. Lower volume roads are candidates for thick overlays or cold in-place recycling (CIR) and overlay repair. Higher volume roads will require reconstruction such as a full-depth recycling and overlay repair.
Very Poor or Failed	< 2.00	 Pavement in very poor condition has a very poor ride quality and has accumulated significant environmental and structural distresses. The surface is pitted and there are wide non-wheelpath longitudinal and transverse cracks. Networked, spalled fatigue cracks and deep ruts are prevalent. The deterioration is so advanced potholes are frequent. The road is no longer navigable at the posted speed limit. Pavement in this condition requires constant maintenance activity such as patching and filling potholes. Citizen complaints are common. This pavement always requires full-depth reconstruction and recycling the road may not be an option.

FIGURE 2. PSI Rating System and Corresponding Pavement Condition (Continued)

PAVEMENT MAINTENANCE AND REHABILITATION STRATEGIES

Pavement service life is a function of many parameters. The parameters of most consequence are the smoothness of the road and the amount of heavy truck loads that the pavement experiences. New pavement has excellent characteristics such as a very smooth ride without any surface distress or defects. Relatively little funding is necessary for new pavement maintenance. However, the smooth ride will gradually become rough due to cracks, distress, or other types of defects as the pavement deteriorates. Therefore, it becomes necessary to spend an increasing amount of funds in order to maintain or rehabilitate the pavement to an acceptable condition level as the pavement deteriorates over time. The types and extents of distress or defects, along with the severity of the pavement roughness, determine what types of repair strategies are required for maintenance and rehabilitation repair work.

Pavement repair strategies are classified into four major categories: Maintenance, Preservation, Rehabilitation, and Reconstruction.

- **Maintenance**. This category includes repairs that address surface deterioration, but that do not improve the pavements ability to carry traffic loads. This includes fog seals, crack sealing, chip seals, slurry seals, and full and partial depth patching.
- **Preservation**. Used more specifically when describing pavement treatments, preservation includes those treatments applied to roads in good condition in order to prevent further degradation and maintain a high level of service. This category mostly involves thin overlays and mill and fills used to maintain surface quality.
- **Rehabilitation**. This category includes more substantial repairs that are applied when the pavement is in fair or worse condition to repair the structurally deficient section and provide a new surface that improves the pavement's ability to carry traffic loads. Typical rehabilitation treatments include plant-mix overlays, mill and fills, and cold in place recycling with a plant mix overlay.
- **Reconstruction**. Reconstruction repairs are applied to roads that are damaged to the point where they require replacement or recycling of the bound layers, and potentially the base layers. Typically, reconstruction involves a roadbed modification followed by the placement of new bound layers.

For simplicity, in most other sections of this report, the term rehabilitation is used to include all preservation, rehabilitation, and reconstruction work.

FIGURE 3 exhibits the construction timing for pavement repair strategies based on the PSI pavement condition rating system. Maintenance and preservation repair strategies are typically applied when a pavement has a PSI rating of 3.50 or higher. Rehabilitation and reconstruction repair strategies are commonly constructed when a pavement has a PSI rating of 3.49 or less.

It should be noted however that the repair strategies explained herein are general policies and that the construction timing varies for each road prioritization category. For example, due to financial constraints, a category 5 road may receive a maintenance treatment such as a chip seal around a PSI rating of 2.5. Conversely, A category 1 road may receive a rehabilitation treatment while still in good condition in order to proactively maintain the higher performance standards present on these routes.

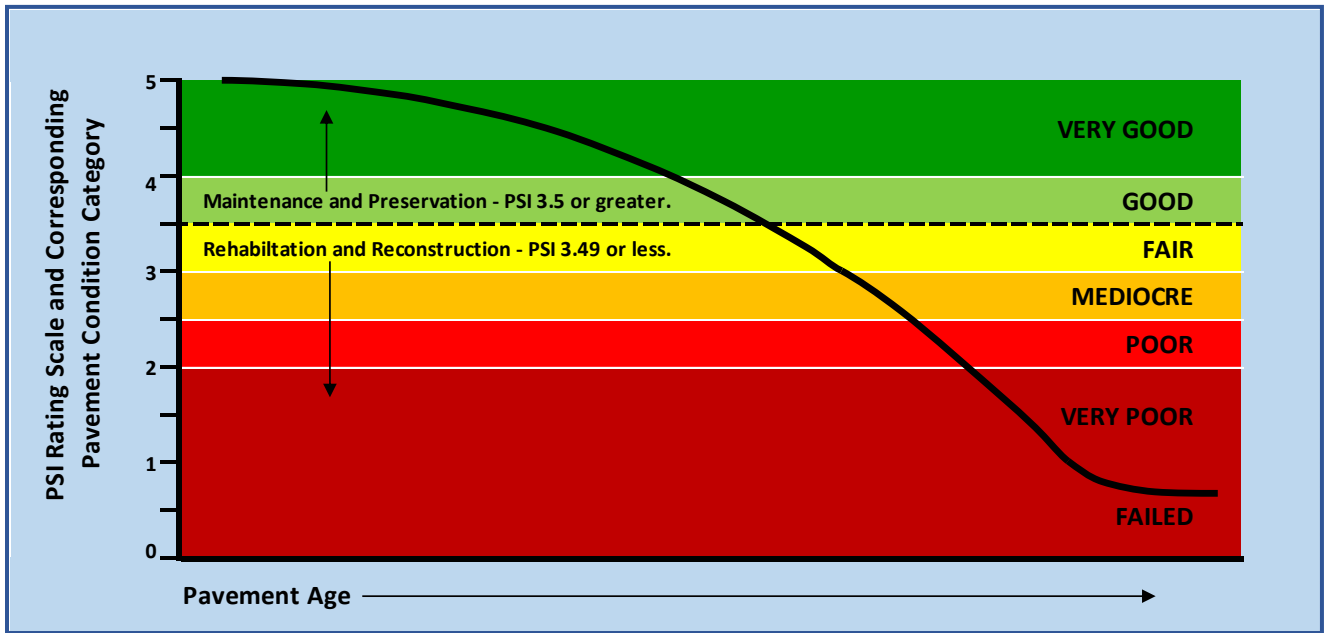

FIGURE 3. Timing for Repair Strategies Based on PSI Rating System

The funds needed for the repair work required to improve roads to acceptable condition levels when pavement is in poor or worse condition are far greater than the funds needed for the repair work when pavement is in fair or better condition. FIGURE 4 shows the timing for the cost saving between various repair options based on the PSI pavement

condition rating system. Project expenditures will significantly increase when pavement is allowed to deteriorate from fair condition into very poor or failed condition. Repair work costs six to ten times more for major reconstruction necessary when pavement is in very poor or failed condition as compared to the less invasive techniques that can be used when pavement is in fair or better condition.

NDOT proactively investigates opportunities to use resources wisely by repairing pavement in fair condition before the pavement deteriorates into worse, and thus more costly to repair condition. This philosophy of proactive pavement repair strategies lowers pavement life-cycle costs and better serves the taxpaying public.

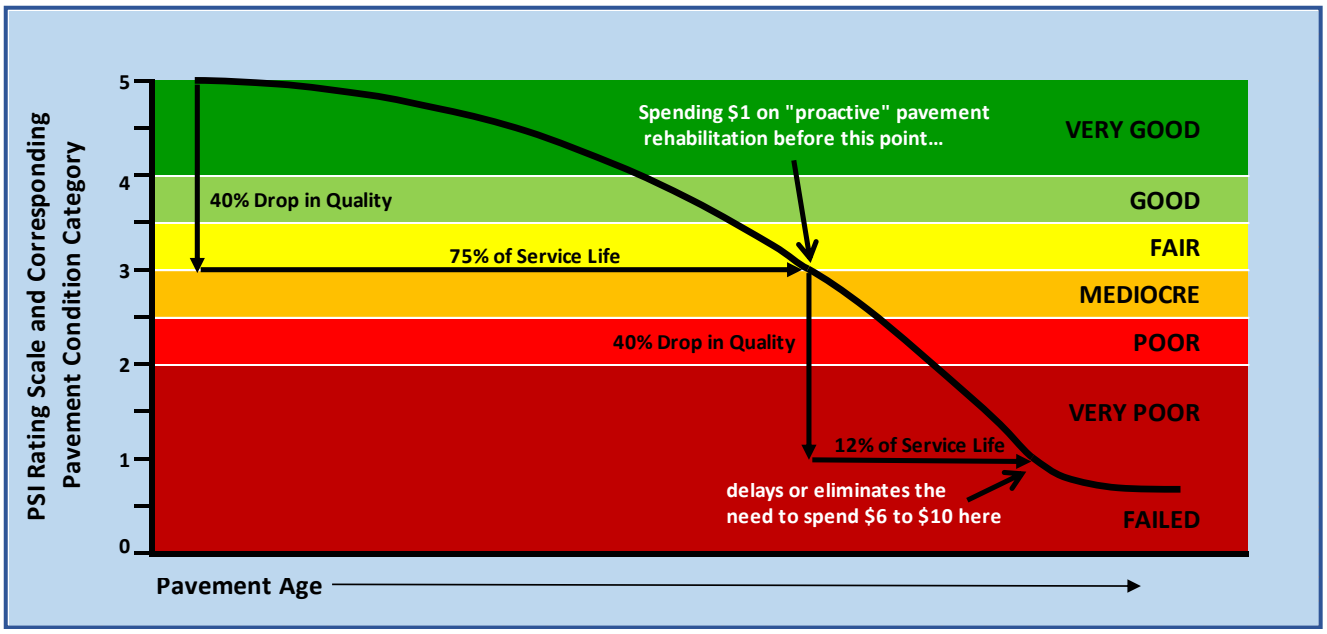

FIGURE 4. Timing for Proactive and Reactive Pavement Rehabilitation Expenditures

REVENUE AND EXPENDITURE

The pavement maintenance and rehabilitation repair work that is performed on the state-maintained roadway network is principally funded through the State Highway Fund, which is a dedicated source of funding established by the Nevada State Constitution expressly for this purpose and appropriated by the legislature. State Highway Fund revenue is primarily provided by Federal Aid and state resources such as the State gasoline and special fuel taxes, vehicle registration fees, commercial carrier fees, and driver license fees.

NDOT invested $317,693,409 for maintenance and rehabilitation repair work on the state-maintained roadway network during fiscal years 2019 and 2020. This expenditure included a $186,118,041 investment of state funds, a $131,207,366 investment of federal funds, and a $3,368,002 investment of funds from other sources. Other funding sources include support by local city and public works agencies as well as private utility and telecommunication enterprise with vested interest in localized areas.

There was $283,178,744 of road repair work contracted out to private contractors and $34,514,665 of road repair work performed by NDOT Maintenance personnel. The maintenance repair work was accomplished by both private road contractors and NDOT personnel. The rehabilitation repair work was solely accomplished by private road contractors. FIGURE 5 displays the funding sources and construction expenditures information that includes both maintenance and rehabilitation repair work for fiscal years 2019 and 2020.

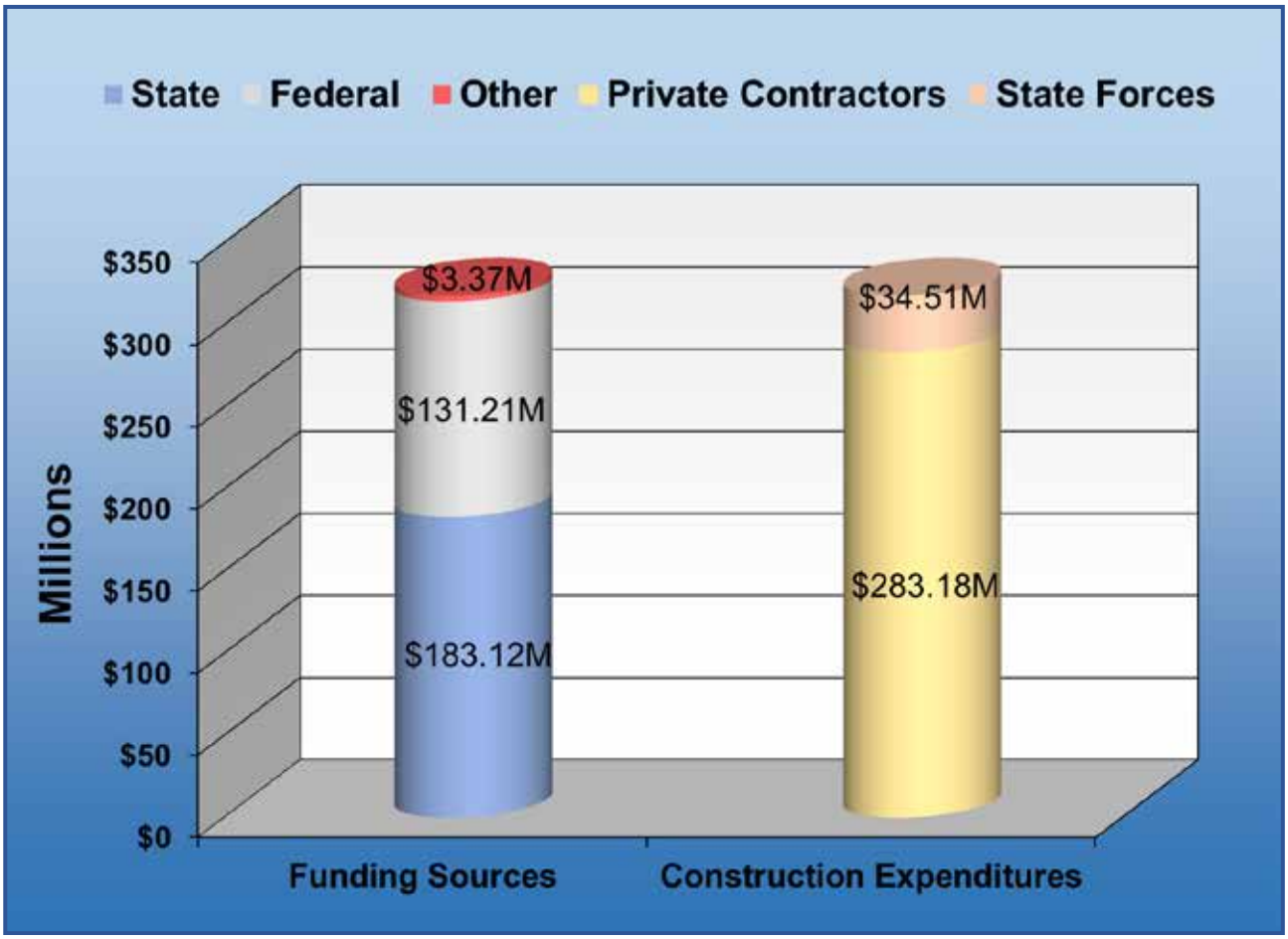

FIGURE 5. Funding Sources and Construction Expenditures

NDOT advertised $283,178,744 of contract maintenance and rehabilitation pavement repair work during fiscal years 2019 and 2020. This obligated expenditure improved or maintained the condition level of 624 centerline miles (1,445 lane miles) of roads. TABLE 3 contains a financial summary of the advertised maintenance and rehabilitation repair work that was accomplished on the state-maintained roadway network during fiscal years 2019 and 2020, along with the corresponding mileage that was improved.

TABLES 4 and 5 list the specific rehabilitation projects that were advertised during fiscal years 2019 and 2020. FIGURE 6 identifies the statewide locations where fiscal year 2019 and 2020 rehabilitation projects were completed.

TABLE 3. Advertised Pavement Repair Work for Fiscal Years 2019 and 2020

Fiscal Year	Contract Maintenance Repair Work Expenditure and Mileage	Contract Rehabilitation Repair Work Expenditure and Mileage	Total Contract Maintenance and Rehabilitation Repair Work Expenditure and Mileage
2019	$17,022,924	$143,276,555	$160,299,479
	176 Centerline Miles 373 Lane Miles	102 Centerline Miles 305 Lane Miles	278 Centerline Miles 678 Lane Miles
2020	$25,128,945	$97,750,320	$122,879,265
	312 Centerline Miles 634 Lane Miles	34 Centerline Miles 133 Lane Miles	346 Centerline Miles 767 Lane Miles
Biennium Total	$42,151,869	$241,026,875	$283,178,744
	488 Centerline Miles 1007 Lane Miles	136 Centerline Miles 438 Lane Miles	624 Centerline Miles 1445 Lane Miles

TABLE 4. List of Rehabilitation Projects Advertised in Fiscal Year 2019

FISCAL YEAR 2019					
Contract Number	**County**	**Mileposts**	**Length in Miles**	**Road Category**	**Cost**
3722	Clark	0.000 - 17.550 0.460 - 3.320	24.410	5 5	$5,842,198
LOCATION: SR 156, LEE CANYON ROAD, FROM SKI RUN TO US 95, CL 0.00 TO CL 17.55; SR 157, KYLE CANYON ROAD FROM THE TRAILING EDGE OF B-609 TO SR 158, DEER CREEK ROAD, CL 0.46 TO CL 3.32.					
SCOPE: ON SR 156, 1.5" COLD MILL, 2" DENSE GRADE PLANT MIX BITUMINOUS SURFACE WITH 3/4" OPEN GRADE BITUMINOUS SURFACE TO SR 158, THEN 1.5" COLD MILL, 2" PLANT MIX BITUMINOUS SURFACE TO US95; ON SR 157, 1.5" COLD MILL, 2" DENSE GRADE PBS WITH 3/4" OPEN GRADE BITUMINOUS SURFACE					
3716	Clark/Nye	21.960 - 43.293 0.000 - 0.950	11.142	3 3	$25,262,492
LOCATION: SR 160 BLUE DIAMOND RD, CLARK COUNTY, FROM 1.03 MILES NORTH OF MOUNTAIN SPRINGS SUMMIT TO THE CL/NY CO. LINE (EASTBOUND ONLY) MP CL 21.960 TO MP NY 0.950					
SCOPE: ROADBED MODIFICATION, PULVERIZE 12 INCHES, REMOVE 4 INCHES, PROCESS 8 INCH, 6 INCH PBS, WITH OPEN GRADE					
3760	White Pine	61.495 - 66.263 37.529 - 37.947	5.186	3 3	$7,829,399
LOCATION: US 50, WHITE PINE COUNTY, FROM INTERSECTION OF RUTH/KIMBERLY ROAD EAST TO WEST END OF ELY, MP WP 61.495 TO 66.263 AND ON US 6 FROM 0.418 MILES WEST OF INTERSECTION OF US 93 TO INTERSECTION WITH US 93, MP WP 37.529 TO 37.947					
SCOPE: 2 INCH COLD MILL, 3 INCH PBS DENSE GRADE, 0.75 INCH PBS OPEN GRADE ON US 50; 2.75 INCH COLD MILL, 2 INCH PBS DENSE GRADE, 0.75 INCH OPEN GRADE ON US 6					
3763	Carson City	3.140 - 8.950	5.81	1	$11,267,006
LOCATION: I 580 CARSON CITY FREEWAY FROM FAIRVIEW INTERCHANGE TO 0.66 MI SO OF THE CC/WA COUNTY LINE. MP CC 3.14 TO CC 8.95					
SCOPE: 2" COLD MILL WITH 2" PLANT MIX BITUMINOUS SURFACE WITH OPEN GRADED SURFACE, ITS, AND WRONG-WAY DRIVER SYSTEM					
3765	Elko	83.260 - 102.790	19.53	1	$35,152,895
LOCATION: I 80 FROM 1.04 E OF THE MOOR INTERCHANGE TO 1.871 MI E OF THE OASIS INTERCHANGE. MP EL 83.26 TO EL 102.79					
SCOPE: 2" MILL WITH 2" INCH PBS OVERLAY & OPEN GRADED; CONSTRUCT NEW EB TRUCK CLIMBING LANE MP EL 93 TO 96 & IMPROVEMENTS TO ON RAMPS AT PEQUOP SUMMIT INTERCHANGE.					
3768	Elko	62.090 - 68.978	6.888	1	$17,311,929
LOCATION: I 80, ELKO COUNTY, FROM 0.597 MILES EAST OF GRAYS CREEK GRADE SEPARATION TO 0.048 MILES WEST OF THE WILLOW CREEK GRADE SEPARATION MP EL 62.09 TO MP EL 68.978					
SCOPE: RUBBLIZE PCCP 1.5 INCH STRESS RELIEF COURSE 5 INCH PLANT MIX OVERLAY WITH AN OPEN GRADED SURFACE.					
3769	Elko	26.580 - 32.000	5.420	1	$12,125,416
LOCATION: I 80 FROM THE TRAILING EDGE OF H-902 TO 0.93 MILES WEST OF OSINO INTERCHANGE. MP EL 26.58 TO 32.00.					
SCOPE: COLD MILL FULL DEPTH, RUBBLIZE PCCP, PLACE 1.5" STRESS RELIEF COURSE, 5" PLANT MIX OVERLAY WITH OPEN GRADE.					
3770	Clark	0.000 - 1.730	1.730	2	$4,066,356
LOCATION: SR 564, CLARK COUNTY, LAKE MEAD PARKWAY IR 515 TO BOULDER HIGHWAY MP CL 0.00 TO MP CL 1.73					
SCOPE: COLD MILL PLANT MIX BITUMINOUS SURFACE WITH OPEN GRADE AND ADA RAMPS					
3772	Clark	2.520 - 7.300	4.780	2	$10,258,041
LOCATION: SR 593 TROPICANA AVE FROM MARYLAND PKWY TO BOULDER HWY. MP CL 2.52 TO 7.30					
SCOPE: MILL AND OVERLAY WITH AREAS OF CONCENTRATION AND ADA IMPROVEMENTS.					
3775	Churchill	85.961- 106.880	20.919	3	$12,343,113
LOCATION: US 50, CHURCHILL COUNTY, FROM 4.2 MILES EAST OF COLD SPRINGS TO CH/LA COUNTY LINE MP CH 85.961 TO MP CH 106.88					
SCOPE: 2 INCH COLD MILL, 1 1/2 INCH STRESS RELIEF COURSE, 2 INCH PLANT MIX BITUMINOUS OVERLAY WITH OPEN GRADE					
3776	Clark	0.000 - 0.460	0.46	3	$1,817,710
LOCATION: SR 157, KYLE CANYON ROAD, CLARK COUNTY, FROM THE BEGINNING OF THE DEAD END TO THE TRAILING EDGE OF B-609. MP CL 0.00 TO MP CL 0.46					
SCOPE: 1.5 INCH COLD MILL WITH 2 INCH PLANT MIX BITUMINOUS SURFACE WITH OPEN GRADE AND SLOPE IMPROVEMENT					

TABLE 5. List of Rehabilitation Projects Advertised in Fiscal Year 2020

FISCAL YEAR 2020					
Contract Number	**County**	**Mileposts**	**Length in Miles**	**Road Category**	**Cost**
3791	Pershing	IR080 PE 62.495-75.090	12.595	1	$17,010,870
LOCATION: I 80, PERSHING COUNTY, FROM 0.513 MILES WEST OF DUN GLEN INTERCHANGE TO PE/HU COUNTY LINE, MP PE 62.495 TO MP PE 75.09					
SCOPE: 1.5 INCH COLD MILL, 2 INCH PLANT MIX BITUMINOUS OVERLAY WITH OPEN GRADE					
3805	Clark	IR015 CL 118.480-123.770 FRCL49 CL 0.000 - 0.220	5.51	1 3	$11,609,540
LOCATION: I 15, CLARK CO, FROM 1.87 MI SOUTH OF THE WEST MESQUITE INTERCHANGE TO THE NV/AZ STATE LINE, MP CL 118.48 TO MP CL 123.77; FRCL49, FROM 0.04 MI SOUTH OF THE JUNCTION OF RAMPS 1 AND 2 TO 0.06 MI NORTH OF RAMPS 3 AND 4, MP CL 0.00 TO MP CL 0.22					
SCOPE: I 15, 1.5 INCH COLD MILL, 2 INCH PLANT MIX BITUMINOUS OVERLAY WITH OPEN GRADE; FRCL49, 2.75 INCH COLD MILL, 2 INCH PLANT MIX BITUMINOUS OVERLAY WITH OPEN GRADE.					
3807	Clark	IR015 CL 26.110-28.540 IR015 CL 29.980-32.450 FRCL61 CL 1.380-1.600	2.695	1 1 3	$10,678,188
LOCATION: I 15 S, CLARK CO, AT SLOAN INTCHG, MP CL 25.22, FRCL61 SLOAN RD MP CL 1.38 TO MP CL 1.60, AND 0.59 MN OF SLOAN INTCHG TO 0.3 MN DUCK CREEK, MP CL 26.11 TO MP CL 32.50, WITH THE EXCEPTION OF STARR INTCHG, MP CL 28.54 TO MP CL 29.98					
SCOPE: 3" COLD MILL W/ 3" PLANT MIX AND 3/4" OPEN GRADED SURFACE AT SLOAN INTCHG RAMPS AND SLOAN ROAD; 2" COLD MILL W/ 2" PLANT MIX AND 3/4" OPEN GRADED SURFACE ON I-15 S					
3812	Clark	SR596 CL 43.007-45.038	2.031	2	$6,911,357
LOCATION: SR 596 JONES BLVD, SOUTH OF US 95, AND NORTH TO SMOKE RANCH ROAD, CLARK COUNTY. MP CL 43.007 TO MP CL 45.038.					
SCOPE: PULVERIZE 14.75 INCHES REMOVE 6.75 INCHES, ROADBED MODIFICATION 8 INCHES, 6 INCHES PBS WITH OPEN GRADE, CONSTRUCT ADA IMPROVEMENTS					
3817	Lander	US050 LA 23.300-24.440	1.14	3	$7,596,298
LOCATION: US 50, AUSTIN, FROM 0.52 MILES E OF SR 305 TO EAST SIDE OF TOWN MP LA 23.30 TO MP LA 24.44					
SCOPE: PULVERIZE EXISTING ROADBED 13 ¾" DEEP, 5 ¾" ROAD-EX, 8" ROADBED-MOD, WITH 5" PBS AND ¾" OPEN GRADED WEARING COURSE. REPLACE WATERLINE AND LINE SEWER LINE					
3821	Washoe	SR659 WA 22.873-22.980 SR659 WA 0.000-6.270	6.377	2 2	$14,503,007
LOCATION: SR 659 S MCCARRAN BLVD, WASHOE COUNTY, FROM S VIRGINIA STREET TO SR 647 W 4TH STREET MP WA 22.873 TO MP WA 22.98 AND MP WA 0.00 TO MP WA 6.27					
SCOPE: MILL AND OVERLAY 3.75" WITH ADA IMPROVEMENTS					
3824	White Pine	US050 WP 67.609-68.450 US093 WP 53.639-53.942	1.144	3 3	$24,929,474
LOCATION: US 50, ELY, AULTMAN ST AND GREAT BASIN BLVD, US 50 MP WP 67.609 TO MP WP 68.450, US 93 MP WP 53.639 TO MP WP 53.942					
SCOPE: PULVERIZATION, ROADBED MODIFICATION, PLANT MIX BITUMINOUS SURFACE WITH OPEN GRADE, CURB, GUTTER, SIDEWALK, LIGHTING, ADA, DRAINAGE, SEWER, AND WATER IMPROVEMENTS.					
3829	Lyon	US050A LY 11.148-14.120	7.139	3	$4,511,586
LOCATION: US 50A, LYON COUNTY, IN FERNLEY, FROM 0.015 MILES SOUTH OF ROYAL OAK DRIVE TO SR 427. LY 11.184 TO LY 14.120.					
SCOPE: 3 AND 3/4" COLD MILL WITH 3" PLANT MIX BITUMINOUS SURFACE OVERLAY WITH 3/4" OPEN GRADED WEARING COURSE AND CONSTRUCT MULTI-USE PATH.					

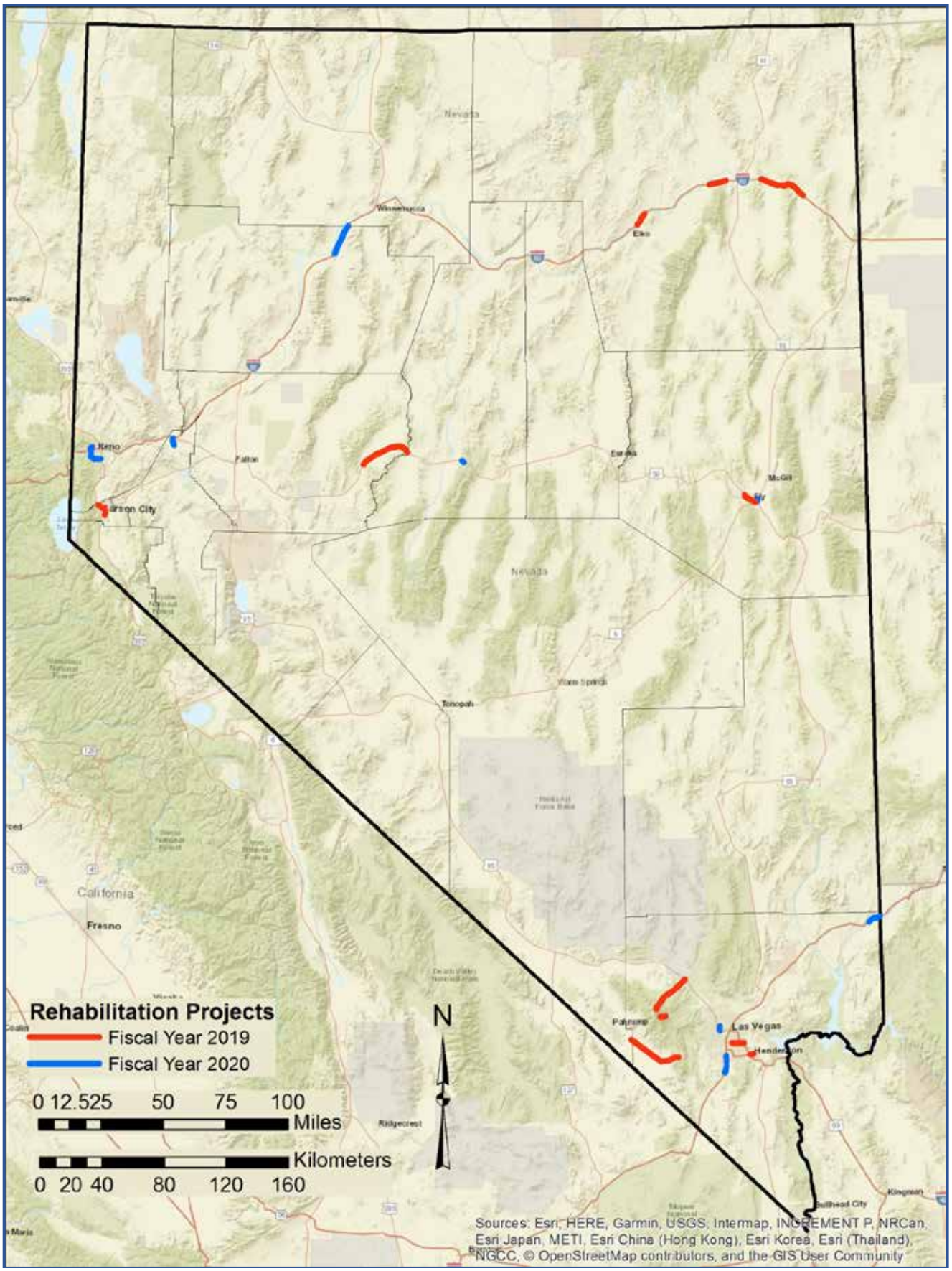

FIGURE 6. Rehabilitation Project Locations

COSTS OF CONSTRUCTION

The costs for maintenance and rehabilitation repair work on highways fluctuate over time. The periodic fluctuations are typically due to instabilities in the costs of road building materials such as asphalt, cement, and steel, as well as the fluctuations in energy costs. Although these fluctuations occasionally lead to price decreases, the general trend for maintenance and rehabilitation repair work costs is in the upward direction.

NDOT recognizes that these periodic cost fluctuations complicate the project planning process and cause uncertainty in the highway construction industry. NDOT tries to mitigate this uncertainty by sharing the risk with contractors through fuel and asphalt escalation clauses in project contracts. However, sharing the risk of cost fluctuations does not eliminate the overall long-term increase in construction costs as reported by the Associated General Contractors of America, the American Road and Transportation Builders Association, the Federal Highway Administration, and other data sources.

The Federal Highway Administration developed the National Highway Construction Cost Index (NHCCI) to measure average changes in the prices of highway construction costs over time. This index is based on pricing information contained in winning highway construction contracts. FIGURE 7 shows the NHCCI index from March 2003 through March 2020. Although the cost trend was reasonably flat for some time, the recent trend shows the price increasing by nearly 8% per year. When compared to a general index such as the Producer Price Index (PPI) published by the Bureau of Labor Statistics (BLS), the NHCCI exhibits similar patterns, but faster growth. This relationship suggests that the costs of road construction are generally outpacing normal inflation, which further strains the ability to provide necessary funding.

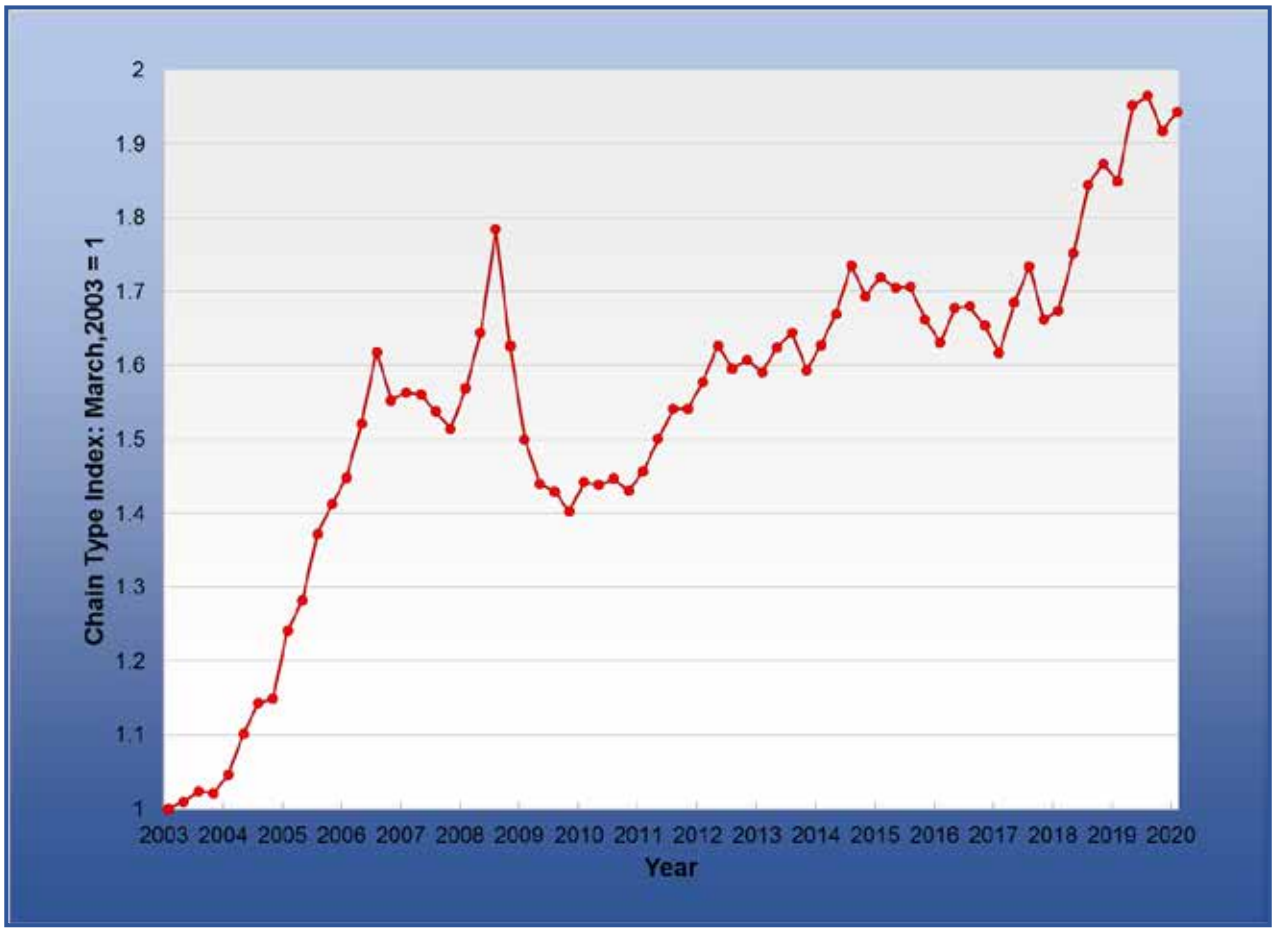

FIGURE 7. National Highway Construction Cost Index (NHCCI)
Source: Federal Highway Administration.

A significant portion of NDOT funding for road construction projects comes from fuel taxes, which have not provided revenue that keeps up with inflation. Because of this, the purchasing power of the revenue for road construction is approximately forty percent of what it was in 1992. Future revenue from fuel taxes will see even more pressure with increasing fuel economy standards and the accelerating adoption of electric vehicles.

PAVEMENT CONDITION

A safe, efficient, and reliable roadway network is a matter of regional importance and promotes the general welfare of all people that live, work, and play in the state. Nevada's pavement has ranked in the top one-half in the nation for the last several years as compared with the overall highway performance and efficiency of other states' roadway networks as reported in the *Annual Highway Report* by the *Reason Foundation*. NDOT uses the PSI pavement condition rating system previously discussed and graphically shown in FIGURE 2 to evaluate and report the condition of the roadway network. TABLE 6 presents the PSI condition data for each road prioritization category on the state-maintained roadway network. Category 1 is divided into asphalt (A) and Portland Cement Concrete (C) surfaces for further clarity.

TABLE 6. PSI Pavement Condition by Road Prioritization Category

Condition	PSI Rating Scale	PSI Condition by Road Prioritization Category Percentage (%) and Centerline Miles						
		Road Category 1		Road Category 2	Road Category 3	Road Category 4	Road Category 5	Roadway Network Totals
		A	C					
Very Good	5.00 to 4.00	67.6% 379.6	4.3% 4.3	34.0% 314.8	25.3% 308.2	4.4% 37.6	0.7% 10.5	**20.0%** **1,055**
Good	3.99 to 3.50	26.0% 146.1	41.3% 41.0	38.0% 352.2	47.7% 580.0	32.2% 276.8	14.9% 238.4	**31.1%** **1,635**
Fair	3.49 to 3.00	5.1% 28.80	37.5% 37.30	16.3% 151.30	21.4% 260.80	38.4% 330.40	28.8% 461.20	**24.1%** **1,270**
Mediocre	2.99 to 2.50	1.1% 6.2	14.7% 14.6	6.7% 61.6	4.4% 53.3	19.8% 170.5	29.0% 463.8	**14.6%** **770**
Poor	2.49 to 2.00	0.1% 0.5	2.1% 2.1	3.1% 28.6	0.9% 10.5	4.2% 36.4	16.2% 258.5	**6.4%** **337**
Very Poor	< 2.00	0.0% 0.0	0.1% 0.1	2.0% 18.4	0.4% 4.4	0.9% 7.9	10.5% 168.2	**3.8%** **199**
Total Miles		**661**		**927**	**1,217**	**860**	**1,601**	**5,265**

* 1) Data as reported in the 2019 PMS Data Warehouse.
2) The reported total of 5,265 miles includes only those roadways that were surveyed in 2019. The total state-maintained roadway network mileage of 5,365 miles mentioned in the *Roadway Network Inventory* section of the report is the official mileage count that includes all roads.

FIGURE 8 is a map of the state's roadway network inventory identified by the PSI rating system. FIGURES 9 through 13 are maps of road prioritization categories 1 through 5 identified by the PSI rating system.

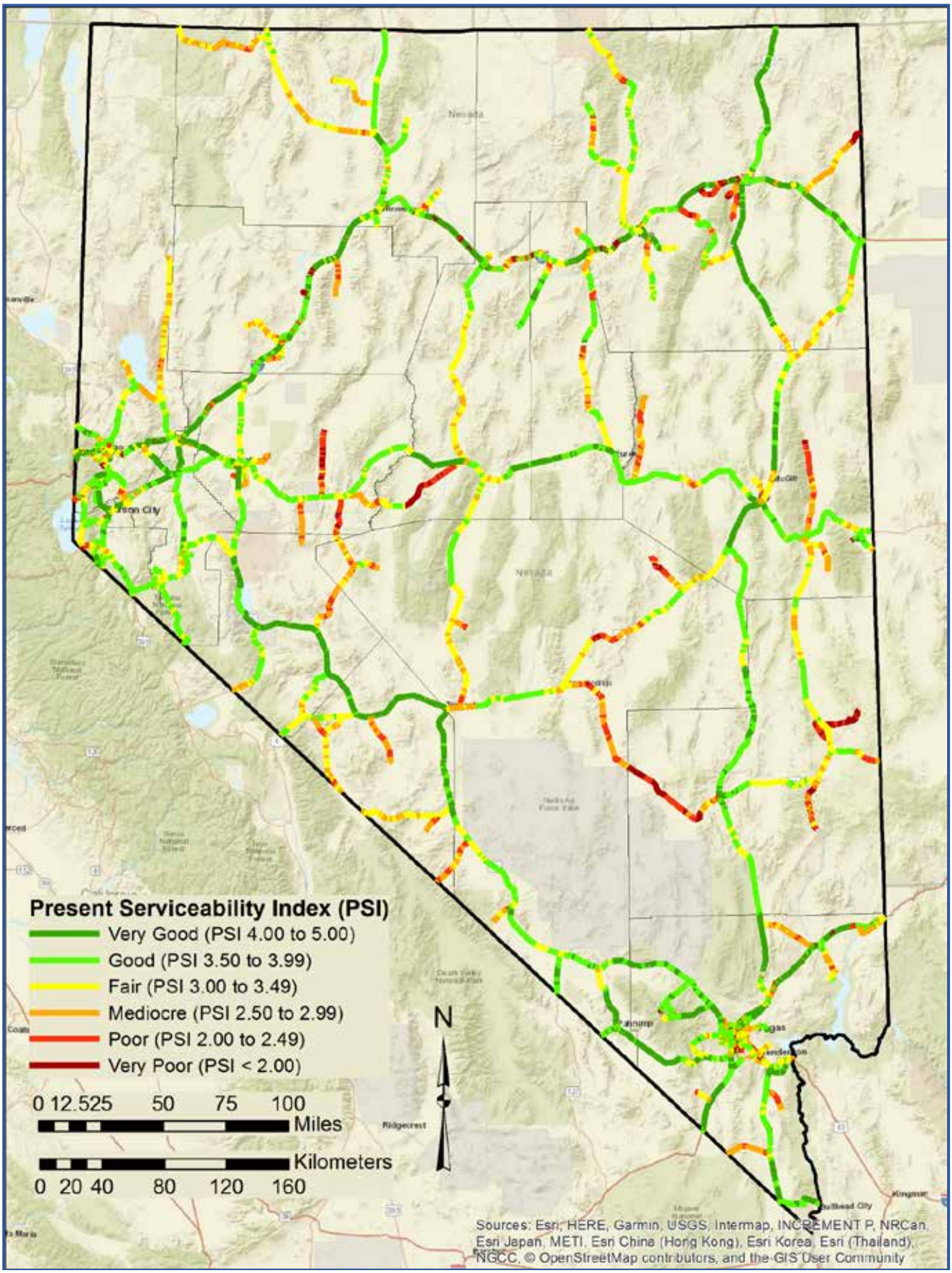

FIGURE 8. Roadway Network Inventory Identified by Present Serviceability Index (PSI)

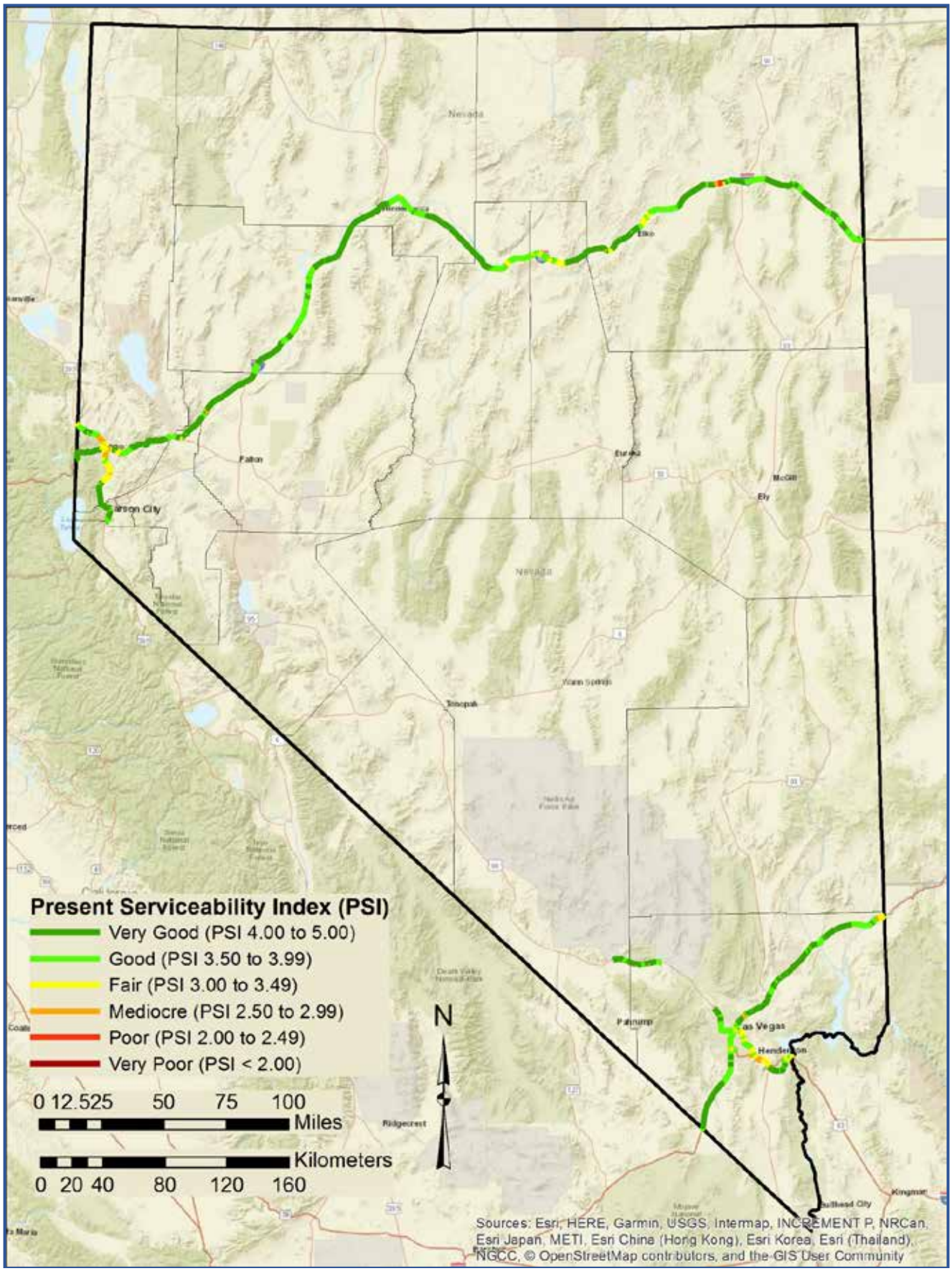

FIGURE 9. Road Prioritization Category 1 Identified by Present Serviceability Index (PSI)

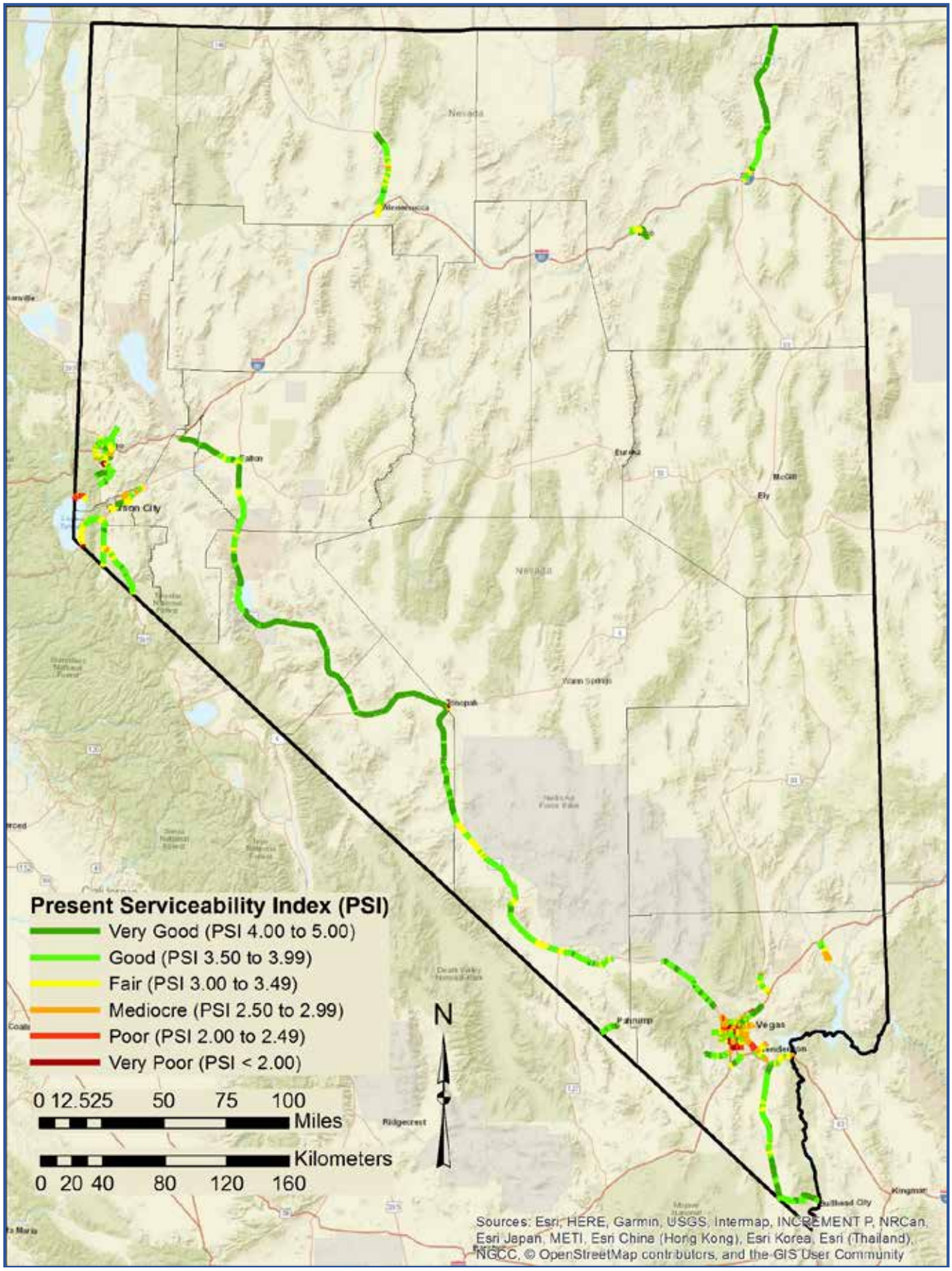

FIGURE 10. Road Prioritization Category 2 Identified by Present Serviceability Index (PSI)

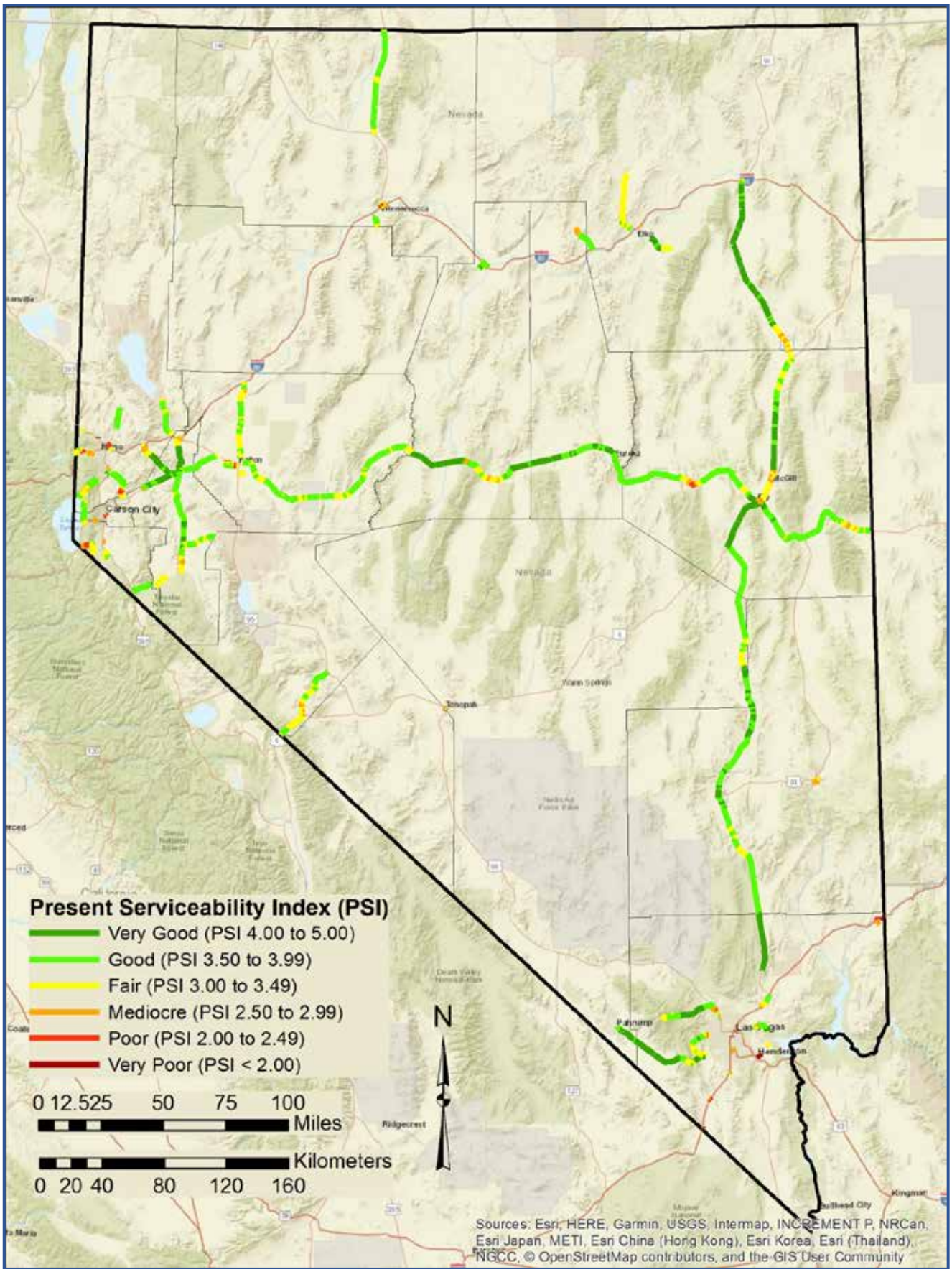

FIGURE 11. Road Prioritization Category 3 Identified by Present Serviceability Index (PSI)

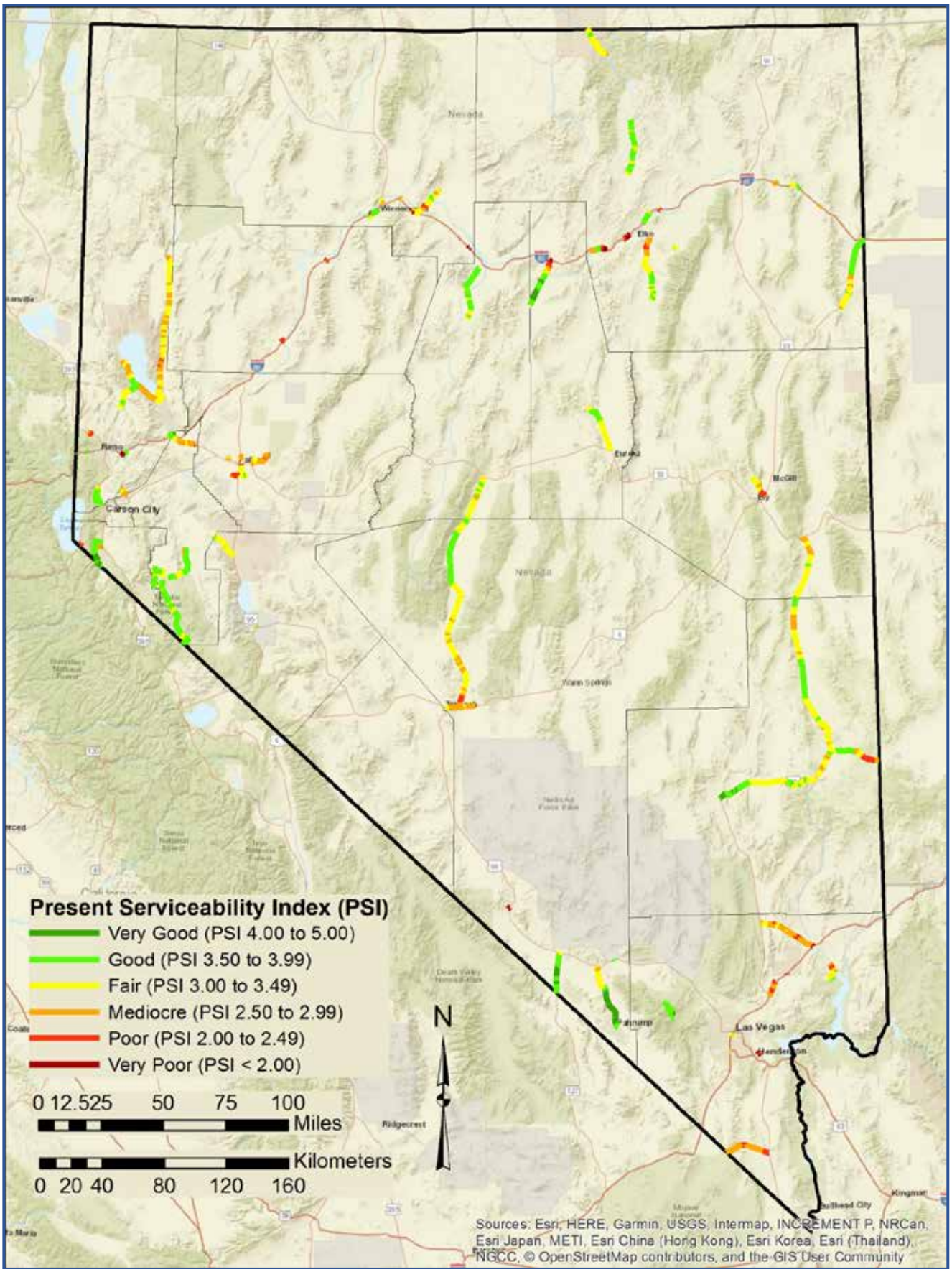

FIGURE 12. Road Prioritization Category 4 Identified by Present Serviceability Index (PSI)

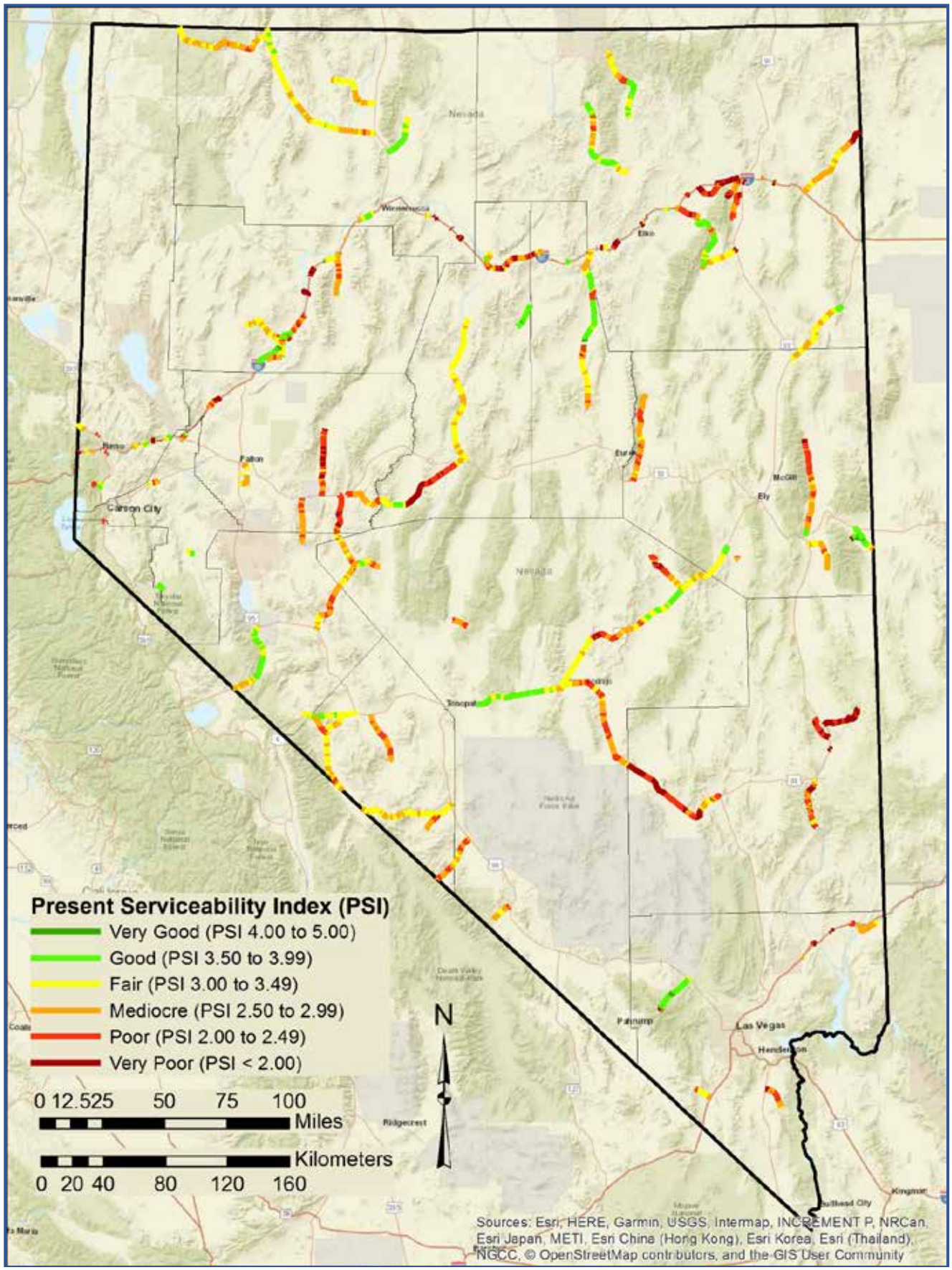

FIGURE 13. Road Prioritization Category 5 Identified by Present Serviceability Index (PSI)

NDOT partitions the state into three districts in order to effectively manage the state's pavement assets. District 1 includes Clark, Esmeralda, Lincoln, and most of Nye County. District 2 is comprised of most of Carson City, Churchill, Douglas, Lyon, Mineral, Pershing, Storey, and Washoe Counties. District 3 consists of the majority of Elko, Eureka, Humboldt, Lander, and White Pine Counties. TABLE 7 shows the pavement condition in each district identified by the PSI rating system, and TABLE 8 shows the pavement condition in each county identified by the PSI rating system.

TABLE 7. District Pavement Condition Identified by Present Serviceability Index (PSI)

District	Average PSI Condition by Road Prioritization Category and Miles per District				
	Road Category 1	Road Category 2	Road Category 3	Road Category 4	Road Category 5
District 1	3.91 199 mi	3.63 519 mi	3.7 280 mi	3.27 371 mi	2.77 529 mi
District 2	3.96 196 mi	3.69 290 mi	3.61 367 mi	3.28 254 mi	2.79 256 mi
District 3	4.02 266 mi	3.86 118 mi	3.78 570 mi	3.35 235 mi	2.89 815 mi
Total All Districts	**3.97 661 mi**	**3.68 927 mi**	**3.71 1217 mi**	**3.29 860 mi**	**2.83 1601 mi**

TABLE 8. County Pavement Condition Identified by Present Serviceability Index (PSI)

County	Average PSI Condition by Road Prioritization Category and Miles per County				
	Road Category 1	Road Category 2	Road Category 3	Road Category 4	Road Category 5
Carson City	4.07 9 mi	3.52 12 mi	3.31 5 mi	Not Applicable	Not Applicable
Churchill	4.26 28 mi	3.84 48 mi	3.57 140 mi	2.87 25 mi	2.35 93 mi
Clark	3.91 192 mi	3.41 286 mi	3.78 137 mi	2.83 69 mi	3.03 51 mi
Douglas	Not Applicable	3.54 56 mi	3.4 26 mi	3.65 19 mi	2.62 1 mi
Elko	4 133 mi	3.98 79 mi	3.81 117 mi	3.33 112 mi	2.83 253 mi
Esmeralda	Not Applicable	4.17 97 mi	Not Applicable	Not Applicable	2.96 141 mi
Eureka	3.84 26 mi	Not Applicable	3.92 54 mi	3.49 41 mi	3.18 68 mi
Humboldt	4.13 61 mi	3.6 38 mi	3.66 51 mi	3.19 23 mi	3.06 166 mi
Lander	3.79 27 mi	Not Applicable	3.91 64 mi	3.51 41 mi	2.73 146 mi
Lincoln	Not Applicable	Not Applicable	3.7 103 mi	3.35 146 mi	2.04 100 mi
Lyon	4.29 16 mi	3.59 29 mi	3.78 112 mi	3.52 77 mi	3.26 14 mi
Mineral	Not Applicable	4.12 93 mi	3.39 35 mi	3.31 11 mi	3.08 62 mi
Nye	4.04 7 mi	3.61 111 mi	3.79 49 mi	3.41 138 mi	2.91 252 mi
Pershing	4.09 75 mi	Not Applicable	Not Applicable	2.36 2 mi	2.83 107 mi
Storey	Not Applicable	Not Applicable	3.5 21 mi	3.04 3 mi	Not Applicable
Washoe	3.78 87 mi	3.42 77 mi	3.52 64 mi	3.16 117 mi	2.97 16 mi
White Pine	Not Applicable	Not Applicable	3.74 241 mi	3.15 36 mi	2.89 130 mi
Total All Counties	**3.97 661 mi**	**3.68 927 mi**	**3.71 1217 mi**	**3.29 860 mi**	**2.83 1601 mi**

Past condition data were reviewed using the PSI pavement condition rating system to determine if the funds spent to perform maintenance and rehabilitation repair work were adequate to maintain or improve the average condition of the roadway network. FIGURES 14 through 19 are the results of this review. The most recent year included in each figure is 2019 – the most recent year for which performance data is available. FIGURE 14 demonstrates the overall average PSI for the entire roadway network has generally been in the fair range, with a generally decreasing trend.

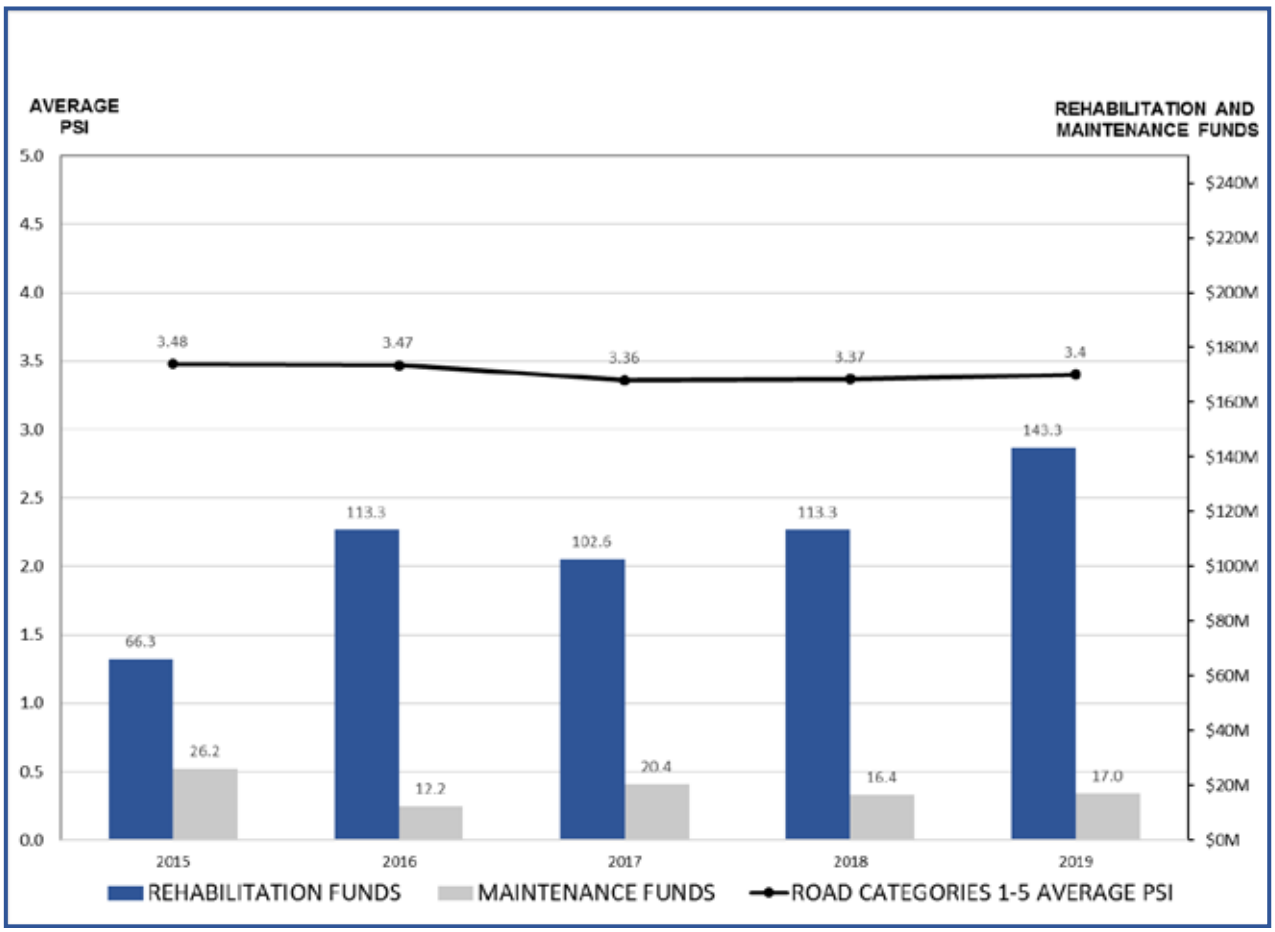

FIGURE 14. Average PSI and Expenditures for Roadway Network

FIGURE 15 illustrates the long-term average PSI for road category 1 and the rehabilitation and maintenance expenditure for each year from 2015 through 2019. Category 1 roads include the controlled access highways such as I-15, I-580, and I-80. Due to interstate economic importance, increased federal condition requirements, and the relatively high volumes and speeds encountered on these routes, they are given the highest priority. Because of this, NDOT spends a substantial amount of the rehabilitation funds to maintain these roads in good condition each year. An average of approximately $53 million per year has been spent on these roads since 2013. Though average condition for category 1 roads has slipped from very good to good, this category still performs at a high level.

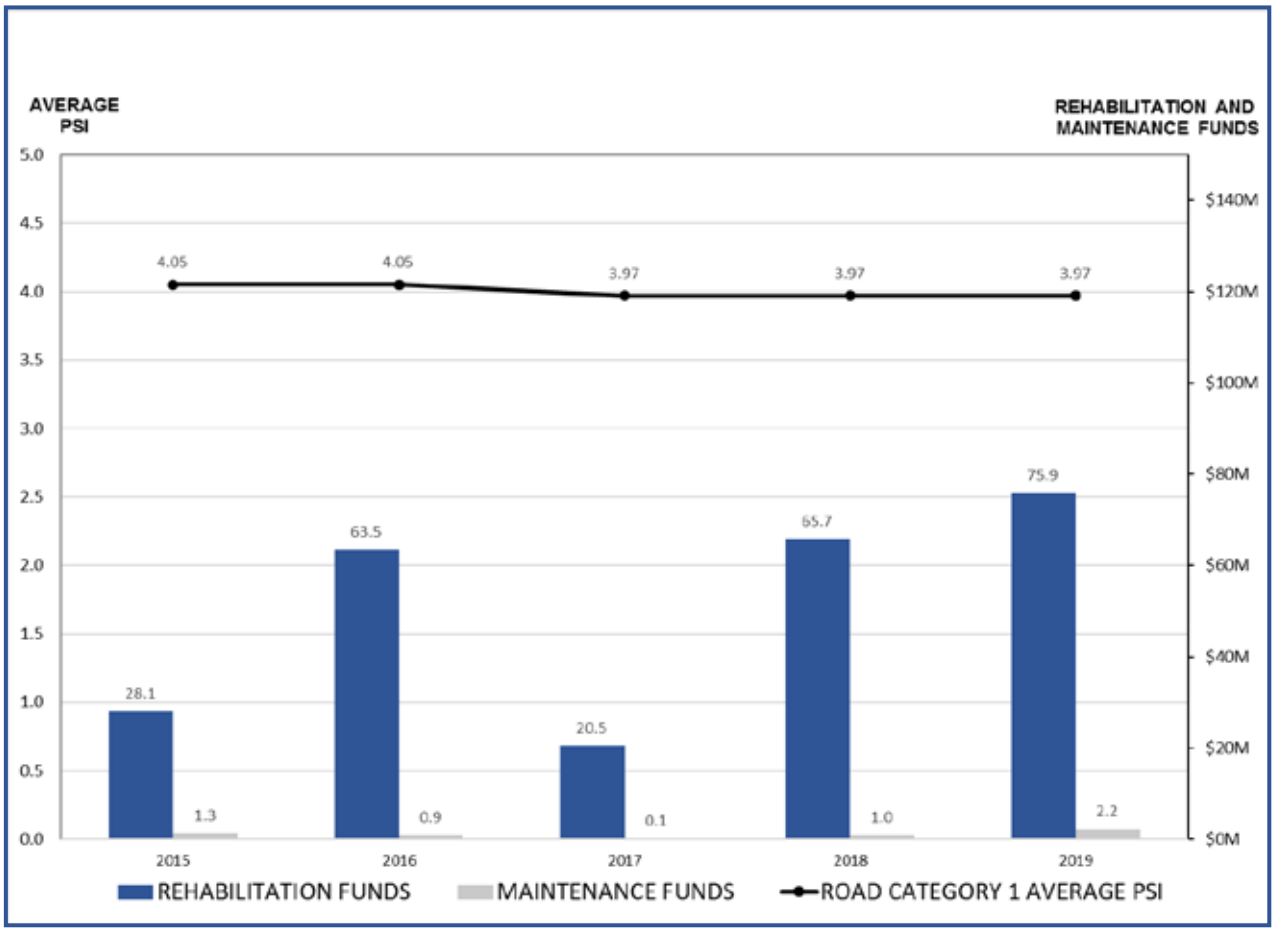

FIGURE 15. Average PSI and Expenditures for Road Category 1

FIGURE 16 shows the long-term average PSI for road category 2 and the rehabilitation and maintenance expenditure for each year from 2015 through 2019. Category 2 roads include routes such as St. Rose Parkway/Lake Mead Drive, US-50 Lincoln Highway, and Fifth Street in Elko. The average PSI has remained in good condition through this period, but the condition is declining. Given that category 2 roads do not meet the new performance goals, they will likely receive funding beyond the historical average of approximately $26 million going forward, and overall performance should start to improve.

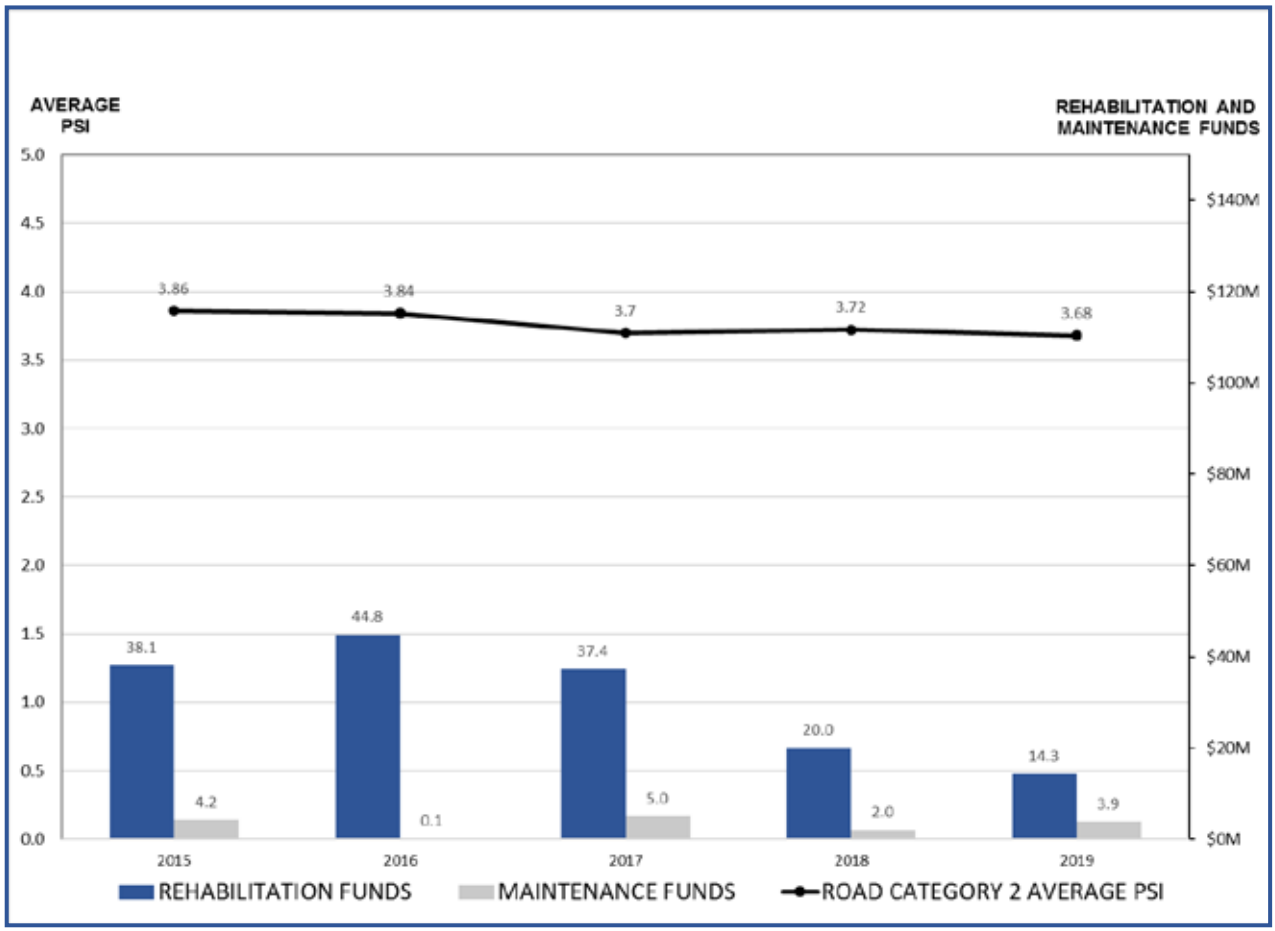

FIGURE 16. Average PSI and Expenditures for Road Category 2

FIGURE 17 displays the long-term average PSI for road category 3 and the rehabilitation and maintenance expenditure for each year from 2013 through 2019. Category 3 roads include routes such as Kyle Canyon Road, SR-28 near Lake Tahoe, and SR-225 at the Elko west urban limits. The average PSI has been solidly in good condition but slightly declining. The decline may accelerate because performance targets are below the current condition. Average funding for road category 3 has been nearly $22 million per year since 2013, which will likely be sustained even with the updated targets put in place.

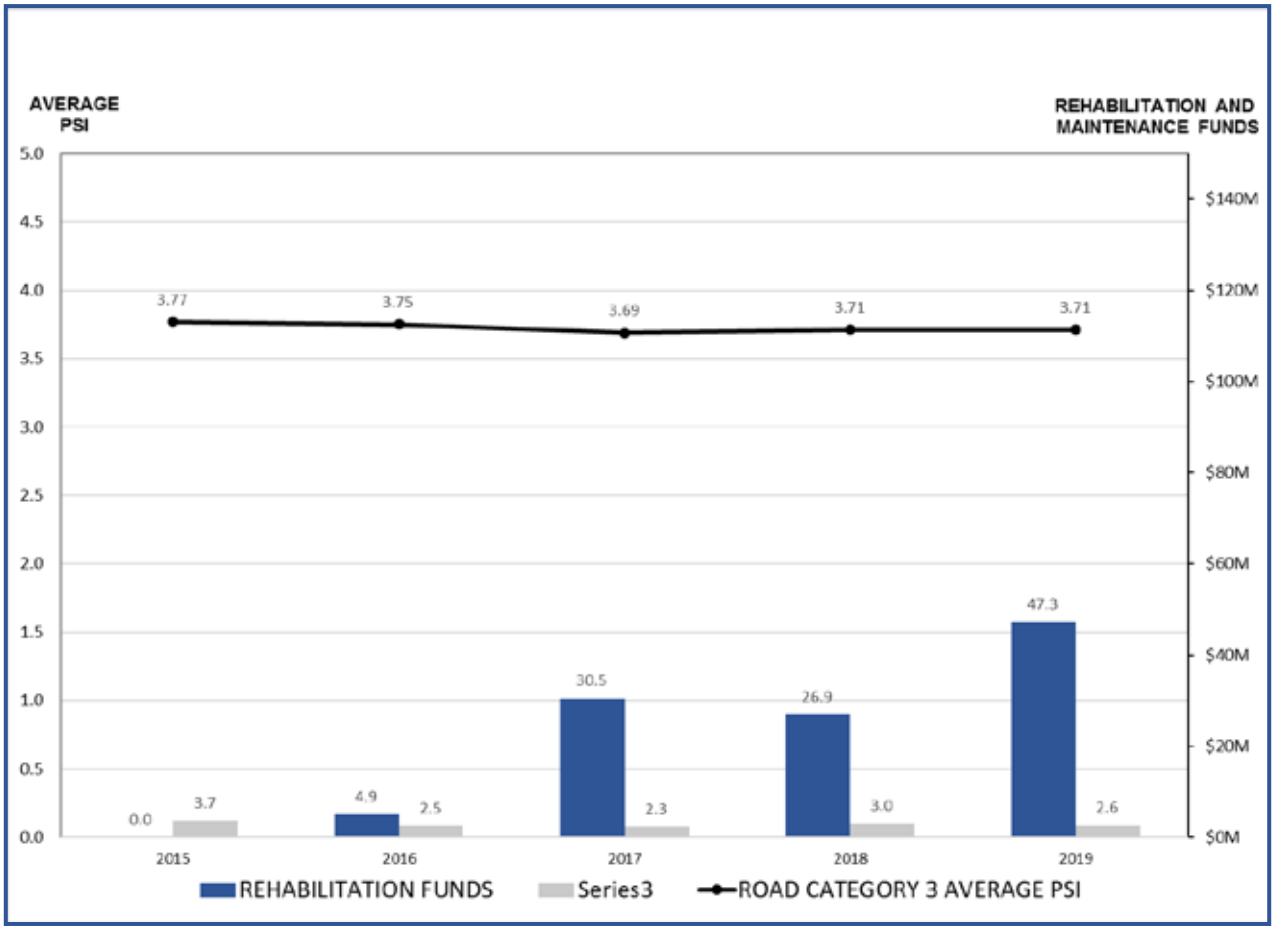

FIGURE 17. Average PSI and Expenditures for Road Category 3

FIGURE 18 demonstrates the long-term average PSI for road category 4 and the rehabilitation and maintenance expenditure for each year from 2015 through 2019. Category 4 roads include routes such as Deer Creek Road, Foothill Road/Genoa Lane, and Jiggs Road. The average PSI has been steadily in the fair category for some time, and it is projected that category 4 roads will stay in fair condition on average despite the limited funding they receive. Average rehabilitation spending in category 4 is only about $1.4 million per year since 2013, but this category also receives significant rehabilitation funding of over $5 million per year, which helps maintain performance.

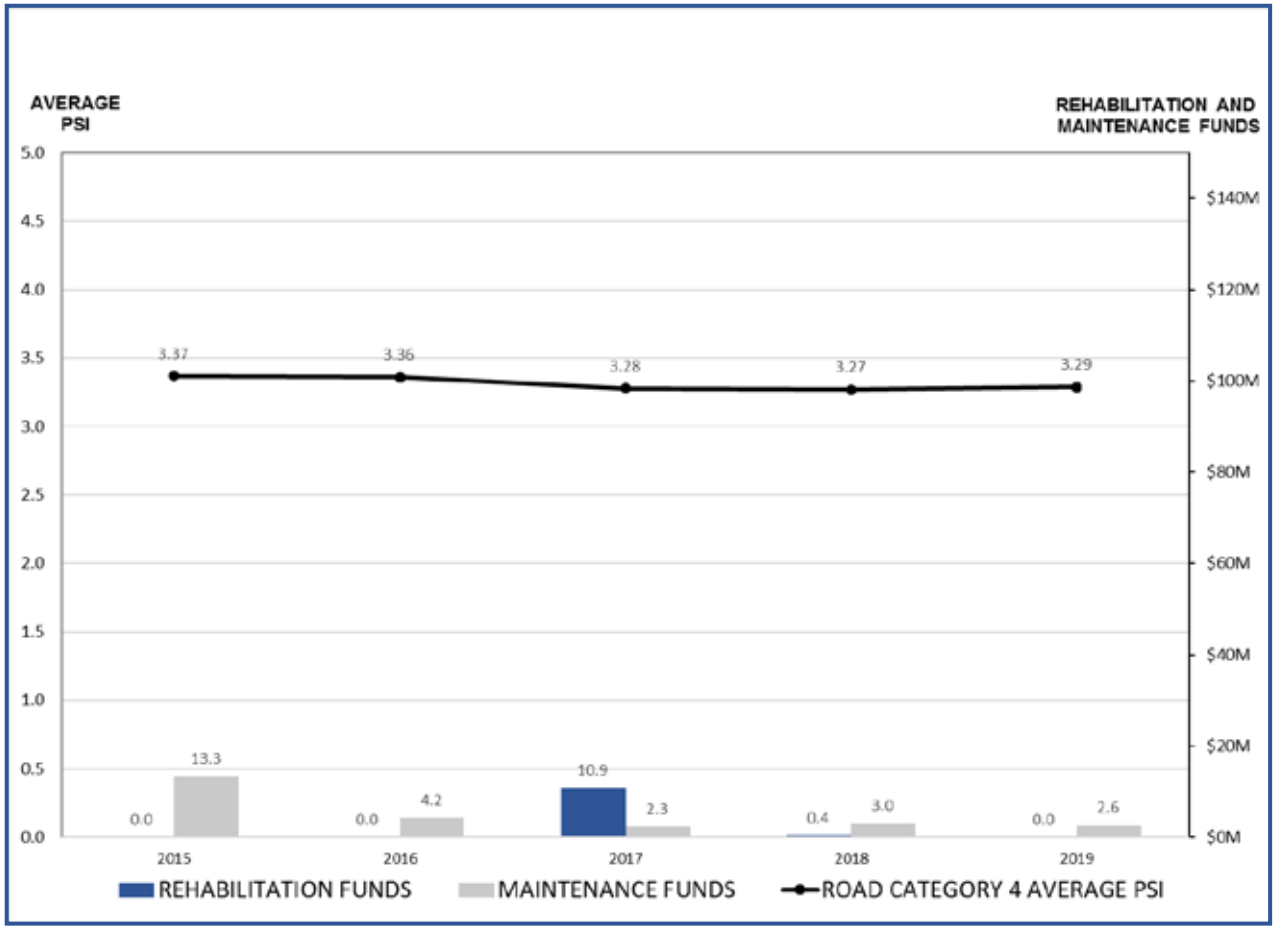

FIGURE 18. Average PSI and Expenditures for Road Category 4

FIGURE 19 presents the long-term average PSI for road category 5 and the rehabilitation and maintenance expenditure for each year from 2015 through 2019. Category 5 roads include routes such as Lee Canyon Road, Dixie Valley Road, and Secret Pass Road. These roads have been solidly in the upper half of mediocre range for a long time. Because of the generally low volume and network importance of category 5 roads, they receive very little rehabilitation funds, though the additional $6 million plus in maintenance funds they receive each year help stabilize performance. Even with updated performance targets, these roads are not meeting performance goals, and increased spending is expected. This should result in the average PSI increasing slowly over time as the new target is reached. However, this modest target will still likely be met without average condition improving beyond the mediocre range.

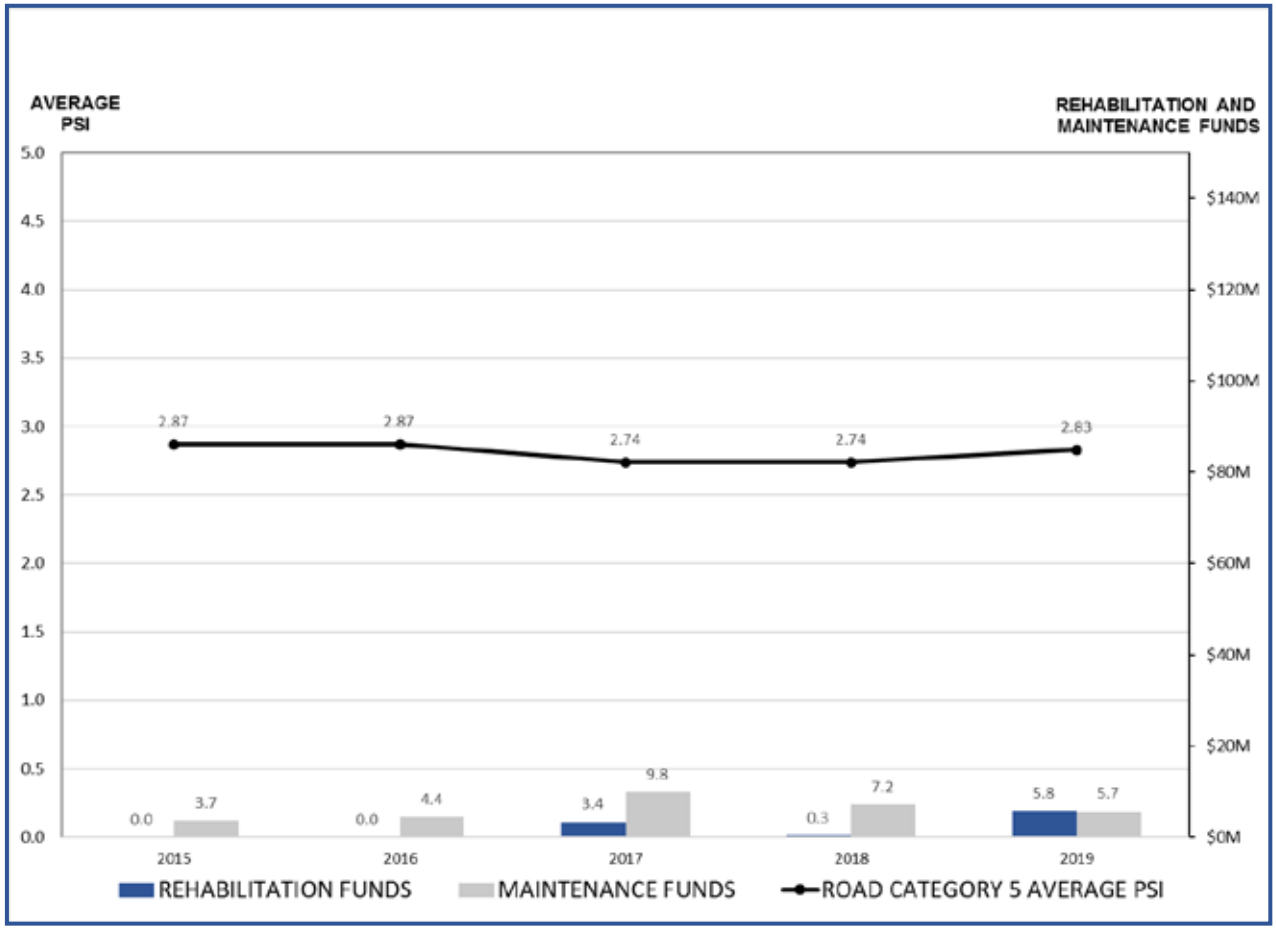

FIGURE 19. Average PSI and Expenditures for Road Category 5

PAVEMENT CONDITION GOAL

A pavement condition goal has been established to provide a measure of the effectiveness of the maintenance and rehabilitation repair work that is performed on state roads. Careful consideration was used to balance the cost of rehabilitation at varying pavement condition levels with the availability of funds. Other criteria used in the process included pavement deterioration rates, the effectiveness of maintenance repair work, traffic volume, the number of heavy trucks, and the cost to repair or replace roads in each road prioritization category. Previously, this goal was set at 95% fair or better for all categories. In early 2020, the performance goal was adjusted to more appropriate, achievable levels, and was set at 95% fair or better for all categories. In early 2020, the performance goal was adjusted to more appropriate, achievable levels, and was set at 95% fair or better for category 1, 90% for category 2, 85% for category 3, 75% for category 4, and 50% for category 5.

TABLE 9 lists the current status of each road category with respect to the recently established pavement condition goal. Category 1 is divided into asphalt (A) and Portland Cement Concrete (C) categories for clarity. The data shows that category 1, 3, and 4 roads meet or exceed the goal, category 2 roads are slightly below the goal, and category 5 roads are somewhat further from the goal.

TABLE 9. Pavement Condition Versus Established Goal by Road Category

Condition	PSI Rating Scale	PSI Condition by Road Prioritization Category Percentage (%) and Number of Miles						
		Road Category 1		Road Category 2	Road Category 3	Road Category 4	Road Category 5	Roadway Network Totals
		A	C					
Very Good	5.00 to 4.00	67.6% 379.6	4.3% 4.3	34.0% 314.8	25.3% 308.2	4.4% 37.6	0.7% 10.5	**20.0% 1,055**
Good	3.99 to 3.50	26.0% 146.1	41.3% 41.0	38.0% 352.2	47.7% 580.0	32.2% 276.8	14.9% 238.4	**31.1% 1,635**
Fair	3.49 to 3.00	5.1% 28.80	37.5% 37.30	16.3% 151.30	21.4% 260.80	38.4% 330.40	28.8% 461.20	**24.1% 1,270**
Mediocre	2.99 to 2.50	1.1% 6.2	14.7% 14.6	6.7% 61.6	4.4% 53.3	19.8% 170.5	29.0% 463.8	**14.6% 770**
Poor	2.49 to 2.00	0.1% 0.5	2.1% 2.1	3.1% 28.6	0.9% 10.5	4.2% 36.4	16.2% 258.5	**6.4% 337**
Very Poor	< 2.00	0.0% 0.0	0.1% 0.1	2.0% 18.4	0.4% 4.4	0.9% 7.9	10.5% 168.2	**3.8% 199**
Total Miles:		**661**		**927**	**1,217**	**860**	**1,601**	**5,265**
Condition Goal: Min. Percentage of Roads in Fair or Better Condition		**95%**		**90%**	**85%**	**75%**	**50%**	
Current Condition: Percentage of Roads in Fair or Better Condition		**96.4%**		**88.3%**	**94.4%**	**75.0%**	**44.4%**	**75.2%**
Does the current condition meet the condition goal?		**YES**		**NO**	**YES**	**YES**	**NO**	**----**

FIGURE 20 displays the percentage of miles per road category as identified by the PSI

pavement condition rating system. The majority of the pavement in road categories 1 through 4 is in fair or better condition. The majority of pavement in road category 5 is in mediocre or worse condition.

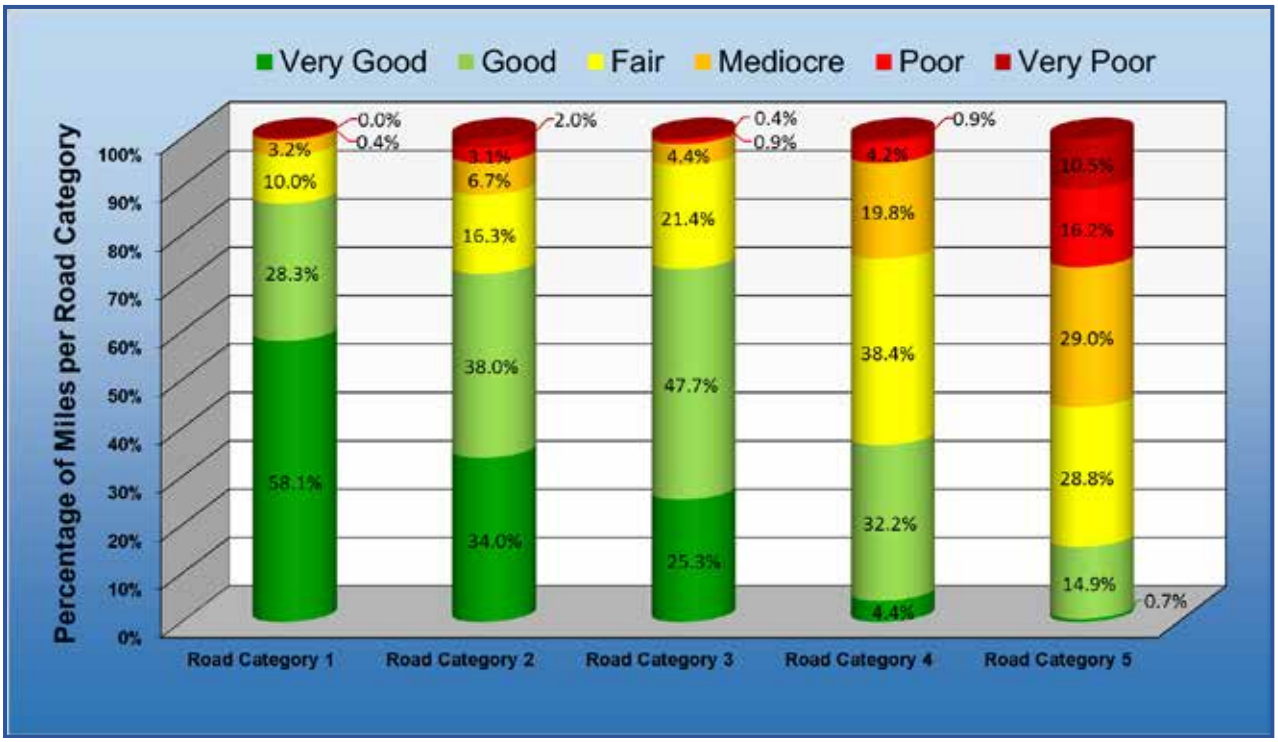

FIGURE 20. Percentage of Miles per Road Category and Pavement Condition

Aside from Category 3, which is performing well above the performance goal, this shows that each successive category has less very good and good roads, and more mediocre, poor, and very poor roads. It is also worth noting that even though the percent fair or better for Category 3 is nearly as high as that for Category 1, fair and good roads make up a much higher portion of those roads, whereas category 1 is predominantly very good.

TRANSPORTATION ASSET MANAGEMENT PLAN CONSISTENCY

The Transportation Asset Management Plan (TAMP) establishes investment expectations for NDOT based on historical state revenue and the typical NDOT share of that revenue. Relevant to the highway preservation process, anticipated investments in pavement maintenance, preservation, rehabilitation, and reconstruction are set in this plan.

Although these specific work type categories are prescribed by FHWA, there is no common definition provided, and each agency must develop internal definitions. Consistent with what has been previously identified, NDOT uses the following work type definitions for this purpose:

- **Maintenance**. This category includes repairs that address surface deterioration, but that do not improve the pavements ability to carry traffic loads - generally funded with Maintenance funds
- **Preservation**. Used more specifically when describing pavement treatments, preservation includes those treatments applied to roads in good condition in order to prevent further degradation and maintain a high level of service – generally funded with 3R funds.
- **Rehabilitation**. This category includes more substantial repairs that are applied when the pavement is in fair or worse condition to repair the structurally deficient section and provide a new surface the improves the pavement's ability to carry traffic loads – generally funded with 3R funds.
- **Reconstruction**. Reconstruction repairs are applied to roads that are damaged to the point where they require replacement or recycling of the bound layers, and potentially the base layers – generally funded with 3R funds.

In order to inform FHWA's annual determination of consistency under 23 U.S.C. 119 (23 CFR 515.13(b)), NDOT provides a breakdown of spending corresponding to each of these categories. TABLE 10 shows the individual category investment targets established in the TAMP, as well as the reported 2019 and 2020 investments.

TABLE 10. Transportation Asset Management Plan Investment Consistency

Work Type	TAMP Expected Investment	FY2019 Investment	FY2020 Investment
Maintenance	$25,000,000	$25,187,734 101%	$27,239,800 109%
Preservation	$35,000,000	$47,497,418 136%	$50,904,912 145%
Rehabilitation	$35,000,000	$57,169,691 163%	$82,321,434 235%
Reconstruction	$5,000,000	$38,064,757 761%	$42,049,542 841%

From this, we can see that each year, NDOT has exceeded investment commitments in each work type category, and significantly so in the preservation, rehabilitation, and reconstruction categories. These numbers are somewhat different from those used elsewhere in this report because of differences in how the spending is accounted for and which projects are specifically included in the defined time period.

ADEQUACY OF PAVEMENT PRESERVATION FUNDS

The adequacy of pavement preservation funds can be determined by comparing the current average spending and resulting condition to the spending anticipated to meet the established pavement condition goal. In addition to the established goal of 95% fair or better for category 1, 90% for category 2, 85% for category 3, 75% for category 4, and 50% for category 5, there is also a general expectation that the overall network PSI should not significantly degrade.

Categories 1, 3, and 4 currently meet the established pavement condition goal, but categories 2, and 5 do not. Although the percent fair or better for several of the categories appears stable, there is a downward trend within the fair or better portion, where the percent of very good and good roads is falling, and the percent fair is rising. This trend will eventually lead to decreasing fair or better performance.

As was shown in FIGURES 14 through 19, the average PSI pavement condition for the entire network is slowly trending downwards. Overall, and within each category, the 2019 PSI is lower than the 2015 PSI.

TABLE 11 is a summary of the average number of miles rehabilitated for years 2013-2020 as well as the average funding allocated to each category during that same time period.

TABLE 11. Average Investment of Preservation Funds by Category

Road Prioritization Category	1	2	3	4	5
Current Average Number of Miles Rehabilitated per Year	26.1	16	19.6	2.7	4.1
Current Average Funds per Year	$53.3M	$25.7M	$21.8M	$1.4M	$1.2M
Total Current Average Funds per Year	**$103.4M**				

TABLE 12 shows the investment necessary to meet and maintain the established fair or better goals. This investment allows both underperforming categories (2 and 5) to meet targeted performance within five years, and keeps all other categories from degrading. Approximately $203 million is necessary to keep the network in a state that meets this target.

TABLE 12. Funding Necessary to Meet and Maintain Fair or Better Targets

Road Prioritization Category	1	2	3	4	5
Average Number of Miles Requiring Rehabilitation per Year	44.1	33.2	40.0	26.8	57.2
Average Funds Required per Year	$83.8M	$53.0M	$34.4M	$14.5M	$17.2M
Total Average Funds Required per Year	**$202.9M**				

Comparing this with the previous spending shows that the total necessary to meet the currently established targets is $99.5 million more than what was historically provided. Compared to the average historical spending, required spending in categories 1 and 3 is nearly 60% more, category 2 is double, category 4 is ten times more, and category 5 is nearly fifteen times more.

The significance of category 1 roads is clear in this spending, where they account for more than 40% of the funds. This is necessary to ensure that these high priority roads are not only maintained above 95% fair or better as a group, but are also not allowed to degrade significantly below their current levels.

While $202.9 million is nearly double the historical spending level, it is somewhat lower than what has been shown as required in many past reports – a result of the modified performance targets.

PROGRESS IN THE 10-YEAR PLAN FOR RESURFACING OF STATE HIGHWAYS

The amount of pavement repair work has been restricted for many years due to long-term financial constraints. The funds allocated for the pavement repair budgets are limited because much funds are needed for other purposes such as capacity improvement projects and other program budget obligations.

Progress towards the previously established pavement condition goal of 95% of all roads in fair or better condition was not being made with the funding available. New performance goals were put in place that are both achievable and provide levels of service appropriate for each category. As part of the commitment to meet these new goals, funding levels have also been increased beyond what has been historically provided.

FIGURE 21 illustrates the projected condition of the state-maintained roadway network over the next ten (10) years using two different budget scenarios. The scenarios presented are:

- Provide funding necessary to maintain the network consistent with the established condition goals.
- Provide reduced budget consistent with historical spending level.

The budget scenario representing the current spending commitment to maintain the percent fair or better targets is represented with the green line. Spending $203 million per year on pavement rehabilitation work should allow each category of roads to quickly meet the established percent fair or better target and maintain the performance long-term. This is shown as a network composite target of approximately 75% going forward. Although the current average percent fair or better is already at this level, categories 2 and 5 are not, and this spending would ensure that all categories meet their individual targets in addition to the network maintaining the composite value.

In order to show the future network condition using the historical funding levels, an average of $103 million – the average expenditure from 2013 through 2020 – is used. This budget scenario is represented by the red line, which shows average yearly condition for each historical year, and projected condition with just the previous average spending for the next ten (10) years. Spending $103 million per year will result in the network

deteriorating to a state where only approximately 65% of roads are in fair or better condition by the year 2031.

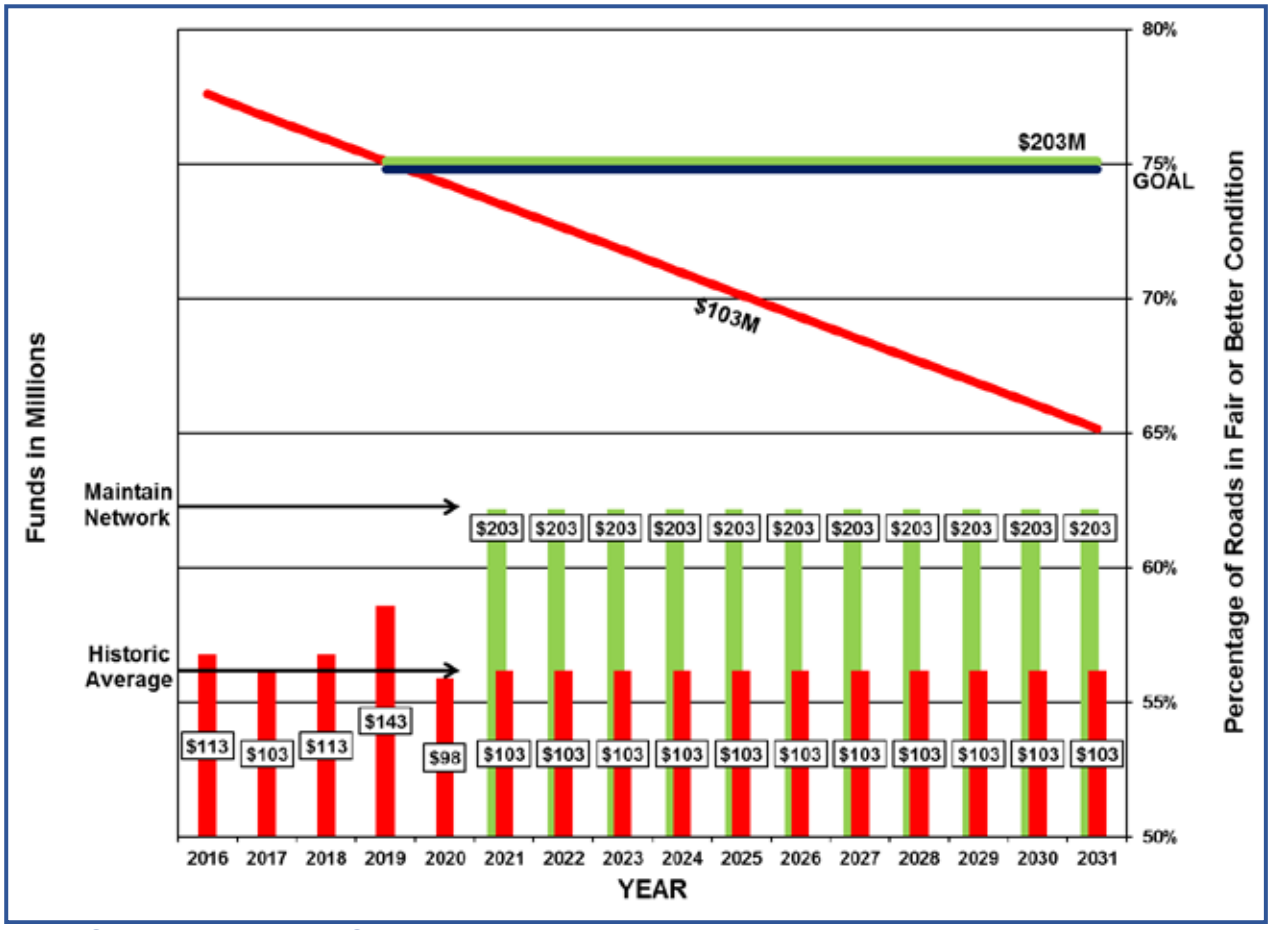

FIGURE 21. Future State-maintained Roadway Network Funding Alternatives

PAVEMENT PRESERVATION SUMMARY

The State Highway Preservation Report is presented to Nevada Legislature with the intent to fulfill the requirements as outlined in Nevada Revised Statute 408.203(3). NDOT is accountable to report the progress made on the resurfacing plan for state highways. The following aspects of the resurfacing plan have been addressed:

- The pavement preservation revenues and expenditures for fiscal years 2019 and 2020 were presented. The revenue for the maintenance and rehabilitation repair work constructed on state highways is primarily funded by the federal government and the State of Nevada. This revenue generally consists of vehicle fuel tax and registration fees. $317,693,409 were invested for road maintenance and rehabilitation repair work during the last biennium. FIGURE 5 illustrates the funding sources and construction expenditures for the road repair work.

- TABLES 3, 4, and 5 summarized the rehabilitation and maintenance repair work that was advertised in fiscal years 2019 and 2020. The information includes lists of rehabilitation projects along with the associated mileage and cost for each project. The project locations and scopes of work were also reported.

- The pavement condition of the state-maintained roadway network was provided. The pavement condition was objectively measured with the Present Serviceability Index (PSI) rating system. This rating system quantifies pavement condition into one of six sections that correspond to pavement in very good, good, fair, mediocre, poor, and very poor or failed condition. The data were described using several methods including tabular format, maps, analysis by district and county distribution, and a long-term investigation displayed on column charts.

- Each road prioritization category was evaluated to determine if the goal to maintain a minimum of 95% of category 1 roads, 90% of category 2 roads, 85% of category 3 roads, 75% of category 4 roads, and 50% of category 5 roads in fair or better condition was met as shown in TABLE 9. It was concluded that category 1, 3 and 4 roads met or exceeded the established pavement condition goal, category 2 roads were only slightly below the goal, and a somewhat larger percentage of category 5 roads did not meet the goal.

- Consistency of the preservation investments was compared to the targets contained in the Nevada Transportation Asset Management Plan. TABLE 10 shows that these investments commitments are not only being met, but significantly exceeded in most cases.

- TABLES 11 and 12 were developed to document the adequacy of pavement preservation funds. The condition of the roadway network was predicted based on deterioration rates and scheduled rehabilitation work. Predicted conditions forecast that the historical average funding level of $103 million per year is inadequate to maintain each category of road in conformance to the established percent fair or better target. The $103 million average funding per year must be increased by an additional $100 million per year, for a total of $203 million per year, to meet the performance targets.

- The progress in the 10-year plan for resurfacing of state highways was examined and two different budget scenarios were investigated. The first budget scenario included an average of $203 million per year expenditure for rehabilitation repair work. This budget scenario would result in a consistent pavement condition level of 75% of roads in fair or better condition, with each category meeting fair or better condition goals. The second budget scenario included only the historical average of $103 million per year expenditure for rehabilitation repair work. This scenario would result in the roadway network pavement condition level deteriorating from 75% to roughly 65% of roads in fair or better condition by the year 2031.

Supplementary information contained in the report includes:

- An explanation of the state-maintained roadway network inventory including the PMS inventory management through designated road prioritization categories 1 through 5.
- A description of the PSI pavement condition rating system that is used to objectively rank pavement conditions for many PMS purposes.
- Definitions for various pavement repair strategies as well as the optimal construction timing based on the PSI pavement condition rating system.
- Commentary regarding the costs for construction of state highway pavement rehabilitation projects.

BRIDGE PRESERVATION

INTRODUCTION

This report summarizes the Nevada Department of Transportation's (NDOT) efforts to preserve the state's bridge infrastructure which was has an approximate as-constructed value of $2.3 billion. Preserving the bridge infrastructure is one of NDOT's highest priorities. Numerous resources are employed to maintain bridges in structurally sound, functional, and safe condition. Although the focus in the following discussion is on state-maintained bridges, information on bridges maintained by other agencies is also included because these bridges are also eligible for federal funds that are administered by NDOT. Moreover, NDOT is responsible for inspecting and reporting the condition of all the bridges open to the public in Nevada, except bridges on federal lands. Bridges on federal lands are inspected and maintained by the federal government.

THE BRIDGE MANAGEMENT SYSTEM

Bridges are managed using the National Bridge Inventory (NBI) data which provides an inventory of bridge condition, location, needed repairs, load limits, susceptibility to flooding, and ownership information. A separate prioritization list enables NDOT to evaluate earthquake susceptibility and risks. This data, together with other factors, allows NDOT to identify preservation priorities and monitor efforts to keep its bridges functioning in good condition.

BRIDGE INVENTORY

There are currently 2,107 public bridges in NDOT bridge inventory. A bridge is a structure spanning 20 feet or more that carries traffic over a depression or obstruction and includes multiple box culverts and pipes. The maintenance of the bridge inventory is shared by many different organizations: NDOT maintains 1,221 bridges; county and city governments maintain 815 bridges; other local agencies maintain 48 bridges; private entities maintain 11 bridges; railroad maintains 6 bridges; and other state agencies maintain 6 bridges.

BRIDGE CONDITION REPORTING

National Bridge Inventory general condition ratings (GCRs) are used to describe the

existing, in-place bridge condition. The materials used in the bridge are considered, as well as the physical condition of the deck, superstructure, and substructure components. This information is used to determine GCR's on a numerical scale that ranges from 0 (failed condition) to 9 (excellent condition) as described in the FHWA Coding Guide.

Bridge serviceability is characterized by the use of a numerical evaluation called the Sufficiency Rating. The Sufficiency Rating is used to assess the overall condition of a bridge and assists in the prioritization of bridge preservation efforts. Sufficiency Ratings vary from 0 to 100. A 100 Sufficiency Rating represents a bridge with no deficiencies.

The condition assessment is based upon a physical inspection of the structure. The deleterious effects of age, environment, fatigue, hydrologic scour, settling, and traffic collisions are assessed in the evaluation. Every bridge in Nevada is inspected at least once every two years. Bridges in poor condition are inspected more often. Inspection findings are factored into the determination of the bridge load, condition, and sufficiency ratings.

The load rating denotes the strength of the bridge compared to design-truck loading. Structures with low condition or load rating may be classified as "Structurally Deficient." Structurally Deficient bridges are not necessarily unsafe or dangerous. Rather, these bridges become a priority for corrective measures, and may be posted to restrict the weight of vehicles using them. If a deficiency is determined to be severe, or the load-carrying capacity is extremely low, the bridge would be closed to protect the travelling public.

NDOT adheres to policies and procedures in accordance with the FHWA's requirements. The FHWA included the verbiage discussing Structurally Deficient bridges in a report to Congress entitled "2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance." The verbiage was as follows:

"Structurally Deficient bridges are not inherently unsafe. Bridges are considered structurally deficient if significant load-carrying elements are found to be in poor or worse condition due to deterioration and/or damage, or the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to the point of causing

intolerable traffic interruptions. That a bridge is deficient does not imply that it is likely to collapse or that it is unsafe. By conducting properly scheduled inspections, unsafe conditions may be identified; if the bridge is determined to be unsafe, the structure must be closed. A deficient bridge, when left open to traffic, typically requires significant maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies. To remain in service, Structurally Deficient bridges often have weight limits that restrict the gross weight of vehicles using the bridges to less than the maximum weight typically allowed by statute."

Bridges are considered Structurally Deficient if:

- Significant load-carrying elements are found to be in poor condition.
- Has insufficient load carrying capacity & may have weight limits to remain in service. (See picture below)

Example of Structurally Deficient Bridge

There are 1,221 bridges on the NDOT-maintained system that were reported in 2019. Based on the report, 12 or 1.0% of the bridges are Structurally Deficient. There are 886 bridges that are maintained by non-NDOT agencies that were reported in 2019. Based on the report, 19 or 2.1% of the bridges are Structurally Deficient. FIGURE 22 summarizes the substandard bridge conditions on NDOT and locally maintained bridge network.

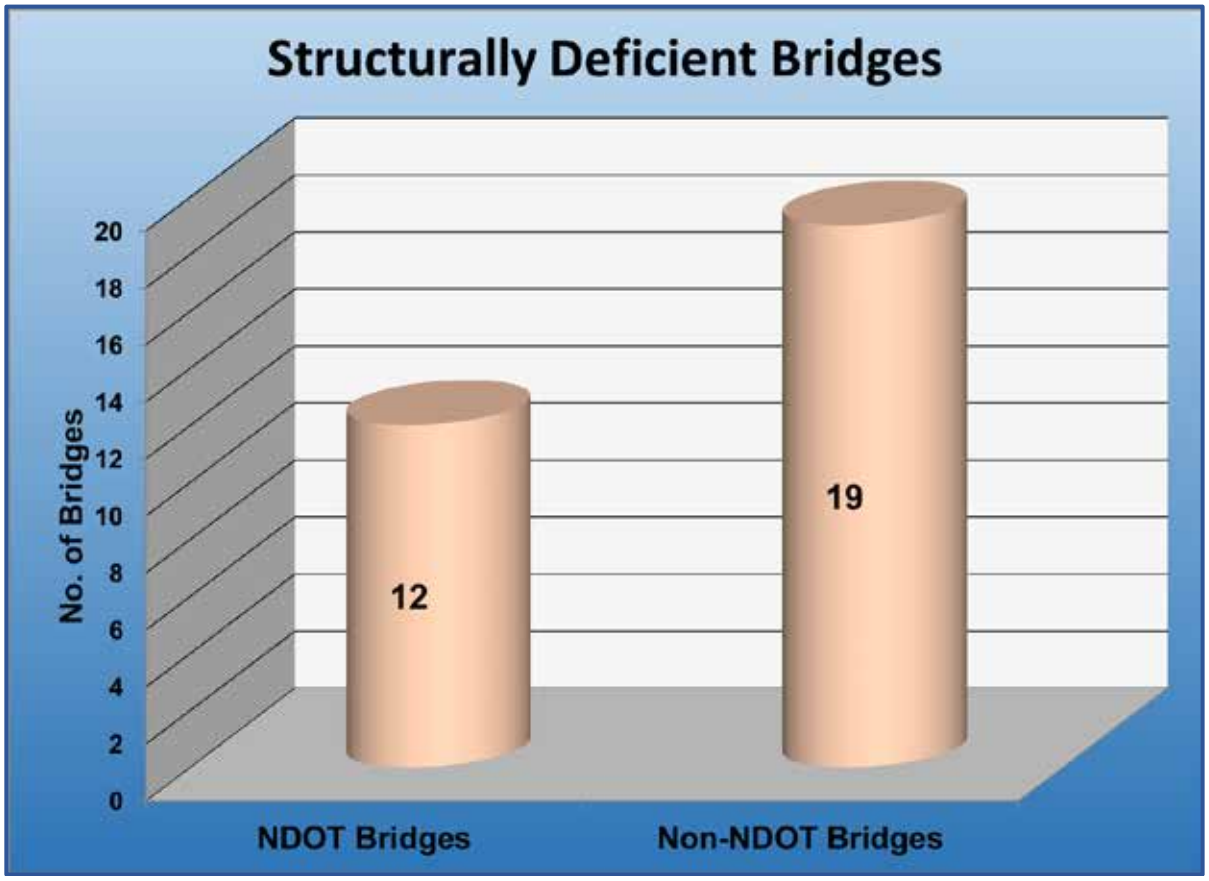

FIGURE 22. Structurally Deficient Bridges

FIGURES 23A, 23B, 23C, 23D and 23E locate the Structurally Deficient bridges in NDOT's bridge inventory.

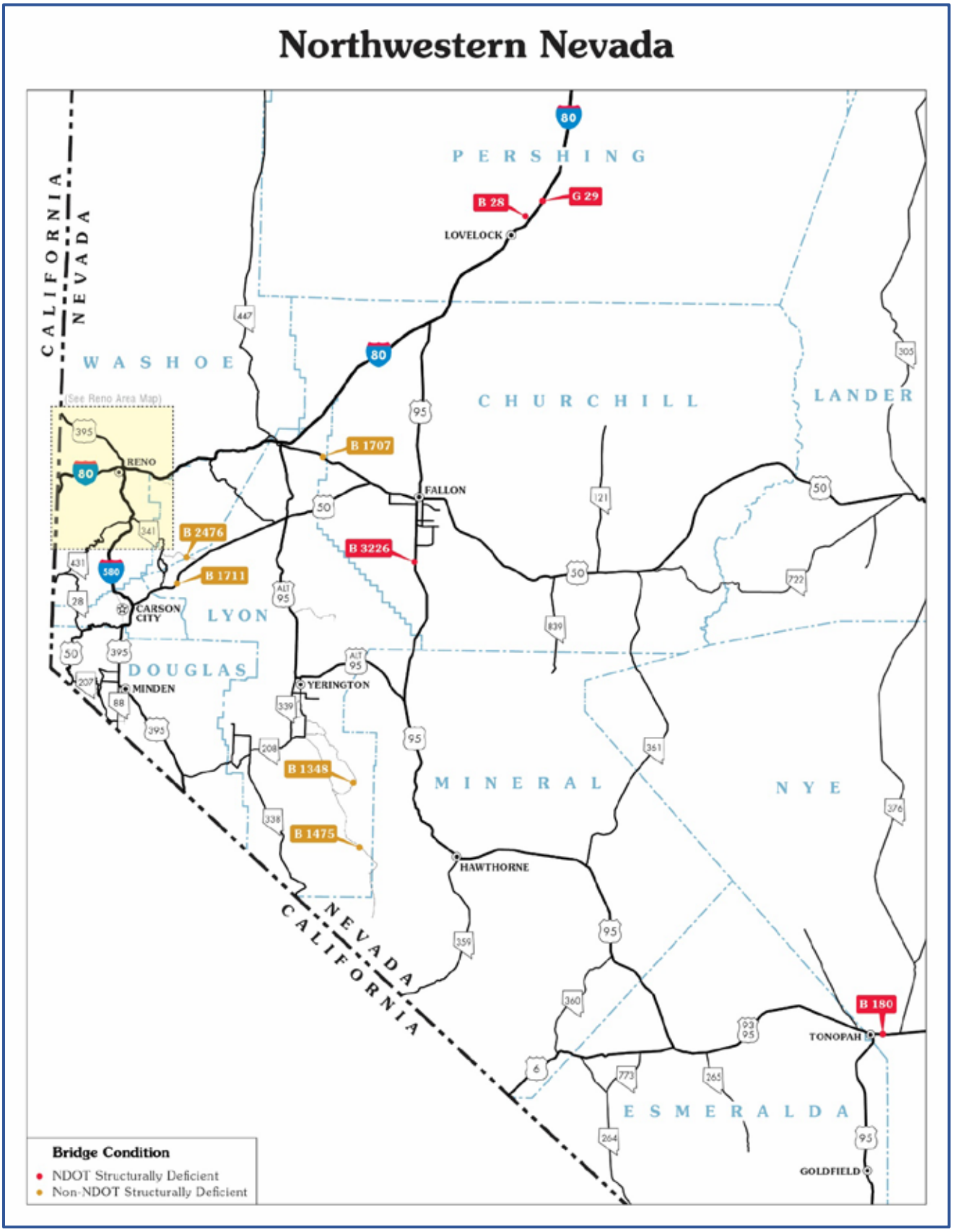

FIGURE 23A. Locations of Structurally Deficient Bridges

(Bridges categorized as Structurally Deficient may have less than desirable load carrying capacity or geometrics, but they are not considered unsafe. Please refer to the discussion in the Bridge Condition Reporting on Page 52 to 54.)

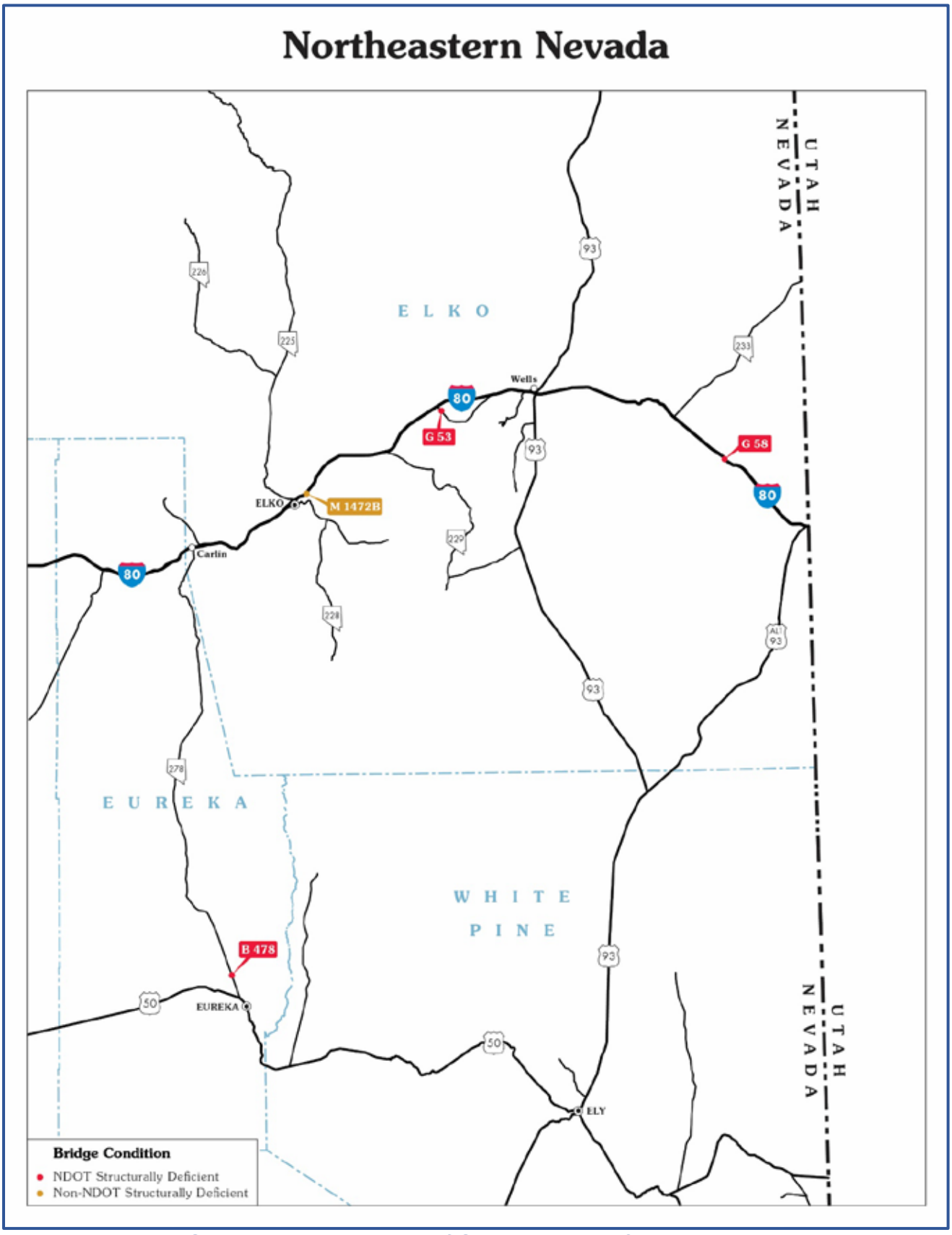

FIGURE 23B. Locations of Structurally Deficient Bridges

(Bridges categorized as Structurally Deficient may have less than desirable load carrying capacity or geometrics, but they are not considered unsafe. Please refer to the discussion in the Bridge Condition Reporting on Page 52 to 54.)

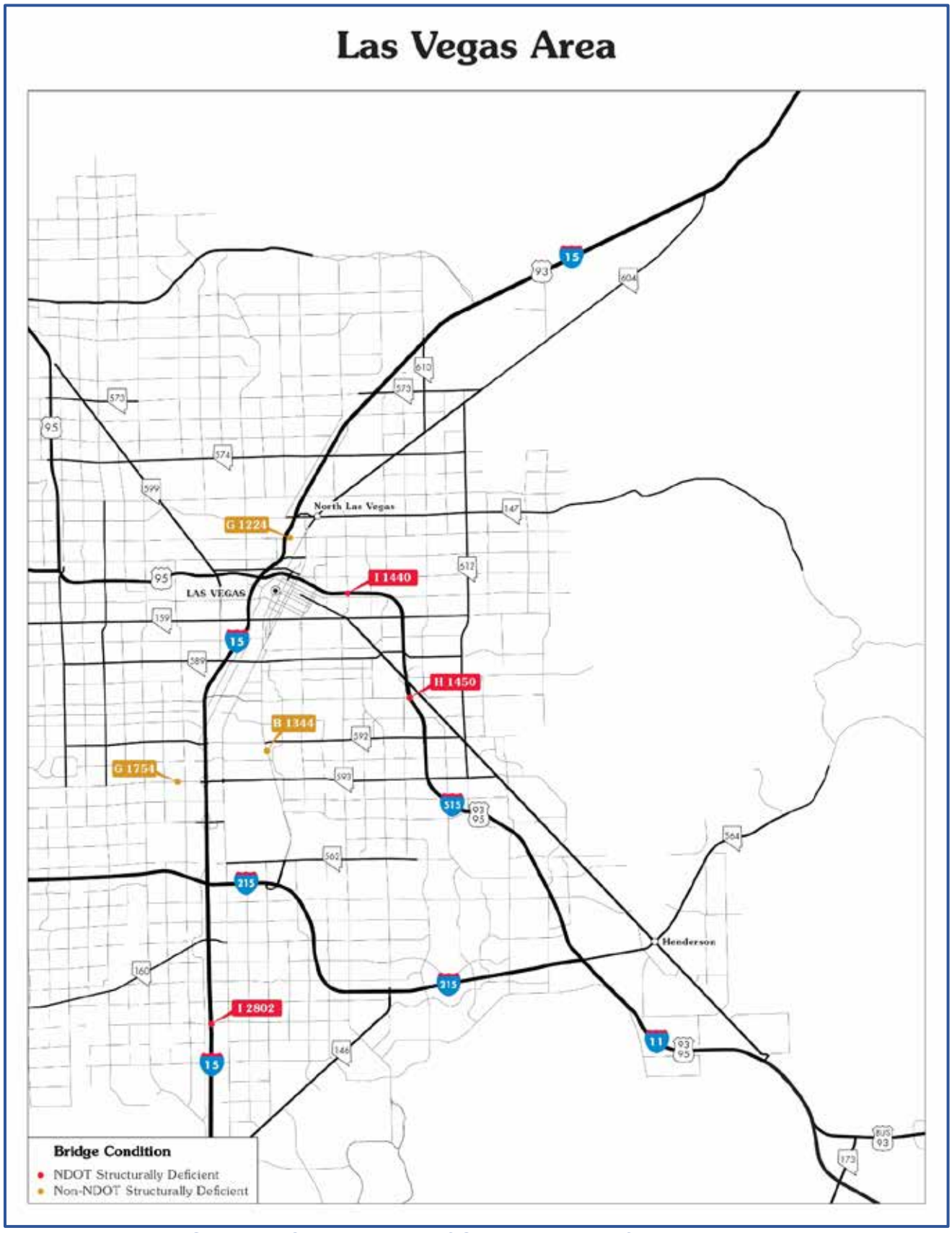

FIGURE 23C. Locations of Structurally Deficient Bridges

(Bridges categorized as Structurally Deficient may have less than desirable load carrying capacity or geometrics, but they are not considered unsafe. Please refer to the discussion in the Bridge Condition Reporting on Page 52 to 54.)

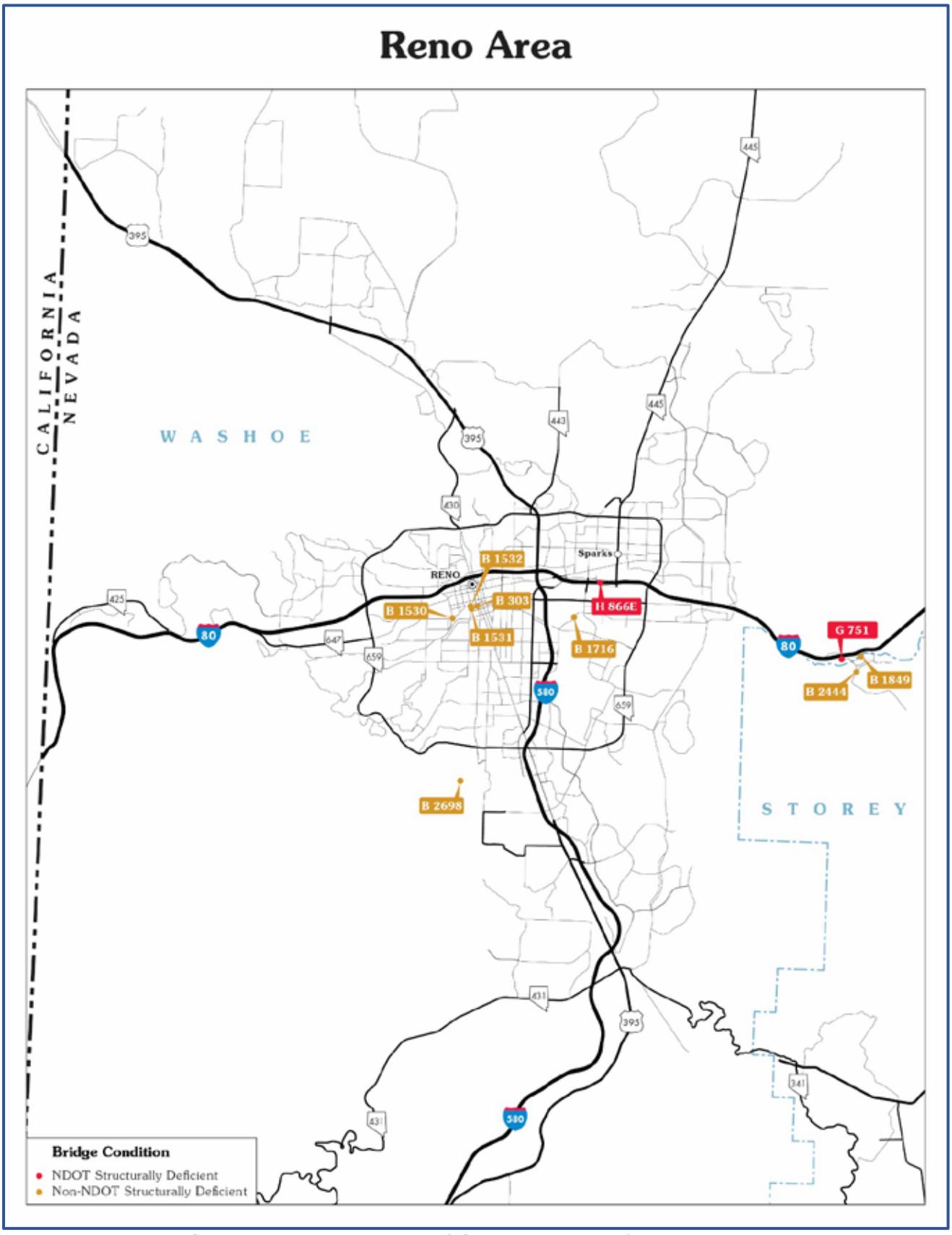

FIGURE 23D. Locations of Structurally Deficient Bridges

(Bridges categorized as Structurally Deficient may have less than desirable load carrying capacity or geometrics, but they are not considered unsafe. Please refer to the discussion in the Bridge Condition Reporting on Page 52 to 54.)

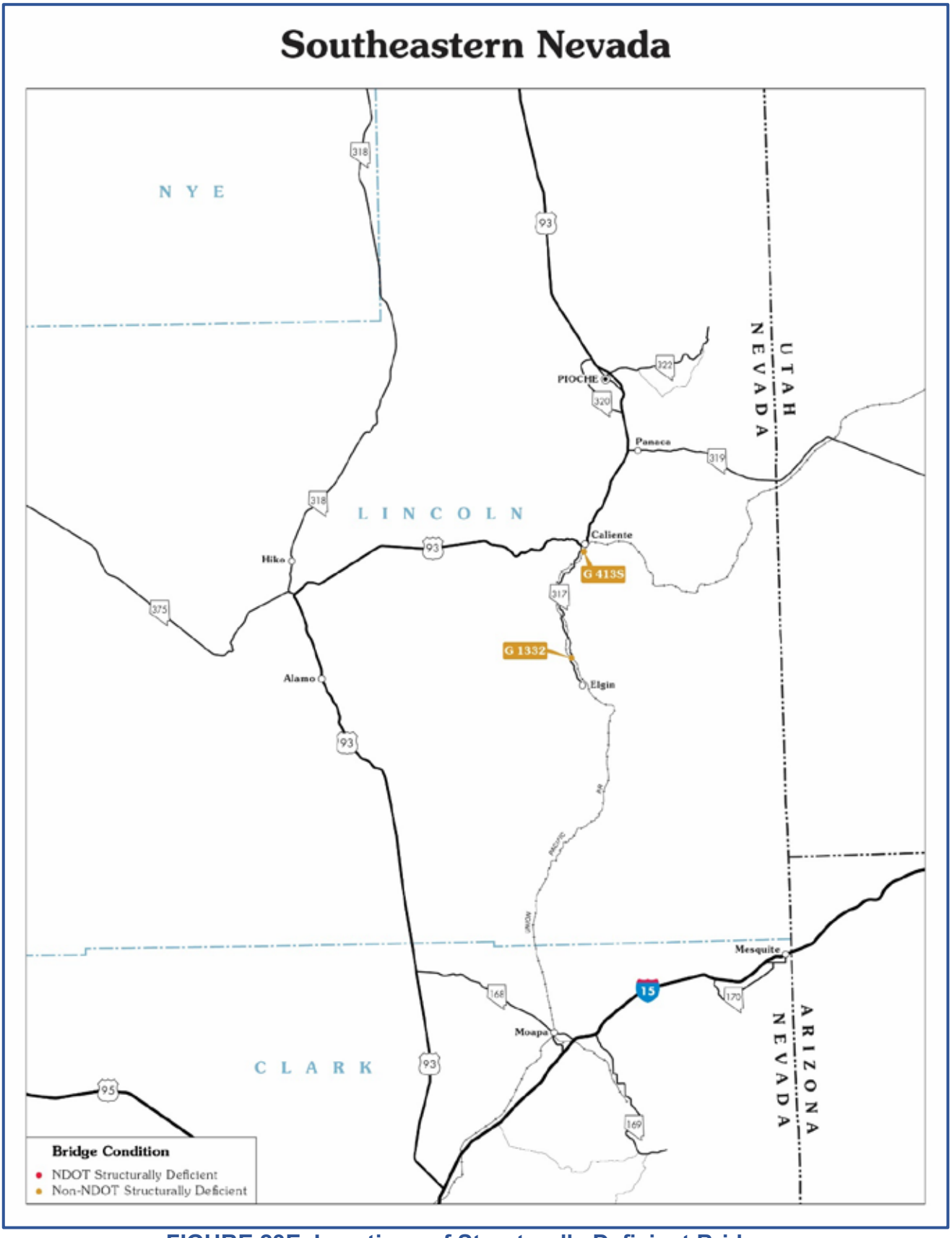

FIGURE 23E. Locations of Structurally Deficient Bridges

(Bridges categorized as Structurally Deficient may have less than desirable load carrying capacity or geometrics, but they are not considered unsafe. Please refer to the discussion in the Bridge Condition Reporting on Page 52 to 54.)

In addition to the sufficiency (and condition) rating, a bridge's susceptibility to seismic activity is considered when assessing its condition or "health." Nevada is the third most seismically active state in the US. Only California and Alaska are more seismically active. The central and western parts of Nevada are the most active, but southern Nevada does have the potential for damaging earthquakes. NDOT has replaced or retrofitted 155 bridge structures at a cost of over $56 million since NDOT began including seismic activity as a component in the project prioritization process. Additionally, NDOT has placed a high priority on 78 more NDOT-maintained bridges in need of seismic retrofitting. The cost to upgrade bridges in need of seismic retrofitting is estimated at $35 million.

The Sufficiency Ratings are numerical ratings used to assess the overall condition of a bridge and assists in the prioritization of bridge preservation efforts. Generally, bridges with Sufficiency Ratings more than 80 (Condition Ratings for critical components of 7 or greater) are considered "good", those with Sufficiency Ratings between 50 and 80 (Condition Ratings of 5 to 6) are considered "fair", and those with Sufficiency Ratings less than 50 (Condition Ratings of 4 or less) are considered "poor". Of the 1,221 bridges maintained by NDOT, only 12 or 1% have a Condition Rating of a critical component of less than 5 and are considered to be in poor condition.

Bridges with condition ratings for critical components of 7 or greater are considered "good", those with Condition Ratings of 5 to 6 are considered "fair", and ratings less than 5 are considered "poor". FIGURE 24 illustrates the condition of bridges in Nevada. Only 1.5% of the bridges in Nevada are considered to be in poor condition. NDOT goes above and beyond the requirement in inspecting bridges. Railroad crossings and pedestrian structures are not required to be inspected by the Federal Highway Administration. For the sake of public safety, NDOT inspects these bridges when they span NDOT facilities, but does not report these ratings.

Nevada bridge conditions compare very favorably to the bridge conditions in many other states, even though more than half of NDOT's bridges are over 40 years old. Older bridges generally have a service life of at least 50 years. Recently built bridges are expected to have a design life of 75 years. This prolonged design life was achieved by improvements in material, design, and construction methods. FIGURE 25 shows the age distribution of the state's bridges grouped by decade in which the bridge was originally constructed.

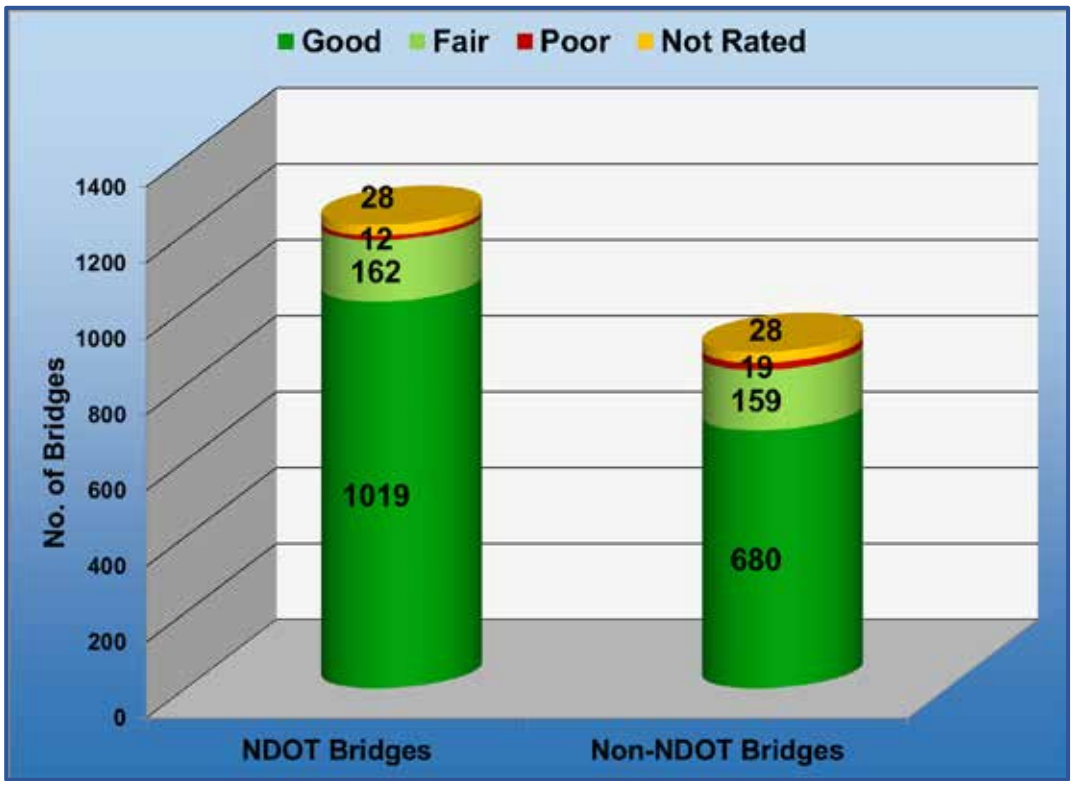

FIGURE 24. Nevada Bridge Conditions

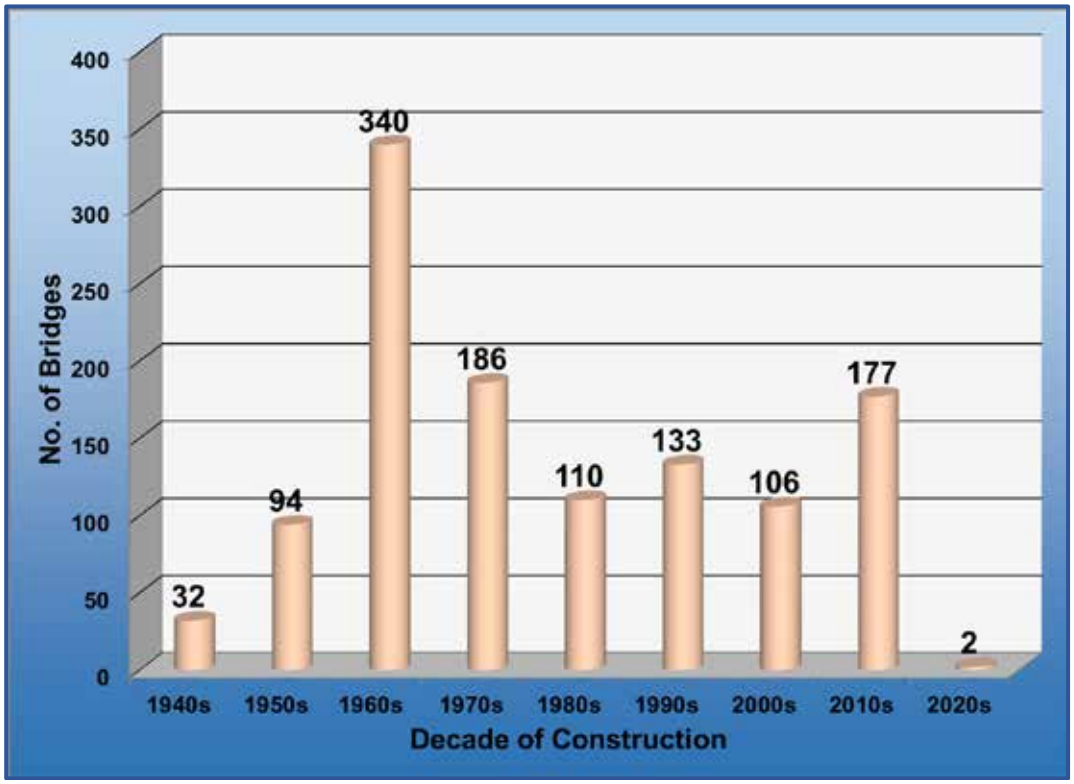

FIGURE 25. NDOT Bridges, Decade of Construction

BRIDGE CONDITION OVER TIME

FIGURE 26 illustrates NDOT-maintained bridge conditions grouped by good, fair, and poor categories over time. The number of bridges in each category has remained fairly stable since 2000. FIGURE 27 shows that the number of Structurally Deficient bridges has decreased significantly from 2000 through 2020.

FIGURE 28 demonstrates that the condition of non-NDOT maintained bridges has retained a similar proportion of good, fair, and poor bridge conditions in comparison to the total number of bridges surveyed from 2000 through 2020. These conditions slightly improved over the years despite the fact that there were over two times as many bridges surveyed in 2020 as compared to 2000. FIGURE 29 depicts the number of Structurally Deficient non-NDOT bridges over time.

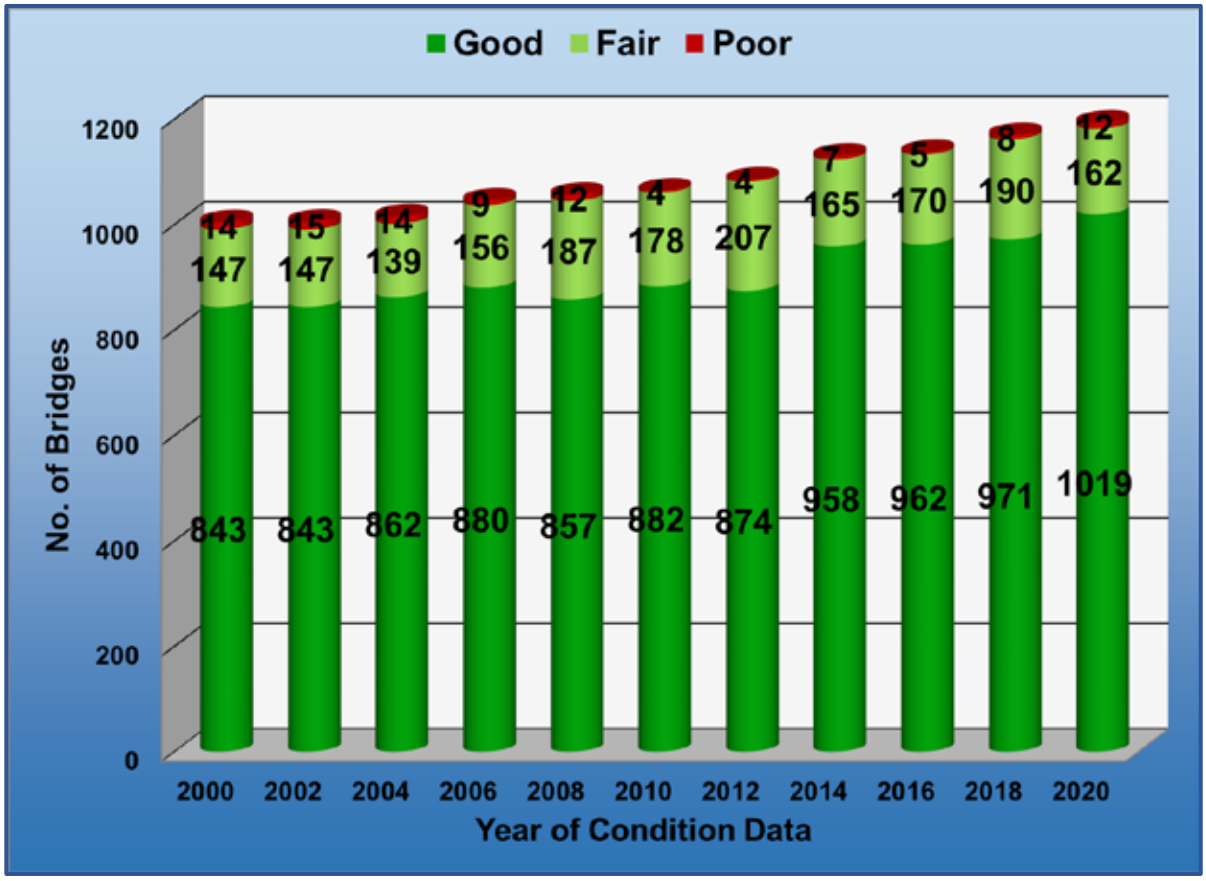

FIGURE 26. NDOT Bridge Conditions over Time

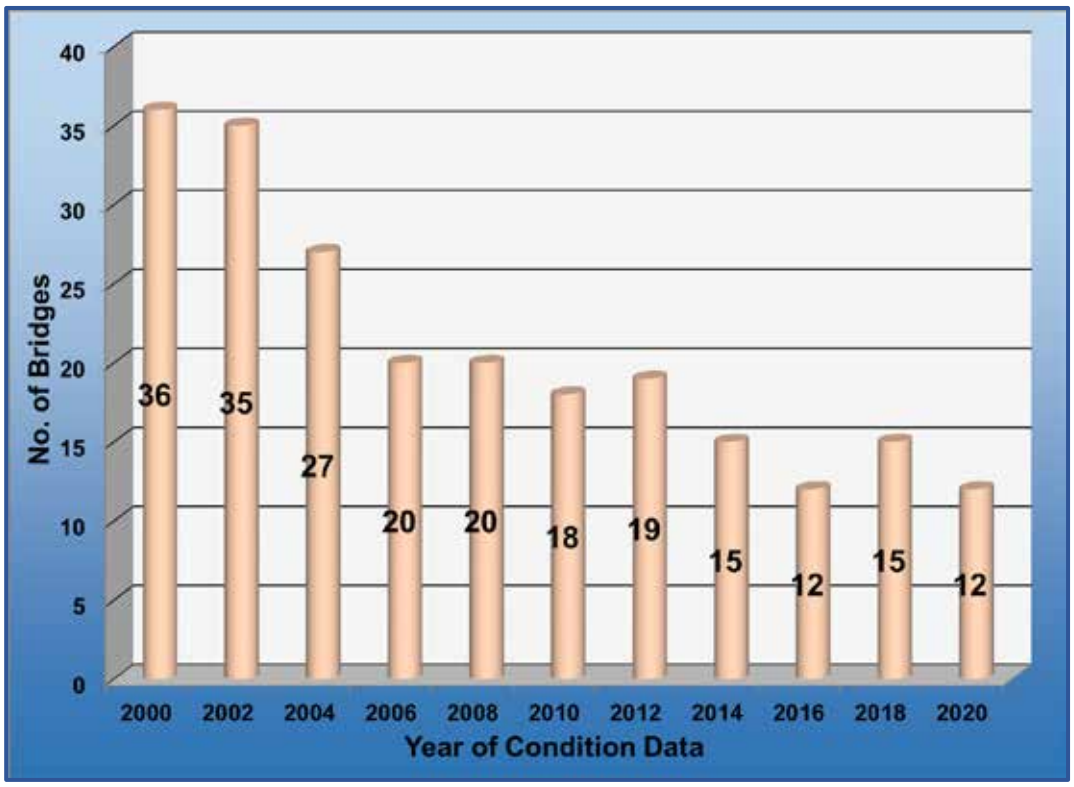

FIGURE 27. Structurally Deficient NDOT Bridges over Time

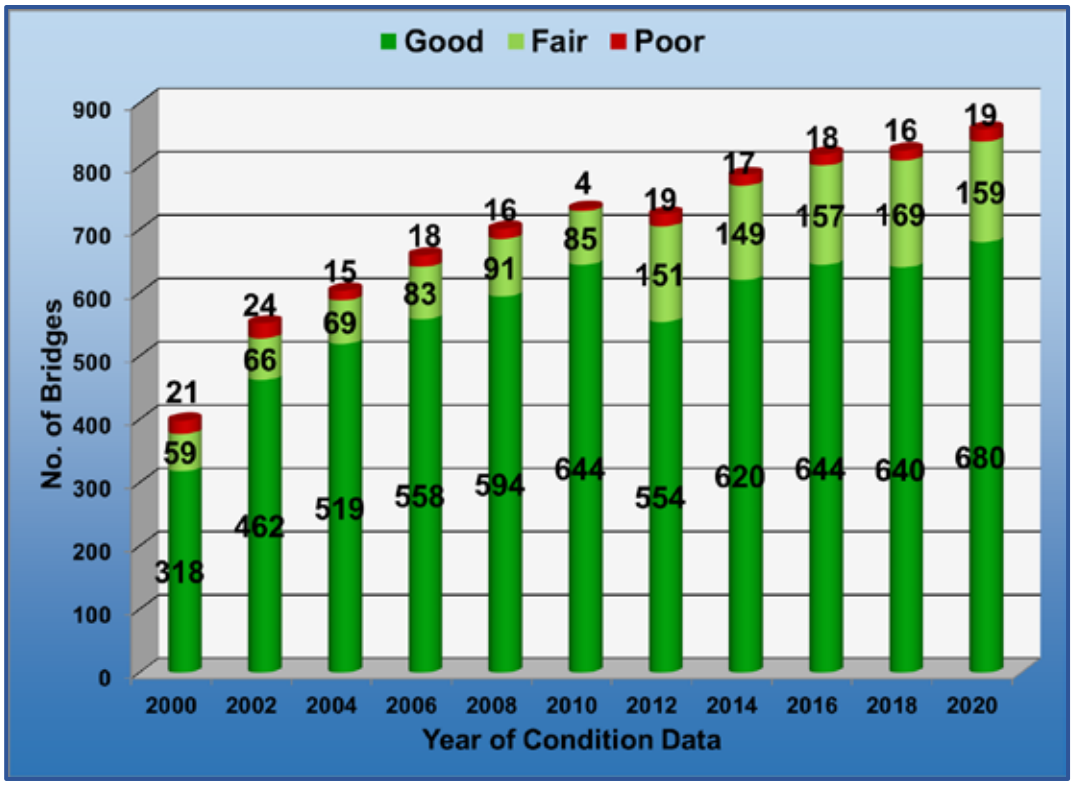

FIGURE 28. Non-NDOT Bridge Conditions over Time

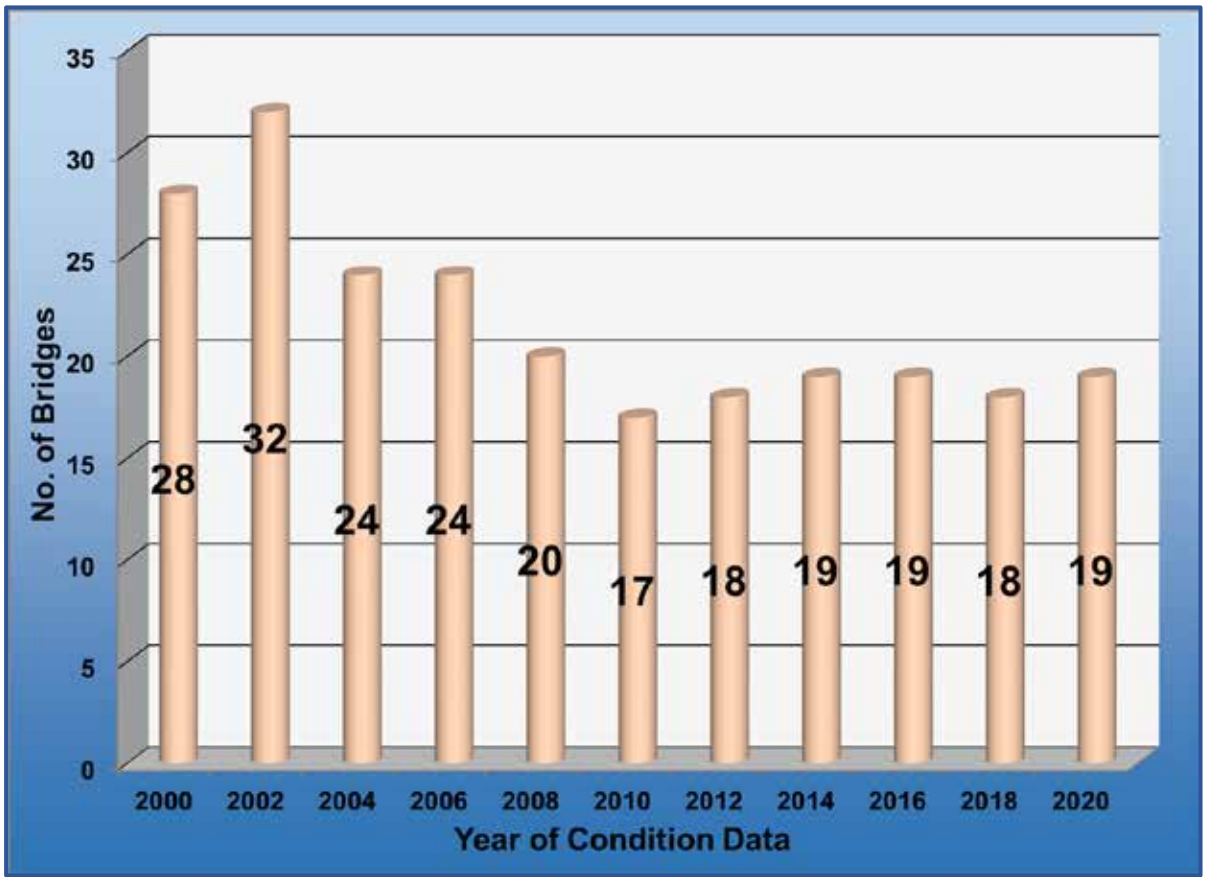

FIGURE 29. Structurally Deficient Non-NDOT Bridges over Time

THE COST OF BRIDGE CLOSURE FOR OWNERS

Structurally Deficient bridge locations are displayed in FIGURE 25A through FIGURE 25E. Currently there are no Structurally Deficient bridges on I-15 in Las Vegas and US-395 in Reno. Only three deficient structures are located on primary routes including one (H-866E) on I-80 in Reno and two (I-1440 and H-1450) on the I-515 in Las Vegas. Both Las Vegas structures are currently in final design awaiting replacement. These routes connect Nevada with the rest of the country rural and carry hundreds of thousands of automobiles and trucks on a daily basis. Some Nevada Interstates bridges carry more than 100,000 vehicles daily in northern Nevada urban areas and approximately 250,000 vehicles daily in southern Nevada urban areas. If closure of a bridge in rural Nevada was required, the detour might add a few hundred additional miles to the travelers' journeys. A bridge closure and subsequent detours in urban areas will create extensive traffic jams and cause additional vehicle crashes. In both and urban bridge closures, the user costs due to travel delay or crashes will be quite significant until the bridge is reconstructed or repaired. Often, user costs due to delay or crashes can be in the hundreds of thousands of dollars per day. The importance of bridge maintenance and rehabilitation cannot be overemphasized.

The economic impacts of a bridge closure and subsequent activities are widespread. For example, the nationally reported bridge collapse in Minneapolis, Minnesota in 2007 had an economic impact on the state totaling $17 million in 2007 and $43 million in 2008 due to user costs. The user costs were estimated at $247,000 per day due to added travel time. The Minneapolis Bridge carried 140,000 vehicles daily before the collapse. This account does not include the compensations to the deceased and injured and the lawsuit expenses.

PROJECT PRIORITIZATION

The bridge preservation program competes for funding with capacity improvement, operations, pavement, hydraulic, and safety projects and programs. Since available funding is never unlimited, engineers prioritize projects in such a manner that will improve the condition of the entire bridge infrastructure network while maximizing bridge performance and keeping costs to a minimum.

Bridge projects are developed and prioritized based upon bridge condition (Condition Ratings and Structurally Deficient status), essentiality for public needs (NHS status, ADT, and ADTT etc.), and association of other ongoing project work at the same location (pavement rehabilitation work etc.). Seismic retrofit work is prioritized based on a bridge's earthquake vulnerability and importance. The seismic vulnerability of older state-owned bridges has been investigated. Certain bridge types, such as large culverts, do not need seismic retrofit.

BRIDGE PRESERVATION FUNDING

Similar to pavement rehabilitation, some bridge preservation work is paid for with state fuel taxes and vehicle registration fees. Historically, available state funding has only been sufficient to provide the required match for federal funds and to fund bridge maintenance costs.

Federal funds are not dedicated for on-system bridge restoration, rehabilitation, or replacement. On-system bridge preservation projects must compete with other types of projects for the limited amount of available federal funds.

Under federal funding guidelines, off-system bridges must receive more than $2 million of the available federal funds. Bridges are described as off-system when the bridges are not located on the federal aid highway system. Off-system roads include Rural Minor Collector and Rural and Urban Local roads. Bridges are described as on-system when the bridges are located on the federal aid highway system. The Interstate, Urban Collector, and Rural Minor Arterial roads are included in the federal aid highway system. Of the 1,221 state-maintained bridges, 915 bridges are on-system and 306 bridges are off-system. Of the 886 county, city, other local agency, private, and other state agency bridges, 124 bridges are on-system and 762 bridges are off-system.

BIENNIAL EXPENDITURES FOR FISCAL YEARS 2019 TO 2020

TABLE 13 lists approximately $16 million worth of bridge preservation work that NDOT obligated in fiscal years 2019 and 2020. TABLE 14 lists the numbers of bridges that NDOT rehabilitated, replaced, or seismically retrofitted in fiscal years 2019 and 2020.

TABLE 13. Bridge Expenditures in Fiscal Years 2019 and 2020

Fiscal Year	Repair Strategy					Total
	Maintenance	Restoration	Rehabilitation	Replacement	Seismic Retrofit	
2019	$779,866	$3,801,904	$0	$1,473,494	$0	$6,055,264
2020	$869,293	$2,279,697	$0	$7,050,679	$0	$10,199,669
Biennium Total	**$1,649,159**	**$6,081,602**	**$0**	**$8,524,173**	**$0**	**$16,254,934**

TABLE 14. Numbers of Bridges Rehabilitated, Replaced, or Seismically Retrofitted in Fiscal Years 2019 and 2020

Fiscal Year	Entity	On Federal-Aid System	Repair Strategy			Total
			Rehabilitation	Replacement	Seismic Retrofit	
2019	NDOT	On-System		2		2
		Off-System		3		3
2020	NDOT	On-System		0		0
		Off-System		2		2
	Local/Other	Off-System		1		1
Total				**8**		**8**

BACKLOG OF BRIDGE PRESERVATION WORK

Ideally, bridges maintained in fair or good condition for as long as possible will extend bridge service life and reduce the need for bridge replacement. Currently, a backlog of approximately $171 million exists for bridge preservation work. Bridge preservation includes repair strategies such as corrective maintenance, rehabilitation, and replacement work. TABLE 15 lists the backlog of currently needed bridge repair work. Preventive maintenance needs are not included in the bridge project backlog because this work is performed using routine maintenance funds.

TABLE 15. Backlog of Bridge Work, State Bridges 2021

(Based on 2020 Condition Data)

System	Repair Strategy Required				Total
	Restoration	Rehabilitation	Replacement	Seismic Retrofit	
Principal Arterial - Interstate	$18,980,027	$21,586,297	$38,591,480	--	$79,157,804
Principal Arterial - Non-Interstate	$6,338,611	$8,454,019	$769,256	--	$15,561,886
Minor Arterial	$3,003,400	$3,237,262	$0	--	$6,240,662
Major Collector	$2,924,273	$1,205,188	$7,267,236	--	$11,396,697
Minor Collector & Local	$1,372,777	$1,620,066	$20,238,760	--	$23,231,603
System Not Identified				$35,000,000	$35,000,000
Total	**$32,619,089**	**$36,102,832**	**$66,866,732**	**$35,000,000**	**$170,588,652**

PRESENT FUNDING VERSUS NEEDED FUNDING

The majority of NDOT maintained bridges were built prior to the 1980s. These older bridges typically have a useful service life of about 50 years, although bridges that were built more recently are expected to have a useful service life of 75 years. It is anticipated that most bridges approaching 50 years old will require major rehabilitation or replacement relatively soon. FIGURE 30 illustrates that many NDOT maintained bridges are approaching 50 years old and may be reaching the end of their useful service life. The estimated cost to replace all of the NDOT maintained bridges that are currently over 50 years old is $1.1 billion. Because of the large number of bridges approaching 50 years

old, the estimated cost to replace all of the NDOT maintained bridges that will be over 50 years old ten years from now is $1.8 billion.

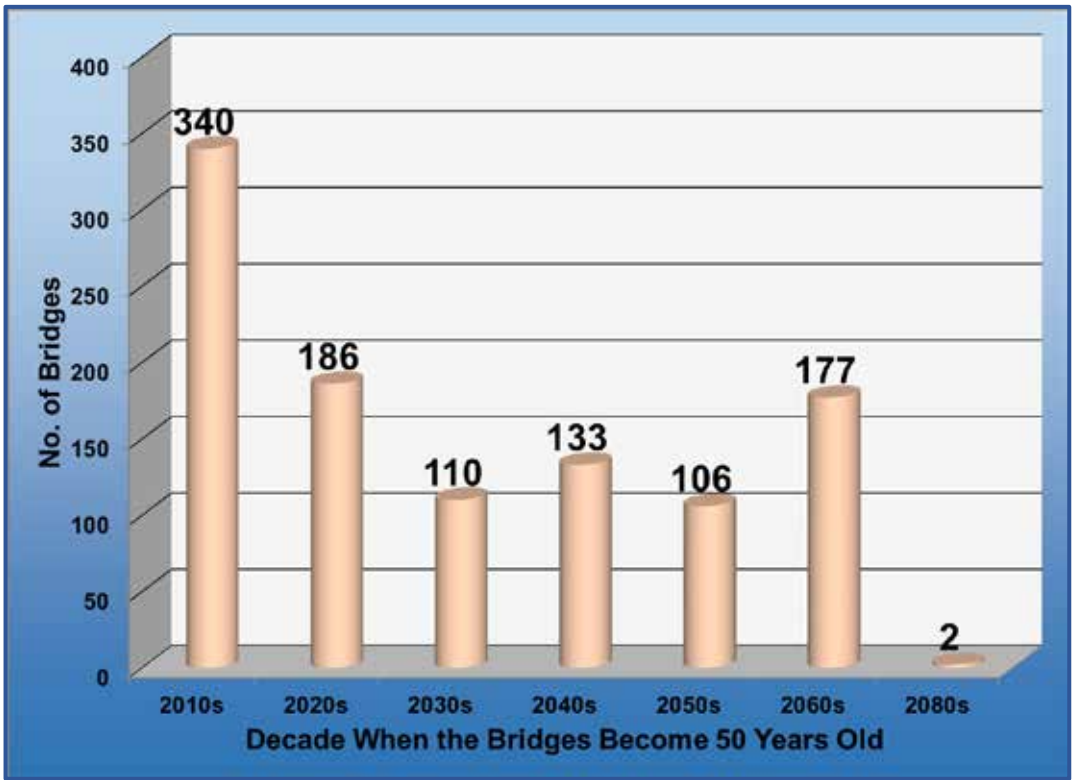

FIGURE 30. Number of 50 Years Old Bridges by Decade

Replacing all of NDOT's bridges over 50 years old is not practical to accomplish in five years or even ten years. The strategy to forecast future bridge preservation costs is to replace the bridges gradually over the next fifty years, before the bridges reach 100 years old. Replacing 2% of the bridges over 50 years old each year will allow for a gradual replacement of all the old bridges, but it does not replace the bridges quickly enough to decrease the number of bridges over 50 years old. Since NDOT already has 507 bridges over 50 years old, replacing 3 bridges a year is a replacement rate of 0.6% which is inadequate. Gradually increasing the replacement rate to 2% over the next ten years will ultimately require replacing 12 bridges a year because NDOT will have approximately 600 bridges over 50 years old at that time. If a 2% annual replacement rate is maintained for the subsequent ten years, the trends will begin to stabilize; twenty years from now NDOT would have approximately 620 bridges over 50 years old and would be replacing 12 bridges each year.

The current backlog of bridge preservation work is estimated to be approximately $171 million. The current $21 million average annual need for bridge preservation work is expected to increase rapidly in the near future as the number of NDOT maintained bridges over 50 years old increases. TABLE 16 lists the bridge costs, funds and backlog for 10 years starting FY 2021 assuming bridge preservation funding increases steadily over the next five years to a target level of $50 million annually. FIGURE 31 illustrates the anticipated costs, funds and backlog growth of the bridge preservation based on TABLE 16 data. Under the proposed funding plan, the current $171 million bridge backlog is expected to gradually decrease by approximately $30 million.

TABLE 16. Anticipated Bridge Backlog, Costs, and Funds

State-Maintained System (in millions of dollars)

Fiscal Year	Bridge Preservation Costs * (Normal Annual Deterioration Costs)			Bridge Preservation Funds ** (Funds Planned for Preservation Work)			Reduced Backlog	Backlog of Bridge Work
	Restoration, Rehabilitation, Replacement & Reconstruction	Maintenance	Total	Restoration, Rehabilitation, Replacement & Reconstruction	Maintenance	Total		
2021	20.1	0.8	20.9	15.0	0.8	15.8	5.1	170.6
2022	22.6	0.8	23.4	23.0	0.8	23.8	-0.4	175.7
2023	27.5	0.9	28.4	30.0	0.9	30.9	-2.5	175.3
2024	30.4	0.9	31.3	35.0	0.9	35.9	-4.6	172.8
2025	33.5	0.9	34.4	40.0	0.9	40.9	-6.5	168.2
2026	36.7	1.0	37.7	45.0	1.0	46.0	-8.3	161.7
2027	42.8	1.0	43.8	50.0	1.0	51.0	-7.2	153.4
2028	46.5	1.0	47.5	50.0	1.0	51.0	-3.5	146.2
2029	47.6	1.0	48.6	50.0	1.0	51.0	-2.4	142.7
2030	48.7	1.1	49.8	50.0	1.1	51.1	-1.3	140.2
2031	49.8	1.1	50.9	50.0	1.2	51.2	-0.3	138.9

* Inflation assumed at 3.00% per annum.

** Assumed revenue growth rate of $5 million per annum to $50 million annual target

Note: Backlog of Bridge work is as of beginning of fiscal year; preservation costs are those incurred during the fiscal year; and preservation funds are those that are available during the fiscal year.

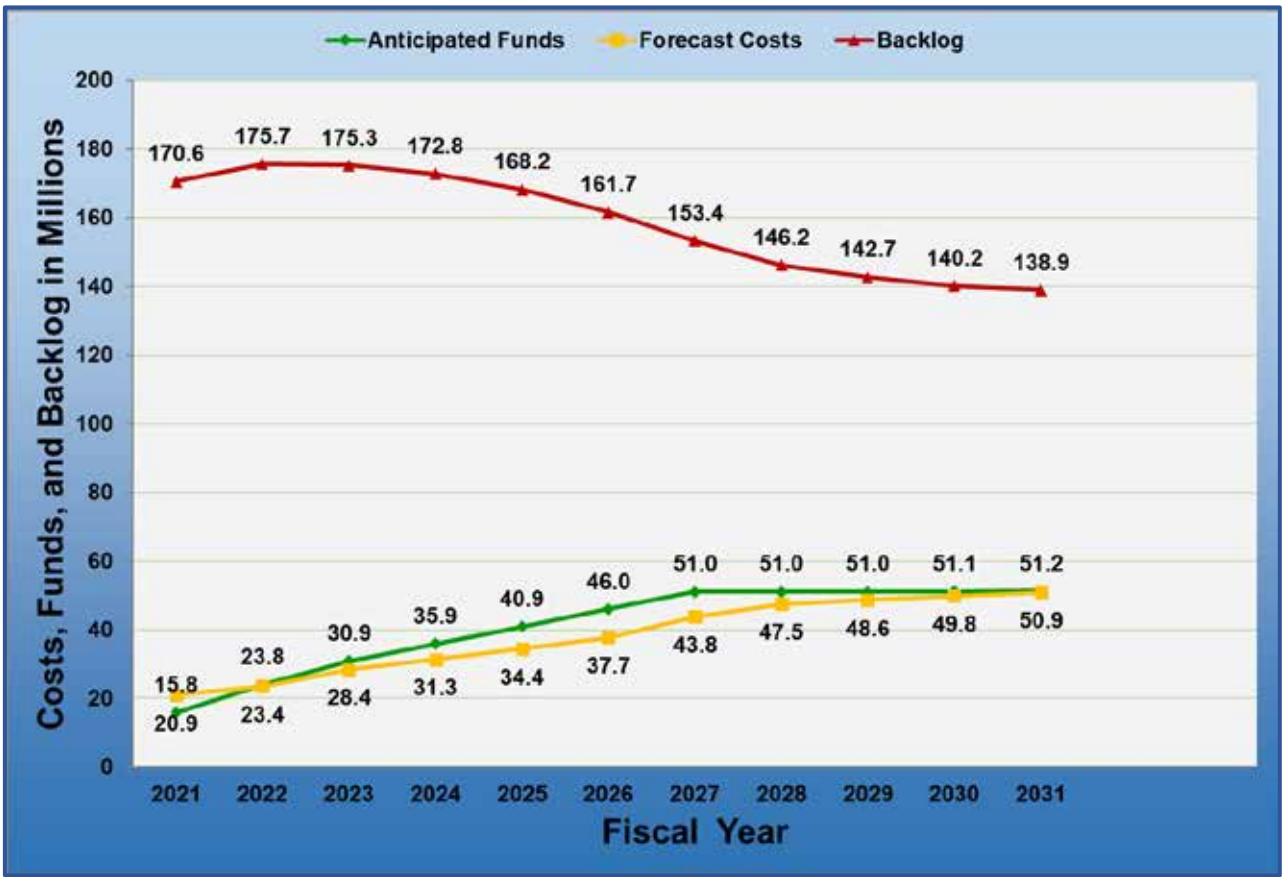

FIGURE 31. Anticipated Costs, Funds and Backlog of Bridge Preservation Work

BRIDGE PRESERVATION ACTION PLAN

NDOT's bridge preservation action plan is similar to plans detailed in previous State Highway Preservation Reports. The action plan is to preserve Nevada's public bridges in good condition by implementing the following bridge management practices:

- Replace or rehabilitate Structurally Deficient bridges before the bridges become hazardous or overly burdensome to users.
- Seismically retrofit bridges that do not meet current seismic standards.
- Apply timely corrective measures to existing structures.
- Apply effective preventive maintenance strategies to existing structures.

BRIDGE PRESERVATION SUMMARY

Nevada has enjoyed the benefit of good bridge conditions as compared to the bridge conditions in many other states for quite a while. Nevada's preservation program and favorable environment has contributed to the good results. However, NDOT's bridge

assets are aging. After a useful life of 50 years, many of NDOT's older bridges will require replacement. NDOT's current bridge replacement rate of approximately 3 bridges a year will not keep up with the large number of bridges reaching the end of their useful life. Increased spending in bridge corrective maintenance, rehabilitation, and replacement is necessary to preserve NDOT's bridge assets and to avoid costly bridge closures and emergency bridge replacements. If bridge preservation spending is increased to match the anticipated funds shown in FIGURE 33, the current backlog of bridge work can be reduced. If the funding is gradually increased as shown over the next five years, the forecast bridge preservation cost is expected to level off at approximately $51 million per year, which is approximately 2% of the as-built bridge assets value.