



2040

NEBRASKA

Good Life. Great Journey.

STATEWIDE TRANSPORTATION PLAN

Needs Analysis

November 30, 2020

This technical memorandum comprises the efforts under Task 5 of the Nebraska Department of Transportation's Statewide 2040 Transportation Plan. Contained within this memorandum are data and information relating to Nebraska's multimodal transportation needs.

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An aerial photograph of a rural landscape. A paved road runs diagonally from the bottom center towards the horizon. The fields on either side are golden-brown, suggesting late autumn or winter. In the distance, there are some buildings and a small cluster of trees. The sky is a deep blue with scattered white clouds. A large, semi-transparent blue circle is overlaid on the left side of the image, containing the text '1 Introduction'.

1 Introduction

1 Introduction

This technical memorandum reports the multimodal transportation needs for Nebraska between fiscal years (FY) 2021 and 2040, where Nebraska's fiscal year runs from July 1 to June 30. Nebraska's transportation system serves many modes, including automobiles and buses, bicycles, pedestrians, rail transportation, aircraft, and boats and barges. The infrastructure and activities that allow these modes to operate involve multiple levels of government as well as the private sector. This technical memorandum quantifies and monetizes 20-year transportation needs associated with the infrastructure, assets, and activities that allow these modes to operate, and it distinguishes between needs associated with state-owned infrastructure and those that are the responsibility of other governments or organizations.

The needs analysis presented in this technical memorandum draws from multiple existing plans and studies where relevant analysis already exists, and it presents original analysis for modes and assets that are not included in existing plans or studies. Notably, the needs analysis for the Nebraska 2040 Statewide Transportation Plan is consistent with the legislatively mandated *2019 State Highway Needs Assessment* for the modes and assets included in the *2019 State Highway Needs Assessment*.¹ This needs analysis also draws from other existing plans and studies conducted by the Nebraska Department of Transportation (NDOT), metropolitan planning organizations (MPOs), and local governments for the relevant needs categories. More details are provided in the memorandum sections corresponding with the needs category. Finally, this technical memorandum also presents original analysis for modes and assets that are included neither in the *2019 State Highway Needs Assessment* nor in other state, MPO, or local plans or studies.

1.1 Structure

The technical memorandum has seven sections including **Section 1 ("Introduction")**. Four of these sections present needs for a particular needs category corresponding with a set of modes or assets, and each section summarizes the methodology used for assessing needs. They contain subsections for individual asset types, which define the scope of the needs, describe the data that informed the analysis and the methods used to conduct it, and highlight standards used to define the needs. The standards used to define needs in a later subtask of Task 5. Needs for some modes or assets were defined in a way that did not require performance-based standards or metrics, such as needs based on historical budgets. In these cases, the subsection on standards summarizes the method that was used instead of performance-based standards since this method may also be appropriate for inclusion in needs validation. The subsections for each needs category present the dollar amounts associated with the 20-year needs. All dollar amounts are in constant 2019 U.S. dollars unless otherwise specified.

The final two sections of the memorandum combine the multiple modes and assets into statewide transportation needs and list the references. The following paragraphs summarize each of the six sections that follow the Introduction in more detail.

Section 2 (“State Highway System”) presents the needs associated with the bridges and roads of the State Highway System. These notably include needs related to pavement and bridge preservation, roadway and bridge modernization, and capital improvements. All of these need categories derive directly from the *2019 State Highway Needs Assessment*.

Section 3 (“Ancillary Assets for the State Highway System”) assesses needs associated with ancillary assets of the State Highway System, including roadway maintenance; rest areas; weigh stations; and intelligent transportation systems (ITS), lighting, and traffic signals. Needs associated with weigh stations and roadway maintenance derive from original analysis, while the other needs areas derive from the *2019 State Highway Needs Assessment*.

Section 4 (“Non-State Roads and Bridges”) assesses needs associated with the non-state roadway system. These primarily include pavement and bridge preservation needs for non-state roads and bridges, which are primarily locally owned. Needs for both of these categories derive from original analysis.

Section 5 (“Non-Highway Needs”) includes non-roadway needs, including those related to urban and rural transit, railroads, aviation, intercity bus transportation, ports and waterways, and bicycle and pedestrian transportation. While rural transit and rail needs derive from the *2019 State Highway Needs Assessment*, the other modes’ needs are derived from other state, local, and MPO-level plans and studies.

Section 6 (“Summary of Findings”) combines the needs from the four previous sections into an overall needs estimate for the statewide and multimodal transportation system between 2021 and 2040.

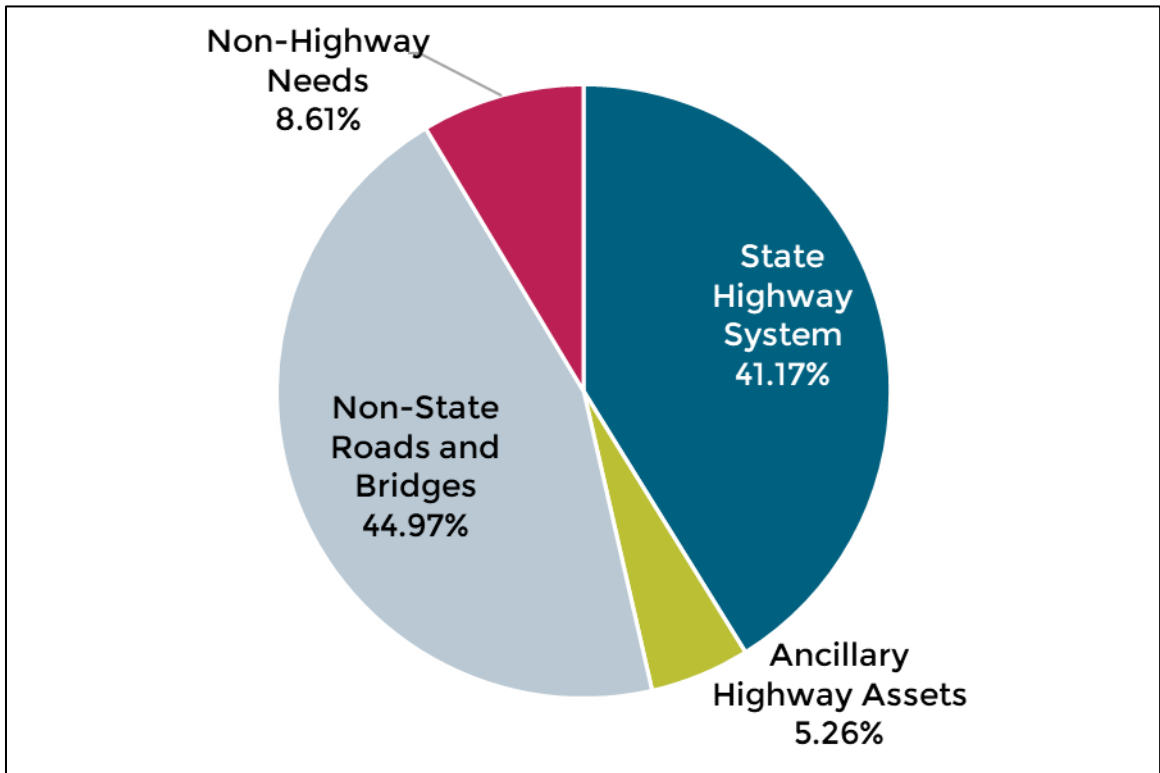
Finally, **Section 7 (“References”)** lists the plans, studies, documents, and interviews cited in the needs analysis.

1.2 Summary of Findings

Statewide needs total **\$28.94 billion**. Forty-six percent of this total is related to the State Highway System either as pavement and bridge needs for the State Highway System (41%) or ancillary assets (5%). The largest needs category is for non-state roads and bridges, with 45 percent of the total. Finally, non-highway needs, which include urban and rural transit, bicycle and pedestrian transportation, aviation, rail, and ports and waterways, are over 9 percent of total. **Figure 1-1** summarizes the needs by category, and the

following sections provide details on needs in each category. **Section 6** contains more detailed results.

Figure 1-1: Needs Share by Category



An aerial photograph of a multi-lane highway stretching through a rural landscape. The fields are golden-brown, suggesting late autumn or winter. In the distance, a large body of water is visible under a blue sky with scattered clouds. A large, semi-transparent blue circle is overlaid on the left side of the image, containing the text '2 State Highway System'.

2 State Highway System

2 State Highway System

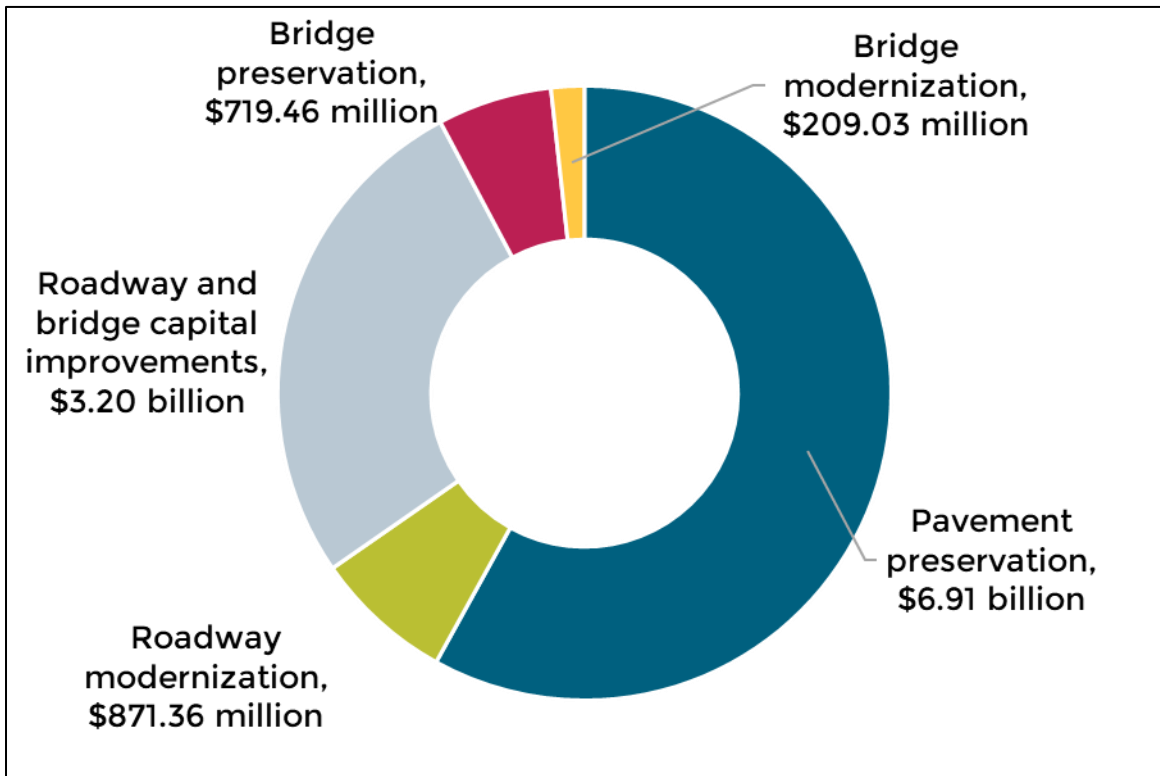
Needs associated with the State Highway System include three major categories of activities on state-owned roads and bridges.

- **Asset preservation:** Includes activities that protect Nebraska's investment in the State Highway System's infrastructure and extend its service life.
- **Capital improvements:** Includes improvements that add capacity or support economic growth.
- **System modernization:** Includes improvements to the State Highway System that upgrade safety, roadway geometry, or mobility without adding capacity.

Each of the following subsections discusses one of these three categories associated with roadways and roadway surfaces, or bridges. The needs in this section derive directly from the *2019 State Highway Needs Assessment*. The *2019 State Highway Needs Assessment* includes several subcategories of needs under roadway modernization which are included in this technical memorandum in Section 3 ("Ancillary Assets for the State Highway System") to highlight their distinct needs.

The following subsections provide details on the calculation of needs on the State Highway System, which total **\$11.91 billion**. **Figure 2-1** summarizes the needs associated with each mode.

Figure 2-1: State Highway System Needs



2.1 Pavement Preservation

This section describes the pavement preservation needs for the State Highway System. Pavement preservation needs include the activities that counteract deterioration and structural decline to extend the service life of pavement on the State Highway System, which includes approximately 10,000 centerline miles of state-owned roads.² Pavement preservation treatments include crack or joint sealing, armor coats, milling, resurfacing, and replacements, among other pavement treatments.³

2.1.1 Data Sources

The *2019 State Highway Needs Assessment* presents pavement preservation needs. The primary data that NDOT used to calculate pavement preservation needs for the *2019 State Highway Needs Assessment* are pavement condition data that NDOT collects annually, programmed projects, and data on the pavement inventory, traffic volumes, and deterioration rates that are stored in NDOT's Pavement Optimization Program (POP).⁴ **Table 2-1** summarizes the data sources used in assessing pavement preservation needs for the State Highway System.

Table 2-1: Data Sources for Pavement Preservation

Name	Publishing Organization	Publication Year
Pavement inventory and condition data for the State Highway System	NDOT	Collected annually
Pavement Optimization Program (POP)	Purchased software	Not applicable
Pavement preservation costs associated with the Metro Area Travel Improvement Study (MTIS)	NDOT	2019

NDOT collects pavement inventory and condition data annually for the State Highway System⁵ using an inertial profiling system in a specially equipped van that collects data on roadway smoothness, rut depth, texture, and faulting, and well as photos of the pavement. This data allows NDOT to calculate a Nebraska Serviceability Index (NSI) rating,⁶ which uses a hundred-point scale where higher values correspond with better pavement condition.⁷

Pavement preservation needs were also supplemented by a 20-year list of pavement preservation projects for interstate highways and freeways in the region of the Omaha - Council Bluffs Metropolitan Area Planning Agency (MAPA) to account for pavement preservation spending in the Metro Area Travel Improvement Study (MTIS).⁸

2.1.2 Methodology

NDOT used the POP to estimate the spending required to achieve the performance target for the State Highway System within the first ten years of the forecast period, and then to maintain that level of performance for the rest of the 20-year forecast period. NSI is weighted by centerline miles.⁹ The POP optimally selects and assigns treatments within a given budget.¹⁰ Additionally, pavement preservation costs calculated in the MTIS report were added with other preservation costs.¹¹

2.1.3 Standards

The primary standard used in setting pavement preservation needs is to achieve an average weighted NSI for the State Highway System of 84.7. This target is derived from the average weighted NSI that would be achieved if approximately 500 miles of the State Highway System were resurfaced each year, allowing the entire system to be repaved once every 20 years on average.¹² This performance target for the entire State Highway System is between NDOT's targets for the weighted average NSI for interstates and for the non-interstate National Highway System (NHS) respectively.¹³ **Table 2-2** lists the standards related to pavement preservation needs.

Table 2-2: Standards for Pavement Preservation

Standard	Source	Appropriate for Needs Validation?
Average weighted NSI of 84.7	NDOT	Yes. The standard is not derived from an external standard or regulation.

2.1.4 Results

Pavement preservation needs for the State Highway System between FY 2021 and 2040 total **\$6.91 billion**.¹⁴

2.2 Roadway Modernization

Roadway modernization in the *2019 State Highway Needs Assessment* includes “safety, geometric, or mobility improvements that do not add capacity to the roadway.”¹⁵ This section documents needs associated with all of the elements of roadway modernization from the *2019 State Highway Needs Assessment* except for rest areas, ITS, lighting, and traffic signals. These three assets are discussed in dedicated sections of the technical memorandum. The following elements of roadway modernization are addressed in this section on roadway modernization.

- **Interstate deficiencies (non-six-lane):** This element comprises work on the portions of I-80 that are currently four lanes and are expected to be four lanes for the foreseeable future. These portions of I-80 are west of Grand Island,¹⁶ and needs primarily include interchange-related work.¹⁷
- **Other miscellaneous interstate:** This element includes costs associated with barrier seals, and repairs to damaged sign structures, among other activities.¹⁸
- **Rural and municipal roadway deficiencies:** These deficiencies are corrected through roadway improvements that do not increase capacity, such as geometric improvements related to number of lanes, lane width, shoulder width, or stopping sight distance related to vertical curves.
- **Gravel roads:** This need element includes the cost to pave all gravel roads on the State Highway System.
- **Rural intersections:** Rural intersection needs are the costs to improve rural intersections “with high traffic volumes and a documented crash history.”¹⁹

2.2.1 Data Sources

Table 2-3 lists the primary data and data sources that informed assessment of roadway modernization needs, which are detailed below.

- **Interstate deficiencies:** Every year NDOT’s Interstate Task Force examines every section of interstate and identifies future work for the Interstates, with special focus on the one-and-six year program.²⁰ In addition, the 30-year *Interstate Pavement Replacement Plan* identifies segments that are expected to require replacements and the year in which the work is expected to occur.²¹
- **Other miscellaneous interstate:** ‘Other miscellaneous interstate’ costs are based on the relevant projects that NDOT has programmed.
- **Rural and municipal roadway deficiencies:** The primary data sources for analyzing rural and municipal roadway deficiencies are the roadway inventory and roadway standards. Roadway design standards for new and reconstructed roads are provided by the Board of Public Roads

Classification and Standards in Title 428 of the Nebraska Administrative Code.²²

- **Gravel roads:** NDOT's analysis of the cost to pave gravel roads uses unit paving costs based on NDOT's internal analysis and on an inventory of the State Highway System, from which NDOT determines the length of gravel roads.
- **Right of way:** The right-of-way analysis uses 10-year project cost averages.
- **Rural intersections:** NDOT's needs assessment for rural intersections is informed by 20-year traffic forecasts and historical crash records.

Table 2-3: Data Sources for Roadway Modernization

Name	Publishing Organization	Publication Year	Element
Interstate Pavement Replacement Plan (30-Year)	NDOT	2019	Interstate deficiencies
Roadway design standards from Title 428 of the Nebraska Administrative Code	Board of Public Roads Classifications and Standards ²³	2016	Rural and municipal roadway deficiencies
Roadway inventory	NDOT	Not published	Rural and municipal roadway deficiencies
Unit costs to pave gravel roads	NDOT	Unknown	Gravel roads
State Highway System inventory	NDOT	Unknown	Gravel roads
20-year traffic volume forecasts	NDOT	Unknown	Rural intersections
Historical crashes	NDOT	Unknown	Rural intersections

2.2.2 Methodology

This subsection summarizes the methodology used to calculate each component of the roadway modernization needs.

- **Interstate deficiencies:** Needs for interstate deficiencies are from programmed interchange projects
- **Other miscellaneous interstate:** Other miscellaneous interstate needs include programmed costs for interstates related to barrier seals, repairs to damaged signs, and similar activities. Needs are the sum of these programmed costs.

- **Rural and municipal roadway deficiencies:** The roadway inventory for the State Highway System was compared with design standards to identify areas where the roadway does not meet design standards. Standards differ for urban and rural areas. For first-class cities with the largest population,²⁴ roads within the U.S. Census Bureau's urban area boundaries are considered urban, and for second-class cities²⁵ roads within municipal corporate boundaries are considered urban. All other roads are considered rural. Standards correspond with forecasted future ADT in 2040. Needs for roadway modernization are the construction costs to correct deficiencies. Construction costs include right-of-way costs and roadway resurfacing.
- **Gravel roads:** Needs associated with gravel roads include the costs to pave and bring up to standard the 39 centerline miles of NDOT-operated gravel highway.²⁶ These are calculated by applying the unit cost to pave gravel roads that NDOT has estimated to the 39 centerline miles of gravel roads on the State Highway System.
- **Right of way:** Right-of-way needs are based on the 10-year average of right-of-way related project costs. Those costs are assumed to be repeated for each year in the 20-year need analysis period.
- **Rural intersections:** Rural intersection needs are determined by multiplying the worst-case scenario interchange costs times the number of rural intersections that may need improvements in the future. Intersection candidates were determined by an ongoing analysis in NDOT's Traffic Engineering Division that identifies rural intersections with crash rates higher than the statewide average. Final intersection selection includes deputy director input.^{27 28}

2.2.3 Standards

Table 2-4 shows the standards used in the calculation of roadway modernization needs. The primary standards relate to rural and municipal roadway deficiencies and are standards for number of lanes, lane width, shoulders, and vertical curves. Standards vary based on functional classification, ADT, and whether the road is new / reconstructed, or is undergoing resurfacing, restoration, and rehabilitation (3R) work.²⁹ Rural intersection needs also involve standards related to crash rates. Needs for other roadway modernization elements are assessed in a way that does not involve comparison with performance thresholds or standards.

Table 2-4: Standards for Roadway Modernization

Standard	Source	Appropriate for Needs Validation?	Element
Lane width (varies based on roadway characteristics)	Board of Public Roads Classifications and Standards	No. Derived from regulation.	Rural and municipal roadway deficiencies
Shoulders (inside and outside) (varies based on roadway characteristics)	Board of Public Roads Classifications and Standards	No. Derived from regulation.	Rural and municipal roadway deficiencies
Vertical curves (varies based on roadway characteristics)	Board of Public Roads Classifications and Standards	No. Derived from regulation.	Rural and municipal roadway deficiencies
Crash rates above statewide average	NDOT Traffic Engineering Division.	Yes. The standard originates with NDOT.	Rural intersections

2.2.4 Results

Roadway modernization needs between 2021 and 2040 are **\$871.36 million**. This excludes the needs associated with rest areas, traffic signals, and ITS, which are documented in other sections of this technical memorandum. **Table 2-5** shows the needs breakdown by element of roadway modernization.

Table 2-5: Roadway Modernization Needs

Topic	Amount (Millions)
Interstate deficiencies (non-six-lane)	\$33.31
Interstate other misc.	\$2.82
Rural and municipal roadway deficiencies	\$336.54
Gravel roads	\$59.69
Right of way	\$34.00
Rural intersections	\$405.00
Subtotal	\$871.36

2.3 Roadway and Bridge Capital Improvements

Roadway and bridge capital improvement needs for the State Highway System include projects that increase capacity through “future bypasses, new roads, interchanges, additional lanes, upgrading freeways, and the completion of the expressway system.”³⁰ Roadway expansion needs include the following elements.

- **Projects under the Build Nebraska Act (BNA) and Transportation Innovation Act (TIA) between 2020 and 2033:** The Nebraska Legislature passed the BNA in 2011 to assign 1/4 of 1 cent of existing state sales tax to state and local highways and roads.³¹ The bill sunsets in 2033, by which time it is expected to have generated \$1.2 billion dedicated to NDOT. Similarly, the Nebraska Legislature passed the TIA in 2016 to allocate new revenue for targeted infrastructure investment to increase mobility, freight movement, economic growth, and transportation safety in Nebraska.³²
- **Widening I-80 to six lanes between Lincoln and Grand Island:** This includes pavement, bridge, and interchange costs associated with the widening of I-80.³³
- **Widening or reconstructing urban state highways.**
- **Urban bridge capital improvements.**
- **Planning and research costs:** These are costs associated with NDOT’s “planning and research” budget.
- **Costs to implement MTIS:** MTIS resulted from a collaboration between MAPA, NDOT, and the Federal Highway Administration (FHWA) to examine the future transportation needs for the Omaha region. The study includes all NHS roads, and non-NHS roads that NDOT and MAPA have designated as priority corridors.³⁴

2.3.1 Data Sources

Table 2-6 summarizes the primary data and data sources that informed needs for each element of capital improvements. The following paragraphs describe the data in greater detail.

Table 2-6: Data Sources for Capital Improvements

Name	Publishing Organization	Publication Year	Element
Historical material and project costs	NDOT	NA	BNA and TIA
BNA and TIA project lengths and scopes ⁱ	NA	NA	BNA and TIA
Segment-level ADT forecasts	NDOT	NA	Widening I-80
Roadway inventory	NDOT	NA	Widening I-80
Historical material and project costs	NDOT	NA	Widening I-80
Segment-level ADT forecasts	NDOT	NA	Widening or reconstructing urban state highways
Historical costs per mile	NDOT	NA	Widening or reconstructing urban state highways
Capital improvement projects in the MTIS ³⁵	NDOT	2019	Costs to implement the MTIS capital improvement projects

NA: Not applicable

Build Nebraska Act (BNA) and Transportation Innovation Act (TIA): The needs for projects associated with the BNA and the TIA are derived from NDOT's analysis of historical material costs, and from the scopes and lengths of projects in the planning, design, or construction pipeline associated with either of these acts. While both data sources are internal to NDOT, the projects were selected through a project prioritization process for which 2,000 stakeholders contributed to the updating and expansion.³⁶

Widening I-80 to six lanes between Lincoln and Grand Island: The primary data sources for the widening of I-80 are NDOT's ADT forecasts and NDOT's roadway inventory with attributes describing the geometry of I-80 between Lincoln and Grand Island. ADT forecasts account for trucks' larger size through a passenger car equivalent factor.³⁷ Costs associated with replacing bridges on I-80 and that cross over I-80 are also used, in addition to unit costs for approach sections of bridges crossing over I-80.³⁸

ⁱ <https://dot.nebraska.gov/media/5802/new-bna-tia-projects-map-list.pdf>

Widening or reconstructing urban state highways: The primary data sources related to widening or reconstructing urban state highways are NDOT's ADT forecasts, which are calculated by applying growth factors to traffic counts,³⁹ and construction costs that NDOT has calculated from historical data.

Urban bridge capital improvements: The primary data source for urban bridge capital improvement needs is the bridge needs program output,⁴⁰ which lists urban bridges that are candidates for improvements.⁴¹

Planning and research costs: Costs associated with planning and research are derived from NDOT's FY 2020 "Planning & Research" budget, which was provided by the NDOT Controller Division.

Costs to implement the MTIS: NDOT incorporated the costs for expansion projects on the State Highway System interstate highways and freeways from the MTIS. These expansion projects are projects that "the operational deficiencies of the freeway system" by adding capacity to select freeway corridors or reconfiguring ramps and interchanges.⁴²

Right of way: The primary data source for calculating right-of-way needs associated with capital improvements is the 10-year average of NDOT's project-related right-of-way costs on the State Highway System.⁴³

2.3.2 Methodology

This subsection summarizes the methodology used for each section of the capital improvement *2019 State Highway Needs Assessment*.

Build Nebraska Act (BNA) and Transportation Innovation Act (TIA): The needs associated with the BNA and the TIA are based on cost estimates for projects that are planned and funded under these acts. In 2016, NDOT released projects that had been selected for funding through the BNA for the next ten years, which were at various stages in the planning, design, and construction pipeline.⁴⁴ Project costs are estimated by applying historical costs to projects' planned length and scope.⁴⁵

Widening I-80 to six lanes between Lincoln and Grand Island: NDOT used forecasted ADT for 2040 to calculate a level of service (LOS) as defined by the Highway Capacity Manual⁴⁶ for I-80 between Lincoln and Grand Island. It estimated the costs to widen segments when they reached a LOS of D by applying historically derived project costs. The total of these costs are the needs for widening I-80 to six lanes between Lincoln and Grand Island, and implement associated geometric improvements at affected interchanges.⁴⁷ It includes costs associated with pavement, interchanges, and bridges.⁴⁸ Interchange needs associated with widening include raising ramp terminals to accommodate the new roadway profile and extending bridges over I-80.⁴⁹ Widening is limited to six lanes based on the Highway Capacity Manual.⁵⁰ Needs account for the cost to widen bridges on highway segments of I-80

that are expected to require widening to six-lanes based on forecasted ADT.⁵¹ Mainline bridge needs account for a widening and rehabilitation strategy that achieves a 62-foot clear bridge width.⁵² Additionally, all bridges that cross portions of I-80 that are being lengthened are considered replaced at an average replacement length of 350 feet, which approximates the length of bridges on existing six-lane segments of I-80, and width based on minimum bridge design standards.⁵³

Widening or reconstructing urban state highways: The *2019 State Highway Needs Assessment* accounts for other urban capacity needs on the State Highway System in cities with population above 5,000. Urban road segments with pavement that the POP model forecasts to be in fair-to-poor pavement condition during the needs assessment period are evaluated for capacity needs based on NDOT's ADT forecast.⁵⁴ Historical costs are applied to estimate project costs if these roads require reconstruction or widening based on forecasted ADT. Specifically, six or more lanes are warranted for non-interstates with future ADT of 36,000 or greater, while four lanes are warranted for non-interstates with future ADT of 10,000 to 35,999.⁵⁵

Urban bridge capital improvements: Needs for urban bridge capital improvements are the sum of project costs for urban bridges that are work candidates. Any bridges that are candidates for improvements and do not currently meet minimum design standards for width⁵⁶ include widening in the project cost.⁵⁷

Planning and research costs: Planning and research costs include what is required for the staff to investigate new strategies and develop projects. It is assumed that the costs associated with planning and research will remain constant through the end of the needs assessment period. The most recent budget is repeated for subsequent years and summed to estimate total needs for planning and research.⁵⁸

Costs to implement the MTIS: NDOT, MAPA, and the FHWA collaborated to develop project-level capital improvement needs for the MAPA region, which are documented in the MTIS. NDOT and MAPA developed strategy packages that allocated spending to the categories of arterial operations, freeway operations, transit, demand management, system gaps, safety, and bike and pedestrian infrastructure, and assess the resulting system performance along a set of multi-topic performance measures.⁵⁹ Details of the process used in MTIS are documented in the MTIS reports.⁶⁰ The needs that are extracted for the 2019 annual needs assessment include the 20-year roadway expansion needs.^{61 62}

Right of way: NDOT calculated the 10-year average of project costs related to right of way. A share of estimated right-of-way needs was assigned to capital improvements based on the share of capital improvement needs compared

with the sum of capital improvement and system modernization needs.⁶³ The right-of-way costs are repeated annually.

2.3.3 Standards

The primary standards used to define and identify needs are related to the LOS at which roads and bridges require widening, and the number of lanes and associated width of roadways and bridges when they are widened. The Highway Capacity Manual is the source for the process for calculating LOS D. Table 2-7 summarizes the standards associated with capital improvements.

Table 2-7: Standards for Capital Improvements

Standard	Source	Appropriate for Needs Validation?	Element of Roadway Modernization
I-80 is widened when LOS D is achieved.	NDOT	Yes. LOS D is based on NDOT's understanding of the expectations of the public and on the American Association of State Highway and Transportation Officials (AASHTO) "Green Book." ⁶⁴	Widening I-80 to six lanes between Lincoln and Grand Island
Minimum bridge widths and clear bridge zones	Nebraska Board of Public Roads Classifications and Standards (NBCS) ⁶⁵	No. Standard is set by the Nebraska Board of Public Roads Classifications and Standards.	Widening I-80 to six lanes between Lincoln and Grand Island & urban bridge capital improvements
Number of lanes warranted by future ADT for non-interstates (6 or more lanes are warranted for future ADT of 36,000 or greater, and four lanes warranted between 10,000 and 35,999 ⁶⁶)	NDOT	Yes. The standard is not derived from statute or regulation.	Widening or reconstructing urban state highways

2.3.4 Results

Roadway and bridge capital improvement needs total **\$3.20 billion**. The largest component of the needs is related to the BNA and the TIA, which

make up nearly 45 percent of capital improvement needs. The second and third largest components respectively are the widening of I-80 to six lanes (23%) and costs to implement MTIS (16%). **Table 2-8** lists the needs associated with each element of roadway and bridge capital improvement.

Table 2-8: Capital Improvement Needs

Category	Amount (Billions)
The BNA and the TIA	\$1.43
Widening I-80 to six lanes between Lincoln and Grand Island	\$0.74
Widening or reconstructing urban state highways	\$0.14
Urban bridge capital improvements	\$0.05
Planning and research costs	\$0.26
Costs to implement the MTIS	\$0.52
Right of way	\$0.07
Subtotal	\$3.20

2.4 Bridge Preservation

This section summarizes 20-year bridge preservation needs associated with the State Highway System from the *2019 State Highway Needs Assessment*, and it presents the data, methods, and standards used to derive them. Bridge preservation includes activities that NDOT undertakes to extend bridge service lives and counteract the deterioration that bridge assets experience. Preservation activities include preventative maintenance, repair, re-decking, rehabilitation, and replacement of bridges that meet the required width.⁶⁷ Bridges on sections of I-80 that are expected to be widened from four to six lanes are excluded from the bridge preservation needs.⁶⁸ (See Section 2.3 for details on needs associated with I-80 widening.) Replacement of bridges whose width does not meet minimum state standards are included in the “Bridge Modernization” needs discussed in Section 2.5.

2.4.1 Data Sources

NDOT's primary data source for bridge needs in the *2019 State Highway Needs Assessment* is an inventory of state system bridges that includes records of their recent conditions, and which is maintained in the AASHTOWare Bridge Management (BrM) model. NDOT's Bridge Division manages the inspection program for bridges on the State Highway System. Inspectors record data about each bridge element using BrM, which allows access to inspection records and facilitates bridge management with asset management features.⁶⁹

BrM includes many other kinds of data that allow the model to operate, including activity costs and bridge deterioration rates. Activity costs include 50'-long work on bridge approaches and 30'-long transitions to roadway sections for replaced bridges. Deterioration rates are finetuned to bridges' characteristics, such as the presence of a water-resistant membrane. Other data that is embedded in the BrM model are not listed, such as activity effects and condition thresholds for treatment eligibility.⁷⁰

A list of roads and associated bridges with programmed projects also informed the needs assessment. This list allows NDOT to identify bridges that are automatically eligible for preservation activities based on other programmed projects.⁷¹

2.4.2 Methodology

NDOT uses its BrM model to identify the minimum funding amount that will achieve performance standards that it has set for the purposes of the needs assessment and which are described in Section 2.4.3. NDOT specifies the total bridge preservation budget and the budgetary split between activity types, namely repair and preservation work on the one hand and re-decking, rehabilitation, and replacement on the other. NDOT begins with total budgets that are close to historical spending levels and adjusts both the total

spending and the budgetary splits iteratively to achieve performance standards for state-system bridges at the lowest overall cost.⁷²

For each iteration, BrM selects activities such that maximum bridge condition is achieved given other constraints and specifications. NDOT has designed BrM's selection of candidates to be consistent with its programming process, in which roadway projects drive the scheduling of bridge projects so that the bridge projects and roadway projects can be bundled. Eligibility is essentially random from the point of view of bridges, which NDOT accounts for in BrM by randomly selecting bridges during each year of the 20-year needs assessment period for eligibility. Bridges with projects that are programmed or expected to be programmed are excluded from this random assessment of eligibility and are instead added to the list of eligible bridges in the year for which the bridge project is programmed.⁷³ BrM selects candidates for bridge activities from the list of eligible bridges based on their forecasted condition for that year. Candidates for replacement, rehabilitating, and re-decking are ranked by lowest condition up to the allocated budget amount. Candidates that are eligible for preservation are randomly selected up to the available budget amount. When work is completed, conditions and the bridges' year of construction are reset to the year of work.⁷⁴

Bridge replacements are either the width that meets standards⁷⁵ or the width of the existing bridge, whichever is greater.⁷⁶ Replaced bridges become ineligible for new activities for the next 15 years in order to accurately simulate actual practices of timing bridge projects with roadway projects at the typical frequency of pavement projects.⁷⁷

NDOT adjusts the funding and work type distributions until the specifications that achieve the performance targets are achieved.⁷⁸ The bridge preservation performance measures used in the annual needs assessment are the percent of bridges on the State Highway System in "poor" condition and the percentage of state system bridges in "good" condition according to federal performance measures. The target is to maintain a constant share of "poor" condition bridges over time.⁷⁹ Although annual budgets are fairly consistent from year to year, there is some annual variation as bridges built around the same year come due for work simultaneously. While the average annual budget is around \$50 million, annual spending up to approximately \$70 million is allowed.⁸⁰

NDOT coordinates bridge preservation with roadway projects, and roadway projects around on-system bridges occur every 15-20 years.⁸¹

2.4.3 Standards

NDOT has adopted two condition standards that are used to define bridge needs and are based on the federal definitions of "good," "fair," and "poor" bridge condition.⁸² The targets are that bridge condition will stay approximately constant over time. The needs standard for "poor" condition is

that the share of bridges in "poor" condition will not surpass 4 percent, which is similar to the share of 3.3 percent reported in 2016 for state-system bridges.⁸³ For the share of bridges in "good" condition, the target is that the share of bridges in "good" condition will not fall below 60 percent, which compares to a 2016 share of state system bridges of 61.2 percent.⁸⁴ An additional standard relates to maximum annual bridge preservation spending. **Table 2-9** summarizes the standards used in defining state system bridge preservation needs.

Table 2-9: Standards for Bridge Preservation

Standard	Source	Appropriate for Needs Validation?
Share of bridges in "poor" condition according to federal performance measures as described in the Transportation Asset Management Plan (TAMP) does not increase (currently approximately 4%).	This target is slightly stricter than the targets in the TAMP ⁸⁵ and the 2018 Annual Report ⁸⁶ that fewer than 5 percent of bridges are in poor condition. It was selected with the understanding that legislators are unlikely to accept bridge condition degrading. ⁸⁷	Yes. NDOT selects the standards. The standard is slightly stricter than the state target reported in the TAMP and the 2018 Annual Report.
Share of bridges in "good" condition does not fall below approximately 60 percent.	This target was selected with the understanding that legislators are unlikely to accept bridge condition degrading. ⁸⁸ There is not an equivalent target reported in the TAMP.	Yes. NDOT selects this standard.
Maximum preservation spending in any given year cannot surpass \$70 million.	This target was selected by NDOT for the annual needs assessment based on experience with historical spending fluctuations. ⁸⁹	Yes. NDOT selects this spending threshold.

2.4.4 Results

Needs for the preservation of state system bridges are **\$719.46 million**.⁹⁰

Table 2-10 details the bridge preservation needs.

Table 2-10: Bridge Preservation Needs

Topic	Amount (Millions)
Interstate Bridges (non-six-lane)	\$217.49
Rural Bridges	\$397.43
Municipal Bridges	\$25.04
Missouri River Bridges	\$45.09
Culvert Needs	\$34.41
Subtotal	\$719.46

2.5 Bridge Modernization

Bridge modernization relates to activities to bring bridges on the State Highway System up to current standards or to keep them at standard as traffic volumes increase. Bridge modernization in the *2019 State Highway Needs Assessment* has two components: bridge widenings to accommodate forecasted traffic and remodeling bridge rails to meet standards. The assessment includes rural bridges, municipal bridges, interstate bridges, and Missouri River bridges. Shoulders are not considered in bridge modernization needs.

2.5.1 Data Sources

This subsection describes the primary data sources related to the bridge modernization needs estimate, which are listed in **Table 2-11**. One of the primary data sources is NDOT's inventory of state-owned bridges with inspection information related to bridge structure width and railing condition. Rail condition matches the item 36a from the National Bridge Inventory (NBI).⁹¹ Data about railings from inspections is binary, showing either that they are to standard or that they are not to standard.

Table 2-11: Data Sources for Bridge Modernization

Name	Publishing Organization	Publication Year
Inventory and condition of state system bridges	NDOT	NA
ADT forecasts	NDOT	NA
Unit costs for bridge widening and bridge railings	NDOT	NA
Programmed road widenings	NDOT	NA

NA: Not applicable

Additionally, NDOT forecasts ADT by applying historically derived growth rates to observed traffic counts.⁹² Unit costs for bridge widening and bringing bridge railings to standard are derived from analysis done by the NDOT Construction Division and NDOT's Bridge Management Group respectively. Widening unit costs are \$185 per square foot, and railing costs are \$480 per linear foot (applied to both sides of a bridge).

A final data source is a list of roadway widening projects that may require widening affected bridges. In addition to officially programmed projects, NDOT also identifies "projects under consideration" that are not yet programmed but are expected to be widened within 20 years.⁹³

2.5.2 Methodology

Bridge widening needs and bridge railing needs are assessed separately. This subsection first summarizes the methodology for estimating needs associated with bridge widening. Inputs for the bridge widening assessment

include 2040 ADT provided by NDOT's Traffic Division, an inventory of state-owned bridges, bridge width standards, unit costs associated with widening, and programmed road widening projects. Shoulders are not considered as part of bridge width needs. The following steps compose the bridge width methodology.

- **Identify bridges that are eligible for widening:** Bridges become eligible for widening whenever an activity occurs. State-system bridges that are eligible for widening are identified for the entire forecasting period based on output from AASHTOWare BrM. More details are available in Section 2.4.2 on bridge preservation needs.
- **Identify necessary 2040 width:** NDOT identifies the standard width for bridges that are eligible for widening. Standards for both 3R and new construction may be used depending on the activity that makes the bridge eligible for widening.⁹⁴
- **Identify bridges requiring widening due to programmed or expected roadway widening projects:** NDOT identifies bridges that will require widening due to programmed or expected roadway widening projects. This includes bridges associated with the widening of I-80 to six lanes between Lincoln and Grand Island, and bridges on other roadway widening projects expected to be completed by 2040.⁹⁵
- **Apply unit costs and estimate statewide need:** NDOT applies unit costs to account for widening for bridges whose current width is less than the standard width or that will need to be widened due to programmed or other expected roadway widening projects. NDOT summed these costs over multiple years and over all widened state-system bridges to estimate needs associated with bridge widening.

The methodology for assessing costs to bring bridge railings on all state-system bridges to standard is composed of identifying bridges with substandard railings and applying unit costs to rectify the substandard railings. Bridge railings are a traffic safety feature, and they are inspected to ensure that their height, material, strength, and geometric features allow them to redirect a vehicle that collides with them. Needs include the subset of state-system bridges that have substandard railings, are at least as wide as standard (and are thus not eligible for bridge widening), and are selected for repair or another bridge activity during the needs assessment period. All bridges that are widened or replaced are built with railings that meet standards.

2.5.3 Standards

Table 2-12 lists the standards used in bridge modernization. The standards for bridge width used in the annual needs assessment are the standards that are associated with minimum 3R clear width requirements from the Board of Public Roads Classifications and Standards. Standards are specific to

functional classification (state and national), urban/rural location, and average daily traffic (ADT).

Table 2-12: Standards for Bridge Modernization

Standard	Source	Appropriate for Needs Validation?
Clear bridge width based on standards board.	Board of Public Roads Classifications and Standards ⁹⁶	No. These standards are set by the Board of Public Roads Classifications and Standards.
Standards for bridge railings.	AASHTO <i>Standard Specifications for Highway Bridges</i> ⁱⁱ	No. These standards align with existing National Bridge Inspection Standards (NBIS). ⁹⁷ However, federal inspection practices are likely to change and may change or eliminate this standard in the NBI. ^{iii iv}

The standards associated with bridge railings are from the American Association of State Highway and Transportation Officials (AASHTO) *Standard Specifications for Highway Bridges*, as described in data reported for the NBI.⁹⁸ Based on these standards, bridges are marked as either meeting standard, substandard, or not applicable.⁹⁹

2.5.4 Results

Needs for modernization of bridges on the State Highway System are **\$209.03 million**. Of this amount, \$77.57 million is related to interstate bridges, \$122.79 million is related to rural bridges, and \$8.67 million is related to municipal bridges.^v **Table 2-13** summarizes bridge modernization needs.

ⁱⁱ As described at the following source: Federal Highway Administration (1995). *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*. Report No. FHWA-PD-96-001. Item 36 - Traffic Safety Features. Retrieved from <https://www.fhwa.dot.gov/bridge/mtguide.pdf>.

ⁱⁱⁱ Interview with NDOT Bridge Division. February 4, 2020.

^{iv} Federal Highway Administration (2019). "National Bridge Inspection Standards." Notice of Proposed Rulemaking. FHWA Docket No. FHWA-2017-0047. November 12, 2019. Retrieved from <https://www.govinfo.gov/content/pkg/FR-2019-11-12/pdf/2019-23929.pdf>.

^v Numbers may not sum due to rounding.

Table 2-13: Bridge Modernization Needs

Topic	Amount (Millions)
Interstate bridges (non-six-lane)	\$77.57
Rural bridges	\$122.79
Municipal bridges	\$8.67
Subtotal	\$209.03

An aerial photograph of a multi-lane highway stretching through a rural landscape. The fields are golden-brown, suggesting late autumn or early winter. In the distance, a large body of water is visible under a sky with scattered clouds. A large, semi-transparent blue circle is overlaid on the left side of the image, containing the title text.

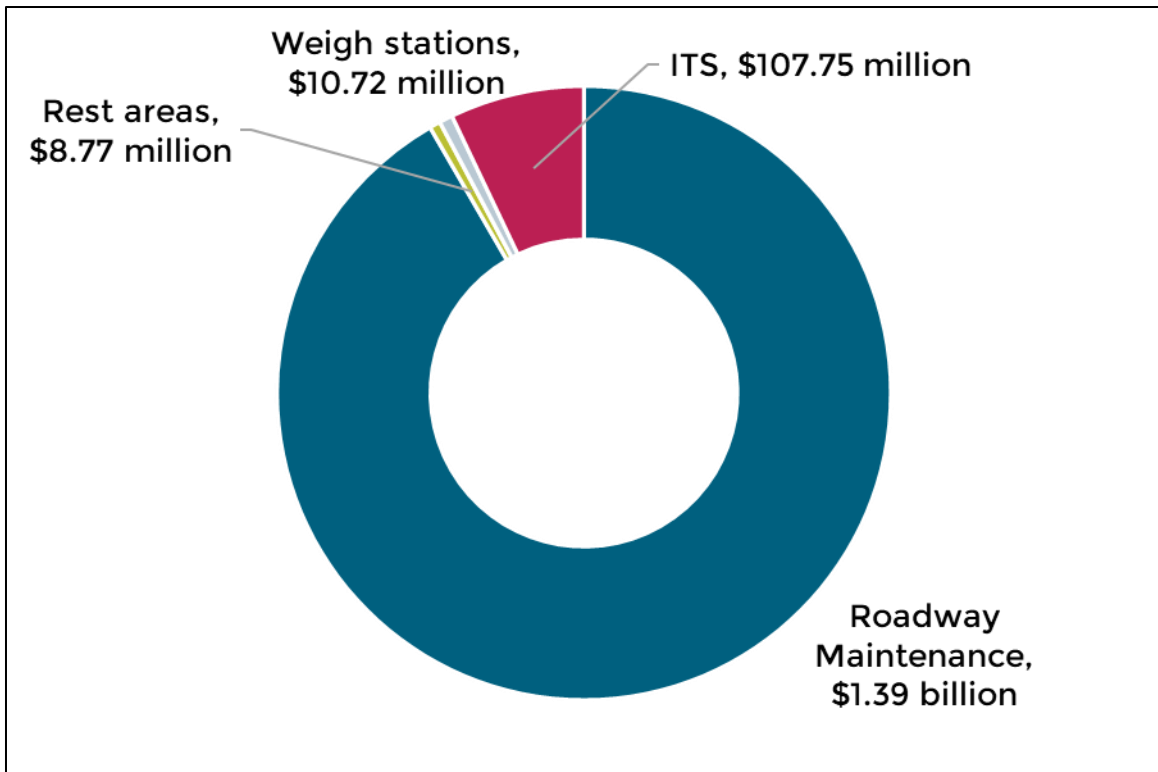
3 Ancillary Assets for the State Highway System

3 Ancillary Assets for the State Highway System

Ancillary assets are necessary for the roads and bridges of the State Highway System to operate properly. They include rest areas, which improve traffic safety by allowing fatigued travelers and commercial drivers to rest. Ancillary assets also include weigh stations that allow for overweight trucks to be identified, reducing the roadway surface degradation associated with overweight vehicles. ITS includes many types of roadside infrastructure that improve highway mobility. This section also presents roadway maintenance needs. Twenty-year needs amounts associated with each of these topics are presented in the following subsections.

The following subsections provide details on the calculation of needs for ancillary assets, which total **\$1.52 billion**. **Figure 3-1** summarizes the needs associated with each mode.

Figure 3-1: Ancillary Asset Needs



3.1 Roadway Maintenance

3.1.1 Introduction

Roadway maintenance keeps roadway systems functioning through routine maintenance and special maintenance activities that including mowing, snow and ice removal, striping, repairing traffic control signals, correcting vandalism, repairing storm or accident damage, and similar activities. Highway maintenance needs in this analysis are categorized related to operations, snow and ice control, and unusual and disaster operations.

3.1.2 Data Sources

Twenty-year roadway maintenance needs are developed using NDOT's 2009-2019 maintenance budgets.¹⁰⁰

3.1.3 Methodology

The 2009-2019 roadway maintenance budgets are first reviewed for relevant line items to be included in the needs analysis. Activities that overlap other needs areas were removed, including system preservation activities that are already represented under highway preservation needs. All relevant maintenance items are then summarized by year and converted to 2019 constant dollars using Consumer Price Index¹⁰¹ inflation rates. To extend the costs into 2040, two extrapolation techniques were considered: linear trendline of maintenance costs and averaging costs to extend the averages into the future. Since the linear trendline extrapolation showed modest decreases in cost, the average costs are used instead.

3.1.4 Standards

Road maintenance needs are based on historical spending rather than the achievement of maintenance-related performance targets. The multifaceted nature of roadway maintenance makes extrapolation of needs from historical spending more accurate than estimation of performance for each aspect of maintenance. Roadway maintenance is not appropriate for needs validation because it is not included in the *2019 State Highway Needs Assessment*.

3.1.5 Results

Twenty-year highway maintenance needs equal **\$1.39 billion** with average annual needs of \$69.72 million. This equates to slightly less than \$7,000 per centerline mile per year. Total needs are represented in **Table 3-1**.

Table 3-1: Roadway Maintenance Costs

Name	Amount (Billions)
Operations	\$0.63
Snow and ice control	\$0.71
Unusual and disaster operations ^{vi}	\$0.06
Subtotal	\$1.39

^{vi} Trendline analysis shows that 'unusual and disaster operation' costs have been increasing over time. This line item has numerous highs and lows. The 2019 costs for unusual and disaster operation cost were far above normal, likely due to the 2019 flood and resulting cleanup. Future costs will likely continue to fluctuate as the number of weather events and the severity of events increases.

3.2 Rest Areas

3.2.1 Introduction

Nebraska's State Highway System hosts 22 rest areas along I-80. The rest areas provide a variety of services to travelers including restrooms, drinking fountains, vending machines, pet exercise areas, picnic shelters, real-time weather and road condition information, and tourist information.¹⁰² This section presents the needs derived from the *2019 State Highway Needs Assessment* and summarizes the methodology that was used to calculate them.¹⁰³

3.2.2 Data Sources

NDOT used internal data sources to identify rest area-related projects that it expects will be required during the 20-year assessment period and to estimate costs for these projects.¹⁰⁴

3.2.3 Methodology

Needs are the costs associated with the rest area projects that NDOT expects will be required during the 20-year assessment period.¹⁰⁵ Cost estimates include full replacement of existing facilities and construction of new facilities. The 2021-2040 needs include construction of three new buildings with site updates and reconstruction of two rest area interchanges, parking areas, and lighting upgrades. The projects affect five rest areas on I-80.¹⁰⁶

3.2.4 Standards

Rest area needs are based on projects that NDOT expected to be required during the 20-year assessment period, as summarized in **Table 3-2**.

Table 3-2: Standards for Rest Areas

Standard	Source	Appropriate for Needs Validation?
Needs are based on expected rest area projects and associated costs.	NDOT (<i>2019 State Highway Needs Assessment</i>)	Yes. The approach does not derive from regulation or statute.

3.2.5 Results

Rest area needs between 2021 and 2040 total **\$8.77 million**.

3.3 Weigh Stations

3.3.1 Introduction

NDOT owns and maintains Nebraska's twelve static weigh stations,¹⁰⁷ which are operated by the Nebraska State Patrol's Field Service Division - Carrier Enforcement.¹⁰⁸ All Nebraska scale facilities use the weigh-in-motion vehicle sorting system. These facilities also use pre-clearance systems (PCS) that provide signals directly to the truck cab (if using an approved PCS) indicating if the vehicle must exit or not.¹⁰⁹

The number of permanent weigh stations is expected to remain the same through 2040, though NDOT is planning to add new virtual weigh stations to provide a more complete statewide station network. Virtual weigh stations are roadside ITS that monitor traffic and can measure weight without an adjacent building. The use of virtual weigh stations will likely fill gaps between permanent stations or be placed ahead of the permanent scales to sort trucks that require enforcement.¹¹⁰

3.3.2 Data Sources

Two primary data sources inform this analysis. The first is NDOT's 2009-2019 maintenance spending associated with weigh stations ("weigh station and scale facility costs").¹¹¹ This dataset including "building and ground maintenance and operation costs to maintain the weigh station and scale facilities."¹¹² This spending provides a basis for estimating future maintenance costs since weigh station maintenance needs are expected to remain at the same level over time.¹¹³ The second source is a unit cost for new virtual weigh stations, which NDOT estimated from correspondence with vendors.¹¹⁴

3.3.3 Methodology

To estimate weigh station maintenance needs, the 2009-2019 weigh station maintenance spending is first converted to 2019 constant dollars using Consumer Price Index^{vii} inflation rates. Since maintenance needs are expected to remain roughly constant over time, the average of these costs (\$320,956) is applied for each year in the 20-year needs assessment period.

The cost to purchase virtual weigh stations is estimated by multiplying the unit cost associated with purchasing virtual weigh station equipment (\$179,000 each) by the number of virtual weigh stations that are expected to be purchased during the 20-year needs assessment period (24).

^{vii} U.S. Bureau of Labor Statistics. CPI Inflation Calculator. Retrieved from https://www.bls.gov/data/inflation_calculator.htm.

3.3.4 Standards

Weigh station needs are not based on achievement of a performance target, but instead are based on a combination of historical spending and costs associated with expected expenditures. Weigh stations are not appropriate for needs validation because they are not included in the *2019 State Highway Needs Assessment*.

3.3.5 Results

The 20-year need for Nebraska's weigh stations totals **\$10.72 million**. This includes \$6.42 million in maintenance for the existing 12 static weigh stations and \$4.30 million for 24 virtual weigh stations.

3.4 Intelligent Transportation Systems (ITS), Lighting, and Traffic Signals

3.4.1 Introduction

Intelligent transportation systems (ITS) are a digital communications networks that gather and disseminate travel information to the public. ITS devices include communications infrastructure, electronic devices, software and hardware to manage the system, and various cameras and messaging devices. ITS components in Nebraska include road weather information systems (RWIS), dynamic message signs (DMS), traveler information kiosks, transportation management centers, and approximately 250 traffic cameras. Traffic Systems Management Operations (TSMO) emphasize strategies such as traffic incident management, roadway weather management, traveler information, and ramp management to realize operational improvements. Many of these strategies leverage ITS infrastructure.¹¹⁵ This technical memorandum discusses ITS/TSMO needs and needs associated with lighting and traffic signals in part because traffic signal coordination is a common TSMO strategy.¹¹⁶

3.4.2 Methodology

The first step in calculating 20-year ITS/TSMO needs is to review the previous ten years of projects in the ITS/TSMO project category. These projects may include the following: DMS, closed circuit television (CCTV) systems, kiosks, gates, or fiber optics. After selecting the ITS/TSMO projects completed in the previous ten years, the average annual cost is defined based on the project costs during that timeframe. The average annual cost in 2019 constant dollars is then extrapolated for the next 20 years to define the 20-year ITS/TSMO needs.

The methodology for lighting and traffic signal needs is similar to that for ITS/TSMO. Projects included in the ten-year review include lighting, traffic signals, and other projects with the major component identified as lighting. The average annual cost for lighting and traffic signals is defined based on the project cost over the 10-year period. The average annual cost in 2019 constant dollars is then extrapolated out for the next 20 years to define the 20-year lighting and traffic signal needs.

3.4.3 Standards

Needs related to ITS, lighting, and traffic signals are based on 10-year average of historical spending, which are extrapolated into the future, as summarized in **Table 3-3**.

Table 3-3: Standards for ITS, Lighting, and Traffic Signals

Standard	Source	Appropriate for Needs Validation?
Needs are based on average historical spending.	NDOT (<i>2019 State Highway Needs Assessment</i>).	Yes. The approach does not derive from regulation or statute.

3.4.4 Results

Needs for ITS/TSMO are included in the Roadway Modernization category of the *2019 State Highway Needs Assessment*. The total needs for ITS/TSMO are \$90.23 million for the next 20 years. ITS/TSMO improvements are primarily the responsibility of NDOT as improvements are made in coordination with NDOT roadway projects. Lighting and traffic signals 20-year needs account for \$17.52 million of the total. The total ITS/TSMO, lighting, and traffic signal needs for the next 20 years is **\$107.75 million**. Table 3-4 summarizes the needs.

Table 3-4: ITS/TSMO, Lighting, and Traffic Signal Needs

Category	Amount (Millions)
ITS/TSMO	\$90.23
Lighting and traffic signals	\$17.52
Subtotal	\$107.75

An aerial photograph of a rural landscape. A paved road runs diagonally from the bottom center towards the top right. The fields are golden-brown, suggesting late autumn or winter. In the distance, there are some buildings and a small cluster of trees. The sky is a deep blue with scattered white clouds. A large, semi-transparent blue circle is overlaid on the left side of the image, containing the text.

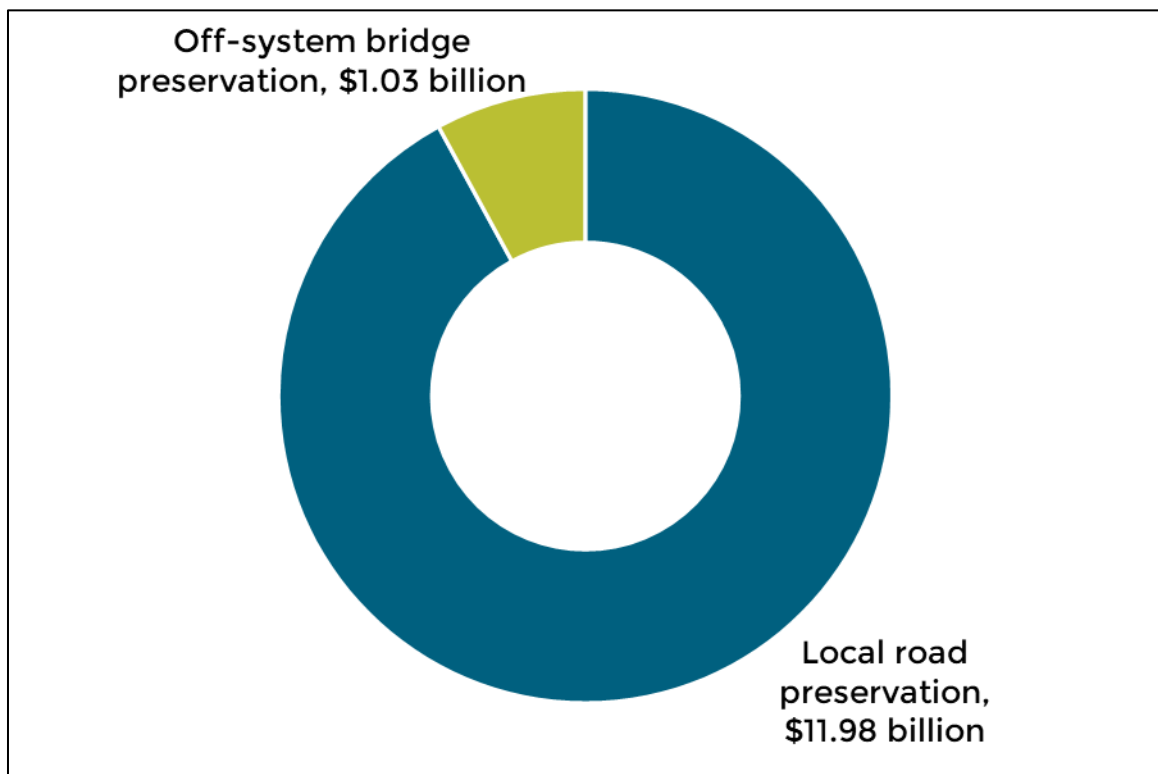
4 Non-State Roads and Bridges

4 Non-State Roads and Bridges

This section uses original analysis to estimate needs associated with preserving local roads and off-system bridges between 2021 and 2040. While the State Highway System maintained by NDOT includes some of the busiest highways in the state, other organizations also own and maintain very large inventories of roads and bridges. This is particularly true for local governments, but also includes other state agencies, private companies, and federal agencies. For instance, the non-state system has nearly nine times as many road centerline miles as the State Highway System,¹¹⁷ albeit with very different characteristics in terms of ADT and surface types. The State Highway System's bridges are larger on average than off-system bridges; while there are twice as many off-system bridges as state bridges, off-system bridges have less overall deck area than the bridges on the State Highway System.¹¹⁸ Preserving this infrastructure protects the investment that Nebraska's residents and businesses have made into primarily locally owned infrastructure.

The following subsections provide details on the calculation of needs for non-state roads and bridges, which total **\$13.01 billion**. **Figure 4-1** summarizes the needs associated with each mode.

Figure 4-1: Non-State Road and Bridge Needs



4.1 Local Road Preservation

4.1.1 Introduction

This section presents the needs associated with roadway surface preservation of Nebraska’s local roadway system and summarizes the data sources and methodology that were used to calculate them. All local roads are included in this analysis regardless of surface type, which includes 61,240 centerline miles of county roads and 23,714 centerline miles of municipal roads.¹¹⁹ Needs associated with bridges are excluded from this analysis.

Roadway surface preservation needs have two components: “met” needs and “unmet” needs. Met needs are those for which adequate funding regardless of source is available under a business-as-usual future funding scenario. By contrast, unmet needs are for activities that the relevant highway or street superintendents judge to be necessary, but for which funding is not currently available and would not be available in the future under a business-as-usual funding scenario.

4.1.2 Data Sources

Table 4-1 lists the primary data and data sources that inform this analysis. The first two data sources are used to compile names and contact information for county highway superintendents and municipal street superintendents for a survey inquiring about their pavement preservation spending. The final data source is an inventory of county and municipally owned centerline miles from the FHWA, which allowed the survey results to be extended to the portions of the local system not represented in the survey results.

Table 4-1: Data Sources for Local Road Preservation

Name	Publishing Organization	Publication Year
Directory of County Officials ^{viii}	Nebraska Association of County Officials (NACO)	No date. Accessed February 18, 2020.
Nebraska Incorporated Places by Legal Classification ^{ix}	Nebraska Department of Economic Development	2014
2018 Highway Statistics "Length by Ownership" [Table HM-10] ^x	FHWA	2018

4.1.3 Methodology

Roadway surface preservation needs are based on a survey of county highway superintendents and an additional survey of municipal street

^{viii} <https://nacone.org/pdfs/directory/Directory.pdf>

^{ix} <https://opportunity.nebraska.gov/files/research/stathand/asect7.htm>

^x <https://www.fhwa.dot.gov/policyinformation/statistics/2018/>

superintendents. Respondents reported the road mileage for which their county or municipality is responsible, recent annual preservation spending, and an additional estimate of the annual spending that would be needed to complete other necessary preservation work. These spending amounts form the respondents' met and unmet needs respectively. Additionally, the survey results are used to develop per-mile cost multipliers for counties and municipalities, which are applied to the road inventories of counties and municipalities that did not participate in the survey to estimate their met and unmet needs. The following paragraphs detail the methodological steps, starting with those related to survey preparation.

Collect contact information: The first step is to compile the names and email addresses for county highway superintendents and municipal street superintendents. The Nebraska Association of County Officials' (NACO) directory of county officials provides a complete list of county highway superintendents' names and email addresses. The project team attempted to find a similar list for municipalities using the League of Nebraska Municipalities' Nebraska Directory of Municipal Officials for 2019.^{xi} However, this directory does not provide email addresses for superintendents.

Since a complete list of municipal street superintendents was not available, a sample of 72 municipalities was selected from among metropolitan class cities, primary class cities, first-class cities, and second-class cities. Cities' websites identify street superintendents more commonly than villages' websites, and cities are expected to have greater staff resources than villages to respond to the surveys. Sampling was used rather than attempting to survey Nebraska's 500+ municipalities^{xii} because of time constraints and to reduce municipalities' aggregate effort to respond to the survey. Forty-two of the 72 municipalities' websites provide adequate information to contact the street superintendent, and contact information for the street superintendent was collected for these 42 municipalities.

Conduct survey: The second step is to develop and distribute the surveys. The survey for counties and the survey for municipalities ask the same questions. Both surveys are designed to be as short as possible while collecting the most essential information for the needs analysis. Specifically, they ask respondents to provide the centerline miles regardless of surface type for which the county or municipality is responsible, recent annual

^{xi} League of Nebraska Municipalities (2019). Nebraska Directory of Municipal Officers. Available at <https://www.lonm.org/news/>.

^{xii} Nebraska Department of Economic Development (2014). Nebraska Incorporated Places by Legal Classification. Retrieved from <https://opportunity.nebraska.gov/files/research/stathand/asect7.htm>.

spending on roadway preservation, whether this amount is adequate to meet the county's or municipality's needs, and how much additional spending would be required to accomplish additional necessary preservation tasks.

The survey was distributed by email and was accompanied by a cover letter introducing the Nebraska 2040 Statewide Transportation Plan, explaining the survey's purpose, requesting responses, and providing contact information for NDOT and the consultant team. Responses were requested within one week of the initial email, and a reminder was distributed two days before the requested response date. Responses were collected via Google Forms.

Analyze responses: Twenty-eight responses from counties and 10 responses from municipalities were received. Each response was assessed for reasonableness, and responses with spending per mile roughly an order of magnitude above or below the median spending per mile were excluded to avoid skewing results. Three counties and two municipalities provided answers that were either unreasonable or incomplete, and were not used. After excluding these answers, the response rates to the original sample were 27 percent for counties and 17 percent for municipalities included in the sample respectively.

The remaining responses provided the met and the unmet needs for these counties and municipalities. Met needs are the sum of their annual current spending times the number of years in the analysis period (20), while unmet needs are the sum of the additional spending times the numbers of years (20) in the analysis period.

The responses are also used to derive county multipliers and municipal multipliers describing the met and the unmet needs per centerline mile of road for each. These are calculated by dividing the sum of the respondents' met or unmet needs by the sum of their centerline mileage. These multipliers allow the met and unmet needs to be estimated for roads owned by counties and municipalities that did not participate in the survey to be estimated.

Calculate remaining local road centerline mileage: The next step is to calculate the size of the locally owned road inventory that is not included in the survey responses. An inventory of locally owned road centerline mileage is collected from the FHWA's 2018 Highway Statistics, as described in **Table 4-1**. The centerline mileage represented by survey responses is subtracted from the county and municipality subtotals to derive the remaining centerline mileage that is not represented in survey responses.

Calculate needs for counties and municipalities without survey responses: Subsequently, the multipliers are applied to the remaining local road centerline mileage to estimate counties' and municipalities' met and unmet needs. Annual local road needs associated with roadway surface preservation

are the sum of the needs derived from the survey and the estimated needs for local roads that were not represented in survey responses.

4.1.4 Standards

Local road preservation needs are derived from spending and additional needs reported by local governments rather than by an explicit level of pavement condition that is consistent across jurisdictions. Local road preservation is not appropriate for needs validation because it is not included in the *2019 State Highway Needs Assessment*.

4.1.5 Results

Local governments' pavement preservation needs are estimated to be **\$11.98 billion**. The met needs are \$7.64 billion, of which 43 percent is associated with counties and 57 percent associated with municipalities. The survey results suggest that municipalities spend more on roadway preservation per mile of road than counties, which may be attributable to the fact that municipal roads are much more heavily urban with higher ADT than county roads, which are almost entirely rural.¹²⁰ The unmet needs are 36 percent of total needs. Since there are 84,955 centerline miles of locally owned roads in Nebraska versus 9,944 centerline miles on the State Highway System,¹²¹ the local road preservation needs equate to an average of \$7,051 per mile per year, which is one fifth the size of annual per-mile pavement preservation needs for the State Highway System. **Table 4-2** provides a more detailed needs breakdown.

Table 4-2: Local Road Preservation Needs (Billions)

Category	Met Needs	Unmet Needs	Total
County	\$3.26	\$1.92	\$5.18
Municipal	\$4.39	\$2.41	\$6.80
Subtotal	\$7.64	\$4.34	\$11.98

4.2 Off-System Bridge Preservation

4.2.1 Introduction

Needs associated with non-state-owned bridges and bridge-sized culverts are the costs to keep the current amount of deck area in “poor” condition constant through 2040, where “poor” condition is defined according to federal performance measures.¹²² Unless otherwise state, all dollar amounts are in constant 2019 U.S. dollars unless otherwise stated.

4.2.2 Data Sources

The primary data sets and data sources for this analysis are listed in **Table 4-3** and are the NBI and replacement unit costs provided by the FHWA. The NBI provides condition data between 2010 and 2018 that allows for the derivation of deterioration rates. The 2019 NBI also serves as a basis for describing the initial condition of the bridges and culverts. The FHWA’s estimate of bridge replacement costs provides unit costs.

Table 4-3: Data Sources for Off-System Bridge Preservation

Name	Publishing Organization	Publication Year
NBI for Nebraska	FHWA ¹²³	2010-2019
Bridge Replacement Unit Costs	FHWA ¹²⁴	2019

4.2.3 Methodology

This subsection describes the methodology used to calculate needs. A programmatic Markov chain model is used to forecast the deck area of bridges and culverts that will be in "good," "fair," and "poor" condition in 2040 under a 'no-build' investment scenario. The amount of deck area that will need to be replaced to prevent "poor" condition quantities from increasing is calculated. The needs are the cost to replace the associated bridges and culverts.

1. **Summarize Initial Condition:** Non-state-owned bridges and culverts are identified in the 2019 NBI. There are 21,717,895 square feet of non-state-owned deck area.¹²⁵ Structures are assigned the condition rating of their lowest-rated component (i.e., deck, superstructure, substructure, culvert), and deck area is calculated based on structure length and width. Approach roadway width is used for culvert width. Separate summaries of initial condition are made for bridges and culverts.
2. **Derive Deterioration Matrix:** Deterioration matrices are derived for bridges and culverts by examining the share of each whose condition rating was reduced during a two-year time period. The following year pairs between 2010 and 2018 are examined: 2010-2012, 2012-2014, 2014-2016, 2016-2018. Year pairs cover every other year because almost all non-state-owned

bridges in Nebraska are inspected biennially.¹²⁶ Transition probabilities are annualized. Table 4-4 shows the resulting transition probabilities.

Table 4-4: Off-System Bridge Transition Probabilities

Condition Rating	Bridge		Culvert	
	Remain Same	Transition	Remain Same	Transition
9	77%	23%	89%	11%
8	85%	15%	91%	9%
7	92%	8%	96%	4%
6	86%	14%	95%	5%
5	96%	4%	93%	7%
4	96%	4%	95%	5%
3	97%	3%	97%	3%
2	96%	4%	78%	22%
1	100%	0%	100%	0%

3. **Identify Activities' Costs and Effects:** Replacement is considered at a cost of \$169 per square foot of deck area, which represents two percent growth over the 2018 costs reported by the FHWA.¹²⁷ Replacement resets condition to the maximum rating of 9. Rehabilitation is not considered because of its low prevalence on the local system.¹²⁸ Cost inflation is assumed to keep pace with monetary inflation in subsequent years.
4. **Calculate Deck Area Requiring Replacement:** The share of non-state-owned bridge and culvert deck area in "poor" condition in 2040 is forecast under a 'no-build' scenario. The amount of bridge and culvert deck area requiring replacement to prevent the share of "poor" condition deck area from increasing is calculated. Structures are replaced in kind except for an increase in length of 10 feet,¹²⁹ which corresponds with an average increase in deck area of 15.8 percent. This 'swell factor' is applied to bridges and culverts upon replacement.
5. **Apply Costs to Replaced Deck Area:** Replacement unit costs are multiplied by the deck area requiring replacement to estimate needs.

4.2.4 Standards

The only standard used in estimating needs is that the share of deck area in "poor" condition will remain approximately constant over the forecast period. This standard is not appropriate for needs validation because off-system bridge preservation needs are not included in the *2019 State Highway Needs Assessment*.

4.2.5 Results

Needs are **\$1.03 billion**. Approximately 93 percent of the total is related to bridges, with the remaining 7 percent related to culverts.^{xiii} Ninety-seven percent of deck area for non-state-owned bridges and culverts is owned by local governments, with the remainder owned by other organizations, which include private organizations (e.g., railroads), other state agencies, and federal organizations.¹³⁰ Accordingly, the vast majority of these needs are expected to be borne by local governments, namely counties and municipalities.

^{xiii} Draft needs were also calculated based on structure age to check results' reasonableness. Bridges whose age would exceed 70 years and culverts whose age would exceed 80 years by 2040 were replaced in kind, except for being lengthened by 10 feet. This analysis produced spending that was similar to the needs that were calculated based on structure condition.

An aerial photograph of a rural landscape. A paved road runs diagonally from the bottom center towards the top right. The fields on either side are golden-brown, suggesting late autumn or winter. In the distance, there are some buildings and a small cluster of trees. The sky is a deep blue with scattered white clouds. A large, semi-transparent blue circle is overlaid on the left side of the image, containing the text.

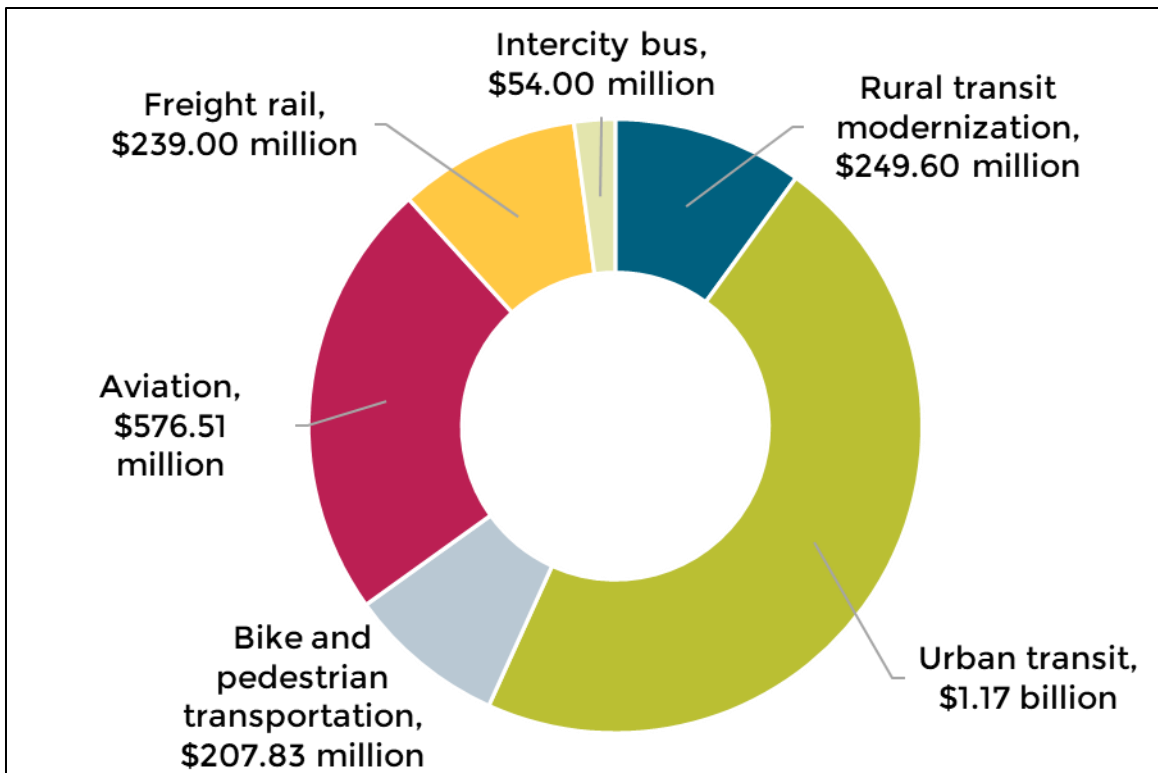
5 Non-Highway Needs

5 Non-Highway Needs

This section presents 20-year needs associated with infrastructure for non-automotive transportation modes in Nebraska. Some of these modes primarily serve the movement of people, including transit, intercity bus, and infrastructure for pedestrian and bicycle transportation. Other modes are primarily oriented toward moving goods, such as ports and waterways. A final set of modes support both passenger and cargo movement, including aviation and needs associated with improving safety for crossings between roads and the railroads used by freight railroads and Amtrak passenger trains. The following subsections present needs for each of these modes in a way that is consistent with the *2019 State Highway Needs Assessment* when applicable, and with other relevant state, local, and MPO plans or studies.

The following subsections provide details on the calculation of non-highway needs, which total **\$2.49 billion**. **Figure 5-1** summarizes the needs associated with each mode.

Figure 5-1: Non-Highway Needs



5.1 Rural Transit Modernization

5.1.1 Introduction

Nebraska’s rural transit operators provide a needed link to services for residents who may not have the ability, means, or desire to operate a personal vehicle. At the time of this writing, Nebraska has 57 rural transit providers, including 56 demand response providers and a single flexible route provider. Transit service is provided in 82 of Nebraska’s 93 counties.^{xiv}

The majority of the existing transit providers are small human services agencies or departments and operate fewer than 10 vehicles. In all, Nebraska’s rural transit providers operate 253 vehicles during peak operations.^{xv} The *2019 State Highway Needs Assessment* includes rural transit modernization needs.

5.1.2 Data Sources

The primary data source for information related to rural transit needs within Nebraska is the *2019 State Highway Needs Assessment*. Within that document, rural transit modernization needs are combined with rail-grade separation projects and with intercity bus transportation. **Table 5-1** lists data sources for rural transit needs.

Table 5-1: Data Sources for Rural Transit Needs

Name	Publishing Organization	Publication Year
<i>2019 State Highway Needs Assessment</i>	NDOT	2019
National Transit Database ¹³¹	Federal Transit Administration	2019

5.1.3 Methodology

Unlike highway infrastructure improvements, transit operations are largely subject to the ability of the transit provider to raise enough local funding to drawdown the federal aid apportioned to NDOT through the Federal Transit Administration’s (FTA) formula grants.¹³²

It is assumed that existing transit providers will continue to provide service to the level that is currently provided. Reflecting the methodology developed for the *2019 State Highway Needs Assessment*, it is assumed that vehicle

^{xiv} Correspondence with NDOT Transit Staff, January 7, 2020. Data retrieved from National Transit Database.

^{xv} Correspondence with NDOT Transit Staff, January 7, 2020. Data retrieved from National Transit Database.

replacements will continue at the current rate along with the improvement or rehabilitation to existing transit facilities.

5.1.4 Standards

The current performance standard for rural transit is to maintain existing levels of service throughout the state. This standard is loosely defined as continuing to provide operating support and vehicle replacement (as needed) to rural providers across Nebraska.¹³³ Ongoing NDOT feasibility studies and planning projects are working to enhance transit in local communities throughout Nebraska, though no single statewide plan exists. As shown in **Table 5-2**, rural transit modernization needs were assessed based on budget projections.

Table 5-2: Standards for Rural Transit Modernization

Standard	Source	Appropriate for Needs Validation?
Needs are based on projected budgets	NDOT Local Assistance Division (<i>2019 State Highway Needs Assessment</i>)	Yes. The needs assessment approach does not derive from regulation or statute.

5.1.5 Results

Total needs for rural transit modernization and operation are approximately **\$249.60 million**. Rural providers in Nebraska are expected to spend approximately \$8.20 million each year in operating costs. Capital improvements related to vehicle replacements and improvements to facilities total approximately \$2.10 million. Annual technology needs are approximately \$200,000. Annual subsidies to rideshare programs are approximately \$480,000. **Table 5-3** summarizes rural transit needs.

Table 5-3: Rural Transit Needs Summary

Topic	Amount (Millions)
Operating	\$164.00
Vehicle Replacement	\$30.00
Capital Construction	\$12.00
Consultant Services	\$30.00
Technology	\$4.00
Rideshare Programs	\$9.60
Subtotal	\$249.60

5.2 Urban Transit

5.2.1 Introduction

Urban area transit agencies in Nebraska transport around 90 percent of transit riders in the state, with rural transit agencies transporting around eight percent of them. Sponsored trips move the remaining transit riders. For sponsored trips, transit agencies coordinate with local organizations for specific trip requests under contract and financially supported by a designated program.¹³⁴

Three urban transit systems currently operate in Nebraska. Omaha's Metro and Lincoln's StarTran operate fixed-route transit services while also providing paratransit per the Americans with Disabilities Act (ADA). Grand Island operates Central Ride Agency of Nebraska (CRANE) Transit, a demand-response transit service. The annual program for these transit providers is included within the existing transportation improvement programs (TIP) and metropolitan transportation plans (MTP) for each jurisdiction.

Metro will begin operation of Nebraska's first bus rapid transit (BRT) system in fall 2020. Metro and StarTran are both seeking to expand BRT service in the future, though funding has not been identified for these projects. The 2017 feasibility study¹³⁵ for the Grand Island transit system suggested options to enhance the transit service within Grand Island from demand-response to a flexible-route system.

5.2.2 Data Sources

Metro's budget and the budgets for Lincoln and Grand Island are the primary source of information for urban transit expenditures in the state. Omaha's Metro transit is a political subdivision of the State of Nebraska, governed by a board of directors appointed by the mayor of Omaha. Metro's annual budget is provided to the Douglas County clerk annually and is posted on its website. StarTran and CRANE both function as departments of the city in which they are located. Budgets for StarTran and CRANE are therefore contained within the municipal budgets of Lincoln and Grand Island respectively.

The TIP for the Lincoln Metropolitan Planning Areas (MPA) was also examined to estimate urban transit needs. MPOs develop fiscally constrained four-year TIPs that identify the source and use of federal aid and regionally significant transportation projects.

Transit development plans (TDP) are short-range plans that identify service gaps and needs, and outline opportunities to improve service through additional frequency, coverage or enhanced efficiency. StarTran and Metro both developed short term improvement plans within the last 10 years.

Table 5-4 lists the data sources for urban transit needs.

Table 5-4: Data Sources for Urban Transit

Name	Publishing Organization	Publication Year
Operating Budget ^{xvi}	City of Lincoln, NE	2018
2019-2020 City of Omaha Transit Authority-Budget ^{xvii}	Metro Transit	2019
Adopted Budget Book 2019-2020 ^{xviii}	City of Grand Island, NE	2019
FY2020 Transportation Improvement Program ^{xix}	MAPA	2019
TIP FY 2020-2023 ^{xx}	Lincoln MPO	2019
Draft FY 2020-2024 TIP ^{xxi}	City of Grand Island, NE	2019
Lincoln Transit Development Plan ^{xxii}	City of Lincoln, NE	2016
Heartland Connections Regional Transit Vision Feasibility Analysis ^{xxiii}	MAPA	2013

5.2.3 Methodology

An annual budget for urban transit was developed from information contained in the most recent capital improvement programs (CIP), TIPs, and TDPs. As with the rural transit providers in the state, it is assumed that the urban transit providers will provide existing transit service to the level of funding availability.

5.2.4 Standards

It is assumed that the urban transit systems within Nebraska will not expand greatly over the life of this project. That said, initiatives from the Omaha Chamber of Commerce are seeking a transformative change for transportation in Omaha. A key strategy of this initiative is to increase

^{xvi} <https://www.lincoln.ne.gov/city/finance/budget/budget20.htm>

^{xvii} <https://www.douglascountyclerk.org/2013-2019-approved-budgets-for-all-douglas-county-political-subdivisions?id=131>

^{xviii} <https://www.grand-island.com/departments/finance/budgets/2020-budget>

^{xix} <https://mapacog.org/projects/tip/>

^{xx} <https://lincoln.ne.gov/city/plan/mpo/tip/tip.htm>

^{xxi} <https://www.grand-island.com/departments/public-works/metropolitan-planning-organization/transportation-improvement-program>

^{xxii} <https://www.lincoln.ne.gov/city/ltu/startran/tdp/>

^{xxiii} https://mapacog.org/wp-content/uploads/2015/11/RTV_FinalReport-2013-Low-Res.pdf

funding for the Metro transit system to provide more frequent and robust service options.¹³⁶

Needs were identified based upon what is committed within the existing programmatic documents rather than being derived from costs to achieve a given level of transit coverage or performance. Urban transit is not appropriate for needs validation because it is not included in the *2019 State Highway Needs Assessment*.

5.2.5 Results

Nebraska's 20-year urban transit needs are **\$1.17 billion**. Table 5-5 summarizes urban transit needs by provider.

Table 5-5: Urban Transit Needs Summary

Provider	Amount (Billions)
Metro	\$0.66
StarTran	\$0.31
CRANE	\$0.02
Subtotal	\$1.17

5.3 Bicycle and Pedestrian Transportation

5.3.1 Introduction

In Nebraska, bicycles are largely treated as motor vehicles and are expected to operate within the street while abiding by the same traffic laws as automobiles.¹³⁷ Some regions contain bike lanes and shared use lanes on bike routes for use by bicyclists. Pedestrian sidewalk construction and maintenance are generally the responsibility of adjacent property owners (with some exceptions such as the City of Lincoln), and code enforcement can be challenging for local communities.¹³⁸ Networks of trails for non-motorized transportation also allow pedestrians and bicyclists to travel for transportation and recreational purposes.

This section presents the needs associated with bicycle and pedestrian transportation. The needs are derived from existing municipal and MPO plans, as described in the following subsections.

5.3.2 Data Sources

Table 5-6 shows the primary data sources for bicycle and pedestrian needs. Nebraska's cities and counties are required to develop certain planning documents to facilitate the programming of future projects and communicate priorities to the public. The most common of these documents is the One-and-Six Year Plan. However, as of 2019, One-and-Six Year Plans are no longer required to be submitted.¹³⁹ These programs provide communities with a vision for future investments. Typically, the first year of the plan is determined to be 'committed,' with the subsequent years being more flexible. One-and-Six Year Plans for cities of the first class were reviewed to identify non-highway projects.

The cities of Omaha and Lincoln maintain CIPs, which list projects and priorities for community investment more consistently than One-and-Six Year Plans. CIPs can vary in the time period that is covered but are more constrained and reliable regarding the timing of and commitment to future projects.

Governments, planning organizations, and advocacy groups have developed active transportation plans to guide related investment. Common active transportation plans include bicycle and pedestrian plans, feasibility studies, and downtown improvement plans. These documents usually contain planning-level estimates of future transportation improvements without being directly linked to budget documents or programs such as a One-and-Six Year Plan, TIP, or the statewide transportation improvement program (STIP), although MPO TIPS also informed the needs assessment.

Table 5-6: Data Sources Bicycle and Pedestrian Transportation

Name	Publishing Organization	Publication Year
Lincoln MPO TIP - Pedestrian, Bike & Trails ^{xxiv}	City of Lincoln, NE	2019
Omaha Capital Improvement Program ^{xxv}	City of Omaha, NE	2019
Adopted Budget Book 2019-2020 ^{xxvi}	City of Grand Island, NE	2019
FY 2020 Transportation Improvement Program ^{xxvii}	MAPA	2019
Draft FY 2020-2024 TIP ^{xxviii}	City of Grand Island, NE	2019
Capital Improvement Update	City of Kearney, NE	2019
Capital Improvement Program	City of Norfolk, NE	2017
Summary of 2018 One-and-Six Year Plan	City of Scottsbluff, NE	2018
2021-2026 One-and-Six Year Street Improvement Plan	City of Hastings	2020
Regional Bike/Ped Plan	MAPA	2015
Lincoln Bike Plan	City of Lincoln, NE	2019
Grand Island Bike/Ped Master Plan	City of Grand Island, NE	2018
Bike Master Plan	City of Hastings	2016

5.3.3 Methodology

Active transportation plans were not used as a source to be consistent among the various modes included in the *2019 State Highway Needs Assessment*. Specifically, NDOT identifies needs in the *2019 State Highway Needs Assessment* for only what can be completed within existing and/or reasonably available revenue streams. Therefore, the analysis involved the collection of needs ^{xxix}from existing public programming and budget documents. Project information gleaned from the existing programs were

^{xxiv} <https://lincoln.ne.gov/city/plan/mpo/tip/tip20/ped.pdf>.

^{xxv} https://planning.cityofomaha.org/images/stories/CIP/2020-2025-CIP_FINAL_8.27.19_forWeb.pdf.

^{xxvi} <https://www.grand-island.com/departments/finance/budgets/2020-budget>.

^{xxvii} <https://mapacog.org/projects/tip/>.

^{xxviii} <https://www.grand-island.com/departments/public-works/metropolitan-planning-organization/transportation-improvement-program>.

consolidated and developed into an annual average need for statewide investment.

5.3.4 Standards

Instead of use of a performance measure for bicycle and pedestrian transportation, needs were derived from fiscally constrained project expenses. This approach was used instead of costs associated with achievement of a given performance target. Bicycle and pedestrian transportation is not appropriate for needs validation because it is not included in the *2019 State Highway Needs Assessment*.

5.3.5 Results

The annual need for bicycle and pedestrian funding to support enhancements within Nebraska is approximately \$10.4 million, which equates to **\$207.83 million** between 2021 and 2040. **Table 5-7** summarizes statewide bicycle and pedestrian needs.

Table 5-7: Bicycle and Pedestrian Needs

Topic	Amount (Millions)
Bicycle/Pedestrian Needs	\$207.83

5.4 Aviation

5.4.1 Introduction

This section summarizes Nebraska's 20-year aviation needs as derived from the *2019 Nebraska Airport Capital Improvement Plan (ACIP)*.¹⁴⁰ Seventy-seven (77) of the 80 Nebraska public-use airports are eligible for state grants and loans from the NDOT Aeronautics Division. State grants are allocated with two scopes: state-only grants and matching grants for federal projects. The State Grant Program allows federal projects over \$500,000 to apply for a two percent matching state grant. The three airports which are not eligible are the state-owned airports: Fairmont, Harvard, and Scribner State Airfields.¹⁴¹ Most but not all of these facilities (70) are also eligible to receive federal funding through the Airport Improvement Program (AIP) grants from the Federal Aviation Administration.¹⁴² The AIP provides grants to public agencies for planning and the development of public-use airports for projects related to airport safety, capacity, security, and environmental concerns.¹⁴³

5.4.2 Data Sources

The ACIP lists airport projects for the next 20 years that will improve the Nebraska airport system, such as runway and taxiway construction, associated easements, hangar rehabilitation and construction, land acquisition, purchase of snow removal equipment, crack and joint sealing, construction of access roads and parking, updating airport layout plans, and lighting upgrades, among others.¹⁴⁴ The ACIP includes only eligible requests that can be supported by expected available funds. However, an appendix to the ACIP lists unfunded projects for each airport. The ACIP and its appendices provided all data to calculate aviation needs, as summarized in **Table 5-8**.

Table 5-8: Data Sources for Aviation

Name	Publishing Organization	Publication Year
Nebraska Airport Capital Improvement Plan, Fiscal Years 2019-2038 ^{xxx}	NDOT Aeronautics Division	2019

5.4.3 Methodology

To calculate aviation project needs, the programmed and unfunded projects listed in the ACIP were identified and summed into several programmed or unfunded categories. Costs were summed without any adjustment for the time period or inflation; while the ACIP represents slightly different years

^{xxx} <https://dot.nebraska.gov/media/13399/cip-report-19.pdf>

(2019-2038) than the Nebraska Statewide Plan, both documents assess a 20-year period. Additionally, ACIP project costs are in constant 2019 dollars,¹⁴⁵ similarly to the other components of this needs assessment.

5.4.4 Standards

Aviation needs are consistent with the projects documented in the ACIP. Aviation is not appropriate for needs validation because it is not included in the *2019 State Highway Needs Assessment*.

5.4.5 Results

Nebraska's 80 public-use airports have combined 20-year needs of **\$576.51 million**, of which \$497.21 million is programmed through the ACIP. An additional \$79.30 million is recorded as unfunded projects, which reflects Nebraska's unmet aviation need. Most of the expected funded projects will be supported through federal aid (\$424.78 million) with significant local match (\$70.30 million). Only a small portion will come from the state funds (\$2.13 million). **Table 5-9** summarizes the 20-year aviation needs.

Table 5-9: Aviation Needs

Category	Amount (Millions)
Programmed federal need	\$424.78
Programmed state need	\$2.13
Programmed local need	\$70.30
Programmed subtotal	\$497.21
Unmet need subtotal	\$79.30
Subtotal	\$576.51

5.5 Rail

5.5.1 Introduction

Freight rail is an economical long-distance transportation mode for bulk carload shipping and for intermodal container transportation, and it has a particularly large role supporting agriculture and manufacturing in Nebraska, among other industries.¹⁴⁶ The *Nebraska State Freight Plan* documents 15 companies that own or have rights to rail in Nebraska. While most of Nebraska's rail activity involves freight, Amtrak's California Zephyr uses track owned by freight railroads to serve five Nebraskan cities.^{147 148}

The primary rail-related needs identified by NDOT for the purposes of the *2019 State Highway Needs Assessment* are at-grade rail crossing improvements and grade separations. At-grade crossing improvements include lighting upgrades, gates at crossings, and constant warning circuitry. At-grade rail crossing needs are additionally only identified for existing crossings with passive controls (i.e., crossbuck signs without lights). Typically, NDOT works with railroads owning the trackage at the crossing to complete the improvements.¹⁴⁹

5.5.2 Data Sources

Data sources that inform the needs assessment for freight rail include the Railroad Inventory Management (RIM) tool, which provides the Federal Railroad Administration's (FRA) train counts. Additionally, NDOT utilizes traffic counts from the NDOT Traffic Engineering Division to determine ADT at crossing locations.¹⁵⁰

5.5.3 Methodology

The methodology for determining the rail needs consist of two key steps: 1) identifying locations for at-grade crossing improvements or grade crossings, 2) assigning costs per locations. The process of identifying locations where at-grade crossing or grade separations are needed is based on traffic exposure rates at the crossing location. The two levels of traffic exposure used for identifying locations are shown in **Table 5-10**. Traffic exposure is determined by the number of vehicles crossing the location per day multiplied by the daily train count, shown in **Equation 1**.

Table 5-10: Exposure Factor Thresholds

Improvement Type	Exposure Factor Threshold
At-grade crossing	3,000
Grade separation	75,000

Equation 1) $AADT \times AADTT = Exposure\ Factor$

Where,

- *AADT* is Average Annual Daily Traffic (vehicles)
- *AADTT* is Average Annual Daily Train Traffic (trains)

The exposure factor for rail crossings utilizes the most current available data for AADT and train counts. The exposure factor is not forecasted into the future. Instead, new locations are reviewed each year as part of NDOT’s annual needs assessment. In 2019 there were eight at-grade crossings on the State Highway System that exceeded the exposure factor threshold and were identified for enhancements, while 22 locations on the State Highway System have been identified for grade separations.

After identifying locations that exceed the exposure factor thresholds, unit costs are applied to the crossing locations. For at-grade crossing improvements, the unit cost of \$450,000 is used. The unit cost for at-grade improvements include labor, materials, and engineering for active warning devices including lights, gates, and constant warning circuitry. The unit cost for grade separations is based on preliminary engineering estimates that factor in attributes of the crossing location. The current cost range for grade separations is between \$6.00 million and \$15.00 million, as shown in **Table 5-11**.

Table 5-11: Estimated Unit Cost by Rail Crossing Improvement Type

Improvement Type	Estimated Cost (Millions)
At-grade active controls	\$0.45
Grade separation	\$6.00-\$15.00

5.5.4 Standards

The thresholds for exposure rates used to select locations where improvements are needed are identified in the Nebraska Rules and Regulations. Title 415 of the Rules and Regulations cover the regulations for transportation (under “Department of Roads”). Chapter 5 provides the guidance for the administration of State and Federal Highway-Rail Grade Crossing Safety Projects. Under this chapter, the threshold for at-grade crossings is established at an exposure rate of 3,000 (Title 415, Ch. 5, Paragraph 003.03C). NDOT has established the threshold for grade separation higher than the Rules and Regulations specify. The Rules and Regulations identify the threshold as an exposure rate of 50,000 (Title 415, Ch. 5, Paragraph 004.004A). **Table 5-12** shows these standards.

Table 5-12: Standards for Rail

Standard	Source	Appropriate for Needs Validation?
Exposure rate above 3,000 for at-grade crossings	Title 415, Nebraska Administrative Code, Chapter 5. 003.03 ¹⁵¹	Yes. Although the standard originates in regulation, the standard is written in such a way as to rely on NDOT's judgment in its implementation. It also includes two other standards, saying that a crossing may be excluded from consideration for active warning devices if "the crossing is a sidetrack and is hand flagged by the railroad" or "there are two trains per day or fewer at the crossing."
Exposure rate above 50,000 for grade separations	Title 415, Nebraska Administrative Code, Chapter 5. 00.04A ¹⁵²	Yes. Although the standard originates in regulation, the standard is written in such a way as to rely on NDOT's judgment in its implementation. Specifically, it says that "a minimum exposure factor of 50,000 for a single crossing shall be required for identification as a potential [grade separation] location," although the standard can be waived for certain justifications.

5.5.5 Results

Based on the locations identified for the *2019 State Highway Needs Assessment*, NDOT has eight at-grade crossings to improve and 22 grade separation projects that meet the thresholds and have had costs applied for the 20-year needs. At-grade crossings are considered within the rail crossing and rural transit modernization category for the *2019 State Highway Needs Assessment*. The 20-year need for at-grade crossings is \$3.60 million. Grade separations are classified under capital improvements in the Annual Needs Assessment. In 2019, the 20-year need for grade separations are \$235.40 million, resulting in total rail needs of **\$239.00 million**. **Table 5-13** shows needs identified for rail crossing improvements.

Table 5-13: Rail Needs

Category	Amount (Millions)
At-grade crossings	\$3.60
Grade separations	\$235.40
Subtotal	\$239.00

5.6 Intercity Bus

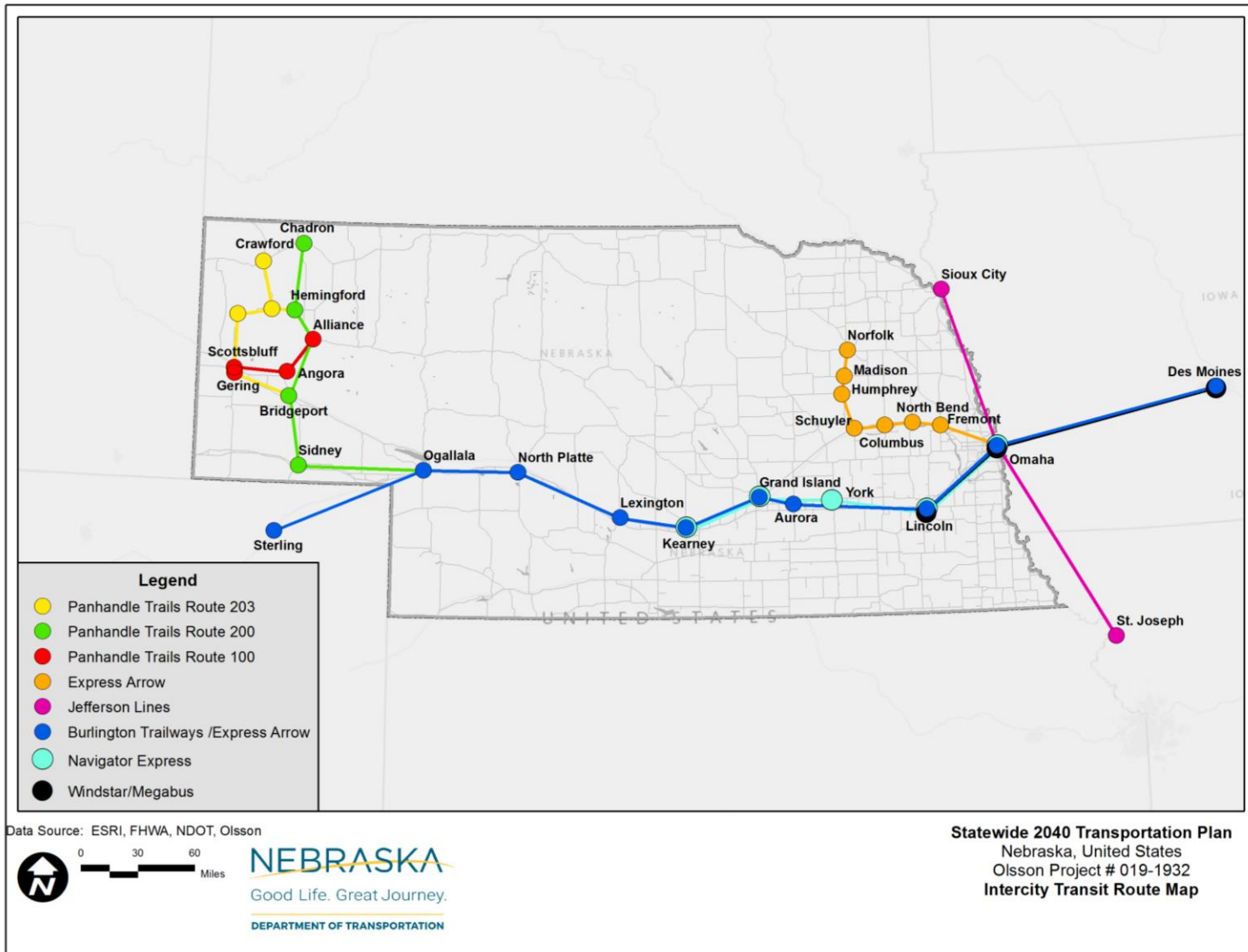
5.6.1 Introduction

As stated in the 2014 *Assessment of Intercity Bus Services in Nebraska*, intercity bus service is defined as regularly scheduled bus service for the general public that operates with limited stops over fixed routes connecting two or more urban areas not in close proximity. According to this definition, intercity bus service must have the capacity for transporting baggage carried by passengers and must make meaningful connections with scheduled intercity bus service to more distance points if such service is available. In rural states like Nebraska, intercity bus service is most often used to connect rural areas with larger urbanized areas.¹⁵³

Private companies provide intercity bus service on the following routes in Nebraska, which is also shown in **Figure 5-2**.

- Burlington Trailways
 - Denver, CO - Omaha
 - Omaha - Chicago, IL
- Express Arrow
 - Denver, CO to Omaha
 - Omaha - Norfolk
- Jefferson Lines
 - Sioux City, IA - Omaha
 - Omaha - St. Joseph, MO
- Navigator Express
 - Kearney - Omaha
- Panhandle Trails
 - Crawford - Bridgeport
 - Chadron - Ogallala
 - Alliance - Gering
- Windstar/Megabus
 - Lincoln - Chicago, IL

Figure 5-2: Nebraska Intercity Bus Routes



Source: Olsson, NDOT Lincoln/Omaha Intercity Feasibility Study, 2020

NDOT is currently conducting two implementation studies for additional intercity bus service. The first study examines intercity routes and service concepts between Lincoln and Omaha. The second study evaluates service options connecting Grand Island, Hastings and Kearney.

5.6.2 Data Sources

Intercity bus service is included in the *2019 State Highway Needs Assessment*. Additionally, as a part of the ongoing NDOT Mobility Management project,¹⁵⁴ intercity bus has been examined on the statewide level (in 2014) and for specific routes (ongoing efforts for Lincoln-Omaha and Grand Island-Hastings-Kearney).

Table 5-14: Data Sources for Intercity Bus Needs

Name	Publishing Organization	Publication Year
<i>2019 State Highway Needs Assessment</i>	NDOT	2019
Nebraska Intercity Bus Assessment ¹⁵⁵	NDOT	2014
Lincoln-Omaha Intercity Bus Feasibility Study (under development)	NDOT	2020
Grand Island-Hastings-Kearney (under development)	NDOT	2020

5.6.3 Methodology

2019 State Highway Needs Assessment provides the basis for intercity bus needs. As other studies that are currently under development are finalized and published, it may allow for the precision of the estimate associated with intercity bus needs to be improved.

Intercity bus needs in the *2019 State Highway Needs Assessment* are part of the Rail Crossing and Rural Transit Modernization line item. The figures contained within this section of the technical memorandum include ongoing support for intercity bus operational assistance and a new intercity bus line item to support expanded intercity bus service between Lincoln and Omaha.¹⁵⁶

5.6.4 Standards

Intercity bus needs identified within this section are based upon the information provided with the *2019 State Highway Needs Assessment* but should be informed and updated pending the finalization of the two ongoing intercity bus feasibility projects. **Table 5-15** explains how intercity bus needs have been identified.

Table 5-15: Standards for Intercity Bus

Standard	Source	Appropriate for Needs Validation?
Needs are based on projected budgets as identified within the annual needs assessment.	NDOT Local Assistance Division	Yes. The needs assessment approach does not derive from regulation or statute. Additional information will be available pending the completion of two ongoing projects.

5.6.5 Results

Using the baseline figures identified within the *2019 State Highway Needs Assessment*, intercity bus needs within Nebraska are estimated to be approximately \$2.70 million annually and approximately **\$54.00 million** for the duration of this statewide transportation plan. These costs include \$1.50 million annually for operating assistance and \$1.20 million annually for the 'intercity bus' line item in the needs assessment, which would include other capital and operational expenses. Program cost to support the intercity bus services are shown in **Table 5-16**. It is anticipated that these figures will be informed by ongoing projects as they are completed.

Table 5-16: Intercity Bus Needs

Topic	Amount (Millions)
Operating Assistance	\$30.00
Intercity Bus Line Item	\$24.00
Subtotal	\$54.00

5.7 Ports and Waterways

5.7.1 Introduction

The Missouri River, along Nebraska's eastern border, is the only navigable waterway for freight serving the state. Freight suitable for river transportation is not time-sensitive, and is generally bulky or heavy. Typical goods moved on river barges include bulk grain, aggregate, or fertilizer. Nebraska has 18 active ports along the Missouri River, but flooding in recent years has impacted river freight.^{xxxii}

5.7.2 Data Sources

Table 5-17 lists the data and documents that were reviewed for the needs analysis, including the Freight Analysis Framework version 4, which was reviewed for the *Nebraska State Freight Plan*.

Table 5-17: Data and Documents Reviewed for Ports and Waterways

Name	Publishing Organization	Publication Year
<i>Nebraska State Freight Plan</i> ^{xxxii}	NDOT	2017, Updated 2019
Development of the Nebraska Supply Chain Optimization Model (NESCOM)	NDOT	2019
Freight Analysis Framework (Version 4) ^{xxxiii}	FHWA	2015
2040 Long Range Transportation Plan ^{xxxiv}	MAPA	2019
Siouxland Regional Transportation Planning Association (SRTPA) 2045 Long Range Transportation Plan ^{xxxv}	Siouxland Interstate Metropolitan Planning Council (SIMPCO)	2014

5.7.3 Methodology

The *Nebraska State Freight Plan* examined the future needs for waterways in Nebraska. Based on the FHWA's Freight Analysis Framework data, river freight volume is expected to decline from 22,700 tons in 2015 to 12,900 tons in 2045. Needs are described qualitatively rather than quantitatively in the

^{xxxii} NDOT. (2020). *2040 Statewide Transportation Plan: Task 3 Technical Memorandum, Existing Conditions*.

^{xxxiii} <https://dot.nebraska.gov/media/10761/nebraska-freight-plan.pdf>

^{xxxiv} https://ops.fhwa.dot.gov/freight/freight_analysis/faf/

^{xxxv} <http://mapacog.org/projects/lrtp/>

^{xxxv} <https://simpco.org/divisions/transportation-planning/long-range-transportation-plans-lrtp/>

Nebraska State Freight Plan. Additionally, long-range transportation plans for the two Nebraska MPOs along the Missouri River were reviewed for projects related to port or waterway improvements. Neither MPO along the Missouri River included port or waterway projects, but did both include water freight as a component of the long-range transportation plan.^{157 158}

5.7.4 Supply Chain Optimization Study

NDOT examined the potential of utilizing transload operations to support bulk goods movement including grain, sand and gravel, fertilizer, and scrap in the *Development of the Nebraska Supply Chain Optimization Model (NESCOM)*.¹⁵⁹ The study developed a scenario where materials were hauled from central Nebraska by rail to either Omaha or Kansas City where it would be transferred to barges and shipped to New Orleans. In the scenario, the annual savings from the Omaha facility was approximately \$42.7 million dollars, while the Kansas City facility saved nearly \$40.5 million. The study notes that there is currently no facility in Omaha to support these transload operations, but if shipping costs were successfully reduced through shipping to the existing facility in Kansas City, then it may be feasible to develop a facility in Omaha to support operations in Nebraska.

5.7.5 Results

Qualitative needs for ports and waterways are identified in the *Nebraska State Freight Plan* based on stakeholder engagement. These notably include a need to maintain waterway access and connectivity. Additionally, with the flooding in recent years, there may be a need for NDOT to coordinate with the U.S. Army Corps of Engineers on waterway maintenance and port access.

An aerial photograph of a rural landscape. A paved road runs diagonally from the bottom center towards the horizon. The fields on either side are golden-brown, suggesting late autumn or winter. In the distance, there are some buildings and a small cluster of trees. The sky is a deep blue with scattered white clouds. A large, semi-transparent blue circle is overlaid on the left side of the image, containing the text.

6 Summary of Findings

6 Summary of Findings

The transportation needs for Nebraska between 2021 and 2040 total **\$28.86 billion**, which is an average of \$1.44 billion per year. **Table 6-1** summarizes the categories, modes, and assets that together form this transportation need. Forty-seven percent of this need is associated with either the State Highway System (41%) or ancillary assets to the State Highway System (5%). The largest component of the needs is associated with the non-state system, both roads and bridges. This makes up 45 percent of Nebraska's transportation needs, and the sheer number of bridges and especially miles of road contribute to its size. Finally, non-highway needs compose the remaining eight percent of Nebraska's needs. **Table 6-1** lists the needs.

Table 6-1: Nebraska Multimodal Transportation Needs

Category	Modes / Assets	Amount
State Highway System	Pavement preservation	\$6,914,760,000
	Roadway modernization	\$871,360,000
	Roadway and bridge capital improvements	\$3,200,302,000
	Bridge preservation	\$719,460,000
	Bridge modernization	\$209,030,000
	Subtotal	\$11,914,912,000
Ancillary Highway Assets	Roadway maintenance	\$1,394,467,931
	Rest areas	\$8,770,000
	Weigh stations	\$10,720,000
	Intelligent transportation systems (ITS)	\$107,750,000
	Subtotal	\$1,521,707,931
Non-State Roads and Bridges	Local road preservation	\$11,980,590,000
	Off-system bridge preservation	\$1,033,920,340
	Subtotal	\$13,014,510,340
Non-Highway Needs	Rural transit modernization	\$249,600,000
	Urban transit	\$1,165,249,000
	Bike and pedestrian transportation	\$207,830,000
	Aviation	\$576,510,000
	Freight rail	\$239,000,000
	Intercity bus	\$54,000,000
	Ports and waterways	\$0.00
	Subtotal	\$2,492,189,000
TOTAL	\$28,943,319,271	

An aerial photograph of a rural landscape. A paved road runs diagonally from the bottom center towards the horizon. The fields on either side are golden-brown, suggesting late autumn or early winter. In the distance, there are some buildings and a small cluster of trees. The sky is a deep blue with scattered white clouds. A large, semi-transparent blue circle is overlaid on the left side of the image, containing the text "7 References".

7 References

7 References

- ¹ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ² NDOT (2019). Transportation Asset Management Plan. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ³ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁴ NDOT (2019). Transportation Asset Management Plan. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ⁵ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁶ NDOT (2019). Transportation Asset Management Plan. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ⁷ NDOT (2019). Transportation Asset Management Plan. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ⁸ Email from NDOT Roadway Asset Management Engineer. April 6, 2020.
- ⁹ Interview with NDOT Roadway Asset Management Engineer on December 9, 2019.
- ¹⁰ NDOT (2019). Transportation Asset Management Plan. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ¹¹ Email from NDOT Roadway Asset Management Engineer. April 6, 2020.
- ¹² Interview with NDOT Roadway Asset Management Engineer on February 14, 2020.
- ¹³ NDOT (2019). Transportation Asset Management Plan. Page 3. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ¹⁴ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ¹⁵ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ¹⁶ Interview with NDOT Roadway Asset Management Engineer. February 14, 2020.
- ¹⁷ "2019 (TO DO) NEEDS summary and documentation.xlsx"
- ¹⁸ Email from NDOT Roadway Asset Management Engineer. December 20, 2019.
- ¹⁹ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ²⁰ Interview with NDOT Roadway Asset Management Engineer. February 14, 2020.
- ²¹ "Mar 2019 Expanded Interstate Rebuild Plan.xlsx." Provided by NDOT on February 14, 2020.
- ²² Board of Public Roads Classifications and Standards. Nebraska Administrative Code. Title 428. Updated May 17, 2016. Retrieved from <https://dot.nebraska.gov/media/5593/nac-428-rules-regs-nbcs.pdf>.
- ²³ Board of Public Roads Classifications and Standards. Nebraska Administrative Code. Title 428. Updated May 17, 2016. Retrieved from <https://dot.nebraska.gov/media/5593/nac-428-rules-regs-nbcs.pdf>.
- ²⁴ Nebraska Revised Statute 16-101. Retrieved from <https://www.nebraskalegislature.gov/laws/statutes.php?statute=16-101>.
- ²⁵ Nebraska Revised Statute 16-102. <https://www.nebraskalegislature.gov/laws/statutes.php?statute=16-102>

- ²⁶ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ²⁷ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ²⁸ Email from NDOT Traffic Engineering Division. March 27, 2020.
- ²⁹ Board of Public Roads Classifications and Standards (2016). Nebraska Administrative Code Title 428. Updated May 17, 2016. <https://dot.nebraska.gov/media/5593/nac-428-rules-regs-nbcs.pdf>.
- ³⁰ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ³¹ NDOT (n.d.). About the Build Nebraska Act. Accessed February 12, 2020. Retrieved from <https://dot.nebraska.gov/projects/bna/>.
- ³² NDOT (n.d.). About the Transportation Innovation Act. Accessed February 12, 2020. Retrieved from <https://dot.nebraska.gov/projects/tia/>.
- ³³ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ³⁴ Federal Highway Administration (FHWA), NDOT, and MAPA (2015). MTIS Phase 1 Executive Summary. Retrieved from <https://mapacog.org/reports/mtis-phase-1-executive-summary/>.
- ³⁵ NDOT (2019). List of MAPA region preservation and capital improvement projects on interstate highways and freeways.
- ³⁶ NDOT (n.d.). Capital Improvements. Retrieved from <https://dot.nebraska.gov/projects/tia/cap-improve/>.
- ³⁷ Interview with NDOT Roadway Design Engineer, March 24, 2020.
- ³⁸ Email from NDOT Bridge Division, March 6, 2020.
- ³⁹ "2019 (TO DO) NEEDS summary and documentation.xlsx." Provided by NDOT Asset Management Engineer on January 24, 2020.
- ⁴⁰ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁴¹ Email from NDOT Bridge Division, March 6, 2020.
- ⁴² FHWA, NDOT, and MAPA (2019). Metro Area Travel Improvement Study. Phase 3 - Freeway System Vision and Implementation Plan. Page 22. Retrieved from http://mapacog.org/wp-content/uploads/2019/12/MTIS_Phase_3_Final_190926.pdf.
- ⁴³ "2019 (TO DO) NEEDS summary and documentation.xlsx."
- ⁴⁴ NDOT (n.d.). New BNA/TIA Projects. Retrieved from <https://dot.nebraska.gov/media/5802/new-bna-tia-projects-map-list.pdf>.
- ⁴⁵ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁴⁶ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁴⁷ Interview with NDOT Roadway Design Engineer, March 24, 2020.
- ⁴⁸ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁴⁹ Interview with NDOT Roadway Design Division on February 24, 2020.
- ⁵⁰ Interview with NDOT Roadway Design Engineer, March 24, 2020.
- ⁵¹ Nebraska Department of Roads (2005). Nebraska Interstate 76, 80, 180, 129, 480 and 680
- ⁵² "2014 Needs Report Methodology.docx." Provided by NDOT Bridge Division.
- ⁵³ Nebraska Administrative Code. Title 428. Rules and Regulations of the Board of Public Roads Classifications and Standards. Chapter 2 - Procedures for Standards. Updated May 17, 2016. Retrieved from <https://dot.nebraska.gov/media/5652/d-procedures-for-classifications-standards-includes-minimum-design-standards.pdf>.

- ⁵⁴ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁵⁵ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁵⁶ Nebraska Administrative Code. Title 428. Rules and Regulations of the Board of Public Roads Classifications and Standards. Chapter 2 - Procedures for Standards. Updated May 17, 2016. Retrieved from <https://dot.nebraska.gov/media/5652/d-procedures-for-classifications-standards-includes-minimum-design-standards.pdf>.
- ⁵⁷ Email from NDOT Bridge Division, March 6, 2020.
- ⁵⁸ Email from NDOT Controller Division, February 6, 2020.
- ⁵⁹ FHWA, NDOT, and MAPA (2015). MTIS Phase 1 Final Report. Retrieved from <https://mapacog.org/reports/mtis-phase-1-final-report/>.
- ⁶⁰ FHWA, NDOT, and MAPA (2019). Metro Area Travel Improvement Study. Phase 3 Executive Summary. Retrieved from http://mapacog.org/wp-content/uploads/2019/12/MTIS_Executive_Summary_Phase_3_20191119.pdf.
- ⁶¹ Interview with NDOT Roadway Design Division, March 6, 2020.
- ⁶² Email from NDOT Roadway Asset Management Engineer. April 6, 2020.
- ⁶³ "2019 (TO DO) NEEDS summary and documentation.xlsx."
- ⁶⁴ Interview with NDOT Roadway Design Engineer, March 24, 2020.
- ⁶⁵ Nebraska Administrative Code. Title 428. Rules and Regulations of the Board of Public Roads Classifications and Standards. Chapter 2 - Procedures for Standards. Updated May 17, 2016. Retrieved from <https://dot.nebraska.gov/media/5652/d-procedures-for-classifications-standards-includes-minimum-design-standards.pdf>.
- ⁶⁶ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁶⁷ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁶⁸ Email from NDOT Bridge Division, March 6, 2020.
- ⁶⁹ NDOT (2019). Transportation Asset Management Plan. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ⁷⁰ NDOT (2018). "Modeling Future Bridge Needs: Predictive Allocation Levels and Strategies to Meet Performance Targets." Excerpted from a presentation at IHEEP in September 2018.
- ⁷¹ Interview with NDOT Bridge Division. February 4, 2020.
- ⁷² Interview with NDOT Bridge Division. February 4, 2020.
- ⁷³ Interview with NDOT Bridge Division. February 4, 2020.
- ⁷⁴ NDOT (2018). "Modeling Future Bridge Needs: Predictive Allocation Levels and Strategies to Meet Performance Targets." Excerpted from a presentation at IHEEP in September 2018.
- ⁷⁵ Board of Public Roads Classifications and Standards. (2016). Nebraska Administrative Code Title 428. Updated May 17, 2016. Retrieved from <https://dot.nebraska.gov/media/5652/d-procedures-for-classifications-standards-includes-minimum-design-standards.pdf>.
- ⁷⁶ Interview with NDOT Bridge Division. February 4, 2020.
- ⁷⁷ Presentation on Modeling Future Bridge Needs. Excerpted from a presentation at IHEEP in September 2018.
- ⁷⁸ Interview with NDOT Bridge Division on September 24, 2019.
- ⁷⁹ Interview with NDOT Bridge Division on September 24, 2019.
- ⁸⁰ Interview with NDOT Bridge Division. February 4, 2020.
- ⁸¹ NDOT (2019). Transportation Asset Management Plan. Page 31. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ⁸² 23 CFR § 490.409. Retrieved from <https://www.law.cornell.edu/cfr/text/23/490.409>.

- ⁸³ NDOT (2019). Transportation Asset Management Plan. Page 34. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ⁸⁴ NDOT (2019). Transportation Asset Management Plan. Page 34. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ⁸⁵ NDOT (2019). Transportation Asset Management Plan. Page 34. Retrieved from <https://dot.nebraska.gov/media/13303/ndot-tamp.pdf>.
- ⁸⁶ NDOT (2018). Annual Report. Retrieved from <https://dot.nebraska.gov/media/3493/annual-report.pdf>.
- ⁸⁷ Interview with NDOT Bridge Division. February 4, 2020.
- ⁸⁸ Interview with NDOT Bridge Division. February 4, 2020.
- ⁸⁹ Interview with NDOT Bridge Division. February 4, 2020.
- ⁹⁰ NDOT (2019). *2019 State Highway Needs Assessment*. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ⁹¹ Federal Highway Administration (1995). *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*. Report No. FHWA-PD-96-001. Item 36 - Traffic Safety Features. Retrieved from <https://www.fhwa.dot.gov/bridge/mtguide.pdf>.
- ⁹² Interview with NDOT Bridge Division. February 4, 2020.
- ⁹³ Interview with NDOT Bridge Division. February 4, 2020.
- ⁹⁴ Interview with NDOT Bridge Division. February 4, 2020.
- ⁹⁵ Interview with NDOT Bridge Division. February 4, 2020.
- ⁹⁶ Nebraska Administrative Code. Title 428. Rules and Regulations of the Board of Public Roads Classifications and Standards. Chapter 2 - Procedures for Standards. Updated May 17, 2016. Retrieved from <https://dot.nebraska.gov/media/5652/d-procedures-for-classifications-standards-includes-minimum-design-standards.pdf>.
- ⁹⁷ Federal Highway Administration (1995). *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*. Report No. FHWA-PD-96-001. Item 36 - Traffic Safety Features. Retrieved from <https://www.fhwa.dot.gov/bridge/mtguide.pdf>.
- ⁹⁸ Federal Highway Administration (1995). *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*. Report No. FHWA-PD-96-001. Item 36 - Traffic Safety Features. Retrieved from <https://www.fhwa.dot.gov/bridge/mtguide.pdf>.
- ⁹⁹ As described at the following source: Federal Highway Administration (1995). *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*. Report No. FHWA-PD-96-001. Item 36 - Traffic Safety Features. Retrieved from <https://www.fhwa.dot.gov/bridge/mtguide.pdf>.
- ¹⁰⁰ Email from NDOT Controller Division, March 4, 2020.
- ¹⁰¹ U.S. Bureau of Labor Statistics. CPI Inflation Calculator. Retrieved from https://www.bls.gov/data/inflation_calculator.htm.
- ¹⁰² NDOT (2015). Nebraska's Interstate 80 Rest Areas. Guidance Document. Retrieve from <https://dot.nebraska.gov/media/1216/rest-areas.pdf>.
- ¹⁰³ NDOT (2019). 2019 State Highway Needs Assessment. Retrieved from <https://dot.nebraska.gov/media/112883/2019-needs.pdf>.
- ¹⁰⁴ Interview with NDOT Roadway Asset Management Engineer on February 14, 2020.
- ¹⁰⁵ Interview with NDOT Roadway Asset Management Engineer on February 14, 2020.
- ¹⁰⁶ Email from NDOT Assistant Roadway Asset Management Engineer, March 9, 2020.
- ¹⁰⁷ Interview with NDOT Operations Division, February 14, 2020.
- ¹⁰⁸ Nebraska State Patrol, Carrier Enforcement (2020). Carrier Enforcement. Retrieved from <https://statepatrol.nebraska.gov/divisions/field-services/carrier-enforcement>.
- ¹⁰⁹ Nebraska State Patrol, Carrier Enforcement (2017). Nebraska Truck Information Guide. August 31, 2017. p13-14. Retrieved from

https://statepatrol.nebraska.gov/sites/default/files/2017-18_truck_guide_8.31.2017.pdf.

¹¹⁰ Interview with NDOT Operations Division, February 14, 2020.

¹¹¹ Email from NDOT Controller Division, March 4, 2020.

¹¹² Email from NDOT Highway Budget and Finance Manager, March 23, 2020.

¹¹³ Interview with NDOT Operations Division, February 14, 2020.

¹¹⁴ Email from NDOT TSMO Engineer, February 22, 2020.

¹¹⁵ Federal Highway Administration (2020). Organizing and Planning for Operations. Updated February 28, 2020. Retrieved from

<https://ops.fhwa.dot.gov/tsmo/index.htm>.

¹¹⁶ Federal Highway Administration (2020). Organizing and Planning for Operations. Updated February 28, 2020. Retrieved from

<https://ops.fhwa.dot.gov/tsmo/index.htm>.

¹¹⁷ Federal Highway Administration (2018). 2018 Highway Statistics. "Length by Ownership" [Table HM-10]/ Retrieved from

<https://www.fhwa.dot.gov/policyinformation/statistics/2018/hm10.cfm>.

¹¹⁸ Federal Highway Administration (2018). Bridge Condition by Owner. Tables of Frequently Requested NBI Information. Retrieved from

<https://www.fhwa.dot.gov/bridge/britab.cfm>.

¹¹⁹ Federal Highway Administration (2018). 2018 Highway Statistics. "Length by Ownership" [Table HM-10]. Retrieved from

<https://www.fhwa.dot.gov/policyinformation/statistics/2018/hm10.cfm>.

¹²⁰ Federal Highway Administration (2018). 2018 Highway Statistics. "Length by Ownership" [Table HM-10]. Retrieved from

<https://www.fhwa.dot.gov/policyinformation/statistics/2018/hm10.cfm>.

¹²¹ Federal Highway Administration (2018). Highway Statistics 2018. Public Road Length - 2018 - Miles by Ownership [Table HM-10]. Retrieved from

<https://www.fhwa.dot.gov/policyinformation/statistics/2018/hm10.cfm>.

¹²² Federal Highway Administration (2017). "National Performance Management Measures; Assessing Pavement Condition for the National Highway Performance Program and Bridge Condition for the National Highway Performance Program." Docket No. FHWA-2013-0053. Retrieved from

<https://www.govinfo.gov/content/pkg/FR-2017-01-18/pdf/2017-00550.pdf>.

¹²³ Federal Highway Administration (2010-2019). National Bridge Inventory. Retrieved from <https://www.fhwa.dot.gov/bridge/nbi/ascii.cfm>.

¹²⁴ Federal Highway Administration (2019). Bridge Replacement Unit Costs 2018. Updated June 5, 2019. Retrieved from

<https://www.fhwa.dot.gov/bridge/nbi/sd2018.cfm>.

¹²⁵ Federal Highway Administration (2019). National Bridge Inventory. Retrieved from <https://www.fhwa.dot.gov/bridge/nbi/ascii.cfm>.

¹²⁶ Federal Highway Administration (2018). National Bridge Inventory. Accessed February 3, 2020. Retrieved from <https://www.fhwa.dot.gov/bridge/nbi.cfm>.

¹²⁷ Federal Highway Administration (2019). Bridge Replacement Unit Costs 2018. Retrieved from <https://www.fhwa.dot.gov/bridge/nbi/sd2018.cfm>.

¹²⁸ Email from NDOT Assistant Bridge Engineer. April 17, 2020.

¹²⁹ Email from NDOT Assistant Bridge Engineer. April 17, 2020.

¹³⁰ Federal Highway Administration (2018). National Bridge Inventory. Accessed February 3, 2020. Retrieved from <https://www.fhwa.dot.gov/bridge/nbi.cfm>.

¹³¹ Data retrieved by NDOT Transit staff, January 7, 2020.

¹³² Correspondence with NDOT Transit Division. February 4, 2020.

¹³³ Correspondence with NDOT Transit Division. February 4, 2020.f

¹³⁴ Correspondence with NDOT Transit Staff, January 7, 2020. Data retrieved from National Transit Database.

- ¹³⁵ City of Grand Island and Grand Island Area Metropolitan Planning Organization (2017). *Regional Transit Needs Assessment and Feasibility Study*. Summary Final Report. Retrieved from <https://www.grand-island.com/home/showdocument?id=20092>.
- ¹³⁶ Omaha Chamber of Commerce. Connect Go: A Bold Transportation Direction. Retrieved from <https://www.omahachamber.org/connectgo/>.
- ¹³⁷ NDOT (2017). Nebraska Bicycle Guide. Retrieved from <https://dot.nebraska.gov/media/1268/bicycle-guide.pdf>.
- ¹³⁸ Nebraska Legislature. Nebraska Revised Statute 15-734. Retrieved from <https://nebraskalegislature.gov/laws/statutes.php?statute=15-734>.
- ¹³⁹ Legislature of Nebraska (2019) Legislative Bill 82. Retrieved from <https://nebraskalegislature.gov/FloorDocs/106/PDF/Intro/LB82.pdf>.
- ¹⁴⁰ NDOT Aeronautics Division (2019). Nebraska Airport Capital Improvement Plan, Fiscal Years 2019-2038. Effective date of April 2019. Retrieved from <https://dot.nebraska.gov/media/13399/cip-report-19.pdf>.
- ¹⁴¹ NDOT Aeronautics Division (2019). Nebraska Airport Capital Improvement Plan, Fiscal Years 2019-2038. Effective date of April 2019. Retrieved from <https://dot.nebraska.gov/media/13399/cip-report-19.pdf>.
- ¹⁴² NDOT Aeronautics Division (2019). Nebraska Airport Capital Improvement Plan, Fiscal Years 2019-2038. Effective date of April 2019. Retrieved from <https://dot.nebraska.gov/media/13399/cip-report-19.pdf>.
- ¹⁴³ Federal Aviation Administration (2017). AIP Overview. Retrieved from <https://www.faa.gov/airports/aip/overview/>.
- ¹⁴⁴ NDOT Aeronautics Division (2019). Nebraska Airport Capital Improvement Plan, Fiscal Years 2019-2038. Effective date of April 2019. Retrieved from <https://dot.nebraska.gov/media/13399/cip-report-19.pdf>.
- ¹⁴⁵ Federal Aviation Administration (2019). Formulation of the NPIAS and ACIP. Effective date of September 3, 2019. Retrieved from <https://www.faa.gov/documentLibrary/media/Order/Order-5090-5-NPIAS-ACIP.pdf>.
- ¹⁴⁶ NDOT (2017). *Nebraska State Freight Plan*. Revised December 2019. Retrieved from <https://dot.nebraska.gov/media/10761/nebraska-freight-plan.pdf>.
- ¹⁴⁷ Amtrak (2020). California Zephyr. Retrieved from <https://www.amtrak.com/routes/california-zephyr-train.html>.
- ¹⁴⁸ Nebraska Department of Roads (2007). Nebraska Railroads. Retrieved from <http://opportunity.nebraska.gov/files/businessdevelopment/winergy/NebraskaRailMap.pdf>.
- ¹⁴⁹ Interview with Local Assistant Division, February 20, 2020, February 20.
- ¹⁵⁰ Interview with Local Assistant Division, February 20, 2020, February 20.
- ¹⁵¹ Title 415, Nebraska Administrative Code, Chapter 5. Updated July 2019. Retrieved from https://www.nebraska.gov/rules-and-regs/regsearch/Rules/Transportation_Dept_of/Title-415/Chapter-5.pdf.
- ¹⁵² Title 415, Nebraska Administrative Code, Chapter 5. Updated July 2019. Retrieved from https://www.nebraska.gov/rules-and-regs/regsearch/Rules/Transportation_Dept_of/Title-415/Chapter-5.pdf.
- ¹⁵³ Nebraska Department of Roads (2014). *Assessment of Intercity Bus Services in Nebraska*. Retrieved from <https://dot.nebraska.gov/media/7029/intercity-bus-assessment-2014.pdf>.
- ¹⁵⁴ NDOT (2019). "Active Projects." Mobility Management. Retrieved from <https://nebraskatransit.com/index.php/mobility-management/mobility-management-active-projects/>.

¹⁵⁵ Nebraska Department of Roads (2014). *Assessment of Intercity Bus Services in Nebraska*. Retrieved from <https://dot.nebraska.gov/media/7029/intercity-bus-assessment-2014.pdf>.

¹⁵⁶ Discussion with NDOT Transit Section, May 6, 2020.

¹⁵⁷ FHWA, NDOT, and MAPA (2019). *2040 Long Range Transportation Plan*. Retrieved from <https://mapacog.org/projects/lrtp/>.

¹⁵⁸ Siouxland Interstate Metropolitan Planning Council (2014). *Siouxland Regional Transportation Planning Association (SRTPA) 2045 Long Range Transportation Plan*. Retrieved from <https://simpco.org/divisions/transportation-planning/long-range-transportation-plans-lrtp/>.

¹⁵⁹ NDOT (2019). *Development of the Nebraska Supply Chain Optimization Model (NESCOM)*.